



DL 256
Datalogger System

User's Guide

Software version 1.3

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CHAPTER 1

Introduction

The Opsis DL 256 is a highly flexible datalogger system designed to manage signals from a large number of different type of sources. Measurement data is stored permanently in the DL 256, from where it can be downloaded by various Opsis software products.

The DL 256 is available in two different models:

- DL 256 standard
- DL 256 PRO

The main difference between the two models is the enclosure. The software is the same in both products, and the operational capabilities are identical.

Chapter 2 in this guide describes the DL 256 hardware, while chapters 3 to 5 describes the DL 256 software.

1.1. System survey

The DL 256 consists of the following items:

- The hardware, based on an IBM PC-compatible processor.
- The DL 256 software, acting as the main user interface, providing data storage and data presentation functions.
- The IO 256 software, being the interface between the sources of data (IOMan system, intelligent sensors, process computers etc.) and the DL 256 software.
- In most configurations, a number of IOMan modules, providing the physical connections of analogue and digital hard-wired signals.

In addition to this, a number of various sensors are of course connected to the DL 256. See figure 1.1.

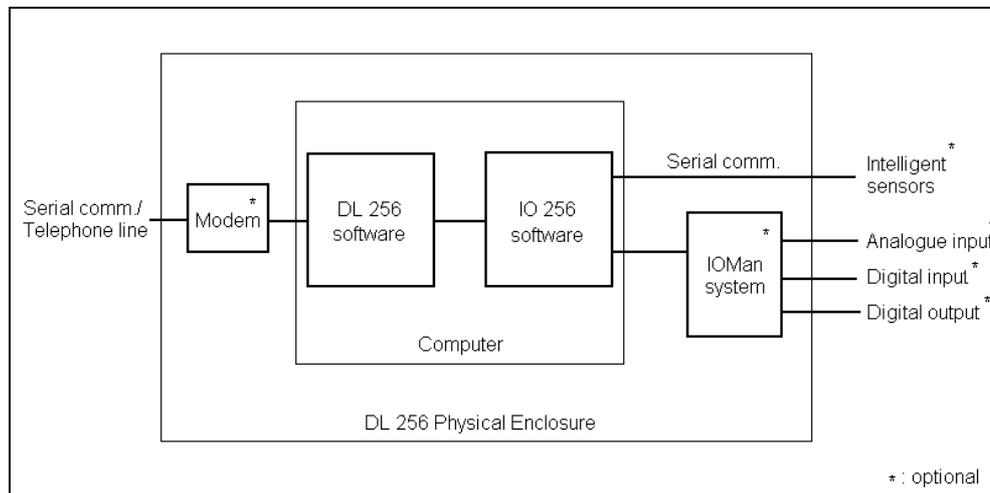


Fig. 1.1. The DL 256 system.

1.2. Documentation

The complete DL 256 is documented in three different publications:

- This guide, describing the hardware and the main DL 256 software.
- The "IO 256 Installation and User Reference Manual", covering the configuration and operation of the data I/O.
- The "IOMan User's Guide", describing the I/O modules of the IOMan system frequently used by IO 256, and sensors available from Opsis.

The latter manual is excluded from the delivery if no IOMan modules are in use in the actual system.

CHAPTER 2

Hardware description

The DL 256 is available in two versions: DL 256 standard and DL 256 PRO. A survey of the two types is given in this chapter, including physical dimensions, brief internal layout and connections.

The actual layout of the electronics and wiring depends on what options have been ordered. The details are therefore described in the documentation supplied with the individual datalogger.

2.1. DL 256 standard

Dimensions

General	Plastic case with transparent front, IP54, intended for mounting on wall.
Width	400 mm
Height	420 mm
Depth	140 mm, all dimensions excluding connectors
Weight	approx. 7 kg, depending on options
Power	230 V AC or 115 V AC, approx. 50 W, depending on options

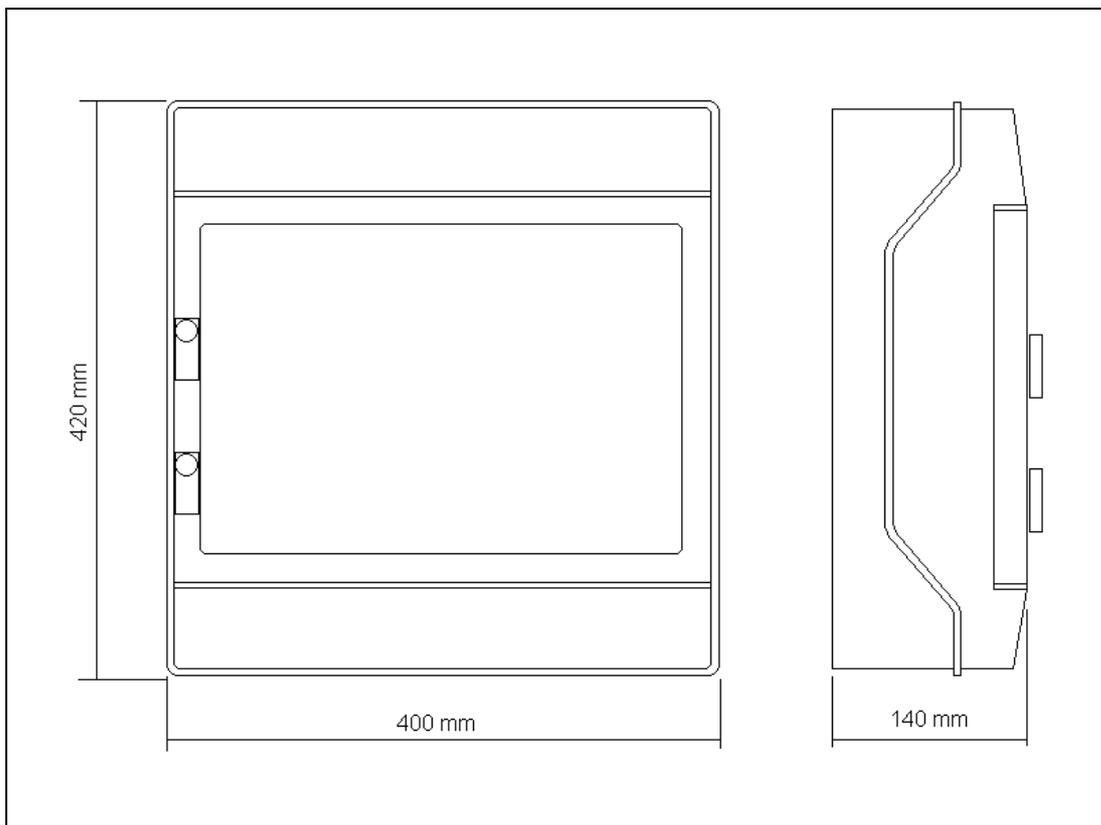


Fig. 2.1. The DL 256 standard with dimensions.

