1.1 Introducing GGS

Introduction

This chapter introduces the GGS system. After reading this chapter you will have a fair idea about the functionality and structure of the system. Following aspects will be elaborated on:

- What is GGS;
- Parts in the system;
- Specific functions and names of these parts.

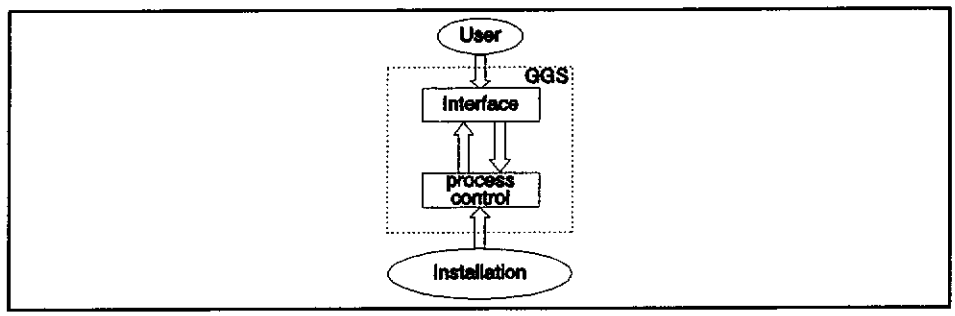
Survey

1.1.1 What is GGS

Introduction

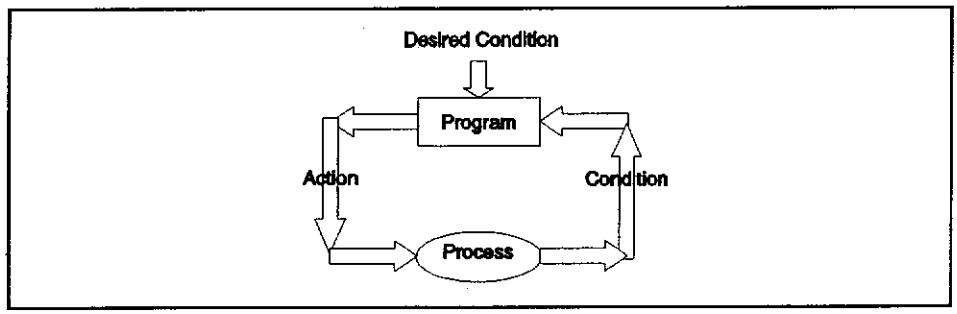
The Grenco Governing System (GGS) is a datalog and control system that Grenco developed especially for industrial refrigeration installations. This means that the various components that are to be found in these installations, like evaporators, compressors, condenser etc. are controlled by the GGS system.

Figure 1 gives a schematic overview.



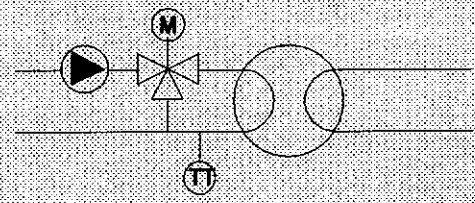
In order to control an installation, a number of conditions are to be met. First of all the installation's present state has to be known. Furthermore information concerning the desired state of the installation is required, as well as some sort of algorithm describing how to reach this desired state. Last but not least, some means of intervention is necessary.

Figure 2 gives an overview of the system as described above and contains all of the mentioned elements.



The following example of a condenser temperature control loop is a practical approach to the matter.

Example: Condenser temperature control loop



Question 1: What is the present process state?

In this example the present state is characterised by the water temperature and the fact whether or not the pump is running. In general one can say that: a process state is determined by means of **measured values** these values are either **analog values** e.g. temperatures, pressures etc. or **digital values** e.g. pump is running, pump is not running. The difference between analog and digital values is that digital values have a fixed number of values e.g. ON/OFF/FAILURE, OPEN/CLOSE where analog values may have a range of values e.g. -40.0..40.0°C 0.0..25.0 Bar.

Question 2: What is the desired state, and how can it be reached?

