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APP721 User manual

U.S. RTU Standard Software Ver. 2.01

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This document may change without any further notice.

1 Introduction

This manual is general for the U.S. Standard 2-Pump RTU Program, using an Flygt RTU (remote terminal unit) for the control and supervision of wastewater pumping stations equipped with one or more pumps. It incorporates the following:

- Powerful 32 bit Elan SC520 Processor
- 16 MB Flash Drive Data memory
- 16 MB DRAM Program memory
- 16 LED Alarm panel
- 2 Line x 20 Character LCD Display

The RTU can be equipped with modems and a separate battery backup supply as options. The RTU standard software contains:

- Parameter-controlled functions for pump control
- Alarm functions
- Operating statistics
- Performance monitoring
- Communication capabilities to the Central system and/or Paging system.

1.1 Menus

The menus are grouped according to function. The first menu in each group also serves as a group header. There are three levels of menus:

1. **User** menu for reading the operating data. These menus are always visible.
2. **Parameter** menus for entering or changing common operating parameters.
3. **Service** menus for settings carried out by the service personnel upon startup.

1.2 Browse the Menus

Browse the menus according to this table.

What do you want to do?	Press this button:
Scroll backwards one menu at a time.	
Advance one menu at a time.	
Enter a submenu, or edit a changeable value	
Exit a submenu, or cancel	

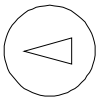
1.3 Change a Parameter

Open parameter: Follow these steps to open any type of parameter for changing.

Step	Action
1	Browse to the relevant menu according to the instruction above.
2	Press the OK button.  Result: A flashing cursor is shown in the display, telling that the change of parameter is allowed

Change: The numerical parameters can be changed position by position in the window menu. The parameters with text can only be changed by selection of alternatives.

Change the different parameters according to this table.

What do you want to do?	Press this button:
Go to the left one digit on the numerical parameter	 Left arrow
Go to the right one digit on the numerical parameter	 Right arrow
Decrement the numerical digit by one, or advance among a set of alternative parameters with text	 Down arrow
Increment the numerical digit by one, or go back among a set of alternative parameters with text	 Up arrow

Save or exit: Save or exit according to this table.

What do you want to do?	Press this button:
Save the changed value.	
Exit the menu without saving the value.	

Result: This table shows possible messages in the display after you have saved a value, and if you need to perform further action.

Message	Description	Action
Value stored	The value has been saved.	- -
Low value (xx)	The value is below the permissible range.	Enter a higher value.
High Value (yy)	The value is above the permissible range.	Enter a lower value.

Reference: For more information about permissible range of value, see Appendix C- List of Menus.

1.4 Alarm panel

This section describes the standard function of the alarm panel. In some special programs the use of the alarm panel may be different.

Table: This table gives an overview of general led on the alarm panel, indicating the most common alarms.

Reference: For specific information about the led see 17.1 Alarm panel .

When an alarm is activated, the led flashes until the alarm have been acknowledged.

Signal from LED	Alarm status	Description
A steady beam	Active	The alarm condition remains, acknowledgement has been performed.
Continuous flashing	Passive	The alarm condition is gone, but acknowledgement has not been performed.

Alarm Handling: Follow the instructions in this table when an alarm is activated on the alarm panel.

What do you want to do?	**Press this button:**	**Result/Comment**
Shift between remote local alarm		When remote is on, alarms will be transmitted to the central system, or a cell phone through SMS.
Acknowledge a new alarm		The alarm is acknowledged, but is not removed from the alarm log.

Note! Acknowledgement with the button affects only the indication on the alarm panel, not the alarm in the alarm log or in the alarm buffer.

2 Start the RTU

Follow these steps to prepare for the start.

Step	Action
1	Connect the RTU as described in the general installation instructions supplied with the unit. Reference: For description of signals, see 21 "Appendix F - Connection".
2	Complete the connection procedure by switching on the unit.

Result: A LED on the front panel indicates the operational status of the unit.

Operational status LED on front panel.

Table: This table shows which light the LED may have and what it means.

Light	Cause
Steady red	The RTU is starting up or in service mode only
Flashing red light	The pump control is not running.
Steady green light	Set points have been entered and the RTU is running.

2.1 Personal safety

! Ensure that personnel cannot come in contact with live cabling or terminal blocks in the course of connection or service work. Maximum caution must be exercised when working on the digital outputs.

2.2 Configuring the RTU

The RTU requires certain parameters and set points to operate. It is supplied with a number of default settings, but some of the menus must be entered by the user, beginning with the settings of a number of menus in the first menu group. Most of these can be entered from the central system. Reference: See 18 Appendix C - List of menus for a complete list.

Table: This table gives an overview of the common menu items that may be altered.

Menu	Instruction/ Comment	See
Display	Select "Service" to show all menus.	3.1.1 Selecting access level
Language	Select the language to use in the RTU.	3.1.2 Selecting language
Enabling Control Functions	Choose any additional connected equipment, such as Square D ATV61 VFD, Square D ATS48 SS, ITT PumpSmart PS200 VFD, or ITT PAN312 Power Analyzer	
Invert inputs	Select the digital inputs connected to the RTU that are "inverted" / active low.	3.2.2 Inverting inputs
Select connected signals	Select signals connected to the RTU inputs and outputs. Note! These set-points are sensitive. Be careful to select the correct input and output or connected equipment may start unpredictable.	3.2.3 Selecting input functions 3.2.4 Selecting output functions
Communication setup	Needed only if the station uses any type of communication, either to a central system or paging system.	
Station number	Must be unique to each RTU. Used by the central system to identify the unit. The number may vary from 1 to 899.	3.3.2 Station number
Communication mode	The settings are necessary to enable RTU communication. • Select the modem/method used to communicate with this station. • Only change the setting for the used serial menu.	3.3.3 Communication selections
DTE speed	Select the communication speed to the modem or other equipment.	3.3.4 DTE speed selection

Protocol	Select protocol used. AquaCom, Comli, Modbus, CCom or GPRS AquaCom. Use AquaCom to the central system, AquaView.	3.3.5 Protocol selection

Other parameters for communication that may be required to be changed include various delays used in special communications like radio or GSM.

Menu	Instruction/ Comment	See
Level sensor	Select the range used by the level sensor. This is the only value needed to use the sensor if a normal level sensor is used. To get accurate flow and pump control, other set-points are needed.	5.1.1 Level transmitter adjustment
Start and stop levels	Set these values to enable basic pump station control	7.1 Start and stop levels
Alarm distribution, precipitation measurement, pump operation, capacity measurement, etc.	It is optional to enter set-points for these functions and much more, depending on which RTU program is used. These settings can also be entered from the central system.	Next chapter
Date and time	**NOTE!** Date and time must be set for the RTU to control the station.	Next section

2.3 Setting the time and date and commissioning the RTU control.

If the RTU is cold started

- It will not control and monitor the station
- The operating status LED will be red and blinking and
- The menu showing date and time will only show question marks.

Instruction : Follow these steps to enter date and time.

Step	Action
1	Navigate to General Setup, Press OK twice
2	Edit the time and date.
3	Press OK to save the value, even if the original time and date is right.

Result: The operating status led changes to green and displays a steady light.

3 System functions

3.1 General

3.1.1 Selecting access level

In this menu you select if you want to access all menus or only the read-only menus. There are three levels of access.

```
Display menu
User
```

Showing only user menus.

The first is the user level and it is default. It will show only some operational data and sensor values.

```
Display menu
Parameter
```

Showing parameter menus.

The second is the parameter level. It will show all menus that you need to control the station including the user menus.

The third level is the service level.

```
Display menu
Service
```

Showing service menus.

Service mode allows you to change all setpoints in the unit (including communication). The service selection will return back to either parameter or user mode five minutes after the last use of the display.

3.1.2 Selecting language

For RTUs with multiple language options, it is possible to change the operating language. This setting will also change the language used for alarm texts sent to the paging system.

```
Language
English
```

The language menu set to English.

3.1.3 Enabling Advanced Options

This function allows advanced RTU functionality, such as direct communication with SIOX expansion modules, or MODBUS communication to various equipment through COM3.

```
Enable Functions
Not Used
```

The menu to select showed functions.

Available options:

Option	Description
VFD using SIOX	Expansion Cards are used to send 4-20mA speed reference signals to connected VFDs
ATV61 / 71 w/ MODBUS	Direct MODBUS communication through COM3 is used to control ATV61 / 71 drives and collect monitoring information
PAN312 Connected	Direct MODBUS communication through COM3 is used to collect 3-Phase Voltage, Amerage and Power information from an PAN312 Power Analyzer
ATS48 SS w/ MODBUS	Direct MODBUS communication through COM3 is used to control ATS48 Soft Starters and collect monitoring information
PS200 VFD w/ MODBUS	Direct MODBUS communication through COM3 is used to control PS200 drives and collect monitoring information

3.1.4 Program information

3.1.4.1 System information

The system ID tells version number of the system program inside the RTU. Use this information to identify the program if you contact Flygt service.

```
System:  5.02.00
ProgID:    843059
```

System and program identity menu.

3.1.5 Program mode function

The program mode function is used when maintaining the RTU. It is possible to restart the RTU, start remote service and load/save set-points.

3.1.5.1 Run mode

```
Program mode
Normal run
```

Run mode changeable from AquaView.

It is possible change the run mode by sending the set-points from AquaView. This is sometimes very useful but it opens a security risk. To prevent the change of this menu set the run mode to Normal locked. This will prevent the possibility to cold start the RTU from the central but will also prevent the possibility to use remote services. Other remote functions from AquaView are not affected by this menu.

```
Program mode
Normal locked
```

Run mode not changeable from AquaView.

It is still possible to activate remote service and cold/warm start the RTU if the menu is changed locally on the RTU.

3.1.5.2 Restarting the RTU

The program mode menu is used if a situation occurs in which the RTU must be cold or warm started. The command will be done shortly after the option is selected, making it possible to cancel the command by changing the menu again.

```
Program mode
Warm start
```

Warm starting the RTU.

Restarting will take up to 1 minute depending on the program.

```
Program mode
Cold start
```

Cold starting the RTU.

> ! Remember that the set-points will be lost and must be re-entered following a cold start.

3.1.5.3 Remote service

Remote service of the RTU is possible if the RTU is called. This includes loading a new program over the telephone line.

```
Program mode
Remote load COM3
```

Remote load on COM3.

Select the COM port to be used in the program mode menu. Note! The RTU will not control the station during remote service.

> ! This service must be done by qualified personnel.

3.1.5.4 Save/load set-points

It is possible to save and load set-points to a file in the RTU. Use this function to protect the set-points from being lost in a cold start. Once you saved the set-points they will be used to start-up the RTU in a cold start. The cold-start will lose alarm, trend and report data, but not control parameters and the RTU will continue to control the station.

Set-points will be saved automatically at midnight if changed.

Another way of using this function is if you experiment with set-points and you want to be able to return to the original set-points. It is also possible to use this option if you want to copy set-points from one RTU to another but only if the two programs are identical (have the same Program ID)

```
Program mode
Save setpoints
```

To save the set-points.

Remember that when loading the set-points the program will assume the same logical state as when they where saved.

```
Program mode
Load setpoints
```

Loading set-points.

! The load set-points does not work if a new RTU program has been uploaded and the old setpoint file remains. This can cause a program crash or other undesirable consequences.

3.1.5.5 Save default set-points

It is possible to change the default values used by the RTU at a cold start-up. This may be used to create a regional variant of the set-points to make the installation easier.

```
Program mode
Save defaults
```

To save the default values.

To create a regional file first set-up the RTU with desired values. Next select the command and the RTU will create a file "Abackup.IMG". This will contain all set-point values. Download the file to your PC and use this file in the installation of future RTUs.

! It is extremely important that the file is installed in the exact same program with the same program ID otherwise the RTU may crash.

3.1.6 Password

Two password menus are included in the RTU to prevent unauthorised personnel from altering settings in the RTU. The function is activated by entering the appropriate four-digit code in the New password menu. When an operator wishes to alter a setting in any menu using the buttons on the front panel, the code must first be entered before the data can be changed.

```
Enter password
   0
```

This is the password menu that appears if the password is activated.

To turn off the password function, enter 0000 as a new password.

Remember that unauthorised personnel must also be prevented from changing settings from the central system to ensure full protection against unauthorised alterations.

3.2 Physical setup

The programs use flexible inputs and output digital signals which allow the user to select input activation condition (Normally-open or Normally-closed contacts) and function for most of the signals.

These settings are required to configure the RTU to work with external equipment.

3.2.1 Viewing Input / Output Status

It is possible to view the status of the digital inputs and outputs connected to the RTU.

```
Input Status
0100100000000000
```

Inputs 2 and 5 activated.

```
Output Status
11000000
```

Outputs 1 and 2 activated.

Switch the menu input to Write mode to get a text description of which digital input you are viewing.

3.2.2 Inverting inputs

Closed contacts normally activate the digital input signals. The signal function can be inverted in the menu if input is to be activated by open contacts.

```
Invert Inputs
0000100010000000
```

This is the invert inputs menu with two inputs inverted.

The inversion of input signals is only possible on inputs directly connected to the RTU. Inputs connected to SIOX units cannot be inverted. In this case use an interposing relay.

3.2.3 Selecting input functions

Some inputs in the program are selectable. The possible options on an individual input depend on position and program. See 21 “Appendix F - Connection” for more information about your program.

Some input functions and a short description of the function are included in the table below. See individual function descriptions for more information.

Available options depend on the program used.

Input function	Description	See
Not used	The input is not used. Connected signal will be ignored.	-------
Spare alarm	A spare alarm is created on the input. The alarm code can be entered to match to the connected equipment	-------
Tripped motor	Pump tripped. This input will create an alarm and stop the pump.	-------
Off switch	Pump turned off. This will stop the pump and prevent the program from starting it.	-------
Leakage	Leakage alarm. This will not normally stop the pump.	-------
High temp.	High pump temperature alarm. This will stop the pump.	
High float	High level float. This function gives an alarm and may also start the pumps.	7.3.1
Low float	Low level float. This function stops the pumps and gives an alarm.	-------
Overflow sensor	Overflow sensor input. This will start the overflow calculation. It is possible to use the level sensor to trigger the overflow but with lower accuracy. To do this make sure the overflow input is not used.	8.5
Power fail	Power fail sensor. This will stop the pumps.	4.2
Intruder sensor	Intruder sensor or switch. This input will enable the intruder alarm.	4.4
Personnel onsite	Personnel on site input. This will activate the personnel on site protection function.	4.3
Intruder + personnel.	Personnel on site combined with intruder sensor. It is possible to combine these two inputs to save one input.	4.3 and 4.4
Energy pulse	Energy pulse counter input.	10.2
Counter pulse	General pulse counter. May be connected to a rain sensor.	11
Timer x	General timer input. Used to create various timer functions together with an output.	12
Generator Running	Generator Running Signal	-------

Input function	Description	See
Generator Warning	Generator Warning Signal	-------
Generator Fail	Generator Fail Signal	-------
Generator Low Fuel	Generator Low Fuel Signal	-------
Chemical Feed Failure	Chemical Feed Failure Signal	-------
Odor Control Failure	Odor Control Failure Signal	-------
Block Pumps	Signal will block pumps without alarm when active	-------

3.2.4 Selecting output functions

Some outputs in the program are selectable. The possible options on an individual output depend on position and program. See 21 “Appendix F - Connection” for more information.

The output functions and a short description of the function are included in the table below. See individual function descriptions for more information.

Available options depend on the program used.

Output function	Description	See
Not used	The output is not used. Contacts will remain open.	-------
High level	Activated by a high level alarm.	5.1.3
Extrem high lev.	Activated by an extremely high level alarm.	-------
Low level	Activated by a low level alarm.	-------
Extrem low lev.	Activated by an extremely low level alarm.	-------
Generic analog x	The output is controlled by the generic analogue signal.	5.3.4
Remote blocked	The output is activated when the RTU gets remote blocked by another RTU.	9.2.2

Output function	Description	See
Alarm pulse	One pulse on every new alarm.	3.5.3
Alarm status	Shows the status of alarms. Low – no alarms, pulse – active not acknowledged alarms, high – active alarms.	-------
Alarm active	Contacts close if there are any active alarms.	-------
Flush valve	Output is activated by the flush valve function.	7.5.4
Timer x out	Activated by the Timer functions.	12
Watchdog	The output is high when the program has set-points and runs properly.	-------
Remote x	The output is controlled by the user from SCADA.	-------
Buzzer	The output is used by intruder alarm and personnel functions. The buzzer is activated to inform the user when the alarms is turn on/off and when working time has expired.	4.3 and 4.4
Siren	Intruder alarm or personnel alarm. Connect to a siren.	-------
Overflow	Activates on overflow condition	-------
Buzzer+siren	Buzzer and siren combined.	-------
Volume pulse	One pulse for each amount of outflow/inflow/overflow volume.	8.2
Common Alarm	Selectable conditions to activate a Common Alarm relay	-------
Pump 1 Failure	Selectable conditions to activate a Pump 1 Failure relay	-------
Pump 2 Failure	Selectable conditions to activate a Pump 2 Failure relay	-------
APF Active	Output is closed during APF Cleaning Cycle	-------
Transducer Fail	Output is closed when Sensor Fault is detected	-------

3.2.5 Pump Failure Alarms

It is possible to select some outputs to have the function “Pump X Failure”. There is a list of possible pump failure conditions that can contribute to this alarm by selecting a 1 in the column digit or 0 if the condition should not close the common pump failure contact.

3.2.6 Common Alarm Output

It is possible to select some outputs to have the function “Common Alarm”. There is a list of possible common alarm conditions that can contribute to this alarm by selecting a 1 in the column digit or 0 if the condition should not close the common alarm contact.

3.3 Communication setup

The RTU can communicate with the central station and paging systems in several different ways. Select communication function depending on connected equipment and desired function.

The programs are equipped with a very flexible communication setup. It is possible to connect various modems and use several protocols.

These settings are only required if the RTU should communicate. A stand alone RTU does not require any changes in this section.

3.3.1 Communication status LED

Underneath the display of the RTU there is a symbol of two telephone handsets with a communication status led.

Communication status led.

Table: This table shows the different lights of the communication status led and what the colours mean.

Colour	Description
Green	The RTU receives data, or MODBUS telegrams sent
Red	The RTU sends out data, or MODBUS telegrams received

3.3.2 Station number

To enable the central system to contact the station and get the status data for the picture you have to enter the correct station number. This number has to be the same as in the central system.

```
Station Number
 50
```

This is the station number menu.

Valid station numbers range from 1 to 899. If MODBUS RTU Protocol is used limit station ID's to 1-247 (this range is supported by the MODBUS RTU standard)

3.3.3 Communication selections

In the communication menus the following selections are available.

Serial menu	Alternative	Function and description	DTE speed
COM 1	Not used	No equipment on COM1.	
	TD22 V22	External TD-22 working in V.22 mode.	1200-4800
	TD22 V.22bisLAPM	External TD-22 working in V.22bis mode with compression and error correction.	1200-4800
	TD22 V23 dial.	External TD-22 working in V.23 mode.	1200
	(TD22 V23 fix.)	Not recommended*. External TD-22 working in V.23 fixed mode.	1200
	TDW33 V.90	External TDW-33 working in V.34 mode.	4800-38400
	TDW33 V.90 X1	External TDW-33 working in V.34 mode. No busy tone detection.	4800-38400
	TDW33 V.90 LAPM	External TD-33 working in V.34 mode with compression and error correction.	4800-57600
	RS232 half dup.	RS232 half duplex.	300-57600
	RS232 full dup.	RS232 full duplex.	300-57600

Serial menu	Alternative	Function and description	DTE speed
	Siox RS232	External Siox driver K32.	Only 4800 or 19200
	Alarm printer	Alarm printer. ASCII protocol.	1200-57600
COM 4	Not used	No equipment on COM4.	
	RS232 half dup.	RS232 half duplex.	300-57600
	RS232 full dup.	RS232 full duplex.	300-57600
	Alarm printer	Alarm printer. ASCII protocol.	1200-57600
	User def. 0	User configuration 0 defined in modem. (AT Z)	300-57600
	Factory set. 0	Modem factory configuration 0. (AT &F)	300-57600
	User def. 1	User configuration 1 defined in modem. (AT Z1)	300-57600
	Factory set. 1	Modem factory configuration 1. (AT &F1)	300-57600

3.3.3.1 Modem TD-22

Use one of these settings if the RTU is delivered with the Westermo TD-22 modem. Select V.23 when the modem shall communicate with CCC0502/0503 modems. Select V.23 fixed when the modem shall communicate with CCD0502/0503 or other TD-22 modems on a fixed line. V.22 should be used to communicate with other Hayes modems.

*

Using TD-22 in V.23 mode is not recommended. The modem is initialized by the RTU and this fixed mode cause the possibility to initialize the modem again to be lost. If the modem loses power the communication is lost. It is therefore highly recommended to connect the TD-22 modem to the same power supply as the RTU if this communication mode is used. This will cause the modem to be initialized safely. A better method is to set the TD-22 modem to V.23 mode using the DIP switches inside the modem and use RS232 half duplex as communication mode.

3.3.3.2 Modem TDW-33

Use one of these settings if the RTU is supplied with the TDW-33 modem.

```
Communic. COM1
TDW33 V.90 X1
```

Communication selected to TD-33 using option X1.

The option TD33 X1 is used when the modem has problems to detect the telephone system dial tone.

3.3.3.3 Modem TD-23

Use the option for RS232 half duplex if the modem TD-23 is used. Set speed to 1200 bit/s.

3.3.3.4 RS232 full duplex

Use this option for point to point communication on a fixed line cable together with Mtc-Com, AquaView or GPRS AquaCom. A null modem or a special null modem cable should be used in this communication.

This option is also used for modems emulating a RS232 line using control signals. This is the preferred option for using modem TD-22 in V.23 fixed mode.

3.3.3.5 RS232 half duplex

Use this option for multi-drop communication using TD-22 or TD-23 on a fixed line cable together with Mtc-Com or AquaView.

3.3.3.6 User defined modems

It is possible to connect other modems to the RTU. In this case the modem needs to be configured using a PC before installation. The configuration should be saved in the internal memory area 0 inside the modem using the command “AT E0 V0 &W0”. The modem will then later on be initiated with the command “AT Z” to recall the saved configuration. See separate documentation for specific modems.

```
Communic. COM4
User def. multid
```

Communication selected to a user defined multi-drop modem on COM4.

It is possible to run the user defined modem in either multi-drop mode or point-to-point mode. Multi-drop mode is used for fixed line modems.

3.3.3.7 Alarm printer

The alarm printer is connected to COM1 usually with 1200 bps. Use 8 bits 1 stop bit and no parity in the printer. Used character table is “MS-DOS 850”.

3.3.3.8 Other information on modems and connections

The line speed depends on the initiation string, line quality and DTE speed. Changing the DTE speed will not always change the line speed.

All modems besides PC card modems are connected to COM1. See the modem documentation for cabling specifications.

When the communication mode is changed then the RTU will automatically restart after a few seconds to reinitialize the COM port.

3.3.4 DTE speed selection

Select the DTE speed for the used menus. The DTE speed is the speed on the serial menu connected to the RTU.

```
Speed COM1
 9600 bit/s
```

DTE speed on COM1 selected to 9600.

If a modem is used this is the speed between the modem and the RTU. This is not the same as the line speed between the two modems.

! It is highly recommended that the DTE speed is equal or higher compared to the line speed.

3.3.5 Protocol selection

Select protocol to use on the serial menus.

```
Protocol on COM1
AquaCom
```

COM1 selected to use AquaCom.

Supported options are:

Menu option	Comment
None	No protocol used. Use this if Siox or alarm printer is selected.
AquaCom	AquaCom dialled or AquaCom fixed. Dialled or fixed mode is selected automatically depending on connected modem.
Modbus	Modbus fixed.
Comli	Comli dialled or Comli fixed.
Ccom	Ccom fixed.
GPRS AquaCom	AquaCom using GPRS.
Other	Other option. This will make the menu change to enter a protocol code. See protocol code below.

! It is not possible to select two dialled serial modems using AquaCom protocol at the same time.

Code	Function	Comment
0	None	No Special protocol selected.
1	Alarm printer	Alarm printer is connected. It is not necessary to select this option if alarm printer is selected as communication mode.
2	Service	It is possible to service the RTU using other COM ports than COM2 using this option.
3	AquaCom slave	Same as menu option.
4	Modbus slave	Same as menu option.
5	Comli slave	Same as menu option.
6-7		Not normally used. Used for master communication and others.
8	Siox	Siox is connected. It is not necessary to select this option if Siox is selected as communication mode.

Code	Function	Comment
9-12		Not normally used. Used for master communication and others.
13	Ccom slave	Same as menu option.
14		Not normally used. Used for master communication and others.
15	MAS Modbus Slave	Use this protocol code for communication with MAS.
16	Unpolled Fixed-line	Used for Radio or GPRS iConnector over AquaCom Central communication.
17	Modbus multi slave	Makes it possible to connect more than one Modbus slave.
18	GPRS AquaCom	Select this for AquaView Central communication over GPRS.
19	DNP3	Used together with another SCADA system.
20	IEC60870-5	Used together with another SCADA system.
21-22		Not normally used.
23		TAP France
24		SMS-Minitel
25		Airlink-SMS USA

3.3.6 Communication time-outs and delays

Avoid changing these values unless absolutely necessary. The communication may be unstable or cease to work if any of these values is set to a faulty value.

3.3.6.1 RTS delay

This is the time required by the modem to stabilise the signal before it starts to transmit data. In certain cases, the RTS delay must be changed to permit communications to work satisfactorily.

```
RTS delay COM1
 200 ms
```

This shows RTS delay set to 200 ms on COM1.

The RTS delay is also used in dialled up communication as a general delay between telegrams. In dialled communication it is rarely used and usually is set to 0 ms.

! Communication may be put at risk if this value is too high. A suitable value is between 100 and 300 ms.

3.3.6.2 Time-out telegram

This setting controls how long the program will wait for an answer from central. A timeout may occur if a long time elapses before a response is received from the central system or another remote terminal unit. The response time in the menu can be increased to prevent this; however, it is recommended that this value (8 seconds) should not be changed unless absolutely necessary.

3.3.6.3 Time-out character

This setting controls how long the program waits for a new character. In some applications where messages are sent in packages there can be gaps. This concern particularly radio communication where you can get time-outs. To avoid them increase the value in this menu.

3.3.6.4 Delay before sending OK

This is the time the program waits from starting a modem communication until sending the first OK message. In special situations where radio modems are used it may be necessary to increase this value if the communication line is not directly ready.

3.3.6.5 Modbus delay

Delay between telegrams in Modbus and Comli, master and slave.

3.3.6.6 Time-out Modbus

Delay after each telegram if an answer from slave is not detected from the RTU.

3.3.7 Max telegram size

It is sometimes necessary to reduce the size of the telegrams sent between the RTU and the CS, especially if radios or cellular modems are used. It is possible to set the size of some of the telegrams using this function.

```
Max telegram
size 2000 byte
```

Telegram size set to default value.

3.3.8 Trend sample

3.3.8.1 Sample time

The RTU continuously samples trend data like levels, flows and currents. The sample rate of this data may be changed in one minute intervals between 1 and 30 minutes. The default sample rate is 5 minutes.

```
Trend sample
time  1 min
```

Sample rate set to one minute.

If the sample rate is changed to one minute the same change has to be done in the set-up of this station in AquaView. A zero in this menu will work as the default value, five minutes.

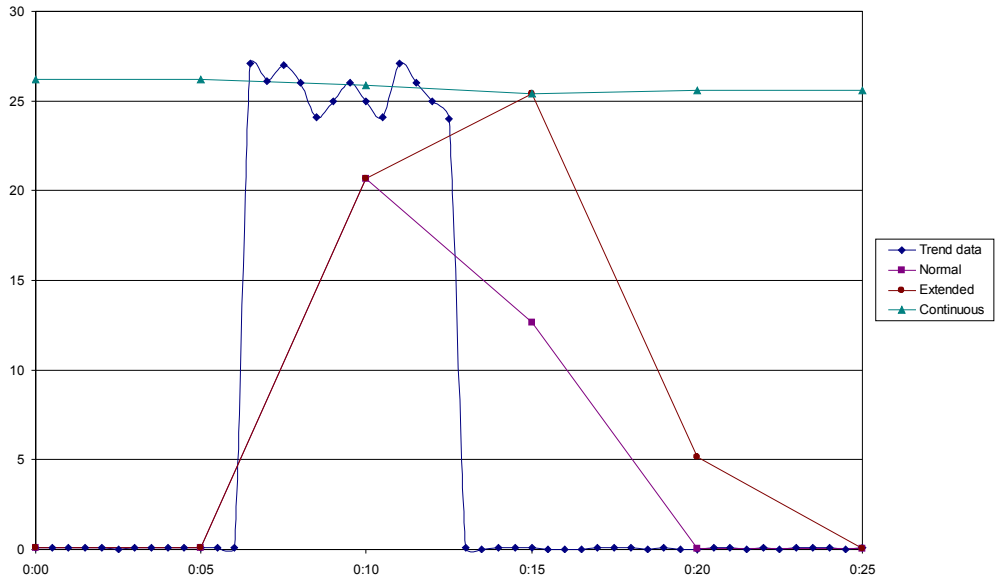
3.3.8.2 Sample method

The way trends are sampled in the RTU may be changed. In some stations with rapid pump-cycles even changing the trend sample rate to one minute may be too long. In this case it is possible to extend the sampled trend in two ways.

```
Trend method
Extended
```

Extending the trend.

This function changes the sampling of trend values that are dependent on pump operation. Affected trends are: Pump currents, pump flow, energy effect and specific energy.



Resulting trend curves in AquaView.

Normal	Trend is sampled 10 times during the selected time. The average is calculated and shown in the resulting trend.
Extended	The trend is sampled during the pump operation. The average value is

used to extend the stored trend. The resulting trend will be guaranteed to show at least one sample with the true maximum value.

Continuous — The trend is sampled during the pump operation. The average is used to store trend during non pump operation resulting in a continuous trend curve.

3.3.9 Remote control timeout

The pumps can be remote-controlled from the central system. The option of starting and stopping the pumps manually is available on the status picture. When remote control is selected, the RTU pump control function is inoperable. When a pump is started remotely, pump control returns to auto mode when the picture is closed after this delay time has been reached.

```
Rem. Ctrl. Timeout
   0 min
```

The remote break delay default value.

A pump that is started with a remote command will always stop at the normal stop level or low level float. It will also stop on any pump failure. The pump will then return to automatic mode.

A pump that is stopped with remote command will stay stopped until the status picture is closed and the remote break delay time has elapsed. The pump will then return to automatic mode and start as normal.

! Care is always required when operating the pumps manually from the central system.

See 20 "Appendix E - Central system" for information on all objects to be controlled remotely.

3.3.10 Modem Answer Delay

This is the delay between the first ring signal and RTU answering the data call.

! Only set this time if the telephone line is also connected to a normal telephone. Setting this value in many stations will increase the data collection time in the CS.

3.3.11 Ethernet Services

The following sections allow a user to configure services available on the RJ45 port present on the APP unit.

```
Ethernet services
######
```

3.3.11.1 HTTP

Selecting this options allows the use of embedded web pages to view station information, alarms, and view / change setpoints in the RTU

3.3.11.2 Telnet

Selecting this option allows the use of Telnet services for file transfer to/from the RTU

3.3.11.3 TFTP

Selecting this option allows the use of TFTP (Trivial FTP) services for file transfer to/from the RTU

3.3.11.4 MODBUS TCP Server

Selecting this option allows the RTU to be polled using MODBUS TCP protocol for information transfer to another SCADA system or RTU.

3.3.11.5 AquaCom TCP Client

Selecting this option allows the RTU to function as a data concentrator by polling data from other APP RTUs in the system. Currently used only in highly customized applications.

3.3.11.6 AquaCom TCP Server

Selecting this option allows the RTU to be polled from Aquaview using TCP communication.