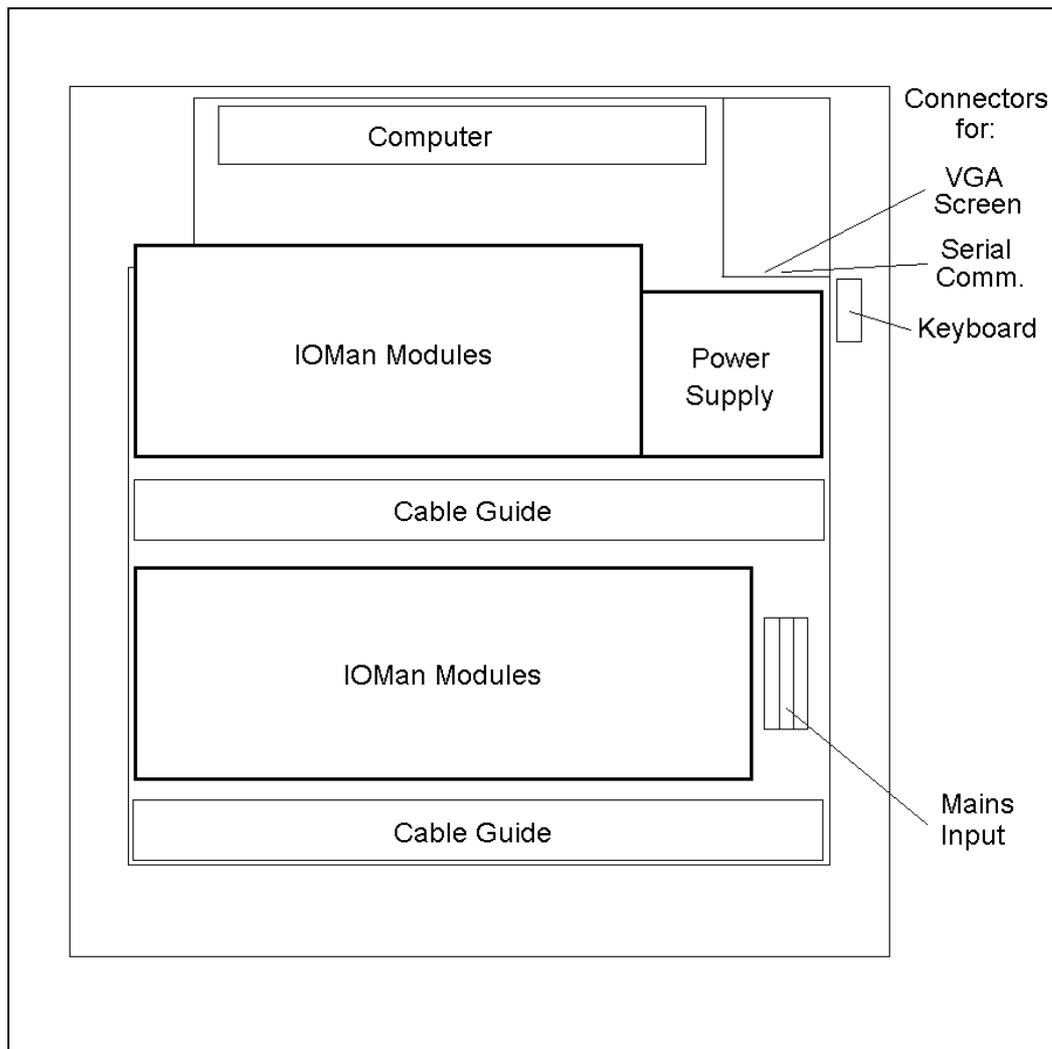


Fig. 2.2. The interior of the DL 256 standard.

The layout of the interior of the DL 256 standard varies depending on what options have been chosen. There is always a computer with its connectors, and a power supply with connections for mains input. In most cases, various IOMan modules are mounted on DIN rails, taking up a major part of the available space. See figure 2.2.

Connectors for screen and keyboard can be found inside the case, as indicated in figure 2.2. Connecting a screen and a keyboard is optional, since the datalogger will operate without them. However, on-site screen and keyboard facilitates the operation and maintenance of the datalogger.

A serial communication connector for operation of the datalogger from a laptop PC running the Opsis DLRemote software can be found next to the screen connector. In some cases, however, this serial port is used for an optional built-in modem.

Please refer to the documentation of the individual DL 256 for an exact description of layout the IOMan modules in use.

2.2. DL 256 PRO

Dimensions

General	Metallic case for mounting in 19" rack, IP30
Width	450 mm
Height	180 mm
Depth	440 mm, all dimensions excluding connectors and mounting support
Weight	approx. 11 kg, depending on options
Power	230 V AC or 115 V AC, approx. 90 W, depending on options