The desired state is in this example a water temperature of 40°C. This desired temperature is called a **setpoint**. The actions that have to be performed in order to reach this setpoint, are laid down in an **algorithm** or control **program**. In this example the program is very simple, if the water temperature is too high the water flow through the condenser is increased, otherwise the water flow is decreased.

Question 3: What means are available to intervene in the process course?

The water flow through the condenser is controlled by means of a control valve. This valve is opened or closed under the control of the GGS system by means of analog or digital output signals.

Recapitulating we recognize the following elements:

Measured values	Temp, pump state.
Program	If temp. > setpoint then valve open, else close valve.
Setpoint	40°C.
Output signals	Valve open/close Pump on/off

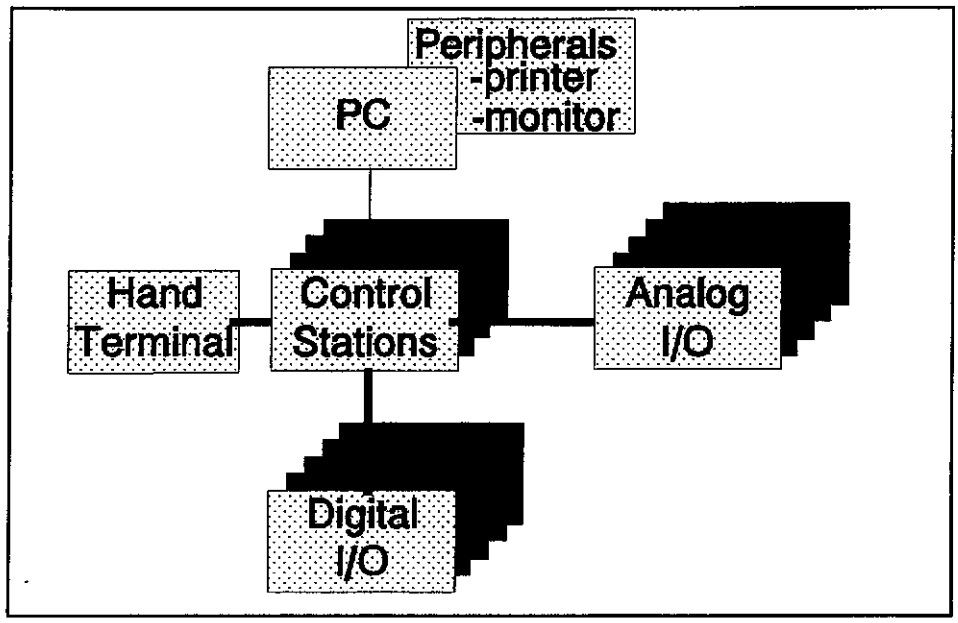
To achieve all the functions mentioned, the GGS system consist of several control stations and a PC, with software to control the cooling plant. The control stations and the PC exchange data via a network. In this way information about the plant can be available on the PC. Or processes on different stations can communicate.

1.1.2 Parts in the system

Introduction

This chapter specifies the various parts in the GGS system.

Overview



GGS may comprise the following parts:

- Personal computer
- Peripherals such as printers and monitors
- Hand terminal
- Control station
- Analog input module
- Analog output module
- Digital input module
- Digital output module
- Power supply

The rest of this chapter will provide more detailed information about each of these parts.

Personal Computer

Task: Supporting the user in operating the system by providing information about the installation and accepting settings for the installation.

Code: see below.

Remarks: The personal computer (PC) consists of the following parts:

- o System unit Code:00010110
- o Keyboard Code:00010111
- o Monitor Code:00010109
- o Line conditioner Code:50010003

Printer

Task: Generating hard copies from user selected information.

Code: 00010003

Remarks: The printers are connected to the the PC. One is connected to a serial port, the other is connected to the parallel port. The serial interface is set to: 1200 baud, even parity, 7 databits and 1 stopbit. For further information refer to the printer manual.

Monitor

Task: Display user selectable reports.

Code: 00010114

Remarks: The monitor is connected to the PC's communication adapter via a serial interface. This interface is set to: 1200 baud, even parity, 7 databits and 1 stopbit. For further information refer to the WY-185 User's Guide.

Hand Terminal

Task: The hand terminal is user for emergency operation in case of malfunction of the PC.