The following items may need to be configured depending on the connection type:

Menu	Description
Default Gateway	Enter the Default Gateway of the router / connecting hardware
Local IP Address	Enter the IP Address to be used by the RTU
Remote CS IP Address	Enter the IP Address of the Central Server
Subnet Mask	Enter subnet mask expected by router or connecting hardware
Telnet Password	Enter password to be used for Telnet service

Service Password Web	Enter password for Service level Web Tool
User Password Web	Enter password for User level Web Tool

3.4 General alarm information

The RTU may generate an alarm in different situations as part of pump station monitoring. The alarm may be due, for example, to the absence of an operating response, but may also be activated by internal monitoring functions. See 19 "Appendix D - List of alarms" for a list of the alarms in the RTU.

3.4.1 Active/passive alarm types

Two alarms are generated in most alarm situations; one when the condition is fulfilled i.e. when the alarm is activated, one when the alarm is passive. In a few alarm situations, the alarm is generated only when the condition is fulfilled. One example of this second type is the "Warm start" alarm.

3.4.2 Alarm priorities

An RTU alarm can be assigned one of four different priorities, A, B, C or D. In some special cases the alarm may also have priority E and H. In most cases, these are used as described below. The Alarm distribution menu described below determines the alarms that are to be transmitted.

Priority	**Shown in the RTU alarm log**	**Sent by RTU to central system or paging**	**Sent by central system to paging**	**Comment**
A	Yes	Yes *	Yes	Is assigned to the most important alarms.
B	Yes	Yes *	No	Is assigned to those alarms which, although not as important, must be reported continuously to the alarm recipient.
C	Yes	No *	No	Usually assigned to those alarms that are only to be recorded locally in the RTU.
D	Yes	Yes *	Yes	Works as A alarms with the difference that they are transmitted to the pager only during working hours.
E	Yes	No	No	Is used by the RTU when the Local alarm mode has been selected. This priority is not

Priority	Shown in the RTU alarm log	Sent by RTU to central system or paging	Sent by central system to paging	Comment
				selectable for individual alarms.
F	No	No	No	Used to hide alarms from showing up in the RTU.
H	No	No	No	Is assigned to alarms working as events. This events is not transmitted automatically, they are instead collected as data.

* The actual priorities transmitted to the central system or paging may be changed. See 3.6.3 "Alarm distribution, selecting alarms for transmission".

See 19 "Appendix D - List of alarms" regarding alarm priorities following a cold start.

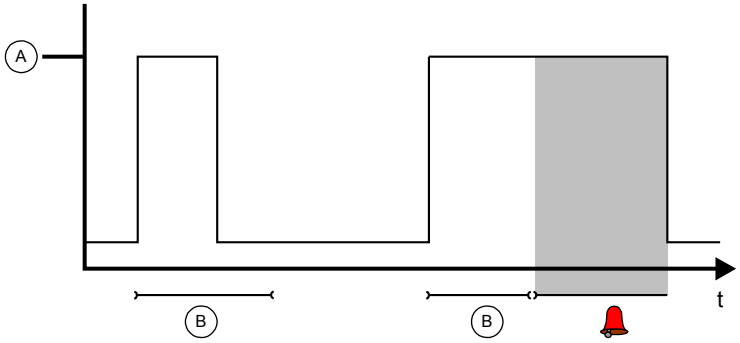
It is possible to change the alarm priority and alarm code locally on the RTU. See 3.6.6 "Changing alarm code and priority".

3.4.3 Alarm activation

Most alarms are in service directly when the RTU is commissioned. The monitoring of analogue values requires alarm limits to be entered for them. The various alarm limits and their respective functions are described in other parts of this document.

3.4.4 Alarm delay

Each alarm can be delayed for a period during which the alarm condition shall be fulfilled before the alarm is generated. A delay is used to ‘filter out’ disturbances of a temporary nature in the system. No general rule can be given regarding a suitable delay since the setting will be dependent on station configuration. However, approx. 10 seconds is a normal setting.



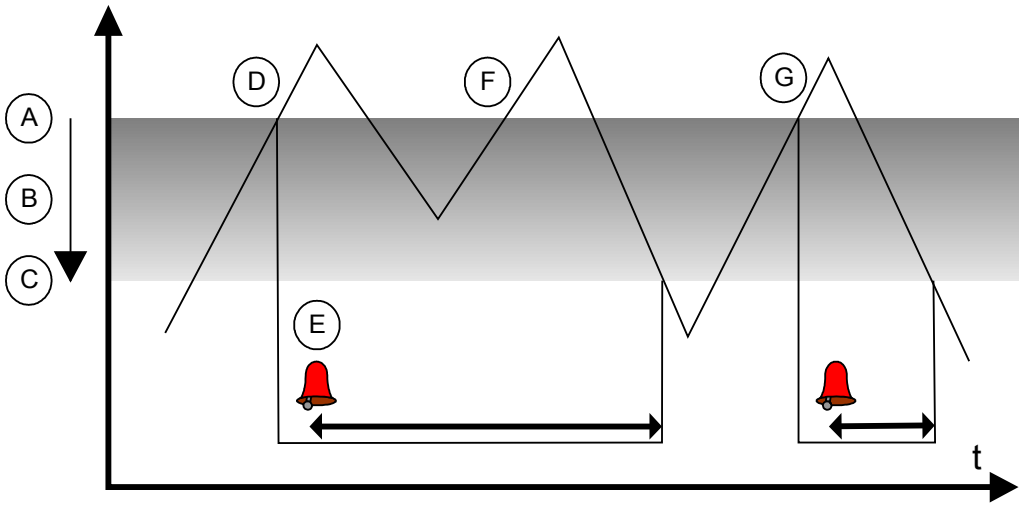
A = Alarm condition present B = Alarm delay

In the above example, an alarm is not generated on the first occasion since the alarm condition is not present for long enough. However an alarm is generated in the second case since the alarm condition is still present when the delay period expires.

Flygt RTU's can be set with different delays for general alarms, high level alarm, low level alarm as well as power failure alarms. If a central system is installed, alarm delays can also be set by means of the central system set point function.

3.4.5 Alarm hysteresis

Alarm hysteresis is another method of filtering out undesired, superfluous alarms. Hysteresis, which is applied to analogue alarm limits, specifies the amount by which the measured value must change for an alarm to be deactivated.



Example of high level alarm with hysteresis and alarm delay.

In the above example, the High level (A) alarm is subject to a limit. The shaded area (B) shows the hysteresis range. If an alarm occurs, the level must fall below the lower hysteresis limit (C) before it can be repeated. The alarm condition is fulfilled at (D), although the alarm itself is generated a little later (E) since it is normally subject to a delay. The alarm remains active while the level remains in the shaded, hysteresis area. Thus, a new alarm is not generated at (F), even though the level has again risen above the high level limit, since it has not fallen below the lower hysteresis limit in the interim. However, at (G), the alarm condition is again fulfilled and an alarm is generated after the specified delay.

Hysteresis operates in similar manner for a Low level alarm. In this case, the level must exceed the upper hysteresis limit before the alarm can be repeated.

The alarm hysteresis is set via menus in the appropriate group menu and can also be set from a central system.

3.5 Local alarm functions

This chapter describes how alarms are used on the RTU locally.

3.5.1 Alarm logging

An alarm generated when the alarm condition is fulfilled is recorded in the alarm log, which accommodates 1000 alarms. If a greater number of alarms are generated, the earliest alarm will be overwritten. You can view the alarm log by displaying the Alarm log menu.

```
ALARM LOG
                0
```

The alarm log menu.

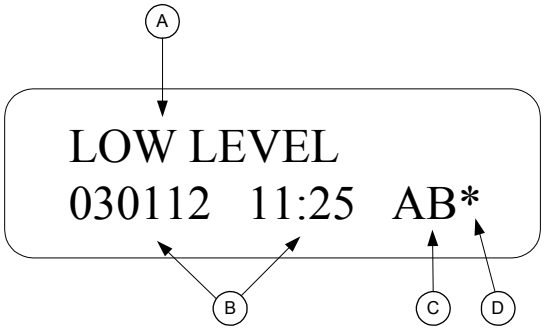
3.5.1.1 Browse the alarm log

Follow these steps to browse the alarm log:

Step	Action
1	Display the Alarm log menu, and press OK. Result: The first alarm is shown in the display.
2	Browse the log with the Up and Down arrows.
3	To delete alarms, press OK. Select Current or All and press OK

Result: The alarm text, consisting of a maximum of 20 characters, is shown in the display of the RTU and recorded in the alarm log.

Example: This is an example of the alarm text.



Alarm displayed on the RTU.

Table: This table gives an overview of alarm text.

Field	Description	Comment/Reference
A	Alarm text indicates that it is an activation alarm, generated when the alarm condition is fulfilled.	When the condition is no longer fulfilled, the alarm is not stored in the alarm log.
B	Date and time of alarm	- -
C	Type and priority (A, B, C or E) assigned to the alarm.	For explanation, see 3.4.2 Alarm priorities.
D	* indicates that the alarm has been transferred to the central or to the alarm system.	For further information, see 19 Appendix D - List of alarms.

Note: Active alarms are not cleared from the log or the central system. Alarms are sent to the central system independent of the alarms in the alarm log.

There is no need to delete alarms to make space for new alarms. If the alarm buffer becomes full, the oldest alarm will be overwritten. The only reason to delete alarms is to make it easier to find new alarms.

3.5.1.2 Common Alarm LED

The lowermost LED on the Alarm Panel is used as a Common Alarm LED. This means that it will begin to flash as soon as a new alarm has been recorded in the alarm log. Always scroll through the alarm log to check for new alarms when this LED flashes. When the alarm log is checked, the LED turns off if the alarm has been acknowledged from the alarm panel.

3.5.1.3 Testing alarm panel LED

The RTU incorporates a function for testing the integrity of all of the led on the alarm panel. Press and hold the alarm acknowledgement button until the LEDs begin to flash. The LEDs will revert to normal operation when the button is released.

3.5.2 Printing out alarms from RTU

A printer can be connected directly to the unit and alarms printed out as they are generated. Note that this does not include alarms received before the printer is connected.

The printer, which must be of the serial type, is connected to COM1 or COM4. Select communication mode Alarm printer in the communications menus. See 3.3.3 "Communication selections".

3.5.3 Alarm output signal

The alarms in the RTU may be indicated with an output. There are three variants on the output with slightly different functions.

Output option	Function
Alarm pulse	One pulse on every new alarm. A short pulse on the output is generated on every new active flank on A, B or D alarms. The length of the pulse may be set in a menu.
Alarm status	Shows the status of alarms. The alarm output will work the same way as an alarm LED. Low - no alarms, pulse - active not acknowledged alarms, high - active alarms. Alarms are acknowledged on the RTU panel.
Alarm active	Shows if there are any active alarms. The output will be high as long as there is an A, B or D alarm active.

Only A, B or D alarms are used with the output. If an alarm is set to C it will not affect the output.

Alarms with only an active flank and no passive flank like Warm start will not affect the output.

3.6 Remote alarm setup

3.6.1 Alarms to central system

Alarms are transmitted to the central system via a dedicated or dial-up connection. Alarms to be transmitted are stored in a buffer. If the buffer becomes full, the earliest alarm will be overwritten by the most recent but this will only happen if the connection to the central system is lost for several days.

A dial-up RTU can also be configured to call a pager directly. The selection to send to the pager is made in the telephone number by entering the special character "&" in the first position. See 3.6.4 "Telephone numbers to CS/Pager".

3.6.1.1 RTU with dedicated connection to central system (CS)

If an RTU is connected to the central system by a dedicated connection, the CS will transmit alarm queries to the RTU. Any alarms in the buffer will then be transmitted.

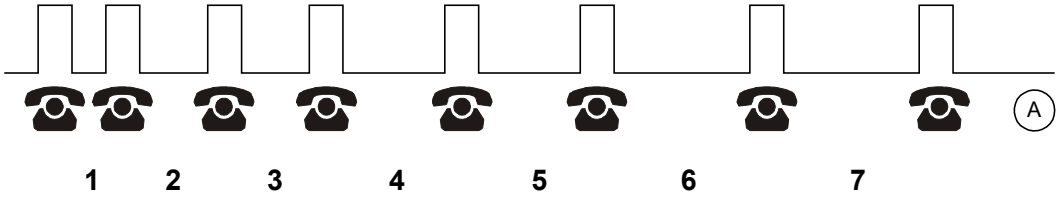
3.6.1.2 RTU with dial-up connection

In the case of a dial-up connection, the RTU will dial to the CS or pager as soon as an alarm is created. For this purpose, the alarm receiver’s telephone number must be entered in the “Telno:1 CS/PAGE” menu in the major menu group, which contains two telephone number menus.

3.6.1.3 How the RTU dials out alarms

The RTU contains two menus for telephone numbers. In the event of an alarm, the RTU rings the first number stored in the first menu. This number may go to the CS or pager. If this is unsuccessful, the unit will make further attempts to call the same number, with a pause between each attempt. The number of attempts is controlled by two menus “Number of calls CS” and “Number of calls to pager”.

When the RTU rings and the call fail, the first pause will be 1 minute long. Thereafter, the pause duration will increase by one minute on each occasion.



A = Pause

RTU alarm dial-out sequence.

If the RTU fails to transmit the alarm to the telephone number in the first menu, further attempts will be made to call the number in the next menu. If this is also unsuccessful, dialling will be blocked (A). The blocking time is set in the Pager cycle menu.

After the blocking the RTU will recommence the sequence from the beginning i.e. making new attempts to call the number in each menu. The RTU will continue to attempt to report the alarm until it succeeds.

The CS will automatically acknowledge if the alarm is successfully transmitted to the CS the alarm.

If the alarm is transmitted to a pager then the RTU will wait for acknowledge from the user. The time the RTU will wait is set in the Pager acknowledge time menu.

If the user fails to acknowledge the alarm the RTU will try the next telephone number in the sequence.

3.6.2 Alarm sending mode

An alarm can be transmitted to the central or alarm system, or simply recorded in the RTU. The appropriate setting is made in the Transmit alarm menu in the main menu group.

```
Transmit alarm
Local today
```

Alarm is only recorded locally in RTU.

Local permanent	Alarms are only recorded in the RTU. All alarms (*) get priority E and will not be transmitted to the central system.
Remote	Alarms are transmitted to the central system. The particular alarms that are transmitted will depend on the setting in the Alarm distribution menu.
Clear	May be used to prohibit alarms, which have not yet been transmitted to the central system, from being sent.
Local today	Same as "Local permanent". The selection will return to remote at midnight.

Select the Local today mode to avoid false alarms, for example when carrying out service work in the pump station.

> ! The Cold start and Personnel alarms are always transmitted to the central or alarm system, regardless of the alarm mode selection.

Alarm mode indicating lamp.

Table: This table gives an overview of the alarm modes shown through the indication lamp.

Indicating lamp	**Alarm mode**
Steady beam	Remote mode, alarms will be transmitted.
Flashes	Alarms waiting to be transmitted.
Off	Local mode, alarms will not be transmitted.

To toggle between Remote and Local Today, press the Local/Remote button.

> ! It is not possible to toggle from the Local permanent alarm mode.

3.6.3 Alarm distribution, selecting alarms for transmission

Select the priorities to be transmitted to the central/pager in the Alarm distribution menu. The default setting is to transmit A and B alarms, as well as P alarms, which represent passive alarm. Enter '1' in the positions corresponding to the transmission priorities.

```
Alarmdistrib.
1101 (ABCP)
```

Alarm distribution for transmission of A and B priority alarms, as well as passive alarms.

See 3.4.2 "Alarm priorities" for more information.

3.6.4 Telephone numbers to CS/Pager

A telephone number may contain up to 20 characters, including the type of dialling and "pause" characters.

The following characters are used to enter the telephone number correctly:

Character	Explanation
&	Used in Paging systems numbers. The '&' character must always be first in the string if this telephone number is a paging number. Otherwise the system assumes that the alarm should be transmitted to a Mtc-Com or AquaView.
T	The RTU transmits digits using tones in what is known as DTMF tone dialling, which is the most common mode. The DTMF tone dialling character must be first in the string when calling the central system but in second position in paging numbers. If the paging system uses a telephone number to the paging central and this is a paging number then do NOT use this character.
P	The RTU transmits digits by sending mechanical pulses. This should be used only if DTMF tone dialling does not work due to older types of telephone exchanges. The pulse dialling character must be first in the string when calling the central system but in second position in paging numbers. If the paging system uses a telephone number to the paging central and this is a paging number then do NOT use this character.
,	The RTU pauses for 2 seconds, e.g. to dial 0 for an outside line. A pause can be inserted at any point in the telephone number. Several pauses may also be inserted in succession. If the paging system uses a telephone number to the paging central and this is a paging number then do NOT use this character.

A telephone number to a Pager may be of the following form:

```
Telno:1 CS / PAGE
T123456
```

Telephone number 123456 entered.

This means that the RTU will ring the number 123456 in the event of an alarm. The character ‘T’ at the start indicates tone dialling.

The number T0,234567 means that the MTC-COM first dials a zero, then pauses for 2 seconds before continuing with 234567.

The telephone numbers can also be entered in the menus using the set point adjustment function in the central system.

3.6.5 Number of calls to CS

The numbers of attempts to call central system are controlled by the menu:

```
Number of calls
CS  5
```

Number of calls to central system.

This is the number of calls the RTU will try to make to the same number before switching to the next number.

3.6.6 Changing alarm code and priority

It is possible to change the alarm priority and alarm code locally on the RTU. This is normally done by sending the "Alarm code filter" from AquaView. Three menus are used for this function. You enter the alarm code of the menu you want to change in the first menu and then you set the priority and code in the following two menus.

Example on how to change the spare alarm on input 6 to another code.

First select the alarm code to change.

```
Select alarm
code   86
```

Go to the next menu.

And change the priority to another code.

```
Alarm priority
A
```

Go to the next menu.

And change to another alarm code.

```
New alarm code
  45
```

The input 6 will now send an A alarm with code 45 "Low pH".

If this alarm is sent to directly from RTU to pager the text will be the old text "Alarm digital input 6". This text can be changed but this must be done by updating the RTU with a special text file (RTU.CFG) using a PC.

3.7 Paging setup

3.7.1 Text paging system and SMS message

The RTU can handle alarm distribution directly to a paging system or to a GSM telephone. The first sign in the menu Telno: CS/PAGE must be “&”, otherwise the program will handle the phone call as if calling to a CS.

3.7.1.1 Numerical paging

The message that is sent to a numerical pager consists of numerical code like “12580501”. It starts with the station number, three digits "125". The next four digits are the alarm code "8050", and the last digit is the priority of the alarm "1". The only setting needed is the telephone number to the pager in the menu "Telno. 1 CS/PAGE" starting with a “&”.

3.7.1.2 Alphanumerical paging

When using alphanumerical paging, the message on the pager consists of alarm text and station name. The following settings are needed:

- The telephone number to the pager in the menu Telno: CS/PAGE starting with a “&”. Neither a “T” nor a comma should be used.
- The telephone number to the paging central. This is the telephone number that is dialled by the modem when an alarm should be transmitted. Information is given on the subscriber agreement and in that company’s documentation. No “&” should be entered in this menu.
- The name of the station should be entered in the menu Station name. If no name is entered, the station number will be sent to the pager.
- If used, enter the password in the menu Password.

3.7.1.3 SMS

When using SMS, the message on the GSM telephone consists of alarm text and station name. The following settings are needed:

- The telephone number to the GSM telephone in the menu Telno: CS/PAGE starting with a “&”. Neither a “T” nor a comma should be used.
- The telephone number to the paging central. This is the telephone number that is dialled by the modem when an alarm should be transmitted. Information is given on the subscriber

agreement and in that company's documentation. No "&" should be entered in this menu.

- The name of the station should be entered in the menu Station name. If no name is entered, the station number will be sent to the pager.
- If used, enter the password in the menu Password.
- If used (SMS for Germany), an identification code should be entered in the menu Identity code.

3.7.2 Number of calls to pager

The numbers of attempts to call the pager central are controlled by the menu:

```
Number of calls
pager  5
```

Number of calls to paging central.

This is the number of calls the RTU will try to make to the same number before switching to the next number.

3.7.3 Pager acknowledge time

If the alarm is transmitted to a pager then the RTU will wait for acknowledge from the user. The time the RTU will wait is set in the "Pager acknowledge time" menu.

```
Pager Ack Time
  10 min
```

The Pager acknowledge menu.

If the user fails to acknowledge the alarm the RTU will try the next telephone number in the sequence.

If you do not want to acknowledge any alarms then set this time to zero. The RTU will then send the alarm and then automatically acknowledge the alarm. Only use this if the paging system has a two way communication to the pager like in SMS.

3.7.4 Paging Cycle Pause Time

If the RTU fails to transmit the alarm to the telephone number in the first menu, further attempts will be made to call the number in the next menu. If this is also unsuccessful, dialling will be blocked. The blocking time is set in the Pager cycle menu.

```
Paging Cycle Pause
time  180 min
```

After the blocking the RTU will restart the sequence from the beginning i.e. making new attempts to call the number in each menu. The RTU will continue to attempt to report the alarm until it succeeds.

3.7.5 Selecting paging system

The RTU can also dial out an alarm directly to a paging system. The correct values must be entered in the parameter menus including Telephone number to PAD, Pager number and more depending on the selected paging system.

The RTU software may handle several paging systems. Countries normally have only one or two paging systems. The systems to use in different countries are listed below. Since this function is heavily dependent on the paging system supplier it might not be completely up to date.

Number	**Paging name**	**Parameters used. See following headlines.**	**Countries**
0	None		
3	MiniCall numeric		Sweden
4	Semadigit		Holland
7	Numerik N/DK	Wt	Norway, Denmark, Sweden
9	Minicall text	Tx, Pw, Id, Pad, Stn	Sweden
10	Semascript	Pad	Holland
11	TAP text	Id, Pad, Stn	England, France, Canada
12	Cityruf DE	Wt	Germany
13	SMS Europ.	Pw, Id, Pad, Stn	Sweden
14	SMS UCP	Pad, Stn	Sweden, Norway, Denmark, Holland, Germany, Austria
16	SemaDigit B	Wt	Belgium
17	SemaDigit NL	Wt	Holland
18	TAP D1 SMS	Pad, Stn	U.S., Germany
19	GSM-SMS	Pad, Stn	U.S., Almost all countries

Number	Paging name	Parameters used. See following headlines.	Countries
20	Numeric A		Austria
21	SMS-SFR F	Pad, Stn	France
22	SMS-Itineris F	Pad, Stn	France
23	TAP F	Id, Pad, Stn	France
24	SMS-Bouygues	Pad, Stn	France
25	SMS-CDMA	Pad, Stn	Australia
	Other		

See the next chapter and also 18 "Appendix C - List of menus" for information about the parameters.

To select the paging system you select the name in the Paging system menu.

```
Paging system
SMS UCP
```

Selecting SMS UCP Paging.

Since the paging systems change all the time the internal system software of the RTU might be updated with newer paging systems. If this happen you can select the option "Other" in the paging menu.

```
Paging system
Other
```

Selecting another paging system.

This will immediately change the menu to enable entering the paging code instead.

```
Paging system
code  0
```

Selecting paging system by code.

Now you are able to select any paging system supported by the newer system software. This number will be larger than the last number in the table above. Selecting number zero will change back the menu to the normal menu menu.

In the set points from AquaView you always have to select the paging number code.

3.7.6 Paging system parameters

Information on some of the menus is given on the subscriber agreement and in that company's documentation.

3.7.6.1 Tx = Paging transmitter number

```
Transmitter no
123456
```

Paging transmitter number

The transmitter number is normally only six characters. It is currently only used in "Minicall text" in Sweden.

3.7.6.2 Id = Paging identity code

```
Identity code
1234
```

Paging identity code

The identity code may be any text or number.

3.7.6.3 Pw = Paging password

```
Pager password
XYZ
```

Paging password

The password may also be any text or number.

3.7.6.4 Pad = Paging number to PAD/SMSC

```
Telno. PAD/SMSC
T0123456789
```

Paging number to PAD/SMSC

The telephone number to the paging central follow the same rules as the normal telephone numbers with the exception that you can not use the "&" character.

3.7.6.5 Stn = Station name

The Station name is entered as specified in the central system.

```
Station name
MYOWNNAME
```

Station name

Try to select a name as close as the one in the CS to avoid confusion. Only capital letters and numbers are allowed.

3.7.6.6 Wt = Delay paging central

```
Delay paging
central 15 s
```

Wait time, delay paging central

The paging delay wait time is used in primitive text paging systems to wait out the voice so the message will be accepted. Some systems do not accept sending the message immediately. This might also be used in other ways in some paging systems.

4 Special alarms and alarm delays

4.1 Analogue and digital alarm delays

Most of the alarms are either delayed by the analogue alarm delay or the digital alarm delay. Set the delays depending on the situation at your station. A general guide is to set both the digital delay and the analogue delay to 10 s but this may need to be changed.

```
Digital Alarm Delay
10 s
```

Digital alarm delay set to 10 s

4.2 Power failure delay

A special delay is used for power failure.

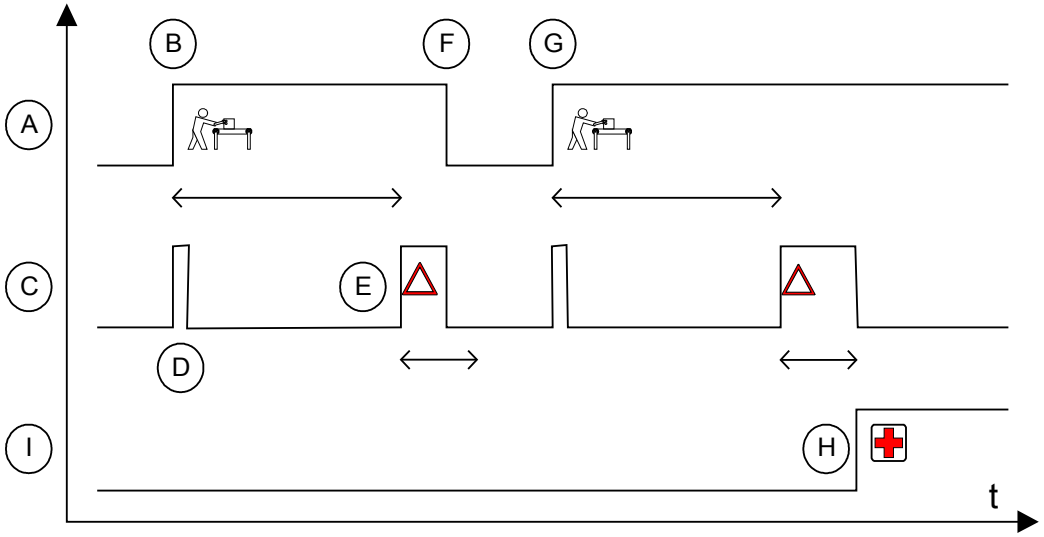
```
Power Fail Alarm
Delay   10 s
```

Power failure alarm delay.

The power failure will stop the pumps immediately. The alarm will however be delayed by the time in the menu. The pumps will start when the power failure signal goes low and after a short start delay.

4.3 Personnel alarm

The personnel alarm is one of the most important alarm functions. The alarm is used when work of any kind is being carried out in the pumping station.



Personnel alarm.

A switch (A) connected to the personnel alarm input, usually the station lighting switch, is operated when work begins (B) in the station, starting a countdown of the specified working period. The output buzzer (C) is activated shortly (D) when the period starts and then when the period has elapsed (E). Some type of warning signal should be connected to this output. The switch should be opened (F) when the warning is received and then closed again to begin a new working period (G). Failure to acknowledge the buzzer signal will start the output siren (I) and send an alarm to the central system (H).

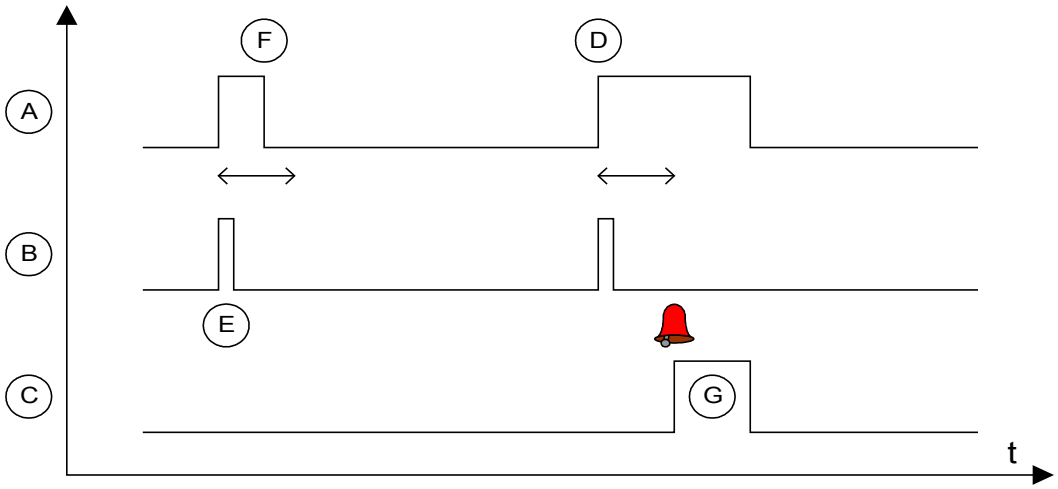
The working and warning periods are set in the “Pers. Alarm Warning” and “Pers. Alarm Delay” menus, and can also be set from the central system. If the periods are changed while the switch is closed, the new settings will not apply until the switch has been opened.

The personnel alarm is dialled out to the central system or paging in all cases, regardless of the alarm mode selected.

4.4 Intruder alarm

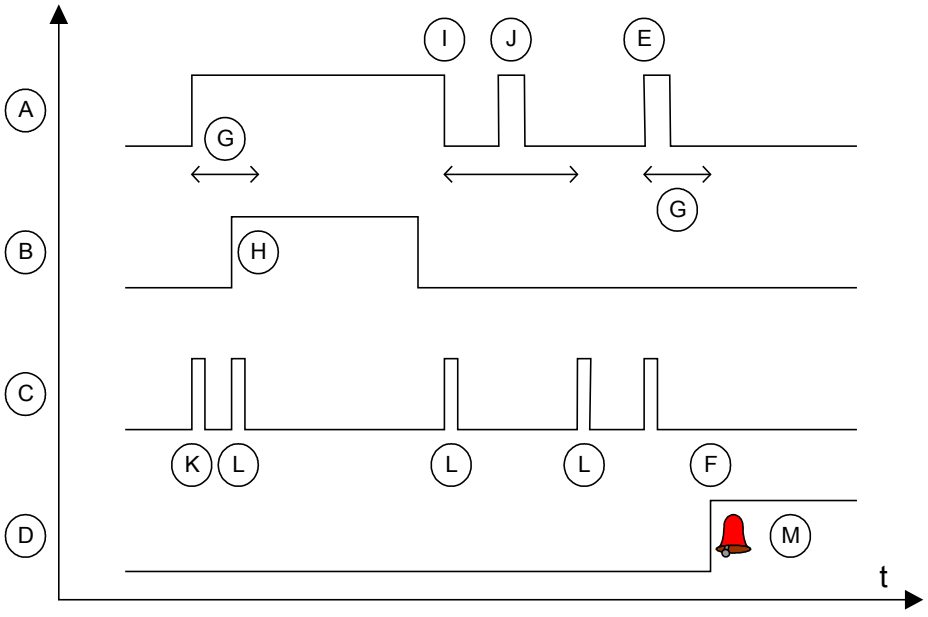
The intruder alarm simply sends an alarm if the input intruder sensor is activated and the alarm is not stopped in some way.

There are two basic ways to use the intruder alarm.



Intruder alarm using only intruder sensor.