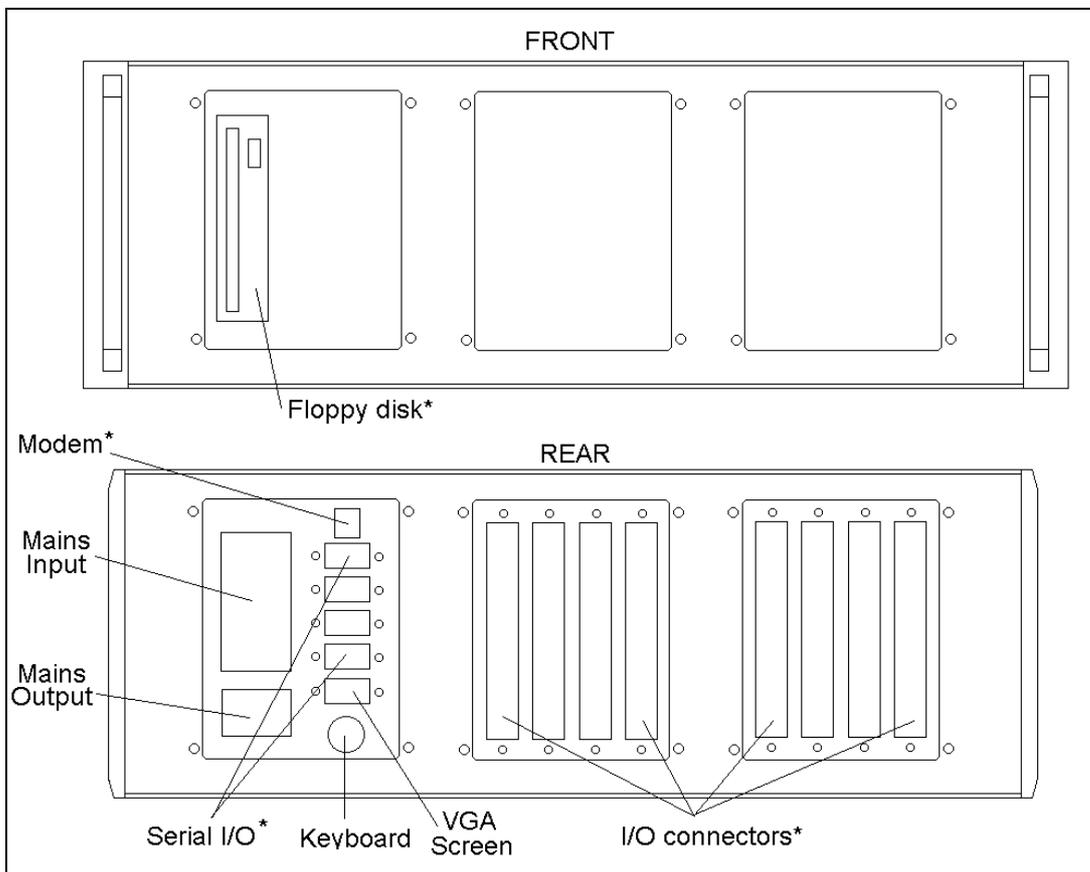


Fig. 2.3. Front and rear view of the DL 256 PRO. Items with star (*) are optional.

Figure 2.3 shows the exterior of the DL 256 PRO. Screen and keyboard are optional, but can always be connected at the rear of the datalogger. The datalogger will operate without screen and keyboard, but they are recommended for on-site maintenance of the equipment.

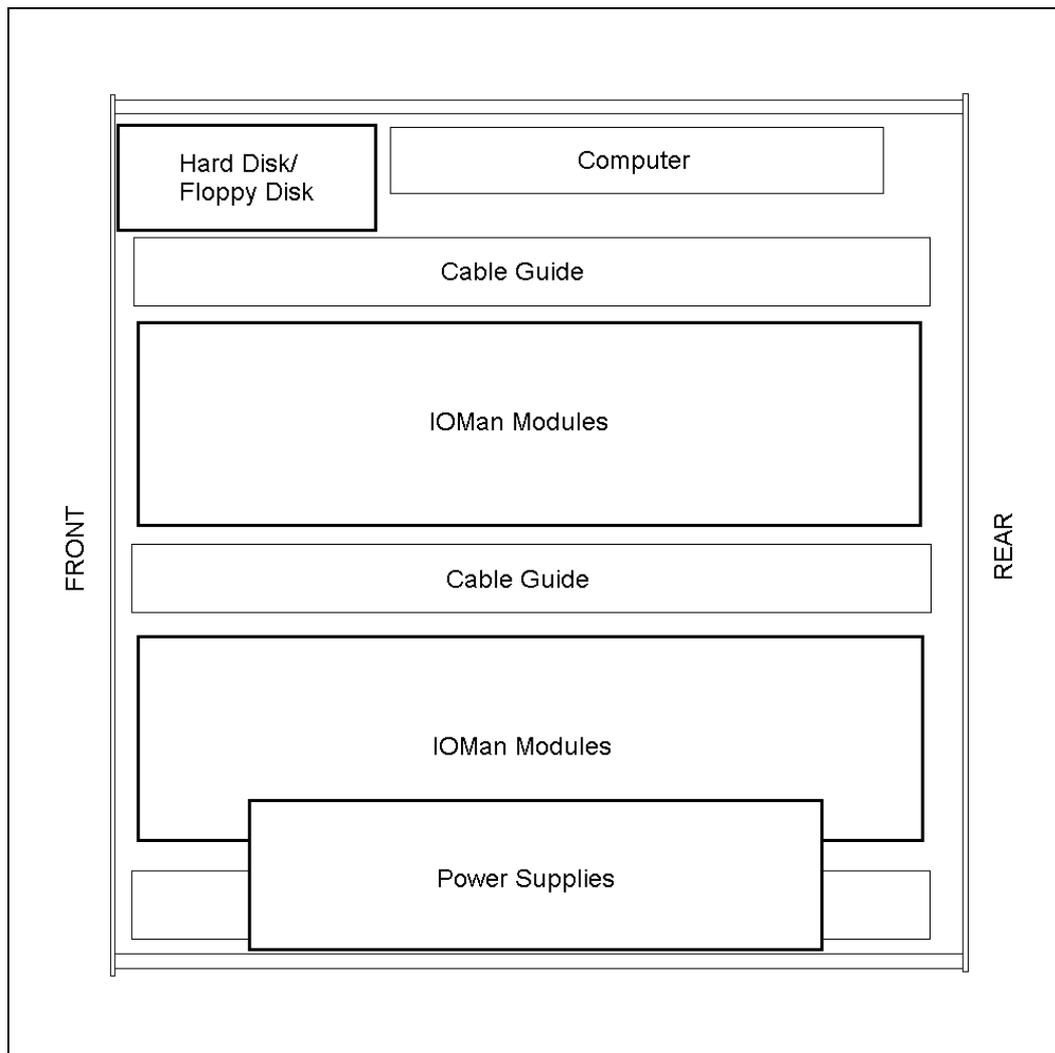


Fig. 2.4. The interior of the DL 256 PRO. Hard disk and floppy disk are optional.

Fig. 2.4 shows the interior of a DL 256 PRO. The detailed layout depends on what options have been selected; please refer to the documentation of the individual datalogger for a detailed description. This description also contains the usage of the I/O connectors shown in figure 2.3.

As can be seen from figure 2.4, the major part of the interior is occupied by optional IOMan modules. Cable guides are used to bring the connections to the rear of the datalogger.

If an on-site screen and keyboard is not used, the configuration of the DL 256 can be made either through a direct link from a laptop PC running the Opsis DLRemote software, or through a dial-up connection using the service functions of the Opsis EnviMan ComVisioner software.

CHAPTER 3

The DL 256 software

This chapter gives an introduction to the DL 256 software. It contains descriptions of the DL 256 start-up, as well as an introduction to the menu system and a discussion about the on-screen displaying of data.

The chapter also contains a discussion about permanent data storage.