Code: 00010001

Remarks: Refer to section II chapter 2.6 for HHT operation.

Control Station

Task: Controlling a part of the refrigeration installation.

Code: 00010101

Remarks: The operation of a control station is determined by the program that is inserted via a special component (EPROM). Make sure that the proper program is installed when replacing a control station.
A control station is sometimes refered to as a local station.

Analog input module

Task: Converting temperatures, pressures and other measured values to data that can be interpreted by the control station.

Code: 00010102

Remarks: A sensorbus module allows connecting 7 or 8 sensors.

Analog output module

Task: Converting data from a control station to a 0..10VDC or 4..20 mA signal.

Code: 00010106

Remarks: The analog outputs are used for driving the EKA-46 with a 0..10VDC signal.

Digital input module

Task: Converting 220 VAC or 24 VDC status signals from the refrigeration installation to 5 VDC signals suitable for the control station.

Code: 00010028 220 VAC
00010044 24 VDC

Remarks: Digital inputs are mounted on the digital mounting rack with code number 00010105. The connection digital mounting rack to control station is done via cable 00010023

Digital output module

Task: Converting 5 VDC control signals from a control station to 220 VAC or 24 VDC signals suitable for operating components in the refrigeration installation.

Code: 00010029 220 VAC
00010033 24 VDC

Remarks: Digital outputs are mounted on the digital mounting rack with code number 00010105. The connection digital mounting rack to control station is done via cable 00010023

Power supply

Task: Converts 220VAC mains to 5 VDC 3 Amp. necessary to operate a control station.

Code: 00010104

Remarks: The power supply hold no secondary fuse, the control station however holds a 2 A microfuse.

1.1.3 The user interface

Introduction

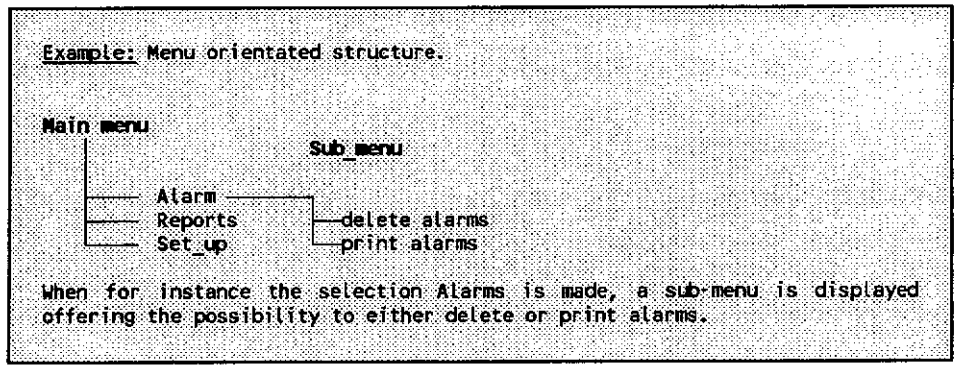
For ease of use while operating the system, a so-called man-machine-interface or user interface is implemented in GGS.

The term man-machine-interface or MMI covers the total of hardware and software used to exchange information between user and system.

This chapter describes what functions are available in the MMI and according to what conventions one has to act.

General

The user interface in GGS is of the menu driven type. This means that the system presents a menu of possibilities for the user to choose from. In order to increase the clarity of arrangement, selections are divided into sub-menus that each deal with a different aspect of the interface. The major advantage with menu driven interfaces is the fact that the user need not to memorize all possible commands.



In a (sub-)menu the following parts can be identified:

- A static text that helps the user to interpret the information on the screen;
- A function key definition;
- A text line explaining what action the user has to perform;
- A number of dynamic fields displaying values that are subject to change e.g. measured temperatures;
- A text line with an alarm message from some installation part which e.g. has a low bound reached.