The simple way is to use only use the intruder sensor (A) and not use the RTU password. The use of a buzzer output (B) and siren output (C) are optional. If the intruder sensor is high and stay high (D), for the period in the intruder delay menu, the alarm will be created. The intruder alarm is simply stopped by a low signal on intruder sensor (F). The output buzzer signal will be activated for a short beep (E) to indicate that the sensor is activated. When the alarm is created the siren output will be permanently high (G) until the alarm disappears. This solution is suitable when external intruder alarm systems are used.



Intruder alarm using intruder sensor and RTU password.

The other way to use the intruder alarm is to use both intruder sensor input (A) and RTU password (B). The use of the buzzer (C) and siren (D) outputs are optional. If the intruder sensor gets high (E) the alarm (F) will be created after the intruder delay (G). In this case it a low signal on the intruder alarm will not stop the alarm. Enter the password (H) in the RTU to stop the alarm. The RTU will show the password menu automatically. The alarm is deactivated as long as the sensor input is active or as long as the RTU display is active. The intruder alarm is activated again two minutes after the sensor input is low (I) and the display of the RTU is off. Sensor input will be ignored during this period (J). The output signal will be activated for a short beep when the sensor is activated (K) and also when the alarm is turned off by entering the password (L). When the alarm is created the siren output will be permanently high (M) until the alarm is deactivated by entering the password in the RTU.

It is possible to connect intruder sensor and personnel on site signals to the same input. It is also possible to connect buzzer and siren outputs to the same output. See 3.2.3 "Selecting input functions".

4.5 Test alarm

To verify that the alarm distribution is working properly, it is possible to configure the RTU to call out a test alarm. The test alarm has B-priority as default, and is transmitted in the same way as an ordinary alarm according to the settings regarding the alarm distribution.

User sets the number of days between every alarm and the time you want the alarm to be transmitted.

```
Testalarm every
 2 days
```

```
Testalarm time
13:00 h:m
```

These settings will send an alarm every other day at 13:00.

4.6 Pump service alarm

The RTU can be programmed with a service alarm, which is activated after the pumps have been in service for a number of hours. The length of the service interval is entered in the Service interval pumps menu in the SERVICE INTERVAL menu group. A service alarm will be generated if the pumps are in service for an extended period.

The “Time after service” menus show how long the pumps have been in service since the last service. The service interval can be set from the central system.

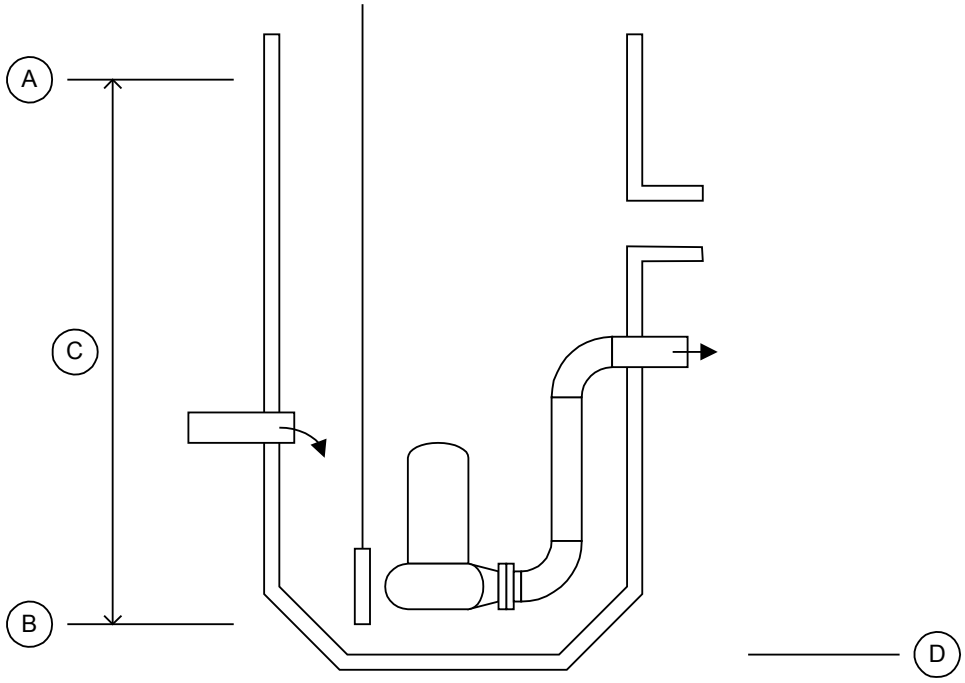
The “Time after service” menus must be reset on completion of service. Press **OK** on the menu and select **Delete value? Yes**. The value in the menu will then be zeroed.

5 Analogue sensors

5.1 Level sensor

5.1.1 Level transmitter adjustment

Adjustment of the level transmitter is extremely simple.



The range is specified in the max level (A) and min level (B) menus in the LEVEL group menu. The range of the sensor (C) is max level minus min level.

Min Level is set to the distance from the bottom (D) of the sump to the level sensor.

Max Level is set to the operating span of the transducer plus the offset from the bottom of the well.

> **!** If the pump sump walls are inclined in the normal pumping range it is important to enter the true value for minimum and maximum level to get a correct value on the inflow and capacity calculation.

Max level normally corresponds to the maximum sensor value 20 mA. Min level corresponds to

the value 4 mA. It is possible to change the maximum and minimum sensor values 20 and 4 mA if different level sensors need to be connected.

5.1.2 Level alarms

Low, very low, high and very high level alarm limits are required to enable the level alarms to be monitored. These limits are entered in the High level alarm and Low level alarm menus in the LEVEL menu group. The alarm can also be provided with hysteresis in the Hyst. level alarm menu to avoid unnecessary alarms.

These alarms use individual alarm delays. The high level alarms are delayed use one delay and the low level alarms use one.

See 3.4.5 "Alarm hysteresis" for a description of the concept of hysteresis.

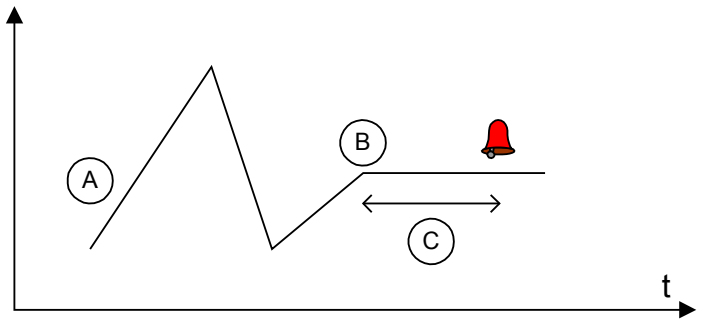
5.1.3 High and low level alarm outputs

The high level alarms and low level alarms activate digital output signals. The output goes high when the alarm is activated and low when the alarm goes passive.

The outputs are intended to be used to control external equipment. The outputs may also be connected to external alarm systems. See 21 "Appendix F - Connection" for more information.

5.1.4 Sensor Freeze

The RTU can also monitor the transmitter. If the sensor fails an alarm is created. The duration for which the level in the sump may remain constant is entered in the *Sensor Freeze* menu and an alarm will be generated if the transmitter value is not altered during that time.



The level (A) changes constantly but at one point in time (B) it ceases to work. The sensor control will wait and see if the level changes (C) for the time set and finally generate an alarm.

The change must exceed 1% of the sensor range within the time limit to count as a working sensor. If numerous false Sensor Fault alarms are generated, try to extend the sensor control time. The function can be disabled by entering zero.

5.2 Current sensors

5.2.1 Pump motor currents

An RTU can both measure and monitor motor currents. A motor current transmitter must supply a DC current signal in the 0-20 mA or 4-20 mA range.

> **!** The operating response digital inputs of the pumps must be connected in order for the measurement to be in operation.

5.2.2 Nominal current

The results of the measurement are displayed in the CURRENT P1 menu. The calculated nominal current is displayed in the next menu. The nominal current shows a calculated average of the current and this value is shown even when the pump does not run.

5.2.3 Current inputs on 2 pump stations

On a two pump station the currents for P1 and P2 are connected to AI 2 and 3. The maximum value of the current measurements is set in the menus Current range P1 to Current range P2. See 21 "Appendix F - Connection".

5.2.4 Current alarms

There are also the possibilities of getting alarms if the currents are too high or too low, the limits are entered in High current P1 to P2 and Low current P1 to P2 menus. In order to avoid repeated alarms if the current is varying around the alarm limit, the value in the menus Curr. Hyst. P1 to P2 can be used to avoid these unnecessary alarms. For a more comprehensive description of this function called hysteresis see 3.4.5 "Alarm hysteresis" for a description. Current alarms are generated only when the pumps are running.

High Current Alarm will stop the affected pump and allow the next in sequence to run. Low Current alarm will also block the pump from running until the specified timer is reached.

5.3 General analogue

Many of the programs have the possibility to connect a general analogue signal. This could be used for example to measure different flows, pH, current, temperature or pressure. It is possible to use the input to replace internal calculations for inflow, outflow, overflow or current on one or two pumps.

5.3.1 Input options

The Maximum value and Minimum value menus must be adjusted to ensure that the transmitter

reads the correct value.

It is possible to select different options on this analogue. The options are:

Menu option	Comment
General	The analogue is used as a general input. No unit will be used when the value is presented. The volume calculation will be turned off.
Flow	The analogue is used to measure a flow. The volume of the flow will be calculated.
Pumpflow	The analogue is used to measure the station pump flow. This will replace the pump flow calculated by the program using only the pump capacities. The flow will be used to monitor pump capacities and alarms and to calculate pumped volume.
Inflow	The analogue is used to measure the station inflow. This will replace the inflow calculated by the program using the level sensor.
Overflow	The analogue is used to measure the station overflow. This will replace the overflow calculation by the program using the level and overflow sensors. If the overflow sensor is used this will be used to start the overflow monitoring. If the overflow sensor is not used the overflow will start when the flow is larger than 1 GPM. This requires the analogue to be trimmed to be accurate on 4 mA or else it may register false overflow alarms.
Current	The analogue is used to measure a current.
PH	The analogue is used to measure pH.
Temperature	The analogue is used to measure temperature in Fahrenheit
Pressure	The analogue is used to measure pressure in PSI.
Level	Redundant Level Sensor- if level sensor on AI1 fails this is used

5.3.2 Volume calculation

If a flow meter is connected and option “Flow” selected then the program will calculate the volume on this flow. The flow is integrated, and the total volume is showed in the menu total flow.

5.3.3 Alarms

Low and high alarm limits are required to enable the value to be monitored. These limits are entered in the High alarm and Low alarm menus. The alarm can also be provided with hysteresis

in the Alarm Hyster. menu to avoid unnecessary alarms. See 3.4.5 "Alarm hysteresis" for a description of the concept of hysteresis.

5.3.4 Level control output

An object may be controlled by the analogue signal. Enter values in the Start value analogue and Stop value analogue to activate the digital output. This output may be used for example to control an external object or to block the pumps.

The output is active either by high level or low level. The function depends on the order of the start and stop levels. If the start level is higher than the stop level then the output will be activated when the analogue is higher than the start level and it will be de-activated when the analogue is lower than the stop level. If the start level is lower that the stop level the output will be reversed. The output will in this case be activated when the analogue signal is lower than the start level and deactivated when the analogue is higher than the stop level.

6 Operational data

The RTU continuously monitors, measures and stores pumping station data. See 20 "Appendix E - Central system" for the trend measurements and report values, which are recorded in the RTU and can be collected in the central system.

The values recorded in the RTU can be read in the appropriate menus. The values are recorded simultaneously in daily and continuous basis and presented as todays, yesterdays or continuous data. Daily recording means that the saved values are zeroed every midnight. Continuous recording means that each value is saved continuously until it is zeroed manually. Yesterday values are the full day value for the previous day.

It is possible to change mode at any time without losing any data. All three types of values are recorded and saved continuously.

6.1 Selecting report mode

Selects the manner in which recorded values are to be displayed in the menu. The reporting mode cannot be selected from the central system. Change the setting in the menu:

```
OPERATIONAL DATA
Today's
```

Report mode menu.

6.2 Restarting counters

It is possible to empty the counters for all local continuous data. Today's and yesterdays values are not possible to change.

To change any report value first change to continuous data.

```
OPERATIONAL DATA
Continuous
```

Report mode in continuous.

Then select the menu with the data to change, select the Write mode and change the value.

6.3 Pumps and Generator Starts / Runtimes

Running times and number of starts are calculated on all pumps.

```
P1 no. of starts
  23 day
```

Daily value for pump 1 number of starts.

```
P1 runtime
 2:10 h:m y-day
```

Yesterday runtime for pump 1.

The program also calculates running time and starts for two simultaneously running pumps. The number of starts in this data is the number of times both pumps were forced to start.

```
Two pump starts
  12 day
```

Daily number of starts for two pumps.

```
Two pump runtime
##### h total
```

Total run time for two pumps.

Calculations for Generator Starts and Runtimes is also available

```
Gen no of starts
  5 day
```

Daily value for Generator number of starts.

```
Gen Runtime
 1:13 h:m y-day
```

Yesterday runtime for Generator

7 Pump control

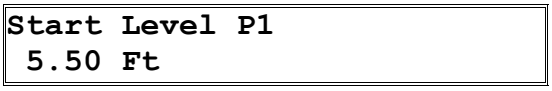
The pump control function determines the manner in which the pumps operate, including starting and stopping, as well as the sequence of operation.

The pump control menus are grouped in the Start and stop levels, Pump control, Advanced pump control and Pump sump cleaning menu group.

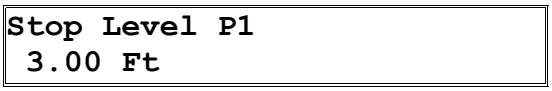
7.1 Start and stop levels

There is one start and one stop level for each pump.

To control a pump set both the start and the stop level. The basic function is that the pump will start at the start level and stop at the stop level.



Start level for pump 1.

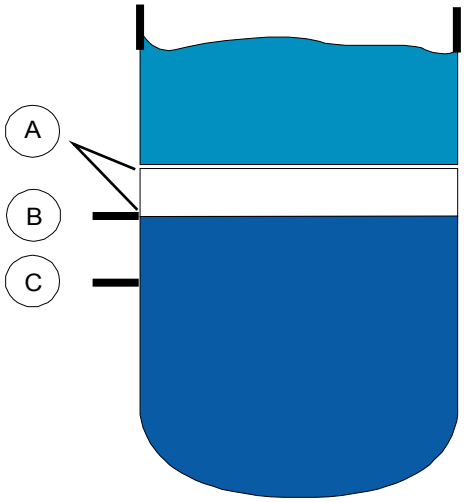


Stop level for pump 1.

If alternation of the pumps is used some, but not all, of the start levels may be set to zero. See 7.4.3 "Maximum running pumps" for more information. If alternation is turned off both start and stop levels has to be used or else the pump will not start.

7.1.1 Random start level

Starting the pumps at the same levels in every instance creates a risk of fouling build-up in the sump. This is prevented by specifying a Random start span in the menu. This provides the pump, not with a single starting level, but with a range of random levels within which to start.



A = Random starting range. Pumps start at some point in this area.
B = Starting level
C = Stop level

Random starting range.

If alternation is not used then it is recommended to use a smaller random starting range than the distance between the used starting levels, otherwise pumps may start in an unpredicted order. If alternation is used it does not mater if the random start range overlap next pump start. The pumps will alternate correctly anyway.

> **!** If stop level is set to zero the pump will be disabled and can not start.

7.2 VFD Control

If the proper option is selected under **General Setup → Enable Functions** the **VFD Output** section will be enabled in the RTU program, giving the user control over operational features pertaining to level / flow control.

To understand the PID Control functions, it is critical to have a basic understanding of how the PID Control is designed to operate. These values are to be adjusted in the field because they can be set properly only by looking at the true operating conditions and adjusting accordingly.

Proportional Control looks at the difference between the measured variable (Level or Flow) and the setpoint (Desired Level or Flow). This difference is called the “error” in the system and

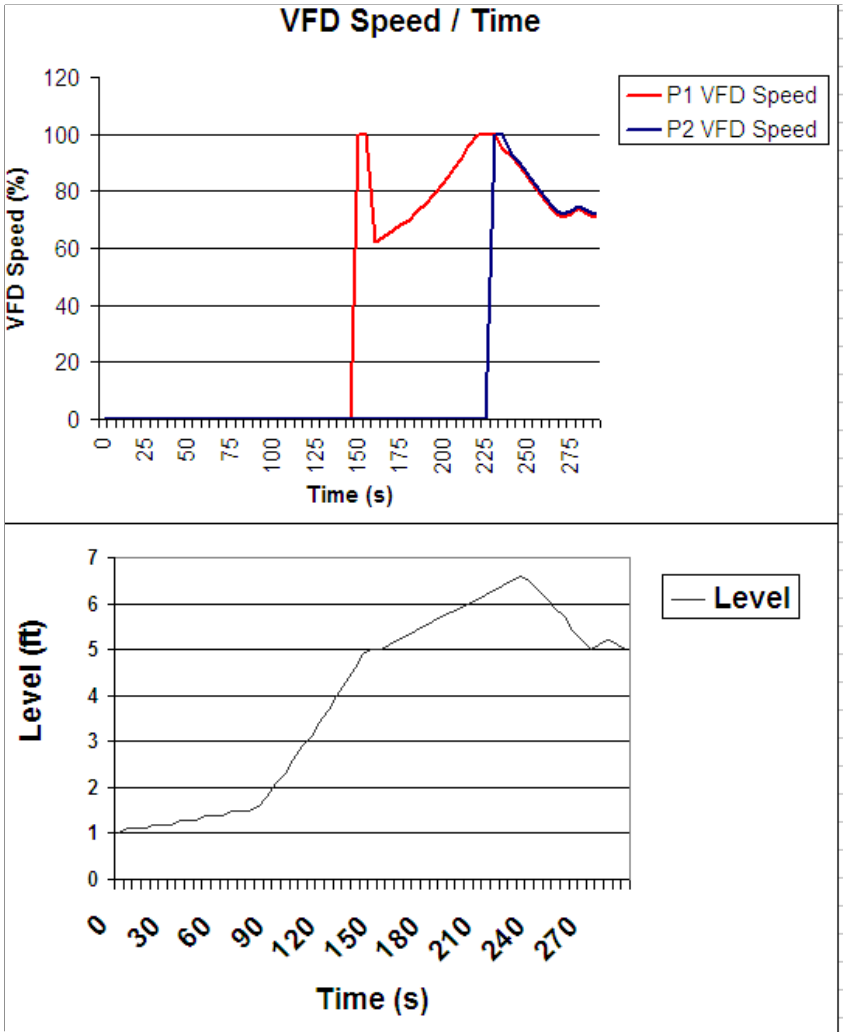
is multiplied by the **Gain** factor (which is settable) in order to produce an output signal that is in proportional to the calculated error.

Integral Control takes into account the difference between the setpoint and measured variable over time; ie, if upon sampling twice it was seen that the level moved away from the setpoint twice as much, the output signal will be twice as high to bring the level back to the setpoint value.

P + I control is typically more than enough for most applications such as liftstation level or flow control; however if Derivative control is necessary it can also be set in the APP controller.

Derivative Control looks at the rate of change of the calculated error, without taking into account how far the error was from the desired setpoint. Basically, it represents a way to "anticipate" any changes in the measured variable but by itself cannot be used for control because a constant error (for example, your desired level is 4 ft. but the station level was holding at a constant 7 ft- there is no "change" in the error; it remains at 3 ft). This calculation introduces an adjustment to the output signal and the time between samples can be adjusted.

This illustration shows a typical pumping scenario, where level rises slowly in a tank until a high inflow event occurs. Pump 1 is in lead and set to start at 5.0 ft, which occurs at 150 s. Pump 1 ramps to 100% for 5 seconds (Flying Start function), then begins ramping at 60%. As the level continues to rise Pump 1 speeds up until it is at 100%. The lag pump turns on at 6.5 ft (230 s), at which point both pumps run at the same speed to bring the level down. Once the level reaches the desired setpoint (5.0 ft), the VFD's hold at that speed and then only speed up / slow down in relation to any changes in level around the desired setpoint.



Menu Item	Description
Pump Output Speed	Indication of running speed of the pump from the VFD
Pump VFD Torque	If using MODBUS communication to VFD, this channel displays the motor torque calculated by the VFD
Pump Motor Power	If using MODBUS communication to VFD, this channel displays the motor power calculated by the VFD

PID Regulator Status	Indicates whether the pump(s) are controlled using P-I-D loop
Flying Start Time	When a pump turns on initially, it will ramp to 100% quickly for this amount of time to eliminate settled debris, then return to normal P-I-D speed
Output Control	If in Automatic, P-I-D control will regulate the process. If in Manual mode, user selects pump running speed
Max / Min Output Value	Useful to set Maximum and Minimum running speeds of the pump
Amplification / Derivation / Integration parameters	Allow tuning of P-I-D loop to field conditions. See explanation above.
Sample Time	Adjust how often new speed signal is transmitted to VFD
PID Source	Allows user to choose between regulating based on Flow Setpoint, Lead Start Level, or Custom Level
Deadband Level / Flow	User selects a deadband for changing output signal to VFD
Start / Stop Ramp	RTU can linearly increase speed of the pump to drive level down to shut-off point

7.3 Basic pump control

7.3.1 Backup control

When the level activates the high level float, a backup function intervenes to start a pump. When the level switch signal disappears, a timer function is initiated to ensure that the pumps continue to run for at least the specified time. This time is specified in the high level run time menu.

```
High Level Run
Time   10 s
```

The high level run time menu.

When the timer runs out the pumps will ether continue to run or stop depending on the level signal. The main purpose of the function is to secure the pumping even if the level sensor fails to work. The most common fail on the sensor will make the level show zero. This will stop the pumps when the high level runtime timer runs out. If the level sensor works as normal the pumps will continue to run and stop at the normal stop level.

The pumps are not started if the time is set to zero. In this case only the alarm is created.

The number of pumps that start will depend on the setting in the maximum running pumps menu. It is possible to select exactly which pumps to start at the high level float. See 7.4.5 "Special control options" for possibilities on how to customize pump operation.

```
Low Level Block
Time #### s
```

Low level block time menu.

When the low level float is activated a similar function exists to protect the pumps to run if the level sensor fails. The pumps are blocked as long as the low level is active and continued to be blocked the time in the low level block time.

7.3.2 Pump No Response Delay

The response error delay controls the time it takes to switch to another pump if the response signal should fail to appear. At the same time the response alarm is created. The switching of pumps only occurs within alternating pumps. If the pump is not alternating the program will only create the alarm and try to run the pump without the response signal. The program will prefer pumps without response error when it starts alternating pumps but it will try to start them if more pumps need to be started. The alarm will clear (become passive) when the response signal appears the next time.

The delay is also used to remove the over current alarm that may otherwise be trigged when the pump starts.

7.3.3 Start/stop delays

The start delay and stop delay can be applied to filter out pump control disturbances. The delay is the interval between the occurrence of the starting condition and the instant of starting. Specifying a delay prevents the pumps from starting as the result of a disturbance.

Specifying a stopping delay will eliminate unnecessary stopping of the pumps. The stopping delay is specified in the Stopping delay menu.

7.3.4 Intermediate delays

Two delays are used to prevent pumps from simultaneously starting and stopping. These delays are also used to prevent a pump from starting immediately after a pump stop or vice versa.

```
Time between
starts   10 s
```

Delay time between two pump starts.

The delay between two starts is sometimes used to protect the pump power supply from the overload occurring when several pumps is starting at the same time. The delay between two stops may be used to protect the pipes from water hammer that occur when a pump stops.

```
Time between
stops   10 s
```

Delay time between two pump stops.

Delay between two starts is also used for to prevent a pump stop when a pump has started. This will in fact be the same as a minimum run time for a pump.

The delay between two stops is also used to prevent a pump from starting after a pump stop.

7.3.5 Maximum start/hour alarm

It is possible to get an alarm if the pumps for some reason start too often. Set the number of starts in the menu to activate the alarm. If the pump starts this number of times within an hour an alarm is created. The alarm does not stop the pump.

This alarm is activated by default and set to 16. To disable the alarm set the value to zero.

7.3.6 Blocking pumps with low current

By entering a value in the"Low current reset time" menu, the pump will be switched off when a low current alarm is generated. The pump is blocked for the amount of time set in the menu. A zero in the menu "Low current reset time" turns this function off.

It is possible to disable the function for individual pumps if only some of the pumps should be blocked. This is done in the special control menu for the pump. See 7.4.5 "Special control options".

7.4 Advanced pump control

7.4.1 Starting control sequences locally

It is possible to start some automatic pump control sequences locally on the RTU display. The alternatives are to activate the APF or to start a pump down. These functions are the same as the corresponding remote command.

```
Action
Select action
```

The select action menu.

The command "Activate APF" will not directly start the pumps; they will start as normal on the

next start level. The menu returns to "Select action" after starting any of the commands.

See 7.5.2 "APF control" and 7.5.3 "Maximum Pump Off Time & Forced Pump Down" for information on these functions.

7.4.2 Alternation

The alternation used is not based on a fixed starting sequence. When alternation is active the exact alternating order will be based on the starting and stopping times. The pump selected to start will be the one that has been still the longest time within the current pump cycle. The pump selected to stop will be the one that has been running the longest time in this pump cycle. If the pump is started manually it will influence the order.

The alternation is also used when two or more pumps are running. The pumps alternate also on high inflow situations where many pumps are running for a longer time.

This method will cause the pumps to start the same amount of times, the running times may however be different if the pump size is not equal.

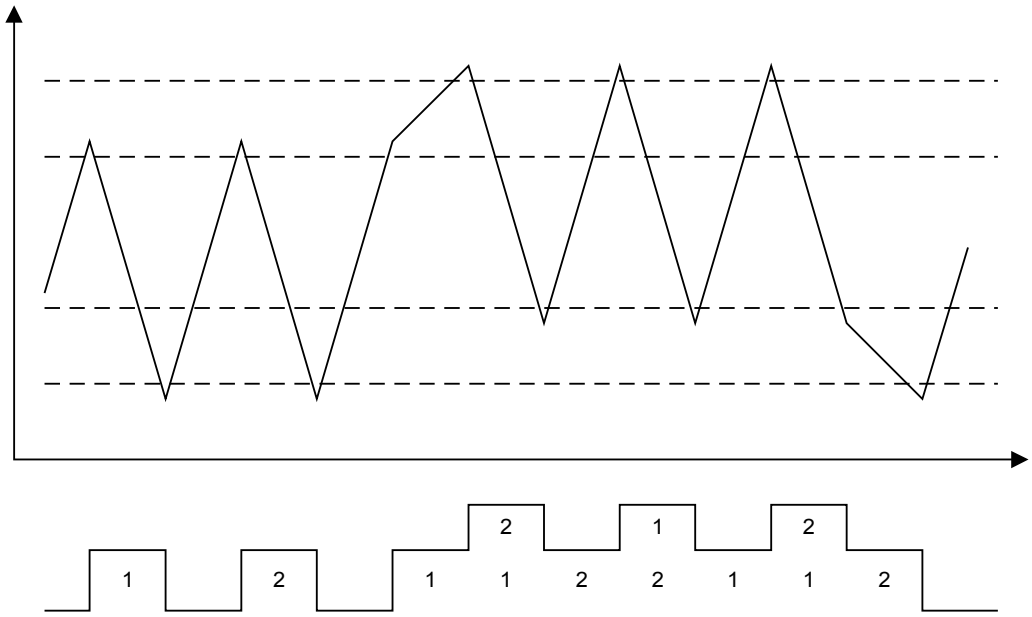
The first pump is started on the lowest starting level, the second pump on the second lowest level and so on. The pumps are stopped in the same way; if all pumps are running the first pump is stopped on the highest stopping level and the last pump is stopped on the lowest stopping level. If only one pump is running it is stopped on the lowest stopping level. This is illustrated in the following pictures.

7.4.2.1 Two pump alternation

The Control option menu is used to specify the pump operating sequence. Three options are available:

- Alternation, lead and lag pump alternate every pump cycle
- P1 first- P1 will always be lead pump, P2 will be lag pump
- P2 first- P2 will always be lead pump, P1 will be lag pump

The illustration below shows the starting and stopping sequence when two pumps alternate.



Picture showing pumping sequence when two pumps are alternated.

The illustration shows two starting levels and two stopping levels and the changing level in the upper part of the picture. The lower part shows running pumps. Two numbers stacked here shows multiple running pumps.

7.4.2.2 Runtime Alternation

```
Alternation Runtime
 #### min
```

If a time value is set in the Alternation Runtime channel, a pump will run for the time value specified, then the RTU will alternate to the next available pump to balance pump runtime- often used in VFD applications.

7.4.3 Maximum running pumps

It is possible to reduce the number of simultaneously running pumps. Use this function if the hydraulic or electric system can not handle all running pumps. Reducing the number of pumps with this function has no effect on which pump is running, it only effects how many.

```
Max running pumps
(norm) #
```

The menu for maximum running pumps.

Example: For a two pump station entering '1' eliminate the simultaneous running of both pumps.

Almost the same effect is achieved if one or more start level values are set to zero when the alternation is active. All stop levels are however always required on active pumps. The

difference between using the maximum running pumps function and removing starting levels is what will happen if the level rises to the high level float. When using maximum running pumps then only the allowed amount of pumps will start. Pumps with no start level will start on the high level float.

7.4.4 Maximum running pumps- Generator

There is a separate channel to limit the number of pumps that can run when a Generator Running signal is present. This prevents a higher energy draw than a generator can handle.

```
Max running pumps
(Gen) #
```

The menu for maximum running pumps.

7.4.5 Special control options

It is possible to set special options to control the pumps. All these options are normally set to off and they rarely need to be changed.

Option	Default function. Off	Special function. On
Disconnected	Pump works as normal.	Pump is disconnected and the control of the pump is turned off completely.
Blocked by P2	Pump is not stopped or blocked when pump 2 runs.	Pump is stopped before pump 2 is started.
Blocked by P3	See above. Only found in four pump stations.	See above. Only found in four pump stations.
Blocked by P4	See above. Only found in four pump stations.	See above. Only found in four pump stations.
No backup run	Pump start on backup run (High level float).	Pump does not start on backup run.
No long run blk.	Pump is stopped if running too long time.	Pump is not stopped if running too long time.
Leakage block	Leakage alarm does not stop and block the pump.	Leakage alarm stops the pump.
Not tele blocked	Pump is blocked when RTU is remote blocked.	Pump is not blocked when the RTU is remote blocked.
Use level E1	If pump is blocked by another pump it will stay blocked until the other	Pump will start and stop on extra start and stop levels 1 (E1) when it is blocked by

Option	Default function. Off	Special function. On
	pump stops.	another pump.
Use level E2	See above. Only found in four pump stations.	Pump will start and stop on extra start and stop levels 2 when it is blocked by another pump. Only found in four pump stations.
APF high pres.	Normal undercurrent sensitivity. Pump will stop on APF on a current change of 12 %.	High undercurrent sensitivity. Pump will stop on APF on a current change of 6 %.
APF no use filt1	Pump stops on APF at current transients.	Pump does not stop at current transients.
APF no use filt2	Pump stops on APF at undercurrent.	Pump does not stop at undercurrent.
No Current Blk.	Pump is blocked by high / low current alarms.	Pump is not blocked by high / low current alarms.

7.4.5.1 Disconnected

Use this option if the pump needs to be removed from the pumping sequence temporary.

7.4.5.2 Blocked by other pump

Use this option if a pump shall stop when another pump runs. The pump is stopped before the other pump starts. If the other pump is started manually the pump is immediately stopped.

See 7.4.7 "Inter-blocking" for more information.

7.4.5.3 No backup run

This option will disable the pump from backup run. Backup run normally starts all pumps or as many as allowed by maximum running pumps set-point. If the station uses different sized pumps smaller pumps may start when the backup run is activated. Remove these pumps with this option if necessary.

See 7.3.1 "Backup control" for more information.

7.4.5.4 No long run block

The function long runtime block is common for all pumps. If some of the pumps are not suited for this function these pumps may be removed from the block by this option.

See 7.5.1 "Maximum pump time" for more information.