3.1. System start-up

All DL 256 software routines will start automatically on power-up of the computer. This includes initialising the IO 256 drivers and starting the DL 256 software itself. During the start-up procedure the screen will display a welcome menu.

While showing the welcome menu, the software searches for the IO 256 input and output drivers, and verifies that they are installed properly. Communication equipment like a dial-up modem will also be initialised at this stage. The progress is displayed in a message box at the bottom of the screen.

After having passed the initialisation, a ten second countdown will be shown on the screen. It is there to allow the IO 256 drivers to start up properly. The countdown may be interrupted by pressing any key on the keyboard. Doing so, the root menu described in the next chapter will be displayed.

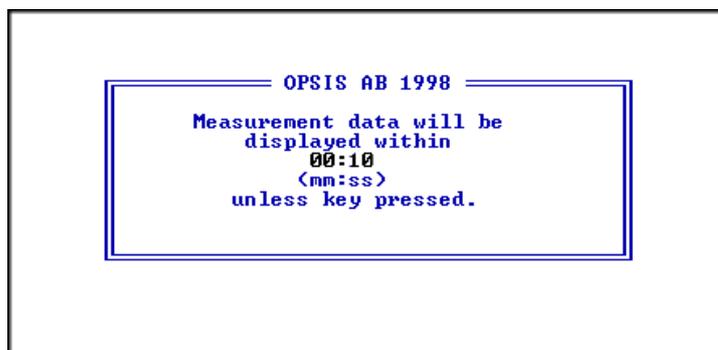


Fig. 3.1. The countdown message.

After the ten second countdown, the Display screen will be shown, as illustrated in figure 3.2.

990716 14:03:41 Disk : 115.6MB	Opsis R&D Instantaneous Values	Opsis AB page 1<2>
Concentrations : SO2 9.851 ppb NOx 23.990 ppb O3 120.902 ppb CO 1.544 ppm	Gas monitor status 1.000 = ok, 0.000 = failure SO2 stat 1.000 NOx stat 1.000 O3 stat 1.000 CO stat 1.000	
Meteorological data W speed 3.063 m/s W dir 219.500 ° Temp 26.551 °C Rel hum 85.601 %		

Fig. 3.2. The Display screen. The information shown is configurable See section 4.7.

The upper box shows the current time of the datalogger and the available disk space. The lower part of the screen can be set to display data from the IO 256, or just plain text information. The data values are either the instantaneous (polled) values or the last averaged values from IO 256. They will be updated as soon as IO 256 has new available, i.e. once every poll interval or every integration time. The layout set-up is described in section 4.7.

Press the **[Space]** key to switch between showing the polled and the integrated values. The current presentation mode is shown in the upper box.

The display may be divided into a maximum of three different pages. If there is more than one page, the current page number will be shown in the upper box. It is then possible to change page by pressing the **[PgUp]** or **[PgDn]** key on the keyboard. The display screen is abandoned by pressing the **[Esc]** key. This will lead to the root menu, described in the next chapter.

The display screen is there only to provide an easy way to view current data. All functions of the datalogger will continue to work even if the display screen is abandoned. This includes reading new values, storing them on the hard disk, serving communication, setting status outputs etc. In some installation menus, some of the functions above will be disabled, however. Those combinations of menus and functions will be pointed out where appropriate. If not specifically said, the datalogger will continue to operate normally, no matter where it is positioned in the menus.

Left unattended in one of the installation or data presentation menus, a special fall-back procedure will make sure that the software will return to the display screen sooner or later. The time for doing so depends on how deep into the sub-menus the user last was positioned. The software will fall back one sub-menu once every 10 minutes after a key has been pressed.

3.2. The root menu

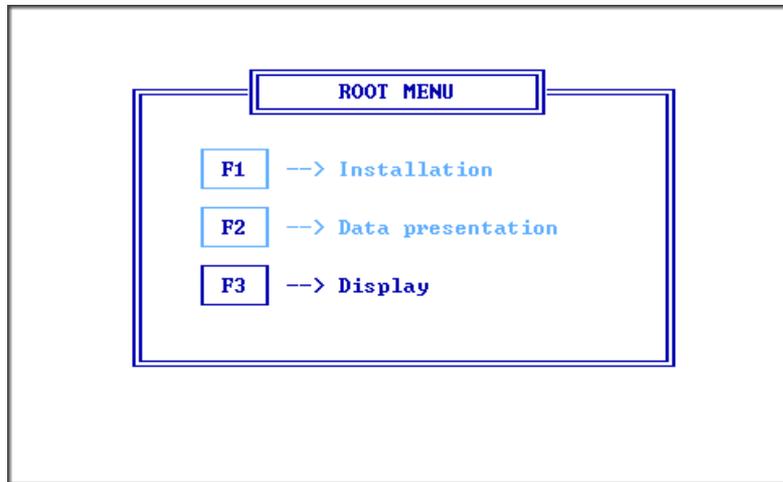


Fig. 3.3. The root menu.

The root menu is the main menu for all functions in the software. To call up a sub-menu, use the function keys directly or use the arrow keys to mark the desired selection and press **[Enter]**. These methods may be used throughout all menus.

[F1] Installation is used to set up the datalogger. Functions such as communication, input channels and timer outputs are defined here. This menu is frequently used during the start-up phase, but once everything is up running, access to this menu is generally not necessary. The Installation menu is described in chapter 4.

[F2] Data presentation is used for viewing historical data stored on the hard disk of the DL 256. It offers a convenient way to look at old measurement results.

[F3] Display will show the display screen as described in the previous section.

3.3. Passwords

The access to the menus in the software may be protected by passwords. Upon accessing the root menu, a user name and a password may have to be given. Once the password is entered, access is given to all functions available to the user. Different passwords may give access to different parts of the software. The functions which may or may not be accessed are

- Installation
- Password set-up
- Data presentation

The set-up of passwords is described in section 4.4.



Fig. 3.4. The menus may be protected by user names and passwords. Characters entered at the log-in procedure will appear as stars on the screen.

3.4. Data storage

Measurement data is permanently stored in the DL 256 either on a flash disk or on an ordinary PC hard disk. The latter is an option available with DL 256 PRO. In the former case, the limited size of the flash disk should be given some attention.

The storage capacity in terms of time depends on the number of datalogger channels and the integration (averaging) time of the datalogger. Each set of datalogger values written to the disk consumes $(3*n)+4$ bytes of data, where n is the number of channels. With this information, it is possible to calculate how long it will take before the disk is filled.

The size of the data section of the flash disk is 2MB. The size of the PC hard disk may vary, but is at least 2 GB.