There are two kinds of dynamic fields:

- Output fields
  The value in these fields are set by the system, the user can not alter it.
- Input fields
  The value of these fields may be set by the user

The fields are colour coded according to the status of the affected processes:

Red = stopped
Green = started

To change a value in an input field proceed as follows:

- Move the cursor by means of the cursor control keys to the field that you want to change;
- Enter the new value;
- Press the ACCEPT function key;

WARNING **If the ACCEPT function key is not pressed but another function key is, the entered value is omitted.**

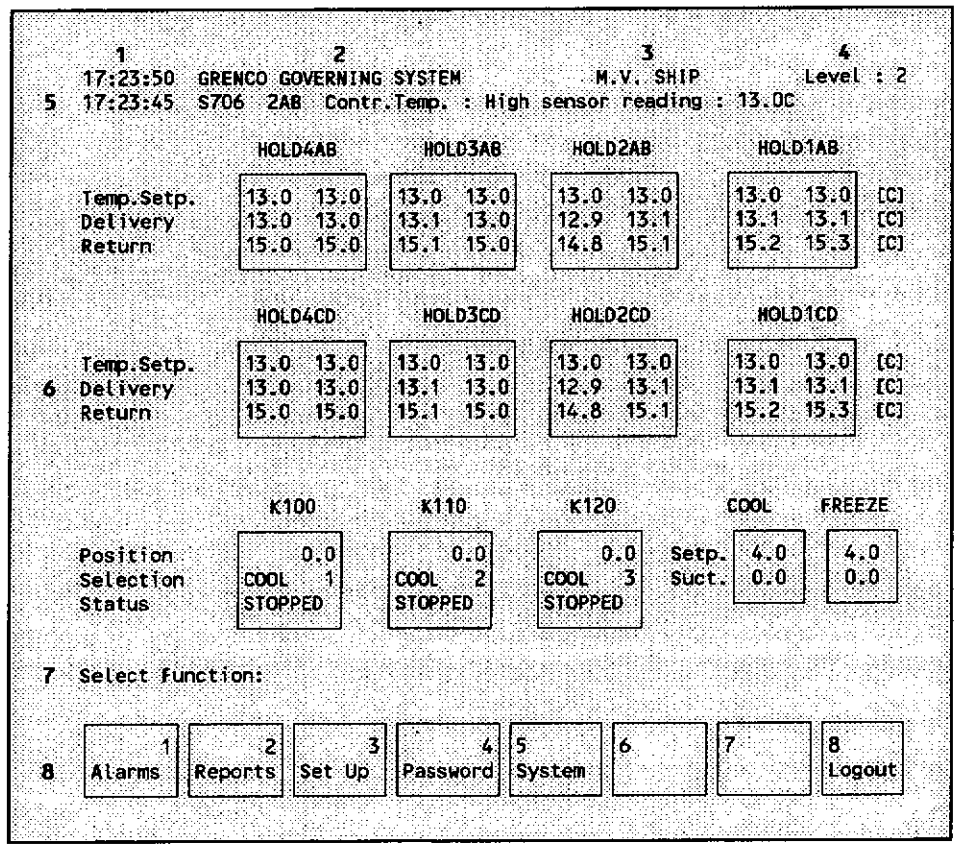
Starting the user interface

The user interface will start up automatically after the PC is switched on. The first or main menu offers an overview for the most important values in the refrigeration installation.

If the PC is switched on but the GGS user interface is not started, it is possible to start the user interface (under MS-DOS) with the following command:

```
PC.EXE
```

Illustration



This is an illustration of a first or main menu of an GGS user interface.

In the illustration there are numbers written by the different user interface parts. These numbers are explained below:

1. Actual system time (hours:minutes:seconds).
2. Grenco logo.
3. Name of the installation.

4. Actual user access level.
   This field indicates the user's actual authorization level by means of a number (between 1 and 6). A higher number indicates increased authorization.

5. Alarm line.
   This line gives the most recent alarm message in the installation.

6. System overview
   The system overview takes up the major part of the main screen, presenting an overview of the refrigeration plant. For instance, you can see information on the various holds and compressors. The colour of the blocks refers to the status of the control processes. Red, for instance, means that the process concerned is off, whereas green means the process is active.
   Block values are updated every 10 seconds.

7. System message line
   This line may help the user decide on what is to be done next or to warn against an error.

8. Function key definition
   The text in a block indicates the function invoked the moment a function key (F1 to F8) is pressed. The available function keys are dependent of the user level.