7.4.5.5 Leakage block

Some users want the pump to stop if the leakage sensor is activated. This option makes the pump stop on this alarm. Since the alarm is not removed automatically it is recommended to set the leakage alarm to A priority if the blocking is activated.

7.4.5.6 Not tele blocked

The pumps stopped if the station receives a remote blocking command. If this is not the desired behaviour set this bit to let the pump continue to run.

See 9.2.2 "Blocking actions" for more information.

7.4.5.7 Use extra levels E1/E2

To start a blocked pump assign the pump an extra start and stop level using special option "Use level E1". This will make the pump start on start level E1 even when it is blocked.

See 7.4.7 "Inter-blocking" for more information.

7.4.5.8 APF options

There are two methods of stopping the pump when the APF function is active, current transients and undercurrent.

It is possible to only stop the pump on transients or undercurrent by using these options.

If the current difference between normal running and 'snoring' is small, the sensitivity may be raised by the "APF high pres." option.

See 7.5.2 "APF control" for more information.

7.4.5.9 No Current Block

By default, all pumps will block on High / Low Current alarms- if a pump should not be blocked on current alarms it is possible to disable the option.

See 7.3.6 "Blocking pumps with low current" for more information.

7.4.6 Manual H-O-A Takeover

A pump cycle can be initiated by starting the pump manually from the control panel. If ON is chosen in the menu Manual control and the pump has been running for more than 5 seconds (in Hand, from an H-O-A switch, for example), the RTU pump control will take over. The pump stops when the stop level is reached.

7.4.7 Inter-blocking

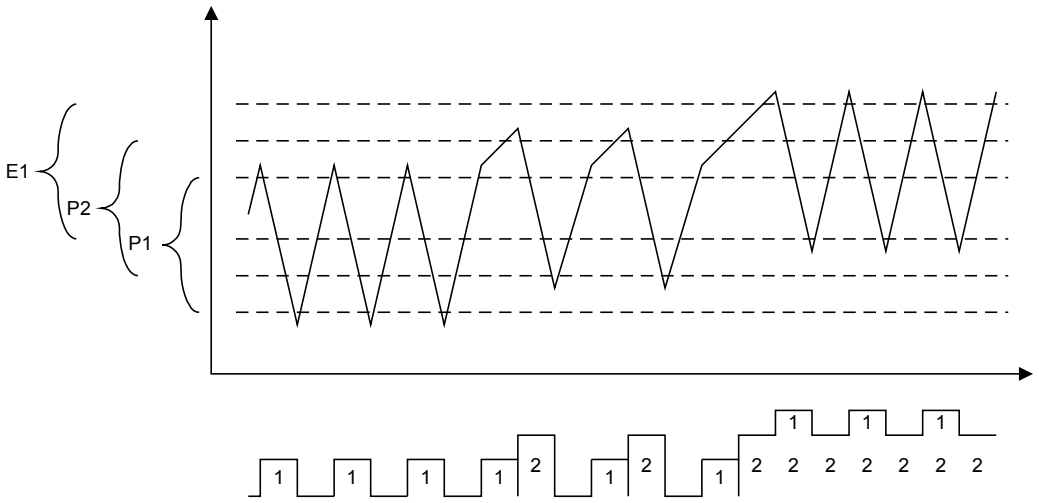
These options are useful if the station use different sized pumps. With these options it is possible to set up a station to use the small pump first and when the inflow gets higher use only the larger pump and finally use both pumps on high inflow.

In a four pump station it is possible to set up many combinations of small and big pumps.

An example:

A two pump station with a small pump P1 and a large pump P2. The small pump P1 runs most of the time and P2 takes over on higher flows. P1 is blocked by P2. On high inflows both pumps work together.

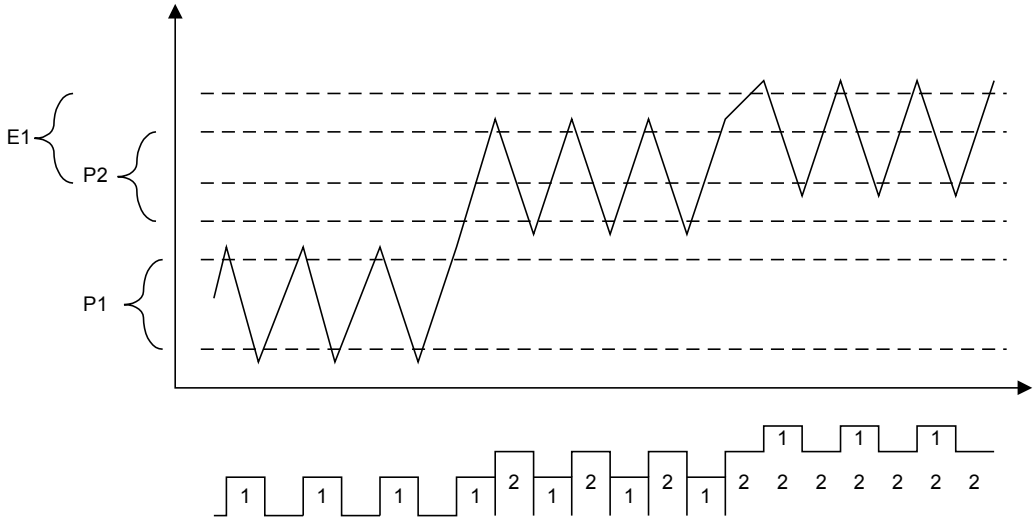
Setup will be, alternation: P1 start first, P1 blocked by P2 and P1 using extra levels E1.



The picture shows the result. The upper part of the picture shows the changing level and the start and stop levels for P1 and P2 together with the extra start and stop level assigned to P1. The lower part shows running pumps. Two stacked numbers means that the pumps are running in parallel.

The result is a station where P1 is pumping the most time to save energy. The cost of using P1 is lower that P2 because of the lower energy consumption on a smaller pump.

Changing the starting levels will result in a slightly different pump sequence.



See 7.4.5 "Special control options" for details about configuration options.

7.5 Sump cleaning

7.5.1 Maximum pump time

To prevent a pump from running continuously for a long time, it is possible to enter a time in the menu “Maximum pump time”. The pump that has exceeded the limit will be stopped. When the time between starts has elapsed, and the level rises above a start level, the next pump according to the starting sequence will start. This will prevent clogging build up that lowers the capacity of the pump.

This function works with all pumps. If one or more of the pumps is not suitable for this the pump may be removed from the function by changing an option in the special control menu for this pump. See 7.4.5 "Special control options" for details about configuration options.

7.5.2 APF control

The APF cleaning function runs the pump to the absolute minimum water level in the sump - the point at which air is drawn into the impeller. The pump is then able to draw off the dirt and grease which normally settles on the surface of the water. By operating down to this minimum water level, the pump also creates turbulence in the water as the air is sucked into the pump, and this turbulence agitates any sludge layer which has formed on the sump floor, allowing this, too, to be drawn off.

The APF function requires that currents are monitored for the pumps.

Activate the APF by setting the number of cleanings per day in the menu.

```
APF clean cycles
per day ##
```

The APF cleaning menu.

7.5.2.1 Stop functions

When the water in the sump has dropped to such a level that the pump begins to draw air, the motor current will drop. The APF function detects this and stops the pump.

The APF function measures the normal operating current of each pump during routine pump cycles, by means of dedicated current transformers. These current values are shown in the nominal current menus and serve as reference values.

```
Nominal curr. P1
###.# A
```

Nominal current for pump 1.

The current is analysed by two different methods, each of which can lead to stopping of the pump. One of these detects a drop in the current in relation to the normal value, while the other detects high rates of change in the current.

Both stop functions are active by default but it is possible to deactivate each of them in the special control option menu for each pump. See 7.4.5 "Special control options" for details.

To switch off the APF function for one pump; deactivate both stop methods. This will block the APF on this pump.

If the difference between normal current and current at 'snoring' is little, the sensitivity can be raised with a special control option.

7.5.3 Maximum Pump Off Time & Forced Pump Down Level

If the inflow rate of a sump is low it can create problems with sedimentation or gases in the station. To avoid these types of problems it is possible to start a pump based on maximum pump off time rather than normal start level.

```
Maximum Pump Off
Time #### min
```

The maximum time between pump cycles.

It is possible to select a different stop level than normal in this case.

```
Forced pump down
level ##.## ft
```

Level used when pumping down.

7.5.4 Flush valve

It is possible to connect a sprinkler valve to flush the walls of the sump regularly. Set the number

of cleanings a day and cleaning duration to activate the function.

```
No of flushings
per day ##
```

Number of sprinkler flushings started each day.

Set any of the two values to zero to stop the function.

8 Flow calculations

The flow calculations are carried out independent of the pump control. It is not necessary to control the pumps to use the flow calculations. The flow calculations only use the level sensor, and optionally other analogue signals, look if the pumps are running using the response signals and then calculate flows and volumes.

8.1 Flows and volumes

The RTU calculates inflow, pumped flow and overflow and the volume for each flow. The volumes are displayed as continuous, daily and yesterday value. See 6.1 "Selecting report mode" for more information on how to change displayed data.

The menus which contain these data are located in the FLOWS AND VOLUMES menu group.

8.1.1 Inflow

The inflow menus show the calculated inflow and inflow volume to the station.

To calculate the inflow the pump sump form and nominal pump capacity must be defined.

```
Inflow
 ###### gpm
```

The inflow menu

To get an accurate inflow calculation it is important that the level sensor show an accurate value and that the pump sump are correctly defined. This is especially important if the walls of the sump are sloping. The inflow is also dependant on the calculated capacity of the pumps.

It is possible to use an external flow meter to measure inflow and connect this to the generic analogue input. This sensor will replace the calculated inflow. See 5.3 "General analogue" for information on how to activate this function.

8.1.2 Outflow / pumped flow

To calculate the outflow or pumped flow and volume the nominal pump capacity must be defined.

Calculation of the pumped flow is based on the calculated capacity and the response of the

pump. In the case of multiple pump operation, pump factors must be stated to ensure the accuracy of the calculation. An expression of the proportion of the total pump capacity which represents the actual capacity, the pump factor is entered in the “Capacity factor 2 pumps” menu. See 8.4 "Capacity" for information on capacity calculation.

It is possible to use an external flow meter to measure pumped flow and connect this to the generic analogue input. This will replace the pump flow calculated by the program. The flow will be used to monitor pump capacities and alarms and to calculate pumped volume. See 5.3 "General analogue" for information on how to activate this function.

8.1.3 Outflow/pump flow calibration

The pump flow and volume need adjustment in some situations. The calculation is based on the calculated capacity of the pump. The calculated pump capacity represents only one operating point for the pump and this may be different from the average pump capacity over a pump cycle. To adjust the difference and increase or decrease the calculated pump flow change the pump flow calibration menu.

```
Outflow calib
###.# %
```

Pump flow calibration.

The formula used to calculate the pump flow is:

Pumped flow = Sum of calculated capacities for running pumps * Capacity factor for number of running pumps * Pump flow calibration.

8.1.4 Sump volume

The pump sump volume is calculated and presented in a menu.

```
Volume sump
#######.# G
```

Volume of pump sump.

This is done when the pump sump is defined. The volume is calculated using the areas and levels in the pump sump definition together with the level meter.

8.2 Volume pulse

It is possible to control external equipments like a water sampler or a chemical feeder based on different flows in the station. A digital output is used to start the equipment using a 3 second pulse. The pulse is created when the amount of water has passed.

```
Volume pulse
#####.# G/pulse
```

Amount of water to make a pulse.

Select the water flow to use to create the pulse.

```
Volume pulse src
################
```

Menu to select pulse source.

The following options are possible.

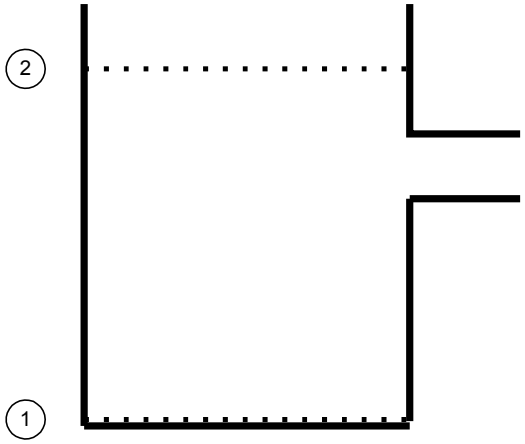
Pumped flow	The pulse is created on the calculated pumped flow.
Inflow	The pulse is created using the calculated inflow.
Overflow	The pulse is created using the overflow. An extra pulse is created when the overflow starts.
Generic ana flow	The pulse is created using the generic analogue.

8.3 Pump sump configuration

The shape and size of the sump must be defined to enable the RTU to calculate the pump flows and capacities. This is done by specifying the surface area at different levels. It is important to specify the surface areas at those levels at which the sump changes shape. The uppermost surface area should be located above the highest possible level in the sump. Up to five different levels can be specified. If the sump has straight walls, it may be sufficient to specify the surface area at two levels. The following are some examples of how the pump surface is defined for different sump shapes.

8.3.1 Sump with straight walls

The first example deals with a sump with straight walls. In this case, two surface areas are sufficient to define the configuration.

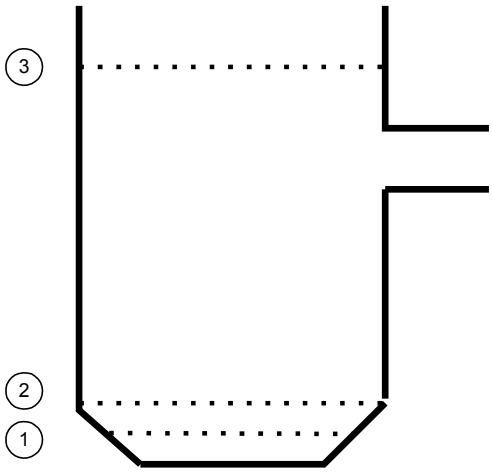


Pump sump with straight walls.

Assume that the calibration range is 0 – 12.00 ft and that the surface area of the sump is 40.0 ft². Select two levels at which to enter the area. For example, level (1) may be 0 ft and level (2) 10.00 ft. Specify 40.0 ft² for both areas.

8.3.2 Sump with straight walls and tapered bottom section

The sump in this example has straight walls and a tapered bottom section. To define a sump of this shape, the surface area must be specified at three levels, at the bottom, at the transition point between the tapered and straight sections, and in the top section.

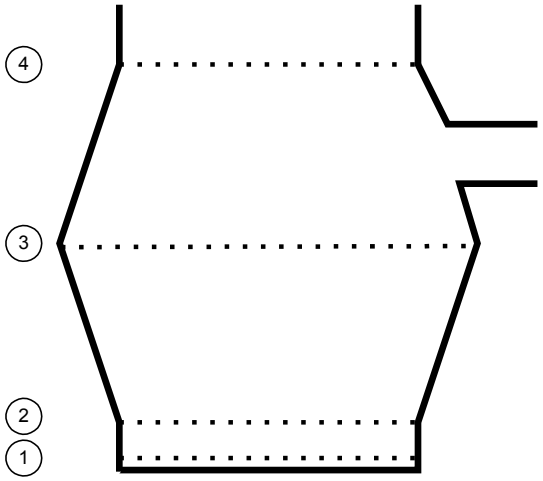


Pump sump with straight walls and tapered bottom section.

As before, assume that the calibration range is 0 – 12.00 ft, also that the transition point between the tapered and straight sections is located at 1.50 ft. Suitable levels at which to specify the surface area are thus (1) 0 ft, (2) 1.50 ft and (3) 10.00 ft (see illustration).

8.3.3 Double-tapered sump with straight bottom section

In this case, the surface area must be specified at four levels for correct definition: at the bottom, at the transition from the straight to the tapered section, at the widest point and, finally, at the top edge.

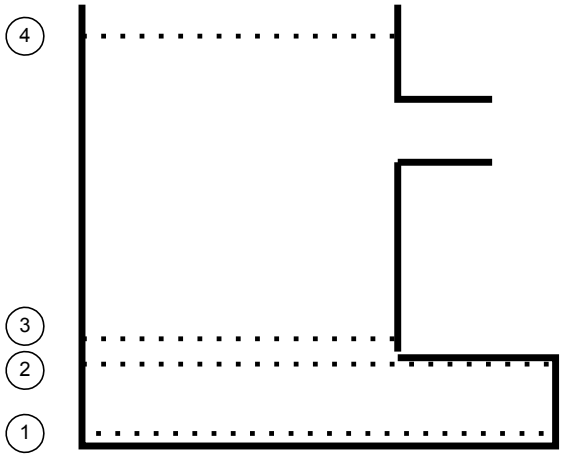


Double-tapered pump sump with straight bottom section.

The calibration range is 0 – 12.00 ft. The surface area should be specified at levels of (1) 0, (2) 1.30, (3) 5.70 and (4) 10.00 ft.

8.3.4 Pump sump with two areas

A sump of this shape must be defined in terms of four surface areas.



Pump sump with two areas.

This sump changes area once. To define it, the surface area must be specified at levels of (1) 0, (2) 5.60 (i.e. the highest level at which the sump has this area), (3) 5.61 and (4) 10.00 ft. The calibration range is 0 – 12.00 ft.

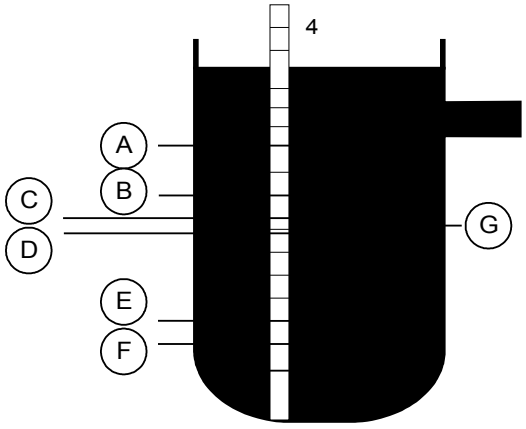
All menus for defining the pump sump are located in the CAPACITY… menu group and can be set from the central system.

8.4 Capacity

8.4.1 Capacity measurement

Capacity measurement is carried out when pumping lowers the level in the sump. For the purpose of calculation, the range in which it is to be carried out i.e. the levels at which measurement is to be started and stopped, must be specified. It is not possible to propose the exact location of the capacity measurement range since this is a function of many factors, which may be unique to each pumping station. To ensure accuracy, however, the measurement period must not be too short. Capacity measurement must take at least 30 seconds and should not be longer than 9 minutes.

As a guideline, the range should be approx. 15% of the pumped range. Capacity measurement should commence somewhat below the lowest starting level, or Starting level 1, while the distance between Starting level 1 and the start of capacity measurement is usually approx. 10% of the pumped range.



A = Start level 2
B = Start level 1
C = Upper level
D = Lower level
E = Stop level 2
F = Stop level 1
G = Capacity measurement

Choice of range for capacity measurement.

In the illustration above, the measurement range is 0 – 12.00 ft. The Starting level 1 is 7.00 ft and the Stopping level 1 is 2.00 ft. The pumped range is calculated as follows:

Pumped range = Starting level 1 - Stopping level 1.

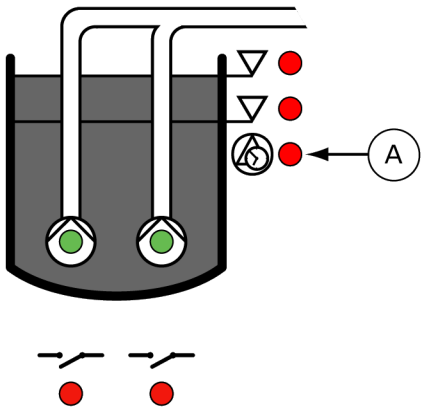
The pumped range in the example is 5.00 ft. The upper level for capacity measurement should be somewhat below Starting level 1. In the normal case, the distance between Start level 1 and the upper capacity measurement level is 10% of the pumped range. Ten percent of 5.00 ft is 0.50 ft, making the upper level 4.50 ft (5.00 ft - 0.50 ft). The distance between the upper and lower capacity measurement levels is usually 15% of the pumped range. Fifteen percent of 5.00 ft is 0.75 ft, making the lower level 3.75 ft (4.50 ft - 0.75 ft).

The example above shows how the capacity measurement parameters can be set. It is important to ensure that measurement is carried out over a sufficiently long time, which should range from 30 seconds to 9 minutes. If the time taken to lower the level below the measurement range is shorter or longer, the range must be increased or decreased appropriately.

The capacity measurement limits are entered in the “Upper Level cap.” and “Lower level cap” menus.

The calculated capacity of the particular pump is based on a mean value calculated over a number of pumping cycles. The number of cycles is specified in the Number of calculations menu. In the normal case, calculation is based on 5 cycles; however, this may need to be increased if the inflow varies significantly. If the number of pumping cycles is zero, the RTU will use the nominal capacity as the calculated value.

An LED indicating that capacity measurement is in progress is mounted on the front panel of the RTU beside the pump operation Led.



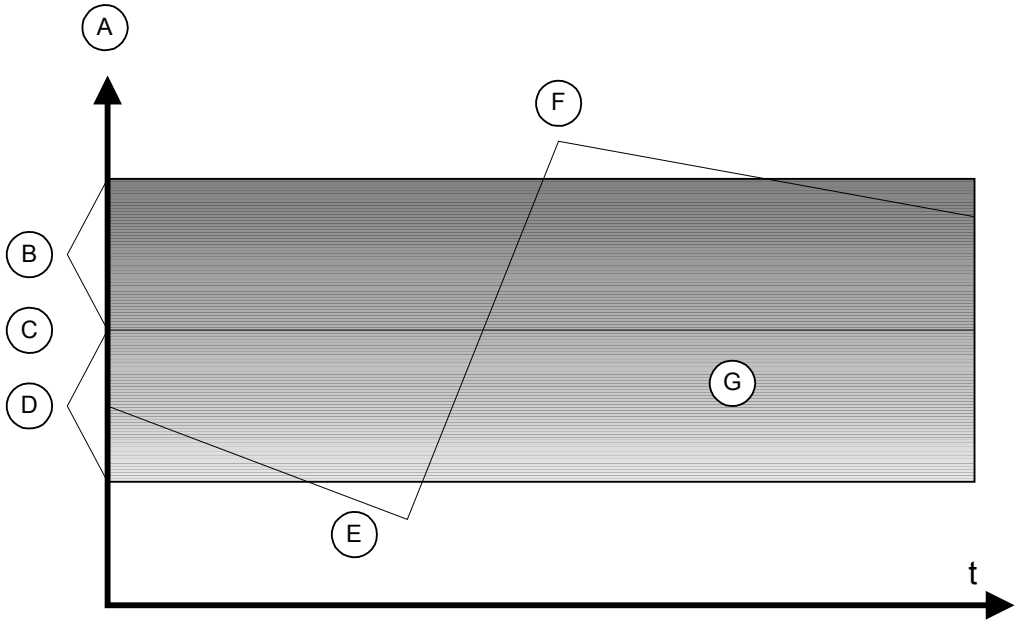
A = Capacity measurement is in progress when LED light and one ore more pumps is running.

An LED on the front panel indicates capacity measurement in progress.

8.4.2 Monitoring of pump capacities

The calculated pump capacities are displayed in the “Calc cap. P1” to “Calc cap. P2” menus The RTU can monitor the calculated pump capacities continuously to compare them with the nominal values. The nominal capacities should be entered in the “Nom. cap. P1” to “Nom. cap. P2” menus for this purpose. The nominal pump capacities are available, for example, from the pump curves. The amount by which the calculated capacity may deviate from the nominal before a capacity deviation alarm is generated should also be specified.

A capacity alarm will be generated if the calculated capacity deviates from the nominal value by more than the permissible amount.



A = Capacity
B = Capacity deviation
C = Nominal capacity
D = Capacity deviation
E = Low capacity alarm
F = High capacity alarm
G = Calculated capacity must vary within shaded area

Calculated pump capacity.

The example above relates to a pump, which is in need of service. The pump capacity is falling steadily and an alarm is generated when the level falls below the low capacity alarm limit (nominal capacity - capacity deviation). The pump is serviced and the capacity rises dramatically. After a time, the level exceeds the high capacity alarm limit (nominal capacity + capacity deviation) before returning to the permissible level.

The capacity calculation and recording menus are located in the CAPACITY group under “Calc. cap. P1” to “Calc. cap. P2”. The settings can also be entered from the central system.

8.5 Overflow

The monitoring and recording of overflow conditions is an important element of pump station monitoring. The overflow flow, overflow time, number of overflows and overflow quantity are recorded in the RTU. An overflow alarm is generated and recorded in its own Overflow alarm log when overflow occurs. All menus which process overflow monitoring and recording are located in the OVERFLOW… menu group.

8.5.1 Overflow alarm log

In addition to the ordinary alarm log, overflow alarms are stored in a special log for overflow alarms only. The overflow alarm log is located in the FLOWS... group menu

```
Overflow alarm
log
```

Overflow alarm log menu

Follow these steps to browse the overflow alarm log:

Step	Action
1	Display the Overflow alarm log menu, and press OK.
	Result: The first alarm is shown in the display.
2	Browse the log with the Up and Down arrows.

Alarms cannot be deleted from the overflow alarm log.

8.5.2 Setting of overflow monitoring

A conventional level switch or an overflow transmitter can be used to record overflow. If a switch is chosen, the RTU will record the overflow period and the number of overflows. There is a delay of 15 sec before the calculation starts to prevent faulty values. A transmitter should be installed if the overflow flow is also to be recorded since this device will provide more accurate values than a level switch.

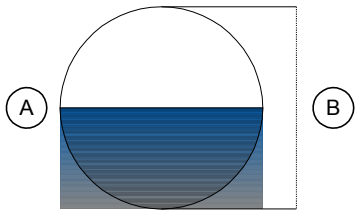
When selecting a transmitter, it is important to specify a type, which has a very high accuracy and is insensitive to changes in atmospheric pressure, fouling, floating sludge and foaming. The transmitter must also be completely submersible.

To enable the RTU to calculate the overflow quantity, the height of the overflow range must be entered and the overflow curve defined. This is done by specifying the flow, which will occur at

different overflow levels. Instead of entering the values for the different overflow segments this can be done by the program in order to ease your calculations in the case of rectangular or V-notch weir.

The type of weir that is used are entered in the Weir select menu, rectangular for rectangular weir, V-notch for the V-notch shaped weir and manual if the values are to be entered manually.

The overflow range is the height of the overflow outlet in the pump sump. The overflow level, which varies between 0 and the top of the overflow range, is the level in the overflow outlet under overflow conditions.



A = Overflow level
B = Overflow range

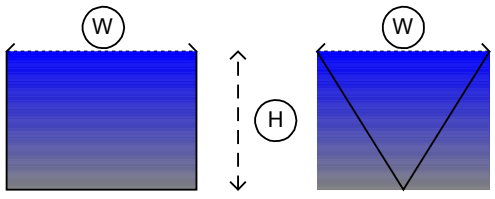
Overflow level and overflow range.

First enter the overflow range. This is entered in the Overflow range menu in the OVERFLOW… menu group.

8.5.3 Using a weir to specify overflow segments

If the Rectangular or V-notch are selected, the width of the weir have to be entered in the Weir width menu, and the discharge coefficient associated with the current weir have to be entered in the menu Discharge coeff.

The discharge coefficient is a value in the range of 0.00-1.00 that describes certain properties of the weir such as the shape of the edge, the dimensions of the menu and of the approach and more. The typical value for rectangular weir is Dc □ 0.62, and for V-notch weir Dc □ 0.58, but it may differ. The manufacturer of the weir should provide this coefficient. What is described in words above is also explained by the following figure except for the Dc.

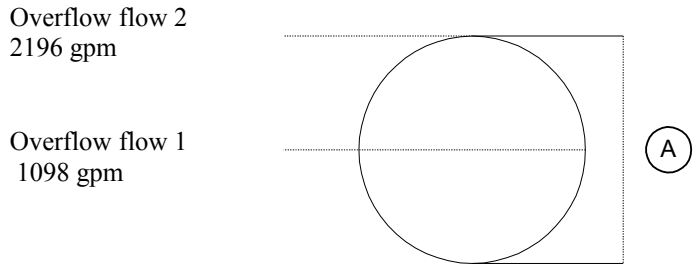


W = Weir width.
H = Overflow range.
Left = Rectangular, right = V-notch.

8.5.4 Setting the overflow segments manually

The overflow curve parameters are then entered. Up to 20 overflow levels can be specified. Although the RTU can calculate the curve for only two levels, it will be more accurate if the values for several levels are entered.

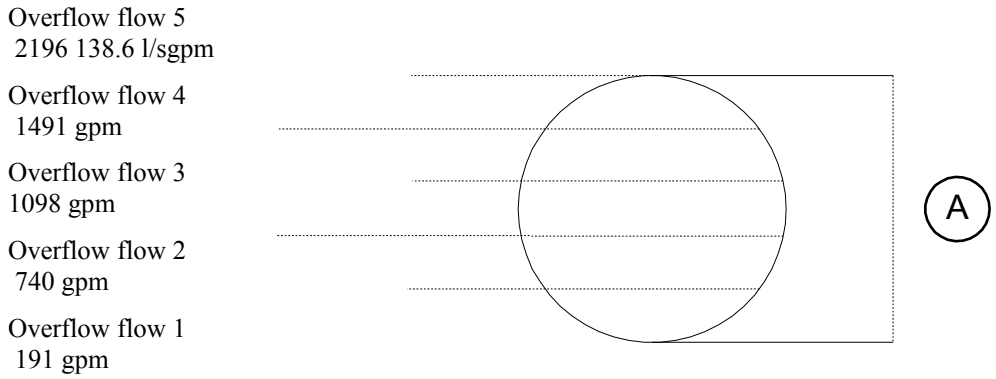
Distribute the chosen levels evenly over the overflow range. If the flow is only specified at two overflow levels, the levels midway in the overflow range and the max. level should be chosen.



A = Overflow range

Flow curve defined by two levels.

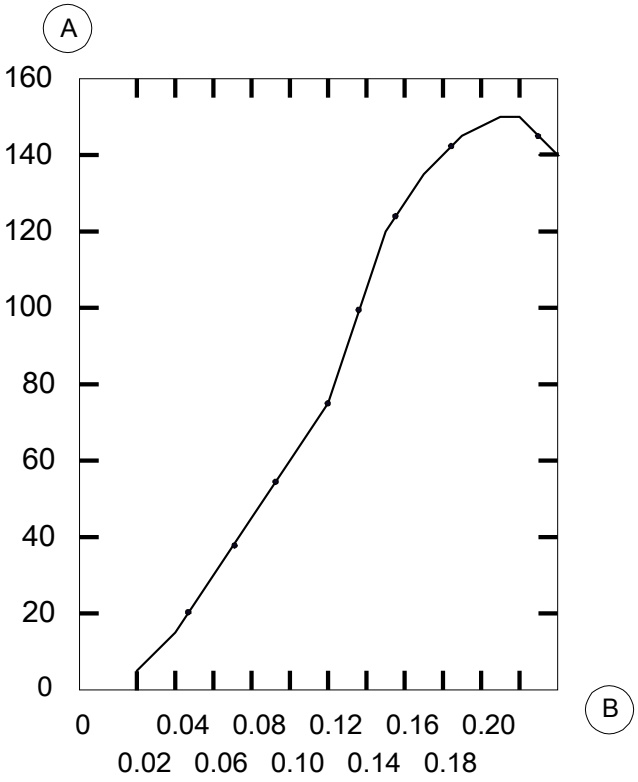
In the example below, the flow is specified at 5 different levels.



A = Overflow range

Flow curve defined at five levels.

Finally, the figure below shows a typical overflow curve calculated on the basis of ten entered values.



A = Overflow flow, gpm
B = Level, ft

Typical overflow curve.

The overflow curve will not be correct if the overflow flow is obstructed or if there is not a free fall to the receiver.

The overflow range and flow can be set from the central system.