Example 1: 16 channels of data is generated with an integration time of 5 minutes. Thus, every five minutes, 52 bytes of data is generated. During a day, 14.6 kB of data is written to the disk. It will take 140 days before the disk is filled.

Example 2: 80 channels of data is generated every minute. The flash disk will then be filled in a little less than 6 days.

Example 3: With the configuration from the second example, but using a 2 GB PC hard disk, it will take more than 16 years before the disk is filled.

When the disk has less space left than the correspondence of two days of operation, the eldest day of data on the disk will be permanently erased. This is done automatically. Thus, data *must* be downloaded from the datalogger more frequently than the time it takes to fill the hard disk, minus two days worth of data. Otherwise, data will be lost permanently.

The automatic erasing of old data has been chosen to ensure continuous operation of the datalogger without any software failures because of lack of storage space. It is the responsibility of the user to make sure that no data is lost by downloading it frequently enough.

CHAPTER 4

Configuration

This section describes the different settings in the installation menu, accessed by pressing **[F1]** in the root menu. The installation procedures includes communication configuration, set-up of the IO 256 software, calibration corrections and other features.

4.1. The Installation menu

All parameters defining the datalogger are set in the Installation menu.

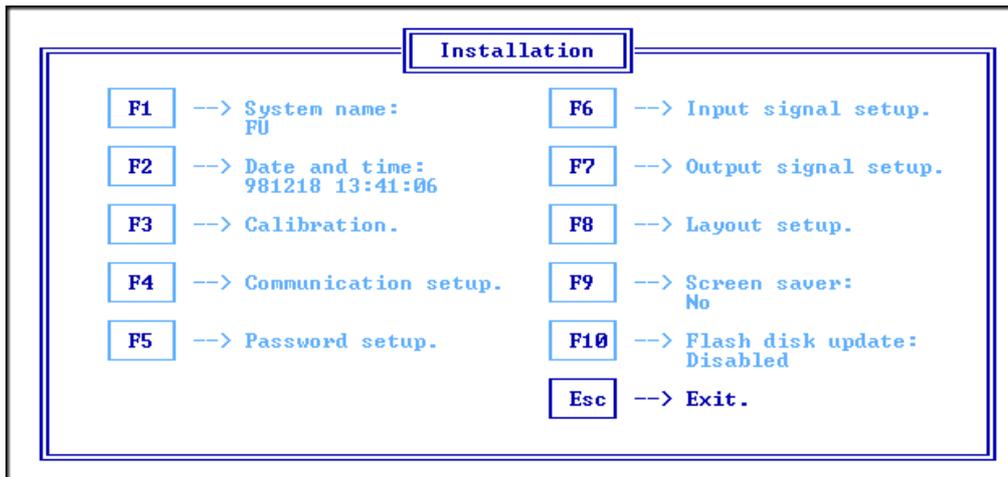


Fig. 4.1. The installation menu.

[F1] System name consists of two characters, which normally should describe the location of the datalogger. The system name determines under what file name data will be stored on the hard disk. It can be altered e.g. if the location of the DL 256 is changed, to indicate that the new data comes from another site.

[F2] Date and time displays and sets the current time of the datalogger. It is displayed as year-month-day hour-minute-second. Since every measurement is time dependent, it is essential that the clock is set correctly. It is up to the user to decide whether correction should be made for daylight saving time. Please also note that the clock may be synchronised through the communication, e.g. using the Opsis EnviMan ComVisioner software. Corrections should then be made to the master clock, and not to the DL 256 clock.

[F3] Calibration gives access to the calibration correction menu. When in use, data from the IO 256 can be automatically corrected based on results of calibrations. See section 4.2. for a detailed description.

[F4] Communication setup defines communication parameters for the DL 256 datalogger. The sub-menu is described in section 4.3.

[F5] Password setup is used to enable the password function and set the user names. The procedure is described in chapter 4.4.

[F6] Input signal setup gives access to the IO 256 installation software. See section 4.5 for more information.

[F7] Output signal setup defines timer outputs, normally used to start calibrations with regular time intervals. The function is described in section 4.6. It is also possible to set a status output manually from this menu, to enable additional, user-initiated calibrations.

[F8] Layout setup defines how the display screen should appear. See section 4.7.

[F9] Screen saver can be either Yes or No. If activated, the screen will turn dark 15 minutes after the last use of the keyboard. It will light up again as soon as a key is pressed. The screen saver is used to protect the screen from burn-in damages.

[F10] Flash disk update can be either disabled, or set to a time interval in minutes. A discussion about this function can be found in section 4.8. A recommended value is 30 minutes, when a flash disk serves as permanent storage of data. Using an ordinary PC hard disk, the function should be disabled.

Press **[Esc]** to return to the root menu.

4.2. Calibrations

It is not an unusual situation to find instruments at a measurement site requiring frequent calibrations. Some conventional point monitors of gas concentrations may need calibrations as often as every day. Some of these instruments can adjust automatically to the calibration results, but some cannot. In the latter case, DL 256 provides functions for doing the adjustments before the values are stored in the datalogger.

The calibration menu, accessed by pressing [F3], contains definitions for these automatic calibration adjustments.

Press [↑][↓][→][←] to select, [Enter] to edit, [Esc] to exit											
in use	name	main ch	zero ch	max z error	span ch	expctd	max s error	alm ch	last accepted		
									zero	span	status
yes	S02	1	13	0.5	14	214.0	15.0	15	0.2	204.0	ok
yes	NOx	2	16	4.0	17	479.6	12.5	18	2.5	484.0	ok
yes	O3	3	19	4.0	-	-	-	-	-2.9	-	ok
yes	CO	4	22	0.2	23	38.6	3.6	-	-0.1	41.5	ok
no		-	-	-	-	-	-	-	-	-	-
no		-	-	-	-	-	-	-	-	-	-
no		-	-	-	-	-	-	-	-	-	-
no		-	-	-	-	-	-	-	-	-	-
no		-	-	-	-	-	-	-	-	-	-
no		-	-	-	-	-	-	-	-	-	-
no		-	-	-	-	-	-	-	-	-	-
no		-	-	-	-	-	-	-	-	-	-
no		-	-	-	-	-	-	-	-	-	-
no		-	-	-	-	-	-	-	-	-	-
no		-	-	-	-	-	-	-	-	-	-
no		-	-	-	-	-	-	-	-	-	-

Warning: All data I/O is stopped while this menu is shown.

Fig. 4.2. The calibration configuration menu.

Up to 16 values can be corrected for span and/or offset calibrations. There are three modes of corrections available:

- Adjustment of the offset only (zero level, background)
- Adjustment based on a span factor only (high level, response)
- Adjustment of both the span and the offset at the same time

To make the DL 256 calibration to work, the IO 256 must be configured in a certain way:

- One data channel contains the value to correct, i.e. the current measurement result. This is the main channel in the calibration menu.
- One data channel holds the latest zero calibration result (if used). This channel is entered as zero channel in the menu.
- One data channel must read the span calibration result, if this is used. The channel number is entered as the span channel.

The IO 256 function "conditional input" is frequently used when dividing monitor output in different channels. Please refer to the IO 256 manual.

Warning: *To avoid undesired corrections during the calibration configuration, all activities of the IO 256 is stopped while this menu is shown.*

In use indicates whether the settings are applied or not. The correction can be switched off temporarily by setting the status from yes to no. The correction can only be activated if all settings make sense. If the correction cannot be activated, one or more settings are missing or are not within the appropriate range.

Name is simply a label identifying the source of the data being corrected.

Main ch points out the channel number of the value is being corrected. Whatever value arrives from the IO 256 software, it will be adjusted according to the span and/or offset values before it is written to the hard disk or shown in the data display. Setting the channel number to zero disables the function completely.

Zero ch points out which channel holds the zero calibration result, if this type of correction is in use. Setting the channel number to zero disables offset adjustments.

If an offset adjustment is in use, the maximum allowed error can be set at max z error. The unit is the same as is provided by IO 256. The zero calibration result will only be accepted as the last zero value if the absolute value is below or equal to this limit. Setting the limit to zero disables error checking, allowing for any zero calibration result to be used for data correction.

Span ch point out which channel holds the span calibration result, if this type of correction is in use. Setting the channel number to zero disables span adjustments.

When span adjustment is used, the target value of the channel must be set as expctd. The unit is the same as is provided by IO 256. The correction will be made based on the comparison between the channel value and this expected value.

A maximum error of the span calibration can be set at max s error. The unit is the same as is provided by IO 256. The span calibration result will only be accepted as the last span value if the absolute value of the difference between the measured and expected span result is below or equal to this limit. Setting the limit to zero disables error checking, allowing for any span calibration result to be used for data correction.

The result of the calibration correction can be directed to one of the input channels as described below. The channel number is set at alarm ch.

The section to the right shows the current accepted calibration values and the status of the defined correction. The status can be:

- Ok: The current zero and or span results are below the error limits (if any), and the last accepted values are therefore the same as the values currently found in the zero and/or span channels.
- Old: The current zero and or span results are *not* within the error limits, and the last accepted values are therefore old, not belonging to the last performed calibration. Check the IO 256 to see the current (bad) values. If either the span or the zero calibration value fails, neither of them will be accepted as last values. This ensures that any correction made is based on data obtained at the same time.
- Fail: Neither the current calibration result value(s), nor the last accepted ones are within the allowed error limits. The main channel value will remain non-corrected, being stored in its raw shape. This situation may occur during start-up before any calibration has occurred, or if the error limits are decreased below the last and current calibration error. The status also shows fail if the IO 256 is not operating correctly, or if a channel value has been set above the number of channels provided by IO 256.

Note: The corrections are always made based on the last accepted calibration results. Those are updated when new integrated values arrive from the IO 256. Also the polled values shown in the data display is corrected by these integrated results.

The following math is performed, depending on the correction mode:

- zero calibration only: $C = r - Z$
- span calibration only: $C = r * S_0 / S$
- Zero and span calibration: $C = (r-Z) * S_0 / (S-Z)$

where

C = corrected value r = raw value Z = zero result
 S = span result S₀ = expected span result

Note: It is possible to store also the non corrected data value simply by configuring the IO 256 to create two channels containing the same monitor signal. One of the channels are configured in the calibration menu, while the other is left alone, thus being passed directly to and stored on the data-logger hard disk. As a result, both the corrected and non-corrected values can be collected by calling the datalogger and reading its data.

The status of the calibration correction can be registered on one of the input channels. As soon as DL256 performs a calibration correction, the result, given as a numerical value can be forwarded to the input channel stated at alarm ch. The following codes are used:

- 1 means OK.
- 2 means Old.
- 3 means Fail.

To make this work, the channel type *must* be set to idle in IO256. See the IO256 documentation for more information. The result is indeed an *output* from DL256, but since it should be stored in the input channels, the value is written to this area directly.

Set alarm ch to zero to disable forwarding of calibration correction results to IO256.

The purpose of storing the calibration correction status is for data collection software to register the status and raise alarms in case of calibration failures.

Note: *The chosen IO256 input channel must be of the type idle for this function to work.*

4.3. Communication

Reading data from the datalogger can be done through either of two serial ports. It is possible to have both ports activated to be able to access the datalogger from two different systems. The two ports, primary and secondary, are treated equally from a communication point of view.

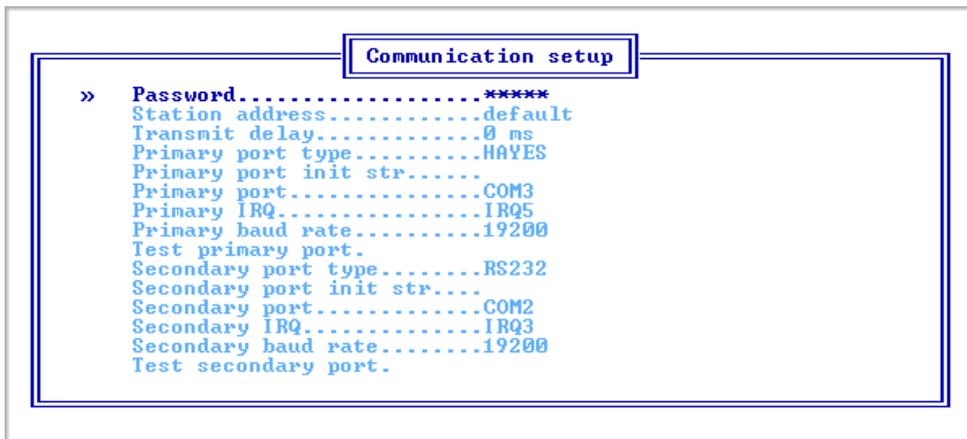


Fig. 4.3. The installation menu for communication.

The communication can be protected by a password. This password has to be known by any software trying to access the datalogger.

A station address is used in configurations where more than one datalogger (or Opsis gas analyser) is sharing the same communication equipment, e.g. a modem connected to a common telephone line. The calling computer can access the correct unit by only talking to the one with the desired station address. If A station address is not used, it should be set to default.