9 Blocking

The blocking functions in the RTU are used mainly to prevent overflows in unsuitable stations. When the flows from several stations converge and the station there is not dimensioned to handle the total flow this function may be used to improve the situation. It is also used to avoid overflows in especially sensitive receivers.

The blocking functions work in principle by sending messages between the RTU's to stop one or more of the stations from pumping. The messages may be sent by telephone calls or by fixed line. The condition that is used to generate and send the blocking message is highly configurable. The action carried out may be to stop one or more pumps or to set an output signal that does something else. The flexibility of the function makes it possible to use it in other ways than

blocking.

9.1 Sending blocking commands

9.1.1 Blocking conditions

The blocking conditions are the rules the RTU use to decide when to send a blocking command, either dialled or fixed. There are two independent sets of conditions and it is possible to select which stations to send the blocking command to on each set.

The conditions inputs that are used to generate a blocking of another RTU is given in the menu Block condition. One or more conditions can be chosen.

```
Block1 condition
############
```

Blocking conditions

Two block condition menus exist. The menu has the options below:

Menu option	Blocking condition
Px failed	Blocking is activated if the pump is failed. Pump has a leak alarm, trip alarm, high temperature alarm or blocked by a low current alarm.
Px switched off	Blocking is activated when the pump is switched off manually.
Block levels	Blocking levels used. Blocking is activated when the sump level reaches the blocking level.
High level	Blocking is activated when the sump level reaches the high level alarm limit.
Extrem high lev.	Blocking is activated when the sump level reaches the extra high level alarm limit.
High level input	Blocking is activated when the sump level reaches the high level float.
Overflow input	Blocking is activated when the sump level reaches the overflow level float/sensor.
Power fail input	Blocking is activated when power fail is detected.
Block input	Blocking is activated when a special digital input is activated.
Gen ana level	General analogue levels used. Blocking is activated when the general analogue reaches the start level.

In the menu Block logic it is possible to select if all conditions or only one condition need to be active to start the blocking. Select "or" if only one condition is needed. Select "and" if all conditions are needed.

```
Block 1 logic
########
```

Select "and" or "or".

Two menus with block logic exist.

9.1.2 Selecting stations to block in dialled blocking

These menus are only used in dialled communication. Select the stations to send blocking commands to by entering the telephone numbers to the stations in the telephone menus.

```
Telephone #1
12345678
```

Telephone number one of six.

Select telephone number to use by the two blocking conditions by setting the menu:

```
Block1 tele# use
000101
```

Telephone numbers 1 and 3 used by blocking command 1.

Two menus that select telephone numbers exist.

9.1.3 Blocking using level sensor

If blocking levels are selected as conditions also set the level to start and stop the blocking using the level sensor.

```
Blocking level
 ##.## Ft
```

Send blocking command on this level.

```
Unblock level
 ##.## Ft
```

Send unblocking command on this level.

9.1.4 Delaying the block messages

The blocking messages are delayed before sent by two menus, block delay and unblock delay. If for example a level float is used as condition the delays are needed to avoid too many telephone calls.

```
Block delay
#### s
```

Delay for sending a block command.

```
Unblock delay
#### s
```

Delay for sending a unblock command.

9.2 Receiving a blocking command

9.2.1 Blocking status

In normal state, the menu Block status displays the text Not Blocked. If the RTU has been blocked by another RTU the text will be changed to Blocked. When the RTU has been unblocked the text Not blocked is shown again.

```
Blocked status
Blocked
```

Station blocked.

To reset the blocking, change the value to "not blocked". This menu can also be used to block the station. This can be used for example to test the blocking functions.

9.2.2 Blocking actions

It is possible to choose activity when an RTU has received a blocking command from another RTU. The pumps are normally blocked when a remote block command is received. To disable blocking of a pump, set the "Not tele blocked" option in the special control menu for the pump. See 7.4.5 "Special control options" on how to do this.

The blocked output is activated by default. The output has to be selected on most programs. See 3.2.4 "Selecting output functions".

9.2.3 Blocking data

Blocking time and events are displayed in two menus. This data are also sent to report.

9.2.4 Selecting stations to block in fixed line blocking

These menus are only used in fixed line communication. Select the station to receive blocking commands from by entering the station ID.

```
Blocked by ID
 ##
```

ID number of station blocking this station.

Also select if block 1 condition or block 2 condition in the sending station should block this

station.

```
Blocked by func
01
```

Blocking function 1 selected to block this station.

Blocking commands in fixed line communication is using the AquaCom telegram TIO. In this telegram there are possibilities to get values from other RTUs connected to another fixed line network. See the Mtc-Com manual on how to use this function.

9.3 Blocking safety

If the transmission fails, the RTU attempts to reach the other RTU as long as the blocking conditions are fulfilled. To increase safety two menus are used. The first in the sending/blocking RTU is a repeat of the blocking command. The second in the receiving/blocked RTU is a timeout of the blocked command. Both or none of the menus has to be used.

```
Repeat block.
#### min
```

Menu to repeat the blocking command.

Set this menu and the RTU will send repeated blocking commands with this interval. Do not set this menu shorter than the time it takes to dial all blocked stations.

```
Timeout block.
#### min
```

Menu to remove the blocking command.

The timeout of the blocking will unblock (remove the blocking command) from the station. If the communication for some reason fails the RTU will resume normal pumping after this time. When the blocking command is repeated the time out will restart. The time out has to be longer than the repeat block time in the blocking RTU.

10 Energy

10.1 Calculated data

The energy calculations show used energy in kWh, current power in kW and specific energy in kWh/MG. The specific energy is the cost of pumping a specific amount of water. It is calculated by using the pumped flow and current power consumption.

```
Energy
######## kWh tot
```

Used energy.

Energy is shown as total, daily and yesterdays values.

```
Power
######.# kW
```

Current power.

```
Specific energy
##.### kwh/MG
```

Calculated specific energy.

If VFDs are connected and communicating through MODBUS additional values are available, such as P1 / P2 Mains Voltage, P1 / P2 Motor Voltage, and P1 / P2 Power Consumption.

The specific energy is the key cost of pumping. This value and the power are calculated momentarily and presented as historical trend.

10.2 Measuring methods

The energy calculation requires either a pulse input or current sensors or both. Select measuring method in the menu:

```
Energy method
################
```

Menu for selecting measuring method.

Options are:

Pulse only	Measured values are calculated using only a digital input pulse.
Current & pulse	Measured values are calculated using both a digital input pulse and the currents of the pumps. The pulse is used for calculation of the consumed energy and the pump currents are used for calculation of the used effect and specific energy.
Current only	Measured values are calculated using only the currents of the pumps.

If currents are used as energy measuring method the power factor for the pumps and the voltage of the pumps is needed for the calculation. As the power factor of the pumps may differ from installation to installation there is a menu for each pump where the power factor of the pump may be entered. The power factor menus are Cos phi pumps. The value for different pumps is often printed on the fact sheet belonging to the pump. The energy is calculated with the use of the value in menu Voltage and the measured currents of the pumps.

If a pulse input is used as energy measuring method the only value needed is the pulse scale. Enter the energy of each pulse in the menu:

```
Energy scale
##.### kWh/pulse
```

Scaling of energy pulse.

11 Counter

A pulse with duration exceeding 10 ms can be connected to the RTU to count pulses. This could be used for example to measure precipitation (see 21 "Appendix F - Connection" for information on the terminal block to which the pulse must be connected). Start by entering the value per pulse in the Counter scale menu. See the supplier's documentation for information regarding this value.

When the amount per pulse value has been entered, the quantity will be recorded in the RTU. The recorded value will be displayed in the Counter menu, which is the first menu in the group menu of the same name. The form in which the value is reported (daily or continuous) will depend on how the RTU is configured. See the beginning of this chapter for instructions on how to select the reporting mode and how to delete recorded values.

An alarm limit can also be entered in the "Max value 5 min" or in the "Max value 24h" menu. The limit should be stated in quantity for a 5-minute or a 24-hour period. The COUNTER group menu contains menus for entering settings and reading out recorded values. All settings can be sent from the central system.

12 Function timers

The program is equipped with two timer functions. Each timer function is controlled by one digital input and controls one digital output. The two timer functions are equal.

There is one menu for each timer function to select operation for the timer. There are six functions to select and there are also two menus for each timer to select time delays.

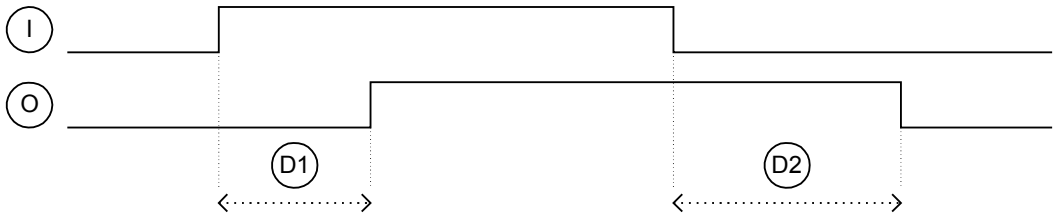
I = Timer input signal.

O = Timer output signal.

D1 = Pulse delay.

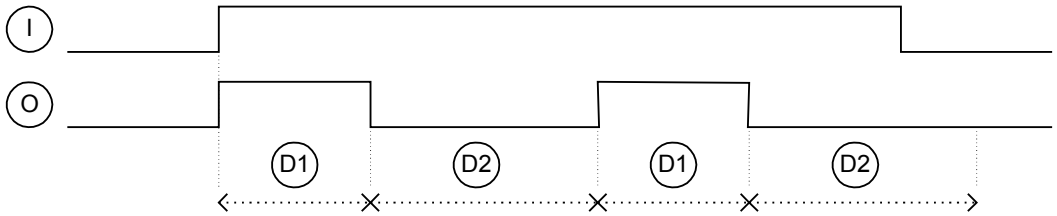
D2 = Pause delay.

Option: On/off delay



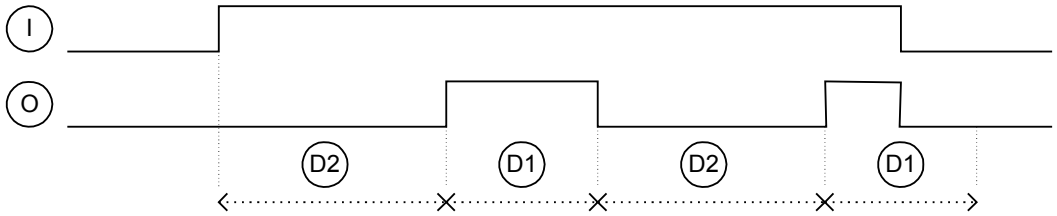
This option will delay the input to the output signal.

Option: Pulses



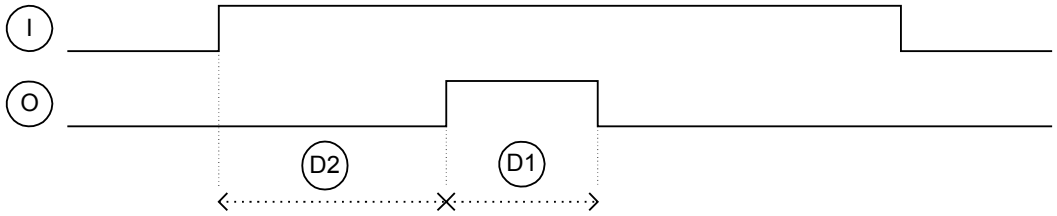
This option will create pulses on the output as long as the input is active.

Option: Pulses delayed



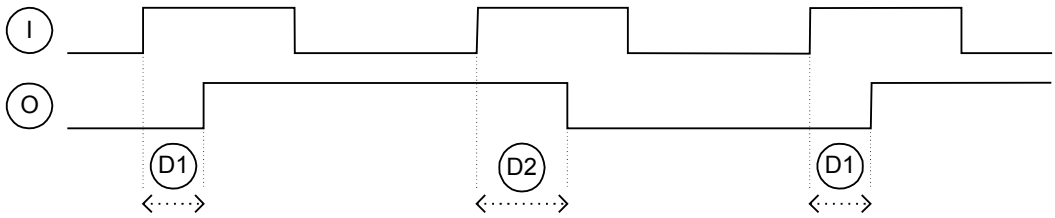
This option will also create pulses on the output but start with the delay.

Option: 1 pulse



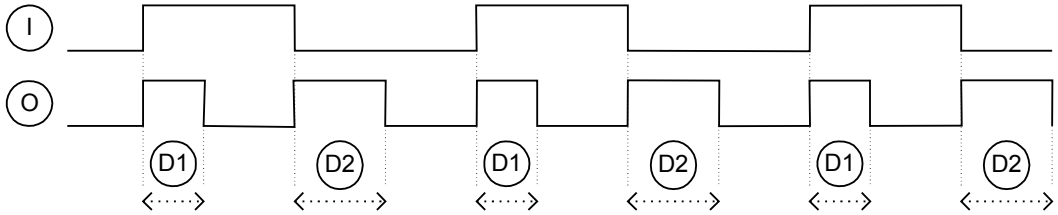
This option will create one single output pulse.

Option: Half pulse



This option will create pulses on the output with half the frequency as the input.

Option: Double pulse



This option will create pulses on the output with double frequency as the input.

13 PAN312 Power Analyzer

When connected, an ITT W&WW PAN312 Power Analyzer can be used to measure three phase current in a station, as well as line-neutral and line-line voltage values. This information will be displayed at the RTU and trended for viewing as a trend in AquaView SCADA Software.

Also available is the power consumption used on each phase as measured by the PAN312.

14 Safety

14.1 Personal safety

! Ensure that personnel cannot come in contact with live cabling or terminal blocks in the course of connection or service work. Maximum caution must be exercised when working on the digital outputs.

14.2 Password function

Two password menus are included in the first menu group to prevent unauthorised personnel from altering settings in the RTU. The function is activated by entering the appropriate four-digit code in the “New password” menu. When an operator wishes to alter a setting in any menu using the buttons on the front panel, the code must first be entered before the data can be changed.

Remember that unauthorised personnel must also be prevented from changing settings from the central system to ensure full protection against unauthorised alterations.

See 3.1.6 "Password" for a description of this function.

14.3 Personnel alarm

The purpose of the personnel alarm function is to increase personnel safety when working in the pumping station. Always activate this alarm when connecting the RTU. See 4.3 "Personnel alarm" for a description of this function.

15 Service and maintenance

! Ensure that personnel cannot come in contact with live cabling or terminal blocks in the course of connection or service work. Maximum caution must be exercised when working on the digital outputs.

15.1 Contacting Support

Before contacting Flygt Technical Support, make sure to have the following information available.

Information	Location
Product designation (type of hardware) Example: APP 721	Lower right-hand corner of the front panel.
Serial number Example: 012345678-1234	Label with bar code and serial number: • (Front mounted RTU) Label is placed on the back of the RTU.
Program name	Located in General Setup
System version	Located in General Setup, see example below
Program ID	Located in General Setup, see example below.
Type of connection	Communication menu: • Station number • ID number fixed • Communic. COM1, COM3 • Speed COM1, COM3 • Protocol on COM1, COM3 • RTS delay COM1, Com3 • Telno. PAD/SMSC (Only needed if it is a dialled RTU).
Telephone number to the RTU	
Type, version and revision number of central system	Central system, for example AquaView.

```
System:  5.02.00
ProgID:   849587
```

Example of System information menu.

15.2 Restarting the RTU

The RTU program mode channel is used if a situation occurs in which the RTU must be cold or warm started. Select the Cold start or Warm start option in the RTU program mode channel. Restarting will take 20 to 60 seconds depending on the program. Remember that the RTU set points must be re-entered following a cold start.

15.3 Remote programming

If the RTU is called, a new program can be downloaded over the telephone line. Select which the COM port use in the RTU program mode channel. The RTU must be started as described under 15.2 ”Restarting the RTU” when the new software has been downloaded.

15.4 Battery life

An external uninterruptable power supply (UPS) can be connected to the RTU. This means that the RTU will continue to record data in the event of a power failure. The duration of the power available under these conditions will depend on the type of battery. The life of a battery normally ranges from two to five years (see battery manufacturer’s specifications).

Setpoints and RTU program are also protected using a lithium ion battery inside the operator panel, type CR2430.

15.5 Replacement of components

Contact Flygt, Technical Support, if hardware components need to be replaced.

15.6 Service in pumping station

A number of recommendations must be followed when carrying out service in the pumping station, for example when removing pumps for maintenance. Start by resetting the alarm mode from remote to Local, to avoid the possible transmission of false alarms to the alarm or central system. Personnel alarms will be sent out regardless of which alarm mode is selected (see under Alarms in the chapter headed Changing alarm mode. The Remote mode should be reselected on completion of service work.

In the case of a dial-up workstation with a spare telephone, an answering delay can be entered in the RTU to allow time for answering the phone. The delay is entered in the Response delay dialled menu.

Changes in settings, for example in pump control, which will apply only during the actual maintenance work, can be carried out most easily using the buttons on the RTU front panel. This makes it easy to restore all of the settings by re-entering the set points from the central system

when work has been completed.

Before altering values in RTU, write down the original values. This is especially important in the absence of a Central system.

16 Appendix A - Troubleshooting

> **!** Ensure that personnel cannot come in contact with live cabling or terminal blocks in the course of connection or service work. Maximum caution must be exercised when working on the digital outputs.

In the event of problems with the RTU, follow the checklists in this chapter. If the problem remains, contact Flygt, Technical Support, see 15.1 "Contacting Support".

16.1 Common problems

The following are some of the most common problems dealt with by Technical Support.

? **Central system is receiving no data**

First determine if the problem is in the central system or in the RTU. Check if data is being received from other RTUs. If so, the problem is probably in the RTU. Otherwise, see the central system documentation.

See Checking communication below if the problem appears to be with the RTU.

? **Only one pump starts regardless of the level in the sump**

First check if any of the pump alarms is active, in which case the pump is blocked.

Next, check the pump control setting.

- Is a starting level value missing?
- Check that the stopping level values are correct.
- Check that the Max. number of pumps running menu is set to ‘1’.

If the pump control parameters are correct, check the connection of the unit as described in the general installation instructions and Appendix - Connection.

? **Pump does not start although starting delay has long elapsed**

Check that the random starting range is not improperly set.

Check the connection of the unit as described in the general installation instructions and Appendix - Connection.

? **Pump currents are not recorded**

Check the pump current settings. See under Pump currents in the chapter headed Monitoring and measurement.

Check that the pump operating responses are connected correctly. The currents are recorded only when pump is running.

No level signal from transmitter

? Start by checking that level transmitter settings have been entered. See under Setting of transmitter in the chapter headed Starting the RTU.

Check that the transmitter is correctly installed, then carry out test measurement.

16.1.1 Checking communication

Start by checking the modem connections. Check that the cables are connected securely. Remember to check the supply voltage to an external modem.

Check the communication led on the front panel. These should flash when the unit is transmitting and receiving data. Reference: For further information, see 3.3.1 "Communication status ".

Modem with dedicated connection between RTU and central system:

Check the modem led to determine if the modem is transmitting and receiving data. See the modem manual for details.

Modem with dial-up connection between RTU and central system:

First check the telephone connection. Connect a telephone in parallel with the RTU. Test the connection by calling another number.

Next, call the RTU from an ordinary telephone to see if the RTU answers.

16.1.2 Checking level transmitter signal

Check for a voltage of at least 8 VDC. across the terminals.

Lift the transmitter out of the water and check that it is delivering a 4 mA current signal. Check that the signal changes when the transmitter is again immersed in the water.

Note that only the Max. level and Min. level settings are required for Level sensor measurement.

16.1.3 Testing digital inputs

To test a digital input, activate a signal, such as a motor protection. Check that the DI status in the Input Status menu changes. If necessary, open the I/O Board cover with caution and verify that the LED lights above the tested DI.

16.1.4 Testing status and alarm LEDs

To test the status and alarm LEDs on the front panel, press and hold the alarm acknowledgement button until the LEDs begin to flash. The LEDs will return to normal operation when the button

is released.

16.1.5 Checking supply voltage

Check the power supply unit connections. Measure the supply voltage at the terminal block and verify it is between 23 – 25 VDC.

17 Appendix B - Front panel LED

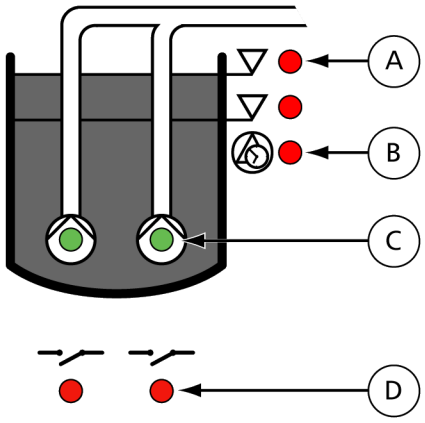
17.1 Alarm panel LED

LEDs display the alarms on the annunciation panel as follows:

Number	Description
1	Overflow.
2	Power failure.
3	High level sensor or float.
4	Low level sensor or float.
5	P1 Tripped
6	P2 Tripped
7	P1 Switched Off
8	P2 Switched Off
9	Leakage P1.
10	Leakage P2.
11	P1 High temperature.
12	P2 High temperature.
13	Pump 1 High Current
14	Pump 2 High Current
15	Generator Fail
16	New alarms in alarm log.

17.2 Operation Led

The following LED indicates pump operation:



A = Indicates when the start level is reached for respective pump
B = Capacity measurement in progress
C = Pump running
D = Pump start output active

Operating indications.

18 Appendix C - List of menus

The list is composed as follows: The left-hand column, Display, shows the appearance of the display in the particular menu. The # character indicates those positions which may/should indicate values. The next column shows the text displayed in the set point setting in the central system, and the range and options which the menu may afford.

ITT W&WW- FLYGT

No	Menu Name	Specification	Description
1	ITT W&WW- FLYGT APP721	**Writable**	Home Page

GENERAL SETUP

No	Menu Name	Specification	Description
2	GENERAL SETUP ...	**Writable**	Setup of general program options
2_1	GSP200US 2.01B ####-##-## ##:##	**Writable**	Shows program name and date/time. Date and time must be set in a cold-started system before the controller will operate the station.
2_2	Display channel ################	**Writable** **Alternative** 0 = User 1 = Parameter 2 = Service	Selection of showed channels. User - Show only result channels. Parameter - Show all application set-up channels. Service - Show all channels including system channels.
2_3	¤ Language ################	**Writable** **Alternative** 0 = English **Central System Text** Language	Select language to show and use in the display for this RTU. 0=English.
2_4	Enable Functions ##################	**Writable** **Alternative** 0 = Not Used 1 = VFD using SIOX 2 = ATV61/71 w/ MODBUS 3 = PAN312 Connected 4 = ATS48 SS w/ MODBUS 5 = PS200 VFD w/MODBUS **Central System Text** Enable Functions	Enable Advanced Program Functionality. 0 = Not Used, 1 = VFD w/ SIOX, 2=VFD w/ ATV61/71 MODBUS, 3=Power Analyzer PAN312, 4=ATS48 w/ MODBUS, 5=VFD w/ ITT PS200 MODBUS
2_5	System Ver: Program ID:	**Read only**	Identifies the RTU program unique ID. Quote this information together with the

			program name in channel 1 when you are calling ITT Flygt support regarding software questions.
2_6	Program mode ################	**Writable** **Alternative** 0 = Normal run 1 = Warm start 2 = Cold start 3 = Remote load COM3 4 = Remote load COM1 5 = Remote load COM4 6 = Save setpoints 7 = Load setpoints 8 = Save defaults 9 = Normal locked **Central System Text** Program mode	Selections: 0 = Normal run. 1 = Warm start (no data loss). 2 = Cold start (remove data). 3 = Remote COM3 (remote service through modem). 4 = Remote COM1. 5 = Remote COM4. 6 = Save setpoints (to file). 7 = Load setpoints (from file). 8=Save defaults, 9=Normal locked
2_7	Enter password ####	**Writable**	Used to logging in to a RTU with activated password. If a new password is selected it protects all channels.
2_8	New password ####	**Writable**	Sets a new password. To change the password you need to enter the current password first. Password is disabled by entering a zero.

PHYSICAL SETUP

No	Menu Name	Specification	Description
3	PHYSICAL SETUP ...	**Read only**	Section for setup of digital inputs / outputs.
3_1	Input Status ################	**Writable** **Alternative** 1 = DI 01 2 = DI 02 3 = DI 03 4 = DI 04 5 = DI 05 6 = DI 06 7 = DI 07 8 = DI 08 9 = DI 09 10 = DI 10 11 = DI 11 12 = DI 12 13 = DI 13 14 = DI 14	This channel shows the status of the digital inputs. '0' = Input not active, '1' = input active.

		15 = DI 15 16 = DI 16	
3_2	Output Status ########	**Writable** **Alternative** 1 = DO 1 2 = DO 2 3 = DO 3 4 = DO 4 5 = DO 5 6 = DO 6 7 = DO 7 8 = DO 8	This channel shows the status of the digital outputs. '0' = Output not active, '1' = Output active.
3_3	Invert Inputs ################	**Writable** **Alternative** 1 = DI 01 2 = DI 02 3 = DI 03 4 = DI 04 5 = DI 05 6 = DI 06 7 = DI 07 8 = DI 08 9 = DI 09 10 = DI 10 11 = DI 11 12 = DI 12 13 = DI 13 14 = DI 14 15 = DI 15 16 = DI 16 **Central System Text** Invert inputs 1-16 (0=NO, 1=NC)	Select which digital input signals to invert. '0' = NO, normal open contact and '1' = NC, normal closed contact.
3_4	Function DI 04 ################	**Writable** **Alternative** 0 = Not used 1 = P2 Tripped 2 = Spare alarm 3 = P1 Off switch 4 = Intruder sensor 5 = Personnel onsite 6 = Intr.sens+pers. 7 = Block Rem. Stn. **Central System Text** Function on DI 04	Function on input signal 04. Select function: 0=Not used, 1=P2 Tripped, 2=Spare alarm, 3=P1 Off switch, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers., 7=Block remote.
3_5	Function DI 05 ################	**Writable** **Alternative** 0 = Not used 1 = P1 High temp.	Function on input signal 05. Select function: 0=Not used, 1=P1 High temp., 2=Spare alarm, 3=P1 Off switch, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers.,

		2 = Spare alarm 3 = P1 Off switch 4 = Intruder sensor 5 = Personnel onsite 6 = Intr.sens+pers. 7 = Low float **Central System Text** Function on DI 05	7=Low Float
3_6	Function DI 06 ################	**Writable** **Alternative** 0 = Not used 1 = P2 High temp. 2 = Spare alarm 3 = P2 Off switch 4 = Intruder sensor 5 = Personnel onsite 6 = Intr.sens+pers. 7 = Block Rem. Stn. **Central System Text** Function on DI 06	Function on input signal 06. Select function: 0=Not used, 1=P2 High temp., 2=Spare alarm, 3=P2 Off switch, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers., 7=Block remote.
3_7	Function DI 07 ################	**Writable** **Alternative** 0 = Not used 1 = P1 Leakage 2 = Chem. Feed Fail 3 = Odor Cont. Fail 4 = Intruder sensor 5 = Personnel onsite 6 = Intr.sens+pers. 7 = Gen. Low Fuel **Central System Text** Function on DI 07	Function on input signal 07. Select function: 0=Not used, 1=P1 Leakage, 2=Chemical Feed Fail, 3=Odor Control Fail, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers., 7=Generator Low Fuel.
3_8	Function DI 08 ################	**Writable** **Alternative** 0 = Not used 1 = P2 Leakage 2 = Chem. Feed Fail 3 = Odor Cont. Fail 4 = Intruder sensor 5 = Personnel onsite 6 = Intr.sens+pers. 7 = Generator Run. **Central System Text** Function on DI 08	Function on input signal 08. Select function: 0=Not used, 1=P2 Leakage, 2=Chemical Feed Fail, 3=Odor Control Fail, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers., 7=Generator Running
3_9	Function DI 09 ################	**Writable** **Alternative** 0 = Not used 1 = Overflow sensor	Function on input signal 09. Select function: 0=Not used, 1=Overflow sensor, 2=Generator Low Fuel, 3=P1 Off switch, 4=Intruder sensor, 5=Personnel onsite,

		2 = Gen. Low Fuel 3 = P1 Off switch 4 = Intruder sensor 5 = Personnel onsite 6 = Intr.sens+pers. 7 = Block Rem. Stn. 8 = Block Pumps **Central System Text** Function on DI 09	6=Intr.sens+pers., 7=Block Remote Station, 8=Block Pumps
3_10	Function DI 10 ################	**Writable** **Alternative** 0 = Not used 1 = Power fail 2 = Spare alarm 3 = P2 Off switch 4 = Intruder sensor 5 = Personnel onsite 6 = Intr.sens+pers. 7 = Block Rem. Stn. **Central System Text** Function on DI 10	Function on input signal 10. Select function: 0=Not used, 1=Power fail, 2=Spare alarm, 3=P2 Off switch, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers., 7=Block Remote Station.
3_11	Function DI 11 ################	**Writable** **Alternative** 0 = Not used 1 = High float 2 = Spare alarm 3 = P1 Off switch 4 = Intruder sensor 5 = Personnel onsite 6 = Intr.sens+pers. 7 = Block Rem. Stn. **Central System Text** Function on DI 11	Function on input signal 11. Select function: 0=Not used, 1=High float, 2=Spare alarm, 3=P1 Off switch, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers., 7=Block Remote Station.
3_12	Function DI 12 ################	**Writable** **Alternative** 0 = Not used 1 = Low float 2 = Generator Warn. 3 = P2 Off switch 4 = Intruder sensor 5 = Personnel onsite 6 = Intr.sens+pers. 7 = Gen. Low Fuel **Central System Text** Function on DI 12	Function on input signal 12. Select function: 0=Not used, 1=Low float, 2=Generator Warning, 3=P2 Off switch, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers., 7=Generator Low Fuel.
3_13	Function DI 13 ################	**Writable** **Alternative** 0 = Not used	Function on input signal 13. Select function: 0=Not used, 1=P1 Off switch, 2=Spare alarm, 3=Intruder sensor, 4=Personnel

		1 = P1 Off switch 2 = Spare alarm 3 = Intruder sensor 4 = Personnel onsite 5 = Intr.sens+pers. 6 = Block Rem. Stn. 7 = Energy pulse 8 = Counter pulse 9 = Timer 1 10 = Timer 2 **Central System Text** Function on DI 13	onsite, 5=Intr.sens+pers., 6=Block remote, 7=Energy pulse, 8=Counter pulse, 9=Timer 1, 10=Timer 2.
3_14	Function DI 14 ################	**Writable** **Alternative** 0 = Not used 1 = P2 Off switch 2 = Spare alarm 3 = Intruder sensor 4 = Personnel onsite 5 = Intr.sens+pers. 6 = Block Rem. Stn. 7 = Energy pulse 8 = Counter pulse 9 = Timer 1 10 = Timer 2 **Central System Text** Function on DI 14	Function on input signal 14. Select function: 0=Not used, 1=P2 Off switch, 2=Spare alarm, 3=Intruder sensor, 4=Personnel onsite, 5=Intr.sens+pers., 6=Block Remote Station, 7=Energy pulse, 8=Counter pulse, 9=Timer 1, 10=Timer 2.
3_15	Function DI 15 ################	**Writable** **Alternative** 0 = Not used 1 = Generator Run. 2 = Spare alarm 3 = P1 Off switch 4 = Generator Warn. 5 = Personnel onsite 6 = Intr.sens+pers. 7 = Block Rem. Stn. 8 = Energy pulse 9 = Counter pulse 10 = Timer 1 11 = Timer 2 **Central System Text** Function on DI 15	Function on input signal 15. Select function: 0=Not used, 1=Generator Running, 2=Spare alarm, 3=P1 Off switch, 4=Generator Warning, 5=Personnel onsite, 6=Intr.sens+pers., 7=Block remote, 8=Energy pulse, 9=Counter pulse, 10=Timer 1, 11=Timer 2.
3_16	Function DI 16 ################	**Writable** **Alternative** 0 = Not used 1 = Generator Fail 2 = Spare alarm	Function on input signal 16. Select function: 0=Not used, 1=Generator Fail, 2=Spare alarm, 3=P2 Off switch, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers., 7=Block remote, 8=Energy pulse, 9=Counter