The remaining settings exist both for the primary and the secondary port.

Port type can be either RS232 or Hayes. RS232 should be used when a direct (leased line) connection exists between the datalogger and the calling computer. Hayes is used for dial-up communication, and also tells the datalogger to initialise the modem with certain Hayes AT commands. Any Hayes AT-compatible modem can be used.

Init string is used to initialise a Hayes modem. The string can contain any AT command available with the modem. The datalogger itself sends most necessary instructions to the modem at initialisation, e.g. forcing it into auto-answer mode. Some additional instructions may however be necessary, like allowing longer carrier lost times in cellular phone communications, or disabling error correction and data compression modes not acceptable to the communication protocol. Please consult the modem manual for further description. If the port type is RS232, the init string should be left empty.

Port can be set to either of COM1 to COM7, corresponding to the physical connection of the communication line. Make sure that the corresponding hardware port actually exists.

IRQ is the interrupt request identity linked to the selected port. It is fixed for COM1 and COM2, but can be altered for the other ports. Consult the hardware documentation to find out the correct IRQ.

Warning: *Be careful when selecting the port and IRQ. Using the wrong settings may result in conflicts with IO 256 or even in the system dead-locks.*

Baud rate can be selected up to 19200 baud. Using a direct line, i.e. when the port type is RS232, the baud rate must correspond to the baud rate of the calling computer. This is also true for Hayes compatible modems, i.e. when the port type is Hayes, using baud rates up to and including 4800 baud. At higher speeds, the actual baud rate will however automatically be adjusted to the baud rate of the calling computer. This enables high transfer speeds for local calls, and more moderate speeds for long-distance calls where the quality of the telephone connection is expected to be not so good.

Test port can be used to verify a communication line or test a modem. Any key typed on the keyboard will be sent through the serial port, and any character arriving from it will be displayed on the screen.

Press **[Esc]** to return to the Installation menu. If a Hayes modem is selected and it is not responding correctly, a warning message will be displayed on the screen before the installation menu is activated.

Note: *The menu shown in figure 4.3 may have an extra line at the bottom saying "External protocol configuration". This gives access to the configuration of a non-standard communication protocol. Refer to the documentation of this extension for details.*

4.4. Password set-up

The passwords protecting the datalogger menus are defined by pressing **[F5]** in the installation menu. The installation of passwords is performed in two steps:

- Establish which users (system operators) will be working with the datalogger. Each system operator should be given a name and a password. At the most 6 operators can be defined.
- Define what menus the system operators should have access to.

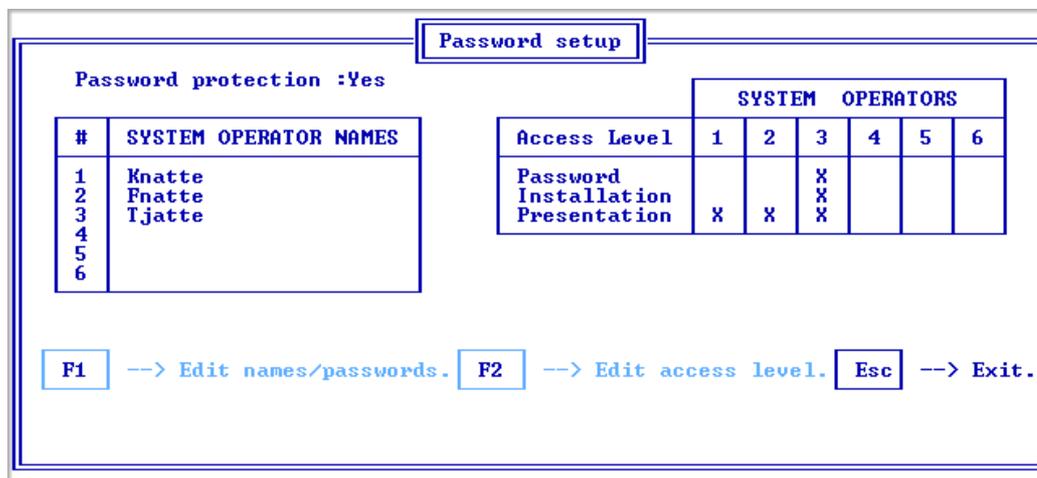


Fig. 4.4. Configuration of the users.

Pressing **[F1]**, and selecting the operator number, the user name and password can be entered. To avoid misspelling the password which cannot be seen, it has to be entered twice. If the second password does not correspond to the first one, both has to be re-entered.

The access levels are set by pressing **[F2]**. The following activities can be protected:

- Password setup, i.e. this menu.
- Installation, all menus and sub-menus described in chapter 4. An operator who has access to Password will automatically also gain access to the entire installation.
- Data presentation, a possibility to view historical data, see chapter 5.

Typically, there is one password for the system manager, who should have access to all menus in the software, and one or more passwords for those who only may access parts of the software, like data presentation.

Press [Esc] to return to the Installation menu. Doing so, the software will check that the entered access levels are reasonable, e.g. that at least someone will be able to go into the password set-up again.

In the upper left corner of the screen, there is a line saying Password protection. The line indicates whether all settings are valid to provide password protection or not. Password protection is only active if all defined operators both have a name and a password.

If activated, the datalogger asks for a name and a password when the user tries to reach the root menu. This can be done either when trying to exit the display screen, or when interrupting the initial countdown procedure, see chapter 3. Once the password has been entered, access is given according to the password setup menu. To avoid unauthorised access to the menus by other users, the user who entered the password should always bring the datalogger back to the display screen before leaving the site.

4.5. Input signals

All signal I/O is handled by the Opsis IO 256 software, included in the DL 256 system. IO 256 may also be used in Opsis gas analysers. IO 256 is designed to provide general functions for handling of analogue and digital signals, and serial communication with e.g. process computers or PLCs. This means that some parts of IO 256 may not find any applications in a DL 256 system.

The IO 256 input menu is accessed by pressing **[F6]** in the installation menu. This menu is used to define sources and timing for the input signals. The IO 256 menu is described in a separate manual.