		3 = P2 Off switch 4 = Intruder sensor 5 = Personnel onsite 6 = Intr.sens+pers. 7 = Block Rem. Stn. 8 = Energy pulse 9 = Counter pulse 10 = Timer 1 11 = Timer 2 **Central System Text** Function on DI 16	pulse, 10=Timer 1, 11=Timer 2.
3_17	Function DO 03 ################	**Writable** **Alternative** 0 = Not used 1 = P1 Failure 2 = High level 3 = Generic analog 4 4 = Remote Stn. Blkd 5 = Alarm pulse 6 = Alarm status 7 = Alarm active 8 = Sprinkler valve 9 = Timer 1 out 10 = Watchdog 11 = Remote 1 12 = Buzzer 13 = Siren 14 = Buzzer+siren 15 = Volume pulse 16 = APF Active 17 = Transducer Fail. **Central System Text** Function on DO 03	Function on output signal 03. Select function: 0=Not used, 1=P1 Failure, 2=Extrem high lev., 3=Generic analog 4, 4=Remote blocked, 5=Alarm pulse, 6=Alarm status, 7=Alarm active, 8=Sprinkler valve, 9=Timer 1 out, 10=Watchdog, 11=Remote 1, 12=Buzzer, 13=Siren, 14=Buzzer+siren, 15=Volume pulse, 16=APF Active, 17=Transducer Fail
3_18	Function DO 04 ################	**Writable** **Alternative** 0 = Not used 1 = P2 Failure 2 = Low level 3 = Generic analog 4 4 = Remote Stn. Blkd 5 = Alarm pulse 6 = Alarm status 7 = Alarm active 8 = Sprinkler valve 9 = Timer 2 out 10 = Watchdog 11 = Remote 2 12 = Buzzer 13 = Siren	Function on output signal 04. Select function: 0=Not used, 1=P2 Failure, 2=Low level., 3=Generic analog 4, 4=Remote blocked, 5=Alarm pulse, 6=Alarm status, 7=Alarm active, 8=Sprinkler valve, 9=Timer 2 out, 10=Watchdog, 11=Remote 2, 12=Buzzer, 13=Siren, 14=Buzzer+siren, 15=Volume pulse, 16=APF Active, 17=Transducer Fail

		14 = Buzzer+siren 15 = Volume pulse 16 = APF Active 17 = Transducer Fail. **Central System Text** Function on DO 04	
3_19	Function DO 05 ################	**Writable** **Alternative** 0 = Not used 1 = High Level 2 = Extrem high lev. 3 = Generic analog 4 4 = Common Alarm 5 = Alarm pulse 6 = Alarm status 7 = Alarm active 8 = Sprinkler valve 9 = Timer 1 out 10 = Watchdog 11 = Remote 1 12 = Buzzer 13 = Siren 14 = Buzzer+siren 15 = Volume pulse 16 = APF Active 17 = Transducer Fail. **Central System Text** Function on DO 05	Function on output signal 05. Select function: 0=Not used, 1=High Level, 2=Extrem high lev., 3=Generic analog 4, 4=Common Alarm, 5=Alarm pulse, 6=Alarm status, 7=Alarm active, 8=Sprinkler valve, 9=Timer 1 out, 10=Watchdog, 11=Remote 1, 12=Buzzer, 13=Siren, 14=Buzzer+siren, 15=Volume pulse, 16=APF Active, 17=Transducer Fail
3_20	Function DO 06 ################	**Writable** **Alternative** 0 = Not used 1 = Low Level 2 = Extrem low lev. 3 = Generic analog 4 4 = Overflow 5 = Alarm pulse 6 = Alarm status 7 = Alarm active 8 = Sprinkler valve 9 = Timer 2 out 10 = Watchdog 11 = Remote 2 12 = Buzzer 13 = Siren 14 = Buzzer+siren 15 = Volume pulse 16 = APF Active 17 = Transducer Fail. **Central System Text**	Function on output signal 06. Select function: 0=Not used, 1=Low Level, 2=Extrem low lev., 3=Generic analog 4, 4=Overflow, 5=Alarm pulse, 6=Alarm status, 7=Alarm active, 8=Sprinkler valve, 9=Timer 2 out, 10=Watchdog, 11=Remote 2, 12=Buzzer, 13=Siren, 14=Buzzer+siren, 15=Volume pulse, 16=APF Active, 17=Transducer Fail

		Function on DO 06	
3_21	Function DO 07 ################	**Writable** **Alternative** 0 = Not used 1 = Common Alarm 2 = Extrem high lev. 3 = Generic analog 4 4 = Remote Stn. Blkd 5 = Alarm pulse 6 = Alarm status 7 = Alarm active 8 = Sprinkler valve 9 = Timer 1 out 10 = Watchdog 11 = Remote 1 12 = Buzzer 13 = Siren 14 = Buzzer+siren 15 = Volume pulse 16 = APF Active 17 = Transducer Fail. **Central System Text** Function on DO 07	Function on output signal 07. Select function: 0=Not used, 1=Common Alarm, 2=Extrem high lev., 3=Generic analog 4, 4=Remote blocked, 5=Alarm pulse, 6=Alarm status, 7=Alarm active, 8=Sprinkler valve, 9=Timer 1 out, 10=Watchdog, 11=Remote 1, 12=Buzzer, 13=Siren, 14=Buzzer+siren, 15=Volume pulse, 16=APF Active, 17=Transducer Fail
3_22	Function DO 08 ################	**Writable** **Alternative** 0 = Not used 1 = Common Alarm 2 = Extrem low lev. 3 = Generic analog 4 4 = Remote Stn. Blkd 5 = Alarm pulse 6 = Alarm status 7 = Alarm active 8 = Sprinkler valve 9 = Timer 2 out 10 = Watchdog 11 = Remote 2 12 = Buzzer 13 = Siren 14 = Buzzer+siren 15 = Volume pulse 16 = APF Active 17 = Transducer Fail. **Central System Text** Function on DO 08	Function on output signal 08. Select function: 0=Not used, 1=Common Alarm, 2=Extrem low lev., 3=Generic analog 4, 4=Remote blocked, 5=Alarm pulse, 6=Alarm status, 7=Alarm active, 8=Sprinkler valve, 9=Timer 2 out, 10=Watchdog, 11=Remote 2, 12=Buzzer, 13=Siren, 14=Buzzer+siren, 15=Volume pulse, 16=APF Active, 17=Transducer Fail
3_23	P1 Fail Output Cond. #########	**Writable** **Alternative** 1 = P1 Leakage	Pump 1 Failure Output Conditions: P1 Leakage, P1 High Temp, P1 Tripped, P1 High Current, P1 Low Current, P1 Switched

		2 = P1 High Temp 3 = P1 Tripped 4 = P1 High Current 5 = P1 Low Current 6 = P1 Switched Off 7 = P1 No Response 8 = P1 Low Capacity 9 = P1 High Capacity **Central System Text** Pump 1 Failure Output Conditions	Off, P1 No Response, P1 Low Capacity; P1 High Capacity
3_24	P2 Fail Output Cond. #########	**Writable** **Alternative** 1 = P2 Leakage 2 = P2 High Temp 3 = P2 Tripped 4 = P2 High Current 5 = P2 Low Current 6 = P2 Switched Off 7 = P2 No Response 8 = P2 Low Capacity 9 = P2 High Capacity **Central System Text** Pump 2 Failure Output Conditions	Pump 2 Failure Output Conditions: P2 Leakage, P2 High Temp, P2 Tripped, P2 High Current, P2 Low Current, P2 Switched Off, P2 No Response, P2 Low Capacity, P2 High Capacity
3_25	Common Alm. Cond. 1 ################	**Writable** **Alternative** 1 = Power Failure 2 = High Level 3 = High Level Float 4 = Low Level 5 = Low Level Float 6 = Pump 1 High Temp 7 = Pump 1 Tripped 8 = Pump 1 Leakage 9 = Pump 1 No Response 10 = Pump 1 Switched Off 11 = Pump 2 High Temp 12 = Pump 2 Tripped 13 = Pump 2 Leakage 14 = Pump 2 No Response 15 = Pump 2 Switched Off **Central System Text** Common Alarm Conditions 1	Conditions to activate Common Alarm: Power Failure, High Level, High Level Float, Low Level, Low Level Float, Pump 1 High Temp, Pump 1 Tripped, Pump 1 Leakage, Pump 1 No Response, Pump 1 Switched Off, Pump 2 High Temp, Pump 2 Tripped, Pump 2 Leakage, Pump 2 No Response, Pump 2 Switched Off
3_26	Common Alm. Cond. 2 ####	**Writable** **Alternative** 1 = Odor Control 2 = Chemical Feed Fail. 3 = Generator Fail 4 = Transducer Failure	Conditions to activate Common Alarm: Odor Control, Chemical Feed Failure, Generator Fail, Transducer Failure,

		Central System Text Common Alarm Conditions 2	

COMMUNICATION

No	Menu Name	Specification	Description
4	COMMUNICATIO N SETUP ...	**Read only**	Section for Communication Setup.
4_1	Station Number ###	**Writable** **Interval** 0 To 0	The station number identifies the RTU. Default station number is 1. This will also be used for the MODBUS ID if MODBUS protocol is selected. NOTE: MODBUS protocol only supports ID numbers less than 247.
4_2	Communic. COM1 ################	**Writable** **Alternative** 0 = Not used 1 = TD22 V.22 2 = TD22 V.22bisLAPM 3 = TD22 V.23 dial. 4 = (TD22 V.23 fix.) 5 = TD33 V.90 6 = TD33 V.90 X1 7 = TD33 V.90 LAPM 8 = RS232 half dup. 9 = RS232 full dup. 10 = Elpro 405 dial. 11 = Alarm printer 12 = User def. 0 13 = User def. 0 HDX 14 = Factory set. 0 15 = User def. 1 16 = Factory set. 1	Select type of communication for COM1
4_3	Speed COM1 ###00 bit/s	**Writable** **Alternative** 0 = 3 1 = 6 2 = 12 3 = 24 4 = 48 5 = 96 6 = 192 7 = 384 8 = 576	Select communication speed (DTE) on COM1

4_4	Protocol on COM1 ################	**Indirect** **Writable** **Alternative** 0 = None 1 = AquaCom 2 = Modbus 3 = Comli 4 = CCom 5 = Other	Selection of protocol on COM1.
4_4	Protocol on COM1 code ##	**Indirect** **Writable** **Interval** 0 To 0	Selection of protocol code for COM1. 3=AquaCom, 4=Modbus, 5=Comli, 13=CCom.
4_5	RTS delay COM1 #### ms	**Writable** **Interval** 0 To 2000 **Central System Text** General and RTS delay COM1 (ms)	The time the RTU waits after sending an RTS signal before it begins to send data. Recommended value is 100-300 ms for RS232 Full Duplex / Half Duplex and 0 ms for telephone line communication
4_6	Communic. COM4 ################	**Writable** **Alternative** 0 = Not used 1 = RS232 half dup. 2 = RS232 full dup. 3 = Elpro 405 dial. 4 = Alarm printer 5 = User def. 0 6 = User def. 0 HDX 7 = Factory set. 0 8 = User def. 1 9 = Factory set. 1	Select communication function on COM4
4_7	Speed COM4 ###00 bit/s	**Writable** **Alternative** 0 = 3 1 = 6 2 = 12 3 = 24 4 = 48 5 = 96 6 = 192 7 = 384 8 = 576	Select communication speed (DTE) on COM4
4_8	Protocol on COM4 ################	**Indirect** **Writable** **Alternative** 0 = None 1 = AquaCom 2 = Modbus	Selection of protocol on COM4.

		3 = Comli 4 = CCom 5 = Other	
4_8	Protocol on COM4 code ##	**Indirect** **Writable** **Interval** 0 To 0	Selection of protocol code for COM4. 3=AquaCom, 4=Modbus, 5=Comli, 13=CCom.
4_9	RTS delay COM4 #### ms	**Writable** **Interval** 0 To 2000 **Central System Text** General and RTS delay COM4 (ms)	The time the RTU waits after sending an RTS signal before it begins to send data. Recommended value is 100-300 ms for RS232 Full Duplex / Half Duplex and 0 ms for telephone line communication
4_10	Time-out teleg. ## s	**Writable** **Interval** 0 To 30 **Central System Text** Time-out telegram (s)	This setting controls how long to wait for a communication response before timing out. Only change the default value if it is absolutely necessary.
4_11	Time-out char #### ms	**Writable** **Interval** 0 To 9999 **Central System Text** Time-out character (ms)	This setting controls how long to wait for a new character in a telegram.
4_12	Send OK delay ##### ms	**Writable** **Interval** 0 To 15000 **Central System Text** Delay before sending OK (ms)	The time the program wait from answering a modem communication until sending the first "OK"response.
4_13	Max telegram size #### byte	**Writable** **Interval** 0 To 9999 **Central System Text** Max telegram size (byte)	The maximum telegram size that is used in AquaCom. Longer telegrams will be split up into smaller ones.
4_14	Trend sample time ## min	**Writable** **Interval** 1 To 60 **Central System Text** Trend sample time (min)	Trend sampling time (1 = 1 min. This controls the sampling rate for Trends going back to AquaView.
4_15	Trend method ################	**Writable** **Alternative** 0 = Normal 1 = Extended 2 = Continuous **Central System Text** Trend sample method	Sample method for trend.0=Normal (logs trend value every X min), 1=Extended (same as normal, but guarantees max point every X min will be present), 2=Continuous (if value drops to 0, holds last value in trend)
4_16	Rem. Ctrl. Timeout	**Writable**	If a pump is remotely controlled by

	#### min	**Interval** 0 To 1440 **Central System Text** Remote ctrl break delay (min)	AquaView, pump will keep running during the time set in this channel before shutting off once the status page is closed.
4_17	Modem Answer Delay ## s	**Writable** **Interval** 0 To 30 **Central System Text** Response delay incoming call (s)	Enter the delay time before answering incoming calls.
4_18	MODBUS delay ##### ms	**Writable** **Interval** 0 To 99999 **Central System Text** Modbus delay (ms)	MODBUS delay between messages when operating in MODBUS Master / Client.
4_19	MODBUS Timeout ##### ms	**Writable** **Interval** 0 To 99999 **Central System Text** MODBUS Timeout (ms)	MODBUS Timeout Delay between telegrams when operating in MODBUS Master / Client.
4_20	Ethernet services ######	**Writable** **Alternative** 1 = HTTP 2 = Telnet 3 = TFTP 4 = MODBUS TCP Server 5 = AquaCom TCP Client 6 = AquaCom TCP Server	Select the ethernet services that should be started. [HTTP: Web page server] [Telnet] [TFTP] [MODBUS TCP Server] [AquaCom TCP Client] [AquaCom TCP Server]
4_21	Default Gateway ################	**Writable**	IP address of the default gateway. Example: If the address is "195 . 67 . 103 . 110", enter "195.67.103.110".
4_22	Local IP address ################	**Writable**	Local IP address for this RTU. Example: If the address is "195 . 67 . 103 . 111", enter "195.67.103.111".
4_23	Remote CS IP address ################	**Writable**	IP address of AquaView Central Server when using TCP/IP. Example: If the address is "195 . 67 . 103 . 112", enter "195.67.103.112".
4_24	Subnet mask ################	**Writable**	The subnet mask for the network. Example: If the subnet mask is "255 . 255 . 255 . 0", enter "255.255.255.0".
4_25	Telnet password	**Writable**	Password to get access to the telnet service

	########## ####		on the RTU.
4_26	Service password web ########## ####	**Writable**	Service password to get write access via HTTP to the web pages on the RTU.
4_27	User password web ########## ####	**Writable**	User password to get read access via HTTP to the web pages on the RTU.

ALARM LOG

No	Menu Name	Specification	Description
5	ALARM LOG ####	**Writable**	Alarm Log section.

ALARM SETUP

No	Menu Name	Specification	Description
6	ALARM SETUP ...	**Writable**	Alarm Setup section.
6_1	Transmit alarm ##########	**Writable** **Alternative** 0 = Local permanent 1 = Remote 2 = Clear 3 = Local today **Central System Text** Alarm status (0=Local, 1=Remote)	Select whether an alarm should be sent to CS or pager. 'Clear' will remove all alarms waiting to be sent. Alarms created when the state is in 'Local' or 'Local today' will not be sent to CS with the exeption of 'Personnell' and 'Cold start' alarms. 'Local today' will return to 'Remote' at midnight.
6_2	Alarmdistrib. #### (ABCP)	**Writable** **Alternative** 1 = A--- Alarm Active 2 = -B-- Alarm Active 3 = --C- Alarm Active 4 = ---P All Alr. Pass. **Central System Text** Alarm distribution (ABCP)	Select the alarms priorities to send to CS/pager. A '1' means that this alarm with this priority should be sent. A '0' that it should not be sent. Default setup is '1101'. A=A Alarm Active. B=B Alarm Active, C=C Alarm Active, P=All alarms Passive (notification when alarm goes away).
6_3	Telno. 1 CS/PAGE ##########	**Writable** **Central System Text** Telephone number 1 CS/Pager	First telephone number to CS or paging system. Use a '&' as the first character for numbers to paging systems.
6_4	Telno. 2 CS/PAGE ##########	**Writable** **Central System Text**	Second telephone number to CS or paging system. Use a '&' as the first character for

		Telephone number 2 CS/Pager	numbers to paging systems.
6_5	Number of calls to CS ##	**Writable** **Interval** 0 To 99 **Central System Text** Number of calls to CS	Alarming to CS. Number of calls the RTU tries to use to contact the CS.
6_6	New alarm pulse length ### s	**Writable** **Interval** 0 To 999 **Central System Text** Pulse length on new alarm (s)	Enter the pulse length of the alarm output at a new alarm. This may be used to control an acoustic alarm.
6_7	Select alarm code ####	**Writable** **Interval** 0 To 0	Select alarm code to show and change.
6_8	Alarm priority #	**Writable** **Alternative** 0 = - 1 = A 2 = B 3 = C 4 = D 5 = F 6 = H	Select new alarm priority for the alarm selected in the previous channel.
6_9	New alarm code ####	**Writable** **Interval** 0 To 0	Select new alarm code for selected alarm.

PAGING SETUP

No	Menu Name	Specification	Description
7	PAGING SETUP ...	**Read only**	Setup for paging.
7_1	Station name ################	**Writable** **Central System Text** Station name	Station name. This name is transmitted to some paging systems. If the name is missing the station number will be transmitted.
7_2	Number of calls to pager ##	**Writable** **Interval** 0 To 99 **Central System Text** Number of calls to pager	Alarming to pager. Number of calls the RTU makes when the service personnel fail to respond.
7_3	Pager ack. time #### min	**Writable** **Interval** 0 To 9999 **Central System Text**	This is the time the user has to acknowledge an alarm that is sent to a pager. If no acknowledge is received the alarm will be sent again. If the time is set to zero no

		Pager acknowledge time (min)	acknowledge is neaded and the unit only calls one time.
7_4	Paging Cycle Pause time #### min	**Writable** **Interval** 0 To 9999 **Central System Text** Wait time pager cycle (min)	Waiting time after a unsuccessful batch of alarm calls before repeating the cycle.
7_5	Paging system ################	**Indirect** **Writable** **Alternative** 0 = None 1 = Minicall numeric 2 = Semadigit 3 = Numerik N/DK 4 = Minicall text 5 = Semascript 6 = TAP text 7 = Cityruf DE 8 = SMS Europ. 9 = SMS UCP 10 = SemaDigit B 11 = SemaDigit NL 12 = TAP D1 SMS 13 = GSM-SMS 14 = Numeric A 15 = SMS-SFR F 16 = SMS-Itineris F 17 = TAP F 18 = SMS-Bouygues 19 = Other	Selection of paging system.
7_5	Paging system code ##	**Indirect** **Writable** **Interval** 0 To 99 **Central System Text** Paging system selection code	Selection of paging system. 0=None, 3=Minicall numeric, 4=Semadigit, 5=BellBoy, 7=Numerik N/DK, 9=Minicall text, 10=Semascript, 11=TAP text, 12=Cityruf DE, 13=SMS Europ., 14=SMS UCP, 16=SemaDigit B, 17=SemaDigit NL, 18=TAP D1 SMS, 19=GSM-SMS M20, 20=Numeric A, 21=SMS-SFR F, 22=SMS-Itineris F, 23=TAP F, 24=SMS-Bouygues.
7_6	Telno. PAD/SMSC ################	**Writable** **Central System Text** Paging number to PAD/SMSC	Phone number to the paging central. This number must be used if alarms are sent via SMS.
7_7	Delay paging central ## s	**Writable** **Interval** 0 To 99 **Central System Text** Delay paging central (s)	Delay between dialling and transmitting of the paging message. Only used in some paging systems.

7_8	Transmitter no ################	**Writable** **Central System Text** Paging transmitter number	Transmit number for paging system. Only used in some paging systems.
7_9	Identity code ################	**Writable** **Central System Text** Paging identity code	Identification code for paging system. Only used in some paging systems.
7_10	Paging password ################	**Writable** **Central System Text** Paging password	Password for paging system. Only used in some paging systems.

ALARM DELAYS

No	Menu Name	Specification	Description
8	ALARM DELAYS ...	**Read only**	Setup for alarm delays.
8_1	Digital Alarm Delay #### s	**Writable** **Interval** 0 To 9999 **Central System Text** Digital alarm delay (s)	Common alarm delay for digital alarms.
8_2	Analog Alarm Delay #### s	**Writable** **Interval** 0 To 9999 **Central System Text** Analogue alarm delay (s)	Common alarm delay for analogue alarms.
8_3	Power Fail Alarm Delay #### s	**Writable** **Interval** 0 To 9999 **Central System Text** Power fail alarm delay (s)	Alarm delay for power fail alarm.
8_4	Pers. Alarm Warning ### min	**Writable** **Interval** 0 To 999 **Central System Text** Pers. Alarm Warning (min)	Enter the time allowed for service work. After this time the output buzzer will start, at which point personnel should reset switch to begin a new timer.
8_5	Pers. Alarm Delay #### s	**Writable** **Interval** 0 To 9999 **Central System Text** Personnel alarm warning time (s)	If the Personnel Switch is not reset in this time, the CS / pager will be notified as the service personnel may be in danger.
8_6	Intruder Alarm Delay #### s	**Writable** **Interval** 0 To 9999 **Central System Text**	Delay before the intruder alarm is sent to CS.

		Intruder alarm delay (s)	
8_7	High Level Alarm Delay ##### s	**Writable** **Interval** 0 To 99999 **Central System Text** High level alarm delay (s)	Alarm delay for high level and extremely high level alarms.
8_8	Low Level Alarm Delay #### s	**Writable** **Interval** 0 To 9999 **Central System Text** Low level alarm delay (s)	Alarm delay for low level and extremely low level alarms.

LEVEL

No	Menu Name	Specification	Description
9	LEVEL ##.## Ft	**Read only**	Shows the level of the water in the sump.
9_1	High Level ##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text** High level (Ft)	Alarm limit for high level. The alarm will be generated when the sump level reach up to this value. Set the alarm level to zero to disable the alarm.
9_2	Extrem High Lev. ##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text** Extremely high level (Ft)	Alarm limit for extremely high level. The alarm will be generated when the sump level reach up to this value. Set the alarm level to zero to disable the alarm.
9_3	Low Level ##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text** Low level (Ft)	Alarm limit for low level. The alarm will be generated when the sump level goes down below this value. Set the alarm level to zero to disable the alarm.
9_4	Extrem Low Lev. ##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text** Extremely low level (Ft)	Alarm limit for extremely low level. The alarm will be generated when the sump level goes down below this value. Set the alarm level to zero to disable the alarm.
9_5	Level Alarm Hyst ##.## Ft	**Writable** **Interval** 0.00 To 10.00 **Central System Text** Level alarm hysteresis (Ft)	Hysteresis for all level alarms. The level must change by this amount to be recorded as a change by the RTU.
9_6	Maximum Level ##.## Ft	**Writable** **Interval**	Maximum value for level sensor. Enter the level measured when the signal is equal to

		-99.99 To 99.99 **Central System Text** Maximum level (Ft)	maximum signal (normally 20 mA). The value is normally equal to sensor range plus the next channel value.
9_7	Minimum Level ##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text** Minimum level (Ft)	Minimum value for level sensor. Enter the level measured when the signal is equal to minimum signal (normally 4 mA). The value is normally equal to the distance from the sump bottom to the sensor.
9_8	Max Sensor Sign. ##.### mA	**Writable** **Interval** 0.000 To 27.466 **Central System Text** Maximum sensor signal (mA)	Maximum sensor signal. Normally 20 mA.
9_9	Min Sensor Sign. ##.### mA	**Writable** **Interval** 0.000 To 27.466 **Central System Text** Minimum sensor signal (mA)	Minimum sensor signal. Normally 4 mA.
9_10	Sensor Freeze Alarm #### min	**Writable** **Interval** 0 To 9999 **Central System Text** Sensor freeze alarm (min)	Sensor freeze time. If the value from the sensor does not move within this time an alarm is generated.

CURRENT P1

No	Menu Name	Specification	Description
10	CURRENT P1 ###.# A	**Read only**	Shows the current for pump 1.
10_1	Nominal curr. P1 ###.# A	**Read only** **Interval** 0.0 To 0.0	Shows the calculated nominal current for pump 1.
10_2	High current P1 ###.# A	**Writable** **Interval** 0.0 To 999.9 **Central System Text** High current P1 (A)	Alarm limit for high current pump 1. Set the alarm level to zero to disable the alarm.
10_3	Low current P1 ###.# A	**Writable** **Interval** 0.0 To 999.9 **Central System Text** Low current P1 (A)	Alarm limit for low current pump 1. Set the alarm level to zero to disable the alarm. It is a possible to switch off the pump on this alarm.
10_4	Curr. hyst. P1 ###.# A	**Writable** **Interval**	Hysteresis for current alarms on pump 1.

		0.0 To 999.9 **Central System Text** Current hysteresis P1 (A)	
10_5	Max current P1 ###.# A	**Writable** **Interval** 0.0 To 999.9 **Central System Text** Current range P1 (A)	Maximum measurement for current transformer pump 1.
10_6	Current P1 signal #######	**Writable** **Alternative** 0 = 0-20 mA 1 = 4-20 mA **Central System Text** Signal type current P1 (0=0, 1=4-20mA)	Type of current transformer for pump 1. Choose between: 0=0-20 mA, 1=4-20 mA.
10_7	P1 Current Source ##############	**Writable** **Alternative** 0 = Analogue Input 1 = MODBUS **Central System Text** Source of Current Signal P1	Select if Current signal is hardwired through analogue input (0) or should be read from MODBUS (1)

CURRENT P2

No	Menu Name	Specification	Description
11	CURRENT P2 ###.# A	**Read only**	Shows the current for pump 2.
11_1	Nominal curr. P2 ###.# A	**Read only** **Interval** 0.0 To 0.0	Shows the calculated nominal current for pump 2.
11_2	High current P2 ###.# A	**Writable** **Interval** 0.0 To 999.9 **Central System Text** High current P2 (A)	Alarm limit for high current pump 2. Set the alarm level to zero to disable the alarm.
11_3	Low current P2 ###.# A	**Writable** **Interval** 0.0 To 999.9 **Central System Text** Low current P2 (A)	Alarm limit for low current pump 2. Set the alarm level to zero to disable the alarm.
11_4	Curr. hyst. P2 ###.# A	**Writable** **Interval** 0.0 To 999.9 **Central System Text**	Hysteresis for current alarms on pump 2.

		Current hysteresis P2 (A)	
11_5	Max current P2 ###.# A	**Writable** **Interval** 0.0 To 999.9 **Central System Text** Current range P2 (A)	Maximum measurement for current transformer pump 2.
11_6	Current P2 signal #######	**Writable** **Alternative** 0 = 0-20 mA 1 = 4-20 mA **Central System Text** Signal type current P2 (0=0, 1=4-20mA)	Type of current transformer for pump 2. Choose between: 0=0-20 mA, 1=4-20 mA.
11_7	P2 Current Source ###############	**Writable** **Alternative** 0 = Analogue Input 1 = MODBUS **Central System Text** Source of Current Signal P2	Select if Current signal is hardwired through analogue input (0) or should be read from MODBUS (1)

GENERAL ANALOG 4

No	Menu Name	Specification	Description
12	GENERAL ANALOG 4	**Read only**	Shows the general analogue 4 input.
12	Volume GA4 Not used	**Indirect** **Read only**	Shown when the volume in general analog 4 is not used.
12	Volume GA4	**Indirect** **Read only**	Volume general analog 4.
12	Volume GA4 #####.#### MG	**Indirect** **Writable**	Volume for general analog 4. Enter a value manually and the counter will continue on this value.
12_2	High value GA4 ####.##	**Writable** **Interval** -9999.99 To 9999.99 **Central System Text** High alarm general analog 4	Alarm limit for high value general analogue 4. Set the alarm level to zero to disable the alarm.
12_3	Low value GA4 ####.##	**Writable** **Interval** -9999.99 To 9999.99 **Central System Text** Low alarm general analog 4	Alarm limit for low value general analogue 4. Set the alarm level to zero to disable the alarm.

12_4	Alarm hyst. GA4 ####.##	**Writable** **Interval** 0.00 To 9999.99 **Central System Text** Alarm hysteresis general analog 4	Hysteresis for general analogue 4 alarms.
12_5	Use of GA4 ################	**Writable** **Alternative** 0 = General 1 = Flow 2 = Pumpflow 3 = Inflow 4 = Overflow 5 = Current 6 = PH 7 = Temperature 8 = Pressure 9 = Level **Central System Text** Use of general analog 4	Select view of general analogue 4. 0=General, 1=Flow, 2=Pumpflow, 3=Inflow, 4=Overflow, 5=Current, 6=PH, 7=Temperature, 8=Pressure, 9=Level
12_6	Max value GA4 ####.##	**Writable** **Interval** -9999.99 To 9999.99 **Central System Text** Maximum value general analog 4	Maximum value for general analogue 4. Enter the value measued by the sensor when the signal is 20 mA.
12_7	Min value GA4 ####.##	**Writable** **Interval** -9999.99 To 9999.99 **Central System Text** Minimum value general analog 4	Minimum value for general analogue 4. Enter the value measued by the sensor when the signal is 0 or 4 mA.
12_8	Signal type GA4 #######	**Writable** **Alternative** 0 = 0-20 mA 1 = 4-20 mA **Central System Text** Signal type general ana. (0=0, 1=4-20mA)	Type of sensor for general analogue 4. Choose between 0=0-20 mA, 1=4-20 mA.
12_9	Start value GA4 ####.##	**Writable** **Interval** -9999.99 To 9999.99 **Central System Text** Start value general analog 4	Enter a start value. When general analogue 4 reach this value a configured output will be activated. This output remains active until the stop value is reached.
12_10	Stop value GA4 ####.##	**Writable** **Interval** -9999.99 To 9999.99 **Central System Text** Stop value general analog 4	Enter a stop value. When general analogue 4 reach the stop value a configured output is activated. This output remains active until the stop value is reached.

OPERATIONAL DATA

No	Menu Name	Specification	Description
13	OPERATIONAL DATA...	**Writable**	Operating Data
13_1	Report Mode ################	**Writable** **Alternative** 0 = Today's 1 = Yesterday's 2 = Continuous	Selects if channels with report data should show today's, yesterday's or continuous values. Today's and yesterday's values cannot be changed. Continuous values may be changed.
13_2	P1 no. of starts	**Indirect** **Read only**	Starts of pump 1.
13_2	P1 no. of starts ####### total	**Indirect** **Writable** **Interval** 0 To 0	Starts of pump 1. Enter a value manually and the counter will continue on this value.
13_3	P1 runtime	**Indirect** **Read only**	Runtime pump 1.
13_3	P1 runtime ##### h total	**Indirect** **Writable** **Interval** 0 To 0	Runtime pump 1. Enter a value manually and the counter will continue on this value.
13_4	P2 no. of starts	**Indirect** **Read only**	Starts of pump 2.
13_4	P2 no. of starts ####### total	**Indirect** **Writable** **Interval** 0 To 0	Starts of pump 2. Enter a value manually and the counter will continue on this value.
13_5	P2 runtime	**Indirect** **Read only**	Runtime pump 2.
13_5	P2 runtime ##### h total	**Indirect** **Writable** **Interval** 0 To 0	Runtime pump 2. Enter a value manually and the counter will continue on this value.
13_6	Two pump starts	**Indirect** **Read only**	Starts two pumps running at the same time.
13_6	Two pump starts ####### total	**Indirect** **Writable** **Interval** 0 To 0	Starts two pumps running at the same time. Enter a value manually and the counter will continue on this value.
13_7	Two pump runtime	**Indirect** **Read only**	Runtime two pumps running at the same time.

13_7	Two pump runtime ##### h total	**Indirect** **Writable** **Interval** 0 To 0	Runtime two pumps running at the same time. Enter a value manually and the counter will continue on this value.
13_8	Gen no of starts	**Indirect** **Read only**	Starts of generator.
13_8	Gen no of starts ####### total	**Indirect** **Writable** **Interval** 0 To 0	Starts of generator. Enter a value manually and the counter will continue on this value.
13_9	Gen runtime	**Indirect** **Read only**	Runtime generator.
13_9	Gen runtime ##### h total	**Indirect** **Writable** **Interval** 0 To 0	Runtime generator. Enter a value manually and the counter will continue on this value.

START AND STOP LEVELS

No	Menu Name	Specification	Description
14	START AND STOP LEVELS ...	**Read only**	Start and stop levels of the pumps.
14_1	Start Level P1 ##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text** Start Level P1 (Ft)	Start level for pump 1. When alternating is selected this start level is shared by all alternating pumps.
14_2	Stop Level P1 ##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text** Stop Level P1 (Ft)	Stop level for pump 1. When alternating is selected this stop level is shared by all alternating pumps.
14_3	Start Level P2 ##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text** Start Level P2 (Ft)	Start level for pump 2. When alternating is selected this start level is shared by all alternating pumps.
14_4	Stop Level P2 ##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text** Stop Level P2 (Ft)	Stop level for pump 2. When alternating is selected this stop level is shared by all alternating pumps.
14_5	Random Start	**Writable**	Makes the start levels vary randomly

	Span #.## Ft	**Interval** 0.00 To 9.99 **Central System Text** Random Start Span (Ft)	between start level and start level+range. Used to avoid accumulation of grease on sump-wall.

VFD Output

No	Menu Name	Specification	Description
15	VFD Output ...	**Writable**	VFD Control
15_1	P1 VFD Output Spd. ###.## %	**Read only** **Interval** 0.00 To 0.00	Speed signal sent to P1
15_2	P2 VFD Output Spd. ###.## %	**Read only** **Interval** 0.00 To 0.00	Speed signal sent to P2
15_3	P1 VFD Torque ###.# %	**Read only** **Interval** 0.0 To 0.0	VFD #1 Torque Value (1 = 0.1% Nominal Torque)
15_4	P2 VFD Torque ###.# %	**Read only** **Interval** 0.0 To 0.0	VFD #2 Torque Value (1 = 0.1% Nominal Torque)
15_5	P1 VFD Motor Power ### %	**Read only** **Interval** 0 To 0	VFD #1 Motor Power (1 = 1% Power)
15_6	P2 VFD Motor Power ### %	**Read only** **Interval** 0 To 0	VFD #2 Motor Power (1 = 1% Power)
15_7	PID Regulator Status ###	**Read only** **Alternative** 0 = OFF 1 = ON	Indicate if PID Regulator is turned Off or On. This channel is showing ON when the pumps are regulated or when the regulator is set to Manual
15_8	Flying Start Time ### sec	**Writable** **Interval** 0 To 999 **Central System Text** Flying Start (0-999 sec)	Enter the amount of seconds the pump should run at full speed before PID control.
15_9	Output Control #########	**Writable** **Alternative** 0 = Automatic 1 = Manual **Central System Text** Output Control (0=Auto,1=Manual)	In Automatic mode pumps will operate according to the PID control. In Manual mode the pumps will use the speed signal in the next channel.

15_10	Manual Output ###.## %	**Writable** **Interval** 0.00 To 100.00 **Central System Text** Manual Output (###.## %)	If the channel before this one is set to Manual mode, the pump will use this constant speed signal for operation.
15_11	Max Output Value ###.## %	**Writable** **Interval** 0.00 To 100.00 **Central System Text** Maximum Output Value (###.## %)	In this channel enter the maximum output value for PID control.
15_12	Min Output Value ###.## %	**Writable** **Interval** 0.00 To 100.00 **Central System Text** Minimum Output Value (###.## %)	In this channel enter the minimum output value for PID control.
15_13	Amplification #### PID	**Writable** **Interval** 0 To 9999 **Central System Text** Amplification (PID controller)	Enter the amplification factor for the PID controller (default is 2)
15_14	Integration Time #### sec PID	**Writable** **Interval** 0 To 9999 **Central System Text** Integration Time (sec) (PID controller)	Enter the integration time for the PID controller (default is 2)
15_15	Derivation Time #### sec PID	**Writable** **Interval** 0 To 9999 **Central System Text** Derivation Time (sec) (PID controller)	Enter the derivation time for the PID controller (default is 2)
15_16	Sample Time #### sec PID	**Writable** **Interval** 0 To 9999 **Central System Text** Sample Time (sec) (PID controller)	Enter the sample time for the PID controller (default is 5)
15_17	PID Input Source ################	**Writable** **Alternative** 0 = Flow 1 = Lead Start Lvl 2 = Custom Level **Central System Text** PID Input Source (0=Flow, 1=Lead Level, 2 = Custom Level)	This channel displays whether the PID controller is currently being controlled on Flow (flow setpoint), Lead Setpoint (maintains Lead Level Setpoint), or Custom Level (maintains level setpoint).

15_18	Level Setpoint ##.## ft	**Writable** **Interval** 0.00 To 99.99 **Central System Text** Level Setpoint (ft)	Enter Level Setpoint to be used when P-I-D is controlling on Level.
15_19	Flow Setpoint #### GPM	**Writable** **Interval** 0 To 9999 **Central System Text** Flow Setpoint (GPM)	Enter Flow Setpoint to be used when P-I-D is controlling on Flow.
15_20	Deadband Level ##.## Ft	**Writable** **Interval** 0.00 To 99.99 **Central System Text** Deadband for Level control (ft)	Enter the deadband for the PID controller. The level must change by more than this value for the PID controller to send a modifed output signal.
15_21	Deadband Flow ##.## GPM	**Writable** **Interval** 0.00 To 99.99 **Central System Text** Deadband for Flow control (GPM)	Enter the deadband for the PID controller. When controlled by flow, flow value must change by more than this value for the PID controller to send a modifed output signal.
15_22	Start / Stop Ramp ###	**Writable** **Alternative** 0 = Off 1 = On **Central System Text** Start / Stop Ramp (0=Off, 1=On)	This channel controls whether or not the PID controller ramps between start and stop levels This uses a fixed speed between start and stop level to help prevent clogging of pumps
15_23	Speed at Stop Level ###.## %	**Writable** **Interval** 0.00 To 100.00 **Central System Text** Speed at Stop Level (###.## %)	If the Start/Stop Ramp is used from previous channel, this will be the speed of the pump when the stop level is reached.

PUMP CONTROL

No	Menu Name	Specification	Description
16	PUMP CONTROL ...	**Read only**	Control of pumps.
16_1	High Level Run Time #### s	**Writable** **Interval** 0 To 9999 **Central System Text** High level float minimum run time (s)	Runtime on high level float. When the high level float is activated the available pumps will start and continue to run at least this time after return of the float. A zero of will prevent the pump(s) from starting and only creates an alarm.
16_2	Low Level Block	**Writable**	Block time on low level float. When the low

	Time #### s	**Interval** 0 To 9999 **Central System Text** Low level float minimum block time (s)	level float is activated all pumps will stop and continue to be stopped for this time after the float goes underwater again. A value of zero will still stop the pumps, but prevent additional blocking once the float goes underwater again.
16_3	Pump No Response Delay #### s	**Writable** **Interval** 3 To 9999 **Central System Text** Alarm pump does not start after (s)	Alarm delay for pump no response. When there is no running signal within this time an operation alarm will be generated. Alternating pumps will switch on this alarm.
16_4	Start Delay #### s	**Writable** **Interval** 0 To 9999 **Central System Text** Start delay (s)	Delay between the start condition and starting the pump.
16_5	Stop Delay #### s	**Writable** **Interval** 0 To 9999 **Central System Text** Stop delay (s)	Delay between the stop condition and stoping the pump.
16_6	Time Between Starts #### s	**Writable** **Interval** 0 To 9999 **Central System Text** Time between two starts (s)	Delay between two pump starts. Also delay between a pump start to a pump stop.
16_7	Time Between Stops #### s	**Writable** **Interval** 0 To 9999 **Central System Text** Time between two stops (s)	Delay between two pump stops. Also delay between a pump stop to a pump start.
16_8	Max Starts Per Hour Alarm ###	**Writable** **Interval** 0 To 999 **Central System Text** Maximum start/hour alarm	An alarm will be generated for the pump if it has more starts in an hour than this value. Default is 16. Enter zero to turn off this alarm.
16_9	Low Curr. Reset Time #### min	**Writable** **Interval** 0 To 9999 **Central System Text** Low current reset time (min)	If a value is entered in this channel, a pump will be switched off when it is reaching a low current alarm, and blocked during the time set.

ADVANCED PUMP CONTROL

No	Menu Name	Specification	Description
17	ADVANCED PUMP CONTROL ...	**Read only**	Advanced control of pumps.
17_1	Action ################	**Writable** **Alternative** 0 = Select action 1 = Activate APF 2 = Pump down	Select remote action. Options: 0=Select action, 1=Activate APF, 2=Pump down.
17_2	Alternation Mode ################	**Writable** **Alternative** 0 = Alternating 1 = P1 First 2 = P2 First **Central System Text** Alternation mode	Alternation Mode. Select between alternation and duty pump. 0=Start Alternation, 1=P1 first, 2=P2 first
17_3	Alternation Runtime #### min	**Writable** **Interval** 0 To 1440 **Central System Text** Alternation Runtime (min)	Pumps will alternate after this time
17_4	Max running pumps (Normal) #	**Writable** **Interval** 0 To 2 **Central System Text** Max running pumps (normal)	Max running pumps. Used to limit the number of pumps running at the same time under normal power.
17_5	Max running pumps (Gen) #	**Writable** **Interval** 0 To 2 **Central System Text** Max running pumps (Generator)	Max running pumps. Used to limit the number of pumps running at the same time under generator conditions
17_6	Max. pump time #### min	**Writable** **Interval** 0 To 9999 **Central System Text** Maximum pump time (min)	Maximum continuous runtime of the pumps. When the pump has run this time it is stopped temporarily. This prevents garbage from building up on the impeller lowering the performance.
17_7	Special Cont. P1 ###########	**Writable** **Alternative** 1 = Disconnected 2 = Blocked by P2 3 = No backup run 4 = No long run blk. 5 = Leakage block 6 = Not tele blocked	Special control of pump 1. Options: 1=Disconnected, 2=Blocked by P2, 3=No backup run, 4=No long run blk., 5=Leakage block, 6=Not tele blocked, 7=Use level E1, 8=APF high sens., 9=APF no transient, 10=APF no undercurr, 11=No cur. blk.

		7 = Use level E1 8 = APF high sens. 9 = APF no transient 10 = APF no undercurr 11 = No Current. Blk. **Central System Text** Special control P1	
17_8	Special Cont. P2 ###########	**Writable** **Alternative** 1 = Disconnected 2 = Blocked by P1 3 = No backup run 4 = No long run blk. 5 = Leakage block 6 = Not tele blocked 7 = Use level E1 8 = APF high sens. 9 = APF no transient 10 = APF no undercurr 11 = No Current. Blk. **Central System Text** Special control P2	Special control of pump 2. Options: 1=Disconnected, 2=Blocked by P1, 3=No backup run, 4=No long run blk., 5=Leakage block, 6=Not tele blocked, 7=Use level E1, 8=APF high sens., 9=APF no transient, 10=APF no undercurr, 11=No cur. blk.
17_9	Start Level E1 ##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text** Start level E1 (Ft)	Extra start level 1. Used by pump selected in special control options.
17_10	Stop Level E1 ##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text** Stop level E1 (Ft)	Extra stop level 1. Used by pump selected in special control options.
17_11	Manual HOA Takeover ####	**Writable** **Alternative** 0 = Off 1 = On **Central System Text** Manual pump start (1=On)	Controls if the RTU shall take over control of pump on manual run by local switch. If a pump is manually controlled for more than 5 seconds the RTU takes over the pump control until the stop level has been reached.

SUMP CLEANING

No	Menu Name	Specification	Description
18	SUMP CLEANING ...	**Read only**	Cleaning of pump sump.
18_1	APF clean cycles	**Writable**	Number of cleaning cycles using the APF

	per day ##	**Interval** 0 To 99 **Central System Text** APF cleaning cycles per day	per day.
18_2	Maximum Pump Off Time #### min	**Writable** **Interval** 0 To 9999 **Central System Text** Forced pump down delay (min)	Forces an extra pump cycle to empty the bassin to avoid stagnant water. The pump with the lowest start level will be started.
18_3	Forced Pump Down Level @##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text** Forced pump down level (Ft)	This is the level the pump will run to when it starts with the forced pump down function. This may be selected lower than the normal stop level but has to be higher than the low level float if used. A zero will use the normal pump stop level.
18_4	No of flushings per day ##	**Writable** **Interval** 0 To 99 **Central System Text** No of sprinkler flushings per day	Number of sprinkler flush starts each day.
18_5	Flushing time #### s	**Writable** **Interval** 0 To 9999 **Central System Text** Sprinkler flushing time (s)	Cleaning time for sprinkler flush valve.

FLOWS AND VOLUMES

No	Menu Name	Specification	Description
19	FLOWS AND VOLUMES ...	**Read only**	Flows and volumes.
19_1	Inflow @###### gpm	**Read only**	The calculated inflow into the sump.
19	Inflow volume	**Indirect** **Read only**	Inflow volume.
19	Inflow volume ######.## MG tot	**Indirect** **Writable** **Interval** 0.00 To 0.00	Inflow volume. Enter a value manually and the counter will continue on this value.
19_3	Outflow ###### gpm	**Read only**	The calculated pump flow out from the sump.
19_4	Pumped volume	**Indirect** **Read only**	Pumped volume.

19_4	Pumped volume ######.## MG tot	**Indirect** **Writable** **Interval** 0.00 To 0.00	Pumped volume. Enter a value manually and the counter will continue on this value.
19_5	Outflow calib ###.# %	**Writable** **Interval** 0.0 To 999.9 **Central System Text** Outflow calibration (%)	Calibration for pumped flow. Change this value to adjust the calculated pumped flow.
19_6	Volume sump ########## gal	**Read only**	Calculated volume in sump.
19_7	Volume pulse ######## G/pulse	**Writable** **Interval** 0 To 2641699974 **Central System Text** Volume output pulse (gal/pulse)	Flow pulses. Enter the volume that is needed to create a pulse. This can be used for sample taking.
19_8	Volume pulse src ################	**Writable** **Alternative** 0 = Pumped flow 1 = Inflow 2 = Overflow 3 = Generic ana flow **Central System Text** Volume output pulse source	Select source for flow pulse. 0=Pumped flow, 1=Inflow, 2=Overflow, 3=Generic ana flow. This channel selects the type of flow to use to create pulses. If overflow is selected the program will make an extra pulse when the overflow starts.

SUMP FORM

No	Menu Name	Specification	Description
20	SUMP FORM ...	**Read only**	Definition of pump sump for capacity calculations.
20_1	Level 1 @##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text** Level 1 (Ft)	Level at area 1. May be zero.
20_2	Area 1 ####.# Ft2	**Writable** **Interval** 0.0 To 9999.9 **Central System Text** Area 1 (Ft2)	Area at level 1.
20_3	Level 2 @##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text**	Level at area 2. May not be zero.

		Level 2 (Ft)	
20_4	Area 2 ####.# Ft2	**Writable** **Interval** 0.0 To 9999.9 **Central System Text** Area 2 (Ft2)	Area at level 2.
20_5	Level 3 @##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text** Level 3 (Ft)	Level at area 3. Zero if not used.
20_6	Area 3 ####.# Ft2	**Writable** **Interval** 0.0 To 9999.9 **Central System Text** Area 3 (Ft2)	Area at level 3. Zero if not used.
20_7	Level 4 @##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text** Level 4 (Ft)	Level at area 4. Zero if not used.
20_8	Area 4 ####.# Ft2	**Writable** **Interval** 0.0 To 9999.9 **Central System Text** Area 4 (Ft2)	Area at level 4. Zero if not used.
20_9	Level 5 @##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text** Level 5 (Ft)	Level at area 5. Zero if not used.
20_10	Area 5 ####.# Ft2	**Writable** **Interval** 0.0 To 9999.9 **Central System Text** Area 5 (Ft2)	Area at level 5. Zero if not used.

CAPACITY CALCULATION

No	Menu Name	Specification	Description
21	CAPACITY CALCULATION ...	**Read only**	Pump capacity calculation in the sump.
21_1	Upper level cap. @##.## Ft	**Writable** **Interval**	Upper level for capacity calculation. Has to

		-99.99 To 99.99 **Central System Text** Upper level cap. calc. (Ft)	be below the lowest start level.
21_2	Lower level cap. @##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text** Lower level cap. calc. (Ft)	Lower level for capacity calculation. Has to be higher than the stop level.
21_3	No. calculations ## (0-20)	**Writable** **Interval** 0 To 20 **Central System Text** Number of calculations (0-20)	Number of average values in capacity calculations. Use 0 and the current pump flow uses nominal capacity.
21_4	Capacity factor #.## 2 pumps	**Writable** **Interval** 0.00 To 1.00 **Central System Text** Capacity factor 2 pumps (0.50-1.00)	Calibration factor for 2 pumps. Divide the real total capacity by the added individual capacities. Example: P1=10 gpm, P2=10 gpm, together 15 gpm the capacity factor is then 0.75. This figure will be used to calculate the pumped flow.

PUMP CAPACITY

No	Menu Name	Specification	Description
22	PUMP CAPACITY ...	**Read only**	Parameters for the capacity alarms.
22_1	Capacity P1 ###### gpm	**Read only**	Shows the calculated pump capacity of P1.
22_2	Nom. cap. P1 ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Nominal capacity P1 (gpm)	Enter the nominal capacity of P1. Used for capacity alarms.
22_3	Cap. div. P1 ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Capacity divergation limit P1 (gpm)	Divergation limit for high and low capacity alarms. Uses nominal capacity +/- this channel.
22_4	Capacity P2 ###### gpm	**Read only**	Shows the calculated pump capacity of P2.
22_5	Nom. cap. P2 ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text**	Enter the nominal capacity of P2. Used for capacity alarms.

		Nominal capacity P2 (gpm)	
22_6	Cap. div. P2 ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Capacity divergation limit P2 (gpm)	Divergation limit for high and low capacity alarms. Uses nominal capacity +/- this channel.

OVERFLOW

No	Menu Name	Specification	Description
23	OVERFLOW ###### gpm	**Read only**	Show calculated overflow.
23_1	Overflow volume	**Indirect** **Read only**	Overflow volume.
23_1	Overflow volume #####.### MG tot	**Indirect** **Writable** **Interval** 0.000 To 0.000	Overflow volume. Enter a value manually and the counter will continue on this value.
23_2	Overflow time	**Indirect** **Read only**	Overflow time.
23_2	Overflow time ##### h total	**Indirect** **Writable** **Interval** 0 To 0	Overflow time. Enter a value manually and the counter will continue on this value.
23_3	Num. overflow	**Indirect** **Read only**	Number of overflows.
23_3	Num. overflow ##### total	**Indirect** **Writable** **Interval** 0 To 0	Number of overflows. Enter a value manually and the counter will continue on this value.
23_4	Num. of days with overflows #####	**Writable** **Interval** 0 To 0	Number of days with overflow events. If the time span between two overflows is less than 24 hours this second overflow is not counted as a separate overflow event.
23_5	Overflow alarm log	**Writable**	Overflow alarm log. Shows all overflow alarms. Press OK to view the alarms.

OVERFLOW DEFINITION

No	Menu Name	Specification	Description
24	OVERFLOW DEFINITION ...	**Read only**	Overflow calculation.
24_1	Overflow level @##.## Ft	**Writable** **Interval** -99.99 To 99.99 **Central System Text** Overflow level (Ft)	The level where overflow occurs. Set this level manually if no overflow sensor is used.
24_2	Discharge coeff. #.##	**Writable** **Interval** 0.00 To 1.00 **Central System Text** Discharge coeff.(0.00-1.00)	Enter the overflow coefficient for the overflow weir. This value is used only to automatically calculate the overflow table. This value will often be named as cd.
24_3	Overflow range #.### Ft	**Writable** **Interval** 0.000 To 32.807 **Central System Text** Overflow range (Ft)	Enter the height of the overflow weir. This height shoud correspond to the maximum flow in the overflow table.
24_4	Weir width ##.### Ft	**Writable** **Interval** 0.000 To 328.097 **Central System Text** Overflow weir width (Ft)	Enter the width of the overflow weir. This value is used only to automatically calculate the overflow table.
24_5	Weir select #################	**Writable** **Alternative** 0 = Manual 1 = Rectangular 2 = V-notch **Central System Text** Weir select (0=Man, 1=Rect, 2=V-Notch)	Overflow table method. 0=Manual, 1=Rectangular, 2=V-notch. Select calculation method for overflow table. Select 'Manual' to define the overflow segment manually. Select 'Rectangular' or ' V-Notch' and the unit will calculate the overflow segments.
24_6	Overflow segment 01: ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Overflow segment 01 (gpm)	The flow over the overflow weir when the level is in this segment. (see overflow description).
24_7	Overflow segment 02: ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Overflow segment 02 (gpm)	The flow over the overflow weir when the level is in this segment. (see overflow description).
24_8	Overflow segment 03: ###### gpm	**Writable** **Interval**	The flow over the overflow weir when the level is in this segment. (see overflow

		0 To 999999 **Central System Text** Overflow segment 03 (gpm)	description).
24_9	Overflow segment 04: ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Overflow segment 04 (gpm)	The flow over the overflow weir when the level is in this segment. (see overflow description).
24_10	Overflow segment 05: ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Overflow segment 05 (gpm)	The flow over the overflow weir when the level is in this segment. (see overflow description).
24_11	Overflow segment 06: ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Overflow segment 06 (gpm)	The flow over the overflow weir when the level is in this segment. (see overflow description).
24_12	Overflow segment 07: ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Overflow segment 07 (gpm)	The flow over the overflow weir when the level is in this segment. (see overflow description).
24_13	Overflow segment 08: ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Overflow segment 08 (gpm)	The flow over the overflow weir when the level is in this segment. (see overflow description).
24_14	Overflow segment 09: ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Overflow segment 09 (gpm)	The flow over the overflow weir when the level is in this segment. (see overflow description).
24_15	Overflow segment 10: ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Overflow segment 10 (gpm)	The flow over the overflow weir when the level is in this segment. (see overflow description).
24_16	Overflow segment 11: ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Overflow segment 11 (gpm)	The flow over the overflow weir when the level is in this segment. (see overflow description).
24_17	Overflow segment 12: ###### gpm	**Writable** **Interval**	The flow over the overflow weir when the level is in this segment. (see overflow

		0 To 999999 **Central System Text** Overflow segment 12 (gpm)	description).
24_18	Overflow segment 13: ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Overflow segment 13 (gpm)	The flow over the overflow weir when the level is in this segment. (see overflow description).
24_19	Overflow segment 14: ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Overflow segment 14 (gpm)	The flow over the overflow weir when the level is in this segment. (see overflow description).
24_20	Overflow segment 15: ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Overflow segment 15 (gpm)	The flow over the overflow weir when the level is in this segment. (see overflow description).
24_21	Overflow segment 16: ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Overflow segment 16 (gpm)	The flow over the overflow weir when the level is in this segment. (see overflow description).
24_22	Overflow segment 17: ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Overflow segment 17 (gpm)	The flow over the overflow weir when the level is in this segment. (see overflow description).
24_23	Overflow segment 18: ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Overflow segment 18 (gpm)	The flow over the overflow weir when the level is in this segment. (see overflow description).
24_24	Overflow segment 19: ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Overflow segment 19 (gpm)	The flow over the overflow weir when the level is in this segment. (see overflow description).
24_25	Overflow segment 20: ###### gpm	**Writable** **Interval** 0 To 999999 **Central System Text** Overflow segment 20 (gpm)	The flow over the overflow weir when the level is in this segment. (see overflow description).

SERVICE

No	Menu Name	Specification	Description
25	SERVICE ...	**Read only**	Service-alarms.
25_1	Service interval P1 ##### h	**Writable** **Interval** 0 To 99999 **Central System Text** Service interval P1 (h)	Service inteval time. When the pump has run this time a service alarm is sent.
25_2	P1 time after service ##### h	**Writable**	This is the time since the last pump service on pump 1. Reset this channel after service.
25_3	Service interval P2 ##### h	**Writable** **Interval** 0 To 99999 **Central System Text** Service interval P2 (h)	Service inteval time. When the pump has run this time a service alarm is sent.
25_4	P2 time after service ##### h	**Writable**	This is the time since the last pump service on pump 2. Reset this channel after service.

RECEIVE BLOCKING

No	Menu Name	Specification	Description
26	RECEIVE BLOCKING ...	**Read only**	Receive blocking.
26_1	Blocked status #################	**Writable** **Alternative** 0 = Not blocked 1 = Blocked	Shows the block status. The status changes when the RTU receives remote blocking or unblocking commands. To override the remote command change the status in this channel.
26_2	Num. of blocks	**Indirect** **Read only**	Number of blockings.
26_2	Num. of blocks ##### total	**Indirect** **Writable** **Interval** 0 To 0	Number of blockings. Enter a value manually and the counter will continue on this value.
26_3	Blocked time	**Indirect** **Read only**	Blocked time.
26_3	Blocked time ##### h total	**Indirect** **Writable** **Interval**	Blocked time. Enter a value manually and the counter will continue on this value.

		0 To 0	
26_4	Timeout block. #### min	**Writable** **Interval** 0 To 9999 **Central System Text** Timeout blocking (min)	The blocked station will be unblocked after this time. This is a saftey function to unblock the station if a unblocking command fail to come. Use the repeat blocking function in the sending RTU and set it to five minutes less than this value.
26_5	Blocked by ID ##	**Writable** **Interval** -1 To 9 **Central System Text** Fixed blocked by ID	Fixed line ID of remote station that blocks this station. Used only in fixed communication.
26_6	Blocked by func ##	**Writable** **Alternative** 1 = Blocked by fnc 2 2 = Blocked by fnc 1 **Central System Text** Fixed blocked by function (21)	Block logic function in the remote station that is used to block this station. Used only in fixed communication. Options: 1=Blocked by fnc 2, 2=Blocked by fnc 1

SEND BLOCKING

No	Menu Name	Specification	Description
27	SEND BLOCKING ...	**Read only**	Send blocking.
27_1	Block delay #### s	**Writable** **Interval** 0 To 9999 **Central System Text** Block delay (s)	Enter the time to wait before the unit actually sends a blocking telegram when the blocking conditions are active.
27_2	Unblock delay #### s	**Writable** **Interval** 0 To 9999 **Central System Text** Unblock delay (s)	Enter the time to wait before the unit is actually sending deblocking when the blocking conditions is passive.
27_3	Repeat block. #### min	**Writable** **Interval** 0 To 9999 **Central System Text** Repeat blocking (min)	Repeating time for blocking command. A new blocking command is sent out after this time. Use the timeout blocking function in the receiving station and set it to five minutes more than this value.
27_4	Telephone #1 ################	**Writable** **Central System Text** Telephone #1	Blocking telephone number. Enter the telephone number of the unit you want to block.

27_5	Telephone #2 ################ #	**Writable** **Central System Text** Telephone #2	Blocking telephone number. Enter the telephone number of the unit you want to block.
27_6	Telephone #3 ################ #	**Writable** **Central System Text** Telephone #3	Blocking telephone number. Enter the telephone number of the unit you want to block.
27_7	Telephone #4 ################ #	**Writable** **Central System Text** Telephone #4	Blocking telephone number. Enter the telephone number of the unit you want to block.
27_8	Telephone #5 ################ #	**Writable** **Central System Text** Telephone #5	Blocking telephone number. Enter the telephone number of the unit you want to block.
27_9	Telephone #6 ################ #	**Writable** **Central System Text** Telephone #6	Blocking telephone number. Enter the telephone number of the unit you want to block.
27_10	Block1 condition ############	**Writable** **Alternative** 1 = P1 failed 2 = P2 failed 3 = P1 switched off 4 = P2 switched off 5 = Block levels 6 = High level 7 = Extrem high lev. 8 = High level float 9 = Overflow input 10 = Power fail input 11 = Block input 12 = Gen ana level **Central System Text** Block 1 condition	Blocking logic set 1. Select the conditions that is required to send a blocking command. Options: 1=P1 failed, 2=P2 failed, 3=P1 switched off, 4=P2 switched off, 5=Block levels, 6=High level, 7=Extrem high lev., 8=High level float, 9=Overflow input, 10=Power fail input, 11=Block input, 12=Gen ana level
27_11	Block1 tele# use ######	**Writable** **Alternative** 1 = Use number 6 2 = Use number 5 3 = Use number 4 4 = Use number 3 5 = Use number 2 6 = Use number 1 **Central System Text** Use tele# for block 1 (654321)	Blocking logic set 1. Select the telephone numbers to use for this blocking condition. Options: 1=Use number 6, 2=Use number 5, 3=Use number 4, 4=Use number 3, 5=Use number 2, 6=Use number 1
27_12	Block 1 logic ########	**Writable** **Alternative** 0 = Or 1 = And **Central System Text**	Blocking logic set 1. Select block logic for this function. 0=Or, 1=And. Select if one (or) or all (and) of the conditions are required to send block commands to other stations.

		Block 1 logic (0=Or, 1=And)	
27_13	Block2 condition ###########	**Writable** **Alternative** 1 = P1 failed 2 = P2 failed 3 = P1 switched off 4 = P2 switched off 5 = Block levels 6 = High level 7 = Extrem high lev. 8 = High level float 9 = Overflow input 10 = Power fail input 11 = Block input 12 = Gen ana level **Central System Text** Block 2 condition	Blocking logic set 2. Select the conditions that is required to send a blocking command. Options: 1=P1 failed, 2=P2 failed, 3=P1 switched off, 4=P2 switched off, 5=Block levels, 6=High level, 7=Extrem high lev., 8=High level float, 9=Overflow input, 10=Power fail input, 11=Block input, 12=Gen ana level
27_14	Block2 tele# use ######	**Writable** **Alternative** 1 = Use number 6 2 = Use number 5 3 = Use number 4 4 = Use number 3 5 = Use number 2 6 = Use number 1 **Central System Text** Use tele# for block 2 (654321)	Blocking logic set 2. Select the telephone numbers to use for this blocking condition. Options: 1=Use number 6, 2=Use number 5, 3=Use number 4, 4=Use number 3, 5=Use number 2, 6=Use number 1
27_15	Block 2 logic ########	**Writable** **Alternative** 0 = Or 1 = And **Central System Text** Block 2 logic (0=Or, 1=And)	Blocking logic set 2. Select block logic for this function. 0=Or, 1=And. Select if one (or) or all (and) of the conditions are required to send block commands to other stations.
27_16	Blocking level 1 @##.## Ft	**Writable** **Interval** 0.00 To 99.99 **Central System Text** Blocking level 1 (Ft)	Blocking level 1. Other stations are blocked at this level.
27_17	Unblock level 1 @##.## Ft	**Writable** **Interval** 0.00 To 99.99 **Central System Text** Un-blockering level 1 (Ft)	Unblocking level 1. Other stations are unblocked at this level.

ENERGY

No	Menu Name	Specification	Description
28	ENERGY ...	**Read only**	Energy calculation.
28_1	Energy	**Indirect** **Read only**	Energy.
28_1	Energy ######## kWh tot	**Indirect** **Writable** **Interval** 0 To 0	Energy. Enter a value manually and the counter will continue on this value.
28_2	P1 Mains Volt. ###.# V	**Writable** **Interval** 0.0 To 0.0	Power Supply Voltage measured by VFD Connected to P1
28_3	P2 Mains Volt. ###.# V	**Writable** **Interval** 0 To 0	Power Supply Voltage measured by VFD Connected to P2
28_4	P1 Motor Voltage ### V	**Writable** **Interval** 0 To 0	Pump Voltage measured by VFD Connected to P1
28_5	P2 Motor Voltage ### V	**Writable** **Interval** 0 To 0	Pump Voltage measured by VFD Connected to P1
28_6	P1 Power Consump. ######.## kW	**Read only**	Power usage measured by VFD connected to P1
28_7	P2 Power Consump. ######.## kW	**Read only**	Power usage measured by VFD connected to P2
28_8	Station Power ######.# kW	**Read only**	Shown used power.
28_9	Specific energy ##### kWh/MG	**Read only**	Shows specific energy. This is the cost of pumping the water.
28_10	Energy method #################	**Writable** **Alternative** 0 = Pulse only 1 = Current & pulse 2 = Current only **Central System Text** Energy calculation method used	Select energy calculation source. 0=Pulse only, 1=Current & pulse, 2=Current only.
28_11	Cos phi P1 #.##	**Writable** **Interval** 0.00 To 1.00	Enter the nominal cosine phi of pump 1.

		Central System Text Cos phi P1	
28_12	Cos phi P2 #.##	**Writable** **Interval** 0.00 To 1.00 **Central System Text** Cos phi P2	Enter the nominal cosine phi of pump 2.
28_13	Voltage ### V	**Writable** **Interval** 0 To 999 **Central System Text** Voltage	Enter the voltage measured between two phases of a pump.
28_14	Energy scale ##.### kWh/pulse	**Writable** **Interval** 0.000 To 99.999 **Central System Text** Energy (kWh/pulse)	Scale value for the digital input signal.

COUNTER

No	Menu Name	Specification	Description
29	COUNTER ...	**Read only**	General counter.
29_1	Counter	**Read only**	Shows counter intensity in units/time.
29_2	Counter	**Read only**	ChCounterSumInd
29_3	Counter runtime	**Read only**	ChCounterTimeInd
29_4	Max value 5 min ########.#	**Writable** **Interval** 0.0 To 99999999.9 **Central System Text** Maximum value per 5 min	Enter the value by which a high alarm counter will be generated. This will be measured on 5 min base.
29_5	Max value 24 h ########.#	**Writable** **Interval** 0.0 To 99999999.9 **Central System Text** Maximum value per 24 hour	Enter the value by which a high alarm counter will be generated. This will be measured on 24 h base.
29_6	Use of counter #################	**Writable** **Alternative** 0 = General 1 = Rain	Select use of counter. This selection changes the shown unit in the channels. 0=General, 1=Rain, 2=Flow.

		2 = Flow **Central System Text** Use of counter	
29_7	Counter scale	**Writable** **Interval** 0.000 To 999.999 **Central System Text** Counter scale (x/pulse)	Enter here the counter scale for counter input.

TEST ALARM

No	Menu Name	Specification	Description
30	TEST ALARM ...	**Read only**	Test alarm function.
30_1	Test alarm every ## days	**Writable** **Interval** 0 To 99 **Central System Text** Test alarm (every xx days)	Enter how often the RTU will send a test alarm. A zero in this channel turns off this function.
30_2	Testalarm time ##:## h:m	**Writable** **Interval** 00:00 To 23:59 **Central System Text** Test alarm time (h:m)	Enter the time of day the unit will send the test alarm.

FUNCTION TIMERS

No	Menu Name	Specification	Description
31	FUNCTION TIMERS ...	**Read only**	Function timers.
31_1	Function timer 1 ##################	**Writable** **Alternative** 0 = No function 1 = On/off delay 2 = Pulses 3 = Pulses delayed 4 = One pulse 5 = Halve pulses 6 = Double pulses **Central System Text** Timer 1 function	Select function for timer 1. Options: 0=No function, 1=On/off delay, 2=Pulses, 3=Pulses delayed, 4=One pulse, 5=Halve pulses, 6=Double pulses.
31_2	T1 pulse time	**Writable**	Enter the on/pulse time or active flank delay.

	##### s	**Interval** 0 To 99999 **Central System Text** Timer 1 pulse time (s)	
31_3	T1 pause time ##### s	**Writable** **Interval** 0 To 99999 **Central System Text** Timer 1 pause time (s)	Enter the off/pause time or the passive flank delay.
31_4	Function timer 2 ############ ##	**Writable** **Alternative** 0 = No function 1 = On/off delay 2 = Pulses 3 = Pulses delayed 4 = One pulse 5 = Halve pulses 6 = Double pulses **Central System Text** Timer 2 function	Select function for timer 2. Options: 0=No function, 1=On/off delay, 2=Pulses, 3=Pulses delayed, 4=One pulse, 5=Halve pulses, 6=Double pulses.
31_5	T2 pulse time ##### s	**Writable** **Interval** 0 To 99999 **Central System Text** Timer 2 pulse time (s)	Enter the on/pulse time or active flank delay.
31_6	T2 pause time ##### s	**Writable** **Interval** 0 To 99999 **Central System Text** Timer 2 pause time (s)	Enter the off/pause time or the passive flank delay.

PAN312 POWER ANALYZER

No	Menu Name	Specification	Description
32	PAN312 Power Analyzer...	**Writable**	PAN312 Power Analyzer Section
32_1	L1-N Voltage Reading #####.# V	**Read only**	PAN312 L1-N Reading (V)
32_2	L2-N Voltage Reading #####.# V	**Read only**	PAN312 L2-N Reading (V)
32_3	L3-N Voltage Reading	**Read only**	PAN312 L3-N Reading (V)

	#####.# V		
32_4	L1-L2 Volt. Reading #####.# V	**Read only**	PAN312 L1-L2 Reading (V)
32_5	L3-L1 Volt. Reading #####.# V	**Read only**	PAN312 L3-L1 Reading (V)
32_6	L2-L3 Volt. Reading #####.# V	**Read only**	PAN312 L2-L3 Reading (V)
32_7	L1 Amp. Reading ####.# A	**Read only**	PAN312 L1 Reading (A)
32_8	L2 Amp. Reading ####.# A	**Read only**	PAN312 L2 Reading (A)
32_9	L3 Amp. Reading ####.# A	**Read only**	PAN312 L3 Reading (A)
32_10	L1 Power Reading ##### VA	**Read only**	PAN312 L1 Reading (VA)
32_11	L2 Power Reading ##### VA	**Read only**	PAN312 L2 Reading (VA)
32_12	L3 Power Reading ##### VA	**Read only**	PAN312 L3 Reading (VA)

19 Appendix D - List of alarms

The following is a list of the alarms which can be generated and transmitted, together with the associated alarm codes and alarm texts, as well as an explanation of the alarm sources.

Only the alarm code is transmitted in the case of an alarm to a paging system that can only receive numbers. The list can be used to obtain an explanation of the alarm codes transmitted and received.

The priority shown is that assigned to the alarm after a cold start.

ALARMS

Alarm Code	Default priority	Delay	Local text	Central System Text	Description
1	B	15	High level	High level	High level in the pump sump. Alarm from the analog level input.
2	B	15	Low level	Low level	Low level in the pump sump. Alarm from the analog level input.
3	A	300	Mains error	Mains error	External power failure. The pumps are blocked.
4	A	10	High level float	High level float	High level float. Alarm from digital input.
5	A	60	Pers. alarm	Personal alarm	Personnel alarm warning time has run out without reset. Personnel may be in danger!
6	A	0	Intruder	Intruder	Burglary alarm reset time has run out before turned off.
11	B	10	Tripped motor P1	Tripped motor protector P1	Pump 1 has a tripped motor. The pump is blocked by this alarm.
12	B	10	Tripped motor P2	Tripped motor protector P2	Pump 2 has a tripped motor. The pump is blocked by this alarm.
15	B	10	High current P1	High current P1	High current P1. Alarm from the analog current input.
16	B	10	Low current P1	Low current P1	Low current P1. Alarm from the analog current input.
17	B	10	High current P2	High current P2	High current P2. Alarm from the analog current input.
18	B	10	Low current P2	Low current P2	Low current P2. Alarm from the analog current input.

28	B		RTU no answer	Substation does not answer	There is no communication with the RTU. This alarm is not created in the RTU, it is created in CS when it fails to contact the RTU.
30	B		No response P1	No response P1	The RTU has not received a response signal from pump 1. The pump has probably failed to start.
31	B		No response P2	No response P2	The RTU has not received a response signal from pump 2. The pump has probably failed to start.
34	A	10	Overflow	Overflow	Overflow. The station is now overflowing.
35	B	10	High temp. P1	High temperature P1	High temperature pump 1.
36	B	10	High temp. P2	High temperature P2	High temperature pump 2.
40	B	10	Low level float	Low level float	Low level float. Alarm from digital input.
51	B	15	Very high level	Extremely high level	Extremely high level in the sump. Alarm from the analog level input.
52	B	15	Very low level	Extremely low level	Extremely low level in the sump. Alarm from the analog level input.
54	B	10	Leakage P1	Leakage P1	Water in oil pump 1.
55	B	10	Leakage P2	Leakage P2	Water in oil pump 2.
72	B		High rainfall	High rainfall	The RTU has calculated a rainfall higher than the high alarm limit.
84	B	10	Alarm input 04	Alarm digital input 04	Spare alarm input 04.
85	B	10	Alarm input 05	Alarm digital input 05	Spare alarm input 05.
86	B	10	Alarm input 06	Alarm digital input 06	Spare alarm input 06.
87	B	10	Alarm input 07	Alarm digital input 07	Spare alarm input 07.
88	B	10	Alarm input 08	Alarm digital input 08	Spare alarm input 08.
89	B	10	Alarm input 09	Alarm digital input 09	Spare alarm input 09.
90	B	10	Alarm input 10	Alarm digital input 10	Spare alarm input 10.

91	B	10	Alarm input 11	Alarm digital input 11	Spare alarm input 11.
92	B	10	Alarm input 12	Alarm digital input 12	Spare alarm input 12.
93	B	10	Alarm input 13	Alarm digital input 13	Spare alarm input 13.
94	B	10	Alarm input 14	Alarm digital input 14	Spare alarm input 14.
95	B	10	Alarm input 15	Alarm digital input 15	Spare alarm input 15.
96	B	10	Alarm input 16	Alarm digital input 16	Spare alarm input 16.
121	B	10	Generator Warn.	Generator Warning	Generator Warning
122	B	10	Generator Fail	Generator Fail	Generator Fail
140	B	10	Chem. Feed Fail	Chemical Feed Failure	Chemical Feed Failure
141	B	10	Odor Cont. Fail	Odor Control Fail	Odor Control Failure
189	B	10	Gen. Low Fuel	Generator Low Fuel	Generator Low Fuel
190	B	10	Pri. Sensor Fail	Primary Level Sensor Fail	Primary Level Sensor Fail
230	B	10	VFD 1 Alarm	VFD 1 Alarm	VFD #1 Gen. Alarm
231	B	10	VFD 2 Alarm	VFD 2 Alarm	VFD #1 Gen. Alarm
232	B	10	VFD 1 Undervolt.	VFD 1 Undervoltage	VFD #1 Undervoltage
233	B	10	VFD 2 Undervolt.	VFD 2 Undervoltage	VFD #1 Undervoltage
234	B	10	VFD 2 Overtemp	VFD 2 Overtemp	VFD #2 Overtemp
265	B	10	VFD 1 Overtemp	VFD 1 Overtemp	VFD #1 Overtemp
8001	C		No teleline	No telephone line	The RTU has failed to detect a dial tone. The alarm is made passive the next time the RTU detects a dial tone.
8002	C		No resp. paging	No response from Paging system	No answer from paging system central.
8004	B		Serv. no resp.	Service personnel no response	Printed out if on-call personnel do not answer.
8005	B		Serv. busy	Service personnel busy	Printed out if on-call personnel telephone is engaged.

8033	C		Invalid tel.no.	Incorrect tel.no	One of the telephone numbers has invalid characters. Check all telephone numbers and correct.
8050	H		Setpoint changed	Setpoint changed	At least one channel have been changed on the local display. The alarm clears when new set points are sent to the RTU.
8083	B		Station blocked	Station blocked	This RTU has received a blocking command from another RTU.
8089	C		Unknown p-system	Unknown paging system	The selected paging system does not exist. The selected code is wrong or the system program needs to be updated to a newer version.
8090	A		Cold start	Cold start	The RTU is cold started. The RTU needs new set points.
8111	C		Telegram long	Telegram too long	The telegram received was too long. This may happen when there are communication problems.
8114	B		Warm start	Warm start	The RTU is warm started. The reason is either power failure or manual restart.
8117	C		Modem error	Modem error	The RTU has detected an error in the modem. If this alarm follows every warm start there is a failure in the modem.
8123	C		Error Hayes com.	Error in Hayes command	The modem responds with an error code on initiation. This may be due to an error in the modem or if you select the wrong modem.
8156	H		Call failed CS	Unsuccessful call to CS	Recorded as an event. The RTU has failed to dial to CS.
8157	H		Call ok CS	Call ok to CS	Recorded as an event. The RTU has succeeded to dial to CS.
8190	B		Fail ana.sig. Px	Contradicting analogue signals, Px	Both high and low float has been activated at the same time. Check the floats.
8191	B		Fail dig.sig. Px	Contradicting digital signals, Px	Both start and stop level are active at the same time. Check setpoints for pumps.
8193	B		Fail signals Px	Contradicting signals on pumps	High float and stop level or low float and start level are active at the same time. Check floats and setpoints.

8199	C		Serial restarted	Serial task restarted	One of the serial channels (with or without modem) was halted and reinitialized by the system software.
8200	C		P-Checksum error	Paging - Checksum error	Checksum error on transmitting a pager message.
8201	C		P-Format error	Paging - Format error	Format error on transmitting a pager message.
8202	C		P-Error pager no	Paging - Error in pager number	The number to the paging central is wrong on sending a paging message.
8203	C		P-Error TX no	Paging - Error in transmitter number	Not a valid transmission number on sending a paging message.
8204	C		P-Wrong password	Paging - Wrong password	Password not valid on sending a paging message.
8205	C		P-ID code error	Paging - ID code error	Authorization code not valid on sending a paging message.
8209	C		P-Serv. blocked	Paging - Service blocked	Paging service blocked on sending a paging message.
8210	C		P-Timeout	Paging - Timeout	Timeout on sending a paging message.
8211	C		P-Busy/other err	Paging - Busy/other error	Paging central [number] engaged.
8212	C		P-Call failed	Paging - Call failed	SMS call failed. There are some communication problem with the SMS central.
8213	B		Low 12V Supply	Low 12V internal supply	The internal 12 V power supply is low. Check internal power transformer.
8214	B		Low 24V Supply	Low 24V external supply	The external 24 V power supply is low. May due to a discharged battery or bad external power.
8215	B		Low int. battery	Low internal battery	The internal battery has low power. This may due to an old battery or that the RTU has been dead (no supply) for a long time. This is detected only at power-up.
8480	B		Max starts P1	Max starts P1	P1 is starting too often. The value that is entered in the channel 'Max start per hour' has been reached.
8481	B		Max starts P2	Max starts P2	P2 is starting too often. The value that is entered in the channel 'Max start per hour' has been reached.
8505	B	0	Sensor Fault	Sensor Fault	Sensor error. If the value from the sensor not change within allocated

					time then the alarm is triggered.
8508	B		Service P1	Service P1	P1 has run the set setvice time. The pump needs service.
8509	B		Service P2	Service P2	P2 has run the set setvice time. The pump needs service.
8510	B	10	High capacity P1	High capacity P1	The RTU has calculated a capacity higher than the high capacity alarm level for pump 1.
8511	B	10	High capacity P2	High capacity P2	The RTU has calculated a capacity higher than the high capacity alarm level for pump 2.
8514	B	10	Low capacity P1	Low capacity P1	The RTU has calculated a capacity lower than the low capacity alarm level for pump 1.
8515	B	10	Low capacity P2	Low capacity P2	The RTU has calculated a capacity lower than the low capacity alarm level for pump 2.
8536	H		Intruder al. off	Intruder alarm decativated	The intruder alarm is disconnected.
8540	A	10	Pic comm error	Pic communication error	Error on communication between Op. Panel and I/O Board in the RTU.
8541	B	120	Ana.sig < 4 mA	Analogue signal < 4 mA	One of the analogue inputs reads < 3.5 mA.
8543	B	120	Ana.sig > 20 mA	Analogue signal > 20 mA	One of the analogue inputs reads > 20.5 mA.
8602	A		High level+pfail	High level+pumpfailure	There is a high level in the sump and at least one pump has failed
8603	B		Blocking	Blocking other stations	The blocking function is activated. This RTU is sending blocking commands to other RTU's.
8606	B	10	P1 switched off	P1 switched off	The Hand-Off-Auto switch is in the Off Position. Pump 1 is stopped.
8607	B	10	P2 switched off	P2 switched off	The Hand-Off-Auto switch is in the Off Position. Pump 2 is stopped.
8615	A	10	Failure 2 pumps	Failure on two pumps	There are two failed pumps.
8630	B		Testcall !	Testcall !	The test alarm is sent to check that the station is alive. It is sent every n:th day at the time in the setpoint.

8634	B	10	High analogue 4	High analogue 4	High alarm value general analogue 4.
8635	B	10	Low analogue 4	Low analogue 4	Low alarm value general analogue 4.
8650	B		High counter 24h	High alarm counter 24 h	The counter has reached the maximum value per 24 hour.
8651	B		High count. 5min	High alarm counter 5 min	The counter has reached the maximum value per 5 minutes.

20 Appendix E - Central system

20.1 Periodic reporting

RTU stores the following operating data for the previous 30 days. The daily report is fetched automatically from the central system once per day. This function can be disconnected from the system.

The following information is summarized in the periodic report:

Text			Description
Run time	P1	h	Pump 1 Running Time
Run time	P2	h	Pump 2 Running Time
Runtime	two pumps	h	Running time when both pumps ran together
Overflow	time	h	Overflow time.
Blocked	time	h	The time this station has been blocked from another RTU.
Runtime	counter	h	Running time counter input.
Generator	Runtime	h	Generator Runtime
Starts	P1		Pump 1 Number of Starts
Starts	P2		Pump 2 Number of Starts
Starts	two pumps		Number of times both pumps ran together
Runtime	P1 total	h	Total Runtime of Pump 1 since startup
Runtime	P2 total	h	Total Runtime of Pump 2 since startup
Capacity	P1	gpm	Pump 1 Calculated Capacity
Capacity	P2	gpm	Pump 2 Calculated Capacity
Inflow	volume	MG	Inflow volume into sump.
Pumped	volume	MG	Pumped volume from sump.

Number of	overflows		Number of overflow events.
Number of	gross	overflows	Number of gross overflow events.
Overflow	volume	MG	Overflow volume.
Volume	analogue 4	MG	General analogue 4 volume.
Energy		kWh	Energy.
Blocked	events		Number of times this station has been blocked from another RTU.
Counter	value		Counter.
Generator	Starts		Generator Starts

20.2 Historical trend

Measurements are stored in RTU at intervals of five minutes as default and are fetched from the central system one or more times every day. The information can then be displayed in graphical form. This function can be disconnected from the system.

The following figures can be presented in the form of a trend graph:

Text			**Description**
Level		Ft	Level in station.
Current	P1	A	Current for pump 1.
Current	P2	A	Current for pump 2.
Value	analogue 4		General analogue 4.
Capacity	P1	gpm	Capacity for pump 1.
Capacity	P2	gpm	Capacity for pump 2.
Inflow		gpm	Inflow in the sump.
Pumped	flow	gpm	Pump flow from the sump.
Pumped	volume	MG	Pumped volume.
Overflow		gpm	Overflow.
Power		kW	Power consumption.
Specific	energy	kWh/MG	Specific energy.
Counter		value/5min	Counter value per 5 minute.
Counter	24 h	sum	Counter sum over 24 hours.
PAN312	L1-N Volt.	V	PAN312 L1-N Voltage
PAN312	L2-N Volt.	V	PAN312 L2-N Voltage
PAN312	L3-N Volt.	V	PAN312 L3-N Voltage

PAN312	L1-L2	V	PAN312 L1-L2 Voltage
PAN312	L2-L3	V	PAN312 L2-L3 Voltage
PAN312	L1-L3	V	PAN312 L1-L3 Voltage
PAN312	L1 Curr.	A	PAN312 L1 Amps
PAN312	L2 Curr.	A	PAN312 L2 Amps
PAN312	L3 Curr.	A	PAN312 L3 Amps
PAN312	L1 Power	VA	PAN312 L1 Power
PAN312	L2 Power	VA	PAN312 L2 Power
PAN312	L3 Power	VA	PAN312 L3 Power

20.3 Remote control

The pumps can be operated by remote control as required. In this case, the units are not controlled by level, but in response to commands from the workstation. Only when the connection is switched out does pump control revert automatically to RTU.

! If pump related alarms are active the pump will not start remotely.

Remote Control

Object	Description
P1	Pump 1. Start and stop of pump. Temporary control while active status picture. The function remote control break delay may extend the manual control of the pump.
P2	Pump 2. Start and stop of pump. Temporary control while active status picture. The function remote control break delay may extend the manual control of the pump.
CLEAN	Control of cleaning function in pump sump.
ALARMS	Acknowledge paging alarms. If alarms is sent from the FMC directly to the pager then it is possible to acknowledge the alarms here.
BLOCK	Control of blocking for this station.
RO1	Control of output 1.
RO2	Control of output 2.
AUTO	Return control to automatic. Releases all remote control commands.

21 Appendix F - Connection

! Ensure that personnel cannot come in contact with live cabling or terminal blocks in the course of connection or service work. Maximum caution must be exercised when working on the digital outputs.

The following is a description of the terminal blocks in the RTU (see wiring diagram at rear of section).

Before connecting external electrical equipment, such as relays, coils etc., to outputs or inputs, check carefully that the electrical specifications comply with those of the RTU. If this is not the case, install the necessary protective equipment to avoid the occurrence of operating disturbances.

Digital input signals

Terminal No	Description
3 - 4	Pump 1 Running- must be connected
5 - 6	Pump 2 Running- must be connected
7 - 8	Pump 1 Tripped
9 - 10	Function on input signal 04. Select function: 0=Not used, 1=P2 Tripped, 2=Spare alarm, 3=P1 Off switch, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers., 7=Block remote.
11 - 12	Function on input signal 05. Select function: 0=Not used, 1=P1 High temp., 2=Spare alarm, 3=P1 Off switch, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers., 7=Low Float
13 - 14	Function on input signal 06. Select function: 0=Not used, 1=P2 High temp., 2=Spare alarm, 3=P2 Off switch, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers., 7=Block remote.
15 - 16	Function on input signal 07. Select function: 0=Not used, 1=P1 Leakage, 2=Chemical Feed Fail, 3=Odor Control Fail, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers., 7=Generator Low Fuel.
17 - 18	Function on input signal 08. Select function: 0=Not used, 1=P2 Leakage, 2=Chemical Feed Fail, 3=Odor Control Fail, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers., 7=Generator Running
19 - 20	Function on input signal 09. Select function: 0=Not used, 1=Overflow sensor, 2=Generator Low Fuel, 3=P1 Off switch, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers., 7=Block Remote Station, 8=Block Pumps

21 - 22	Function on input signal 10. Select function: 0=Not used, 1=Power fail, 2=Spare alarm, 3=P2 Off switch, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers., 7=Block Remote Station.
23 - 24	Function on input signal 11. Select function: 0=Not used, 1=High float, 2=Spare alarm, 3=P1 Off switch, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers., 7=Block Remote Station.
25 - 26	Function on input signal 12. Select function: 0=Not used, 1=Low float, 2=Generator Warning, 3=P2 Off switch, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers., 7=Generator Low Fuel.
27 - 28	Function on input signal 13. Select function: 0=Not used, 1=P1 Off switch, 2=Spare alarm, 3=Intruder sensor, 4=Personnel onsite, 5=Intr.sens+pers., 6=Block remote, 7=Energy pulse, 8=Counter pulse, 9=Timer 1, 10=Timer 2.
29 - 30	Function on input signal 14. Select function: 0=Not used, 1=P2 Off switch, 2=Spare alarm, 3=Intruder sensor, 4=Personnel onsite, 5=Intr.sens+pers., 6=Block Remote Station, 7=Energy pulse, 8=Counter pulse, 9=Timer 1, 10=Timer 2.
31 - 32	Function on input signal 15. Select function: 0=Not used, 1=Generator Running, 2=Spare alarm, 3=P1 Off switch, 4=Generator Warning, 5=Personnel onsite, 6=Intr.sens+pers., 7=Block remote, 8=Energy pulse, 9=Counter pulse, 10=Timer 1, 11=Timer 2.
33 - 34	Function on input signal 16. Select function: 0=Not used, 1=Generator Fail, 2=Spare alarm, 3=P2 Off switch, 4=Intruder sensor, 5=Personnel onsite, 6=Intr.sens+pers., 7=Block remote, 8=Energy pulse, 9=Counter pulse, 10=Timer 1, 11=Timer 2.

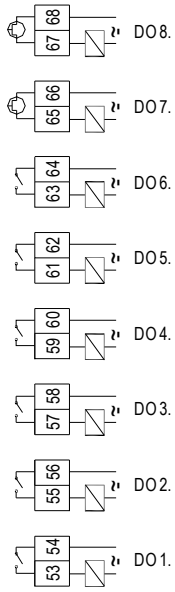
Digital output signals

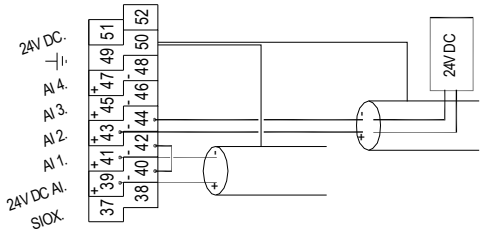
Terminal No	Description
53 - 54	Output. Run P1.
55 - 56	Output. Run P2.
57 - 58	Function on output signal 03. Select function: 0=Not used, 1=P1 Failure, 2=Extrem high lev., 3=Generic analog 4, 4=Remote blocked, 5=Alarm pulse, 6=Alarm status, 7=Alarm active, 8=Sprinkler valve, 9=Timer 1 out, 10=Watchdog, 11=Remote 1, 12=Buzzer, 13=Siren, 14=Buzzer+siren, 15=Volume pulse, 16=APF Active, 17=Transducer Fail
59 - 60	Function on output signal 04. Select function: 0=Not used, 1=P2 Failure, 2=Low level., 3=Generic analog 4, 4=Remote blocked, 5=Alarm pulse, 6=Alarm status, 7=Alarm active, 8=Sprinkler valve, 9=Timer 2 out, 10=Watchdog, 11=Remote 2, 12=Buzzer, 13=Siren, 14=Buzzer+siren, 15=Volume pulse, 16=APF Active, 17=Transducer Fail
61 - 62	Function on output signal 05. Select function: 0=Not used, 1=High Level, 2=Extrem high lev., 3=Generic analog 4, 4=Common Alarm, 5=Alarm pulse, 6=Alarm status, 7=Alarm active, 8=Sprinkler valve, 9=Timer 1 out,

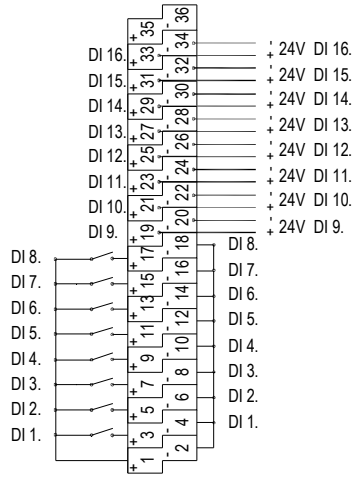
	10=Watchdog, 11=Remote 1, 12=Buzzer, 13=Siren, 14=Buzzer+siren, 15=Volume pulse, 16=APF Active, 17=Transducer Fail
63 - 64	Function on output signal 06. Select function: 0=Not used, 1=Low Level, 2=Extrem low lev., 3=Generic analog 4, 4=Overflow, 5=Alarm pulse, 6=Alarm status, 7=Alarm active, 8=Sprinkler valve, 9=Timer 2 out, 10=Watchdog, 11=Remote 2, 12=Buzzer, 13=Siren, 14=Buzzer+siren, 15=Volume pulse, 16=APF Active, 17=Transducer Fail
65 - 66	Function on output signal 07. Select function: 0=Not used, 1=Common Alarm, 2=Extrem high lev., 3=Generic analog 4, 4=Remote blocked, 5=Alarm pulse, 6=Alarm status, 7=Alarm active, 8=Sprinkler valve, 9=Timer 1 out, 10=Watchdog, 11=Remote 1, 12=Buzzer, 13=Siren, 14=Buzzer+siren, 15=Volume pulse, 16=APF Active, 17=Transducer Fail
67 - 68	Function on output signal 08. Select function: 0=Not used, 1=Common Alarm, 2=Extrem low lev., 3=Generic analog 4, 4=Remote blocked, 5=Alarm pulse, 6=Alarm status, 7=Alarm active, 8=Sprinkler valve, 9=Timer 2 out, 10=Watchdog, 11=Remote 2, 12=Buzzer, 13=Siren, 14=Buzzer+siren, 15=Volume pulse, 16=APF Active, 17=Transducer Fail

Analogue input signals

Signal No	Terminal No	Description
03:01	41 - 42	Pump sump 1 level. Level signal for pump control and flow calculations.
03:02	43 - 44	Unscaled current signal 1.
03:03	45 - 46	Unscaled current signal 2.
03:04	47 - 48	Unscaled general analog 4.







DO1	*Digital output signal 1*
DO2	*Digital output signal 2*
DO3	*Digital output signal 3*
DO4	*Digital output signal 4*
DO5	*Digital output signal5*
DO6	*Digital output signal 6*
DO7	*Digital output signal 7*
DO8	*Digital output signal 8*
AI1	*4-20 mA analogue input signal 1*
AI2	*4-20 mA analogue input signal 2*
AI3	*4-20 mA analogue input signal 3*
AI4	*4-20 mA analogue input signal 4*
DI1	*Digital input signal 1*
DI2	*Digital input signal 2*
DI3	*Digital input signal 3*
DI4	*Digital input signal 4*
DI5	*Digital input signal 5*
DI6	*Digital input signal 6*
DI7	*Digital input signal 7*
DI8	*Digital input signal 8*
DI9	*Digital input signal 9*
DI10	*Digital input signal 10*
DI11	*Digital input signal 11*
DI12	*Digital input signal 12*
DI13	*Digital input signal 13*
DI14	*Digital input signal 14*
DI15	*Digital input signal 15*
DI16	*Digital input signal 16*

RTU

Example 1

Connection of digital inputs signals for normally open contacts. In this example DI 1-8

Example 2

Connection for digital input signal if the equipment delivers a voltage. In this example DI9-16. Note: No jumpers on the negative side.

Example 3

Connection for analogue input signals when a two-wire sensor is supplied with power from the RTU. In this example AI1.

Example 4

Connection for analogue input signals if the sensor is supplied from an external power supply. In this example AI2.