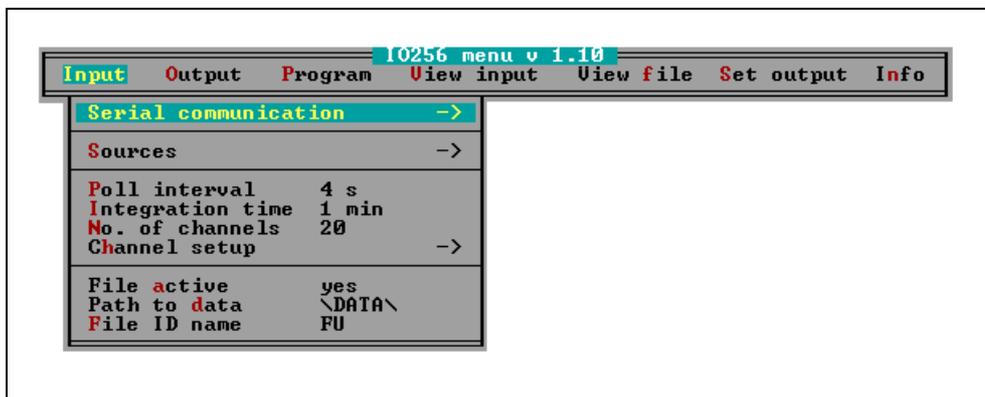


Fig. 4.5. The input set-up menu in the IO 256 software.

The integration time in the IO 256 input menu defines the time resolution of the entire DL 256 system. Some settings in the IO 256 menu will be transferred to other software menus. This includes the number of input channels, and the names and units of all channels. Names and units seen in the display screen comes from the IO 256 configuration. In addition, when first entering the data presentation menu (see chapter 5), The number of channels, names and units will be taken from the IO 256 configuration valid at that occasion.

Warning: No data will be transferred from the IO 256 drivers to the hard disk of the datalogger as long as the IO 256 menu is activated. Instead, values will be temporarily stored in a buffer, capable of holding up to 5 averaged sets of values. When the buffer is full, input data will be lost. In addition, the timer outputs will stop working when entering the IO 256 menu. The status signals will be kept at the values they had upon entering. The IO 256 menu should therefore only be activated during short periods of time.

4.6. Output signals

Timer outputs are used to activate external events, e.g. calibration of gas monitors. DL 256 provides 80 outputs which can be set individually. The DL 256 software is responsible for sending status values to the interface of the IO 256. It is then up to the IO 256 drivers to take care of the status values, e.g. to set digital outputs. A set timer will send the value 1.0 to IO 256. A reset timer corresponds to the value 0.0. The 80 channels corresponds to the first 80 output channels in IO 256.

The timer output configuration is accessed by pressing **[F7]** in the installation menu.

ch	type	day/length<min>	on	off	remark	status
1	>>daily		03:30:00	03:40:00	S02	off
2	daily		03:30:00	03:40:00	NOx	off
3	manual		00:00:00	00:05:00	O3	off
4	weekly	Mo	03:30:00	03:40:00	CO	off
5	not used					
6	not used					
7	not used					
8	not used					
9	not used					
10	not used					
11	not used					
12	not used					
13	not used					
14	not used					
15	not used					
16	not used					

Warning: Timer controlled outputs are disabled until exit from this menu. Manual control is available.

Fig. 4.6. The timer output configuration menu.

Use the **[PgUp]/[PgDn]** and arrow keys to move the cursor to a specific location, and press **[Enter]** to change the setting.

Type can be either of the following:

- daily: The timer will be set once a day.
- semi-daily: The timer will be set the first of January, and then once every second day.
- weekly: The timer will be set once every week, at the day of week specified at day.
- semi-weekly: The day of week is specified at day. The timer will be set the first day this day of week occurs in the year, and then once every second week.
- monthly: The timer will be set once every month, at the date specified at day.
- semi-monthly: This option will set the timer in January at the date specified at day, and then once every second month.
- manual: The timer is not set automatically. However, it is still possible to change the status manually, as described below.

(continued)

- **sequence:** The output will toggle on and off regularly, normally several times per day. Enter the cycle length (period) in minutes under length. Enter the time during the cycle when the output goes on and off in the corresponding columns. In no case should the on or off time be set outside the cycle length.

Example: For an output to be set the first half hour of every two hour interval, set the length to 120 minutes, on to 00:00:00 and off to 00:30:00.

Use the daily output type if the output should be set only once a day.

On and Off sets the time interval during which the timer should be on. 'On time' may be after 'off time' if the type is daily, and the status should be set over midnight. This is however not allowed for the other types.

On and Off is also specified when the timer type is manual. However, in this special case, it is only the difference between the two times that is used by the software. The absolute setting of the time does not matter. See below.

Remark is simply a text which can be entered to make a note of what the timer is used for.

Status shows the current status of the output. The current status can be changed manually by moving the cursor to the desired position in this column and pressing **[Enter]**. The following rules apply:

- The output will change immediately when **[Enter]** is pressed. The status can be changed any number of times while the output menu is displayed.
- If the output is switched on manually, and it is kept in this state when leaving the output menu, it will remain on for the time interval given by the difference by the on time and the off time. After this time, it will be set to the off state automatically.
- The automatic reset to the off state described above can be overridden by re-entering the output menu and setting the state to off manually.

[F1] will give access to the output configuration menu in the IO 256 software. This corresponds to going directly into the input configuration menu as described in the previous chapter.

[F2] will in the same way give access to the IO 256 test procedure for the outputs. It can be used to verify the current timer output values.

[F3] displays the settings for CU004/007 control. The Opsis calibration unit can be controlled from DL256, allowing for instance supply of calibration gas or intake from different sampling points to conventional monitors. When enabled, there is a direct correspondence between the status of an output and the status of a valve in the CU004 or CU007.

Refer to the separate CU004/007 manual for more information about this device.

(continued)

Pressing **[F3]** displays the menu shown in figure 4.7. To enable the calibration unit control, set Enabled to yes. Set Port, Address and IRQ No. to match the port which the CU is connected to. For COM1 and COM2, the Address and IRQ are fixed and cannot be changed. Refer to chapter 6 for information about ports.

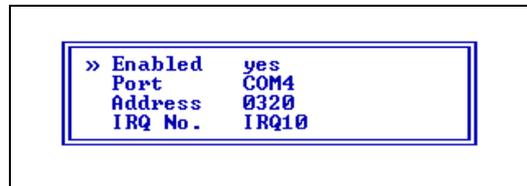


Fig. 4.7. The menu for setting CU004/007 communication.

Warning: Be careful when selecting the port, address and IRQ. Using the wrong settings may result in conflicts with IO256 or even in the system dead-locks. Refer to chapter 6 for information about the ports.

When the CU004/007 is enabled, a new column is shown in the output menu, as illustrated in figure 4.8. Any of the outputs, no matter what type it is, can be linked to a calibration unit valve from this column.

A single valve can only be assigned to a single output. A valve must have a corresponding output in the IO256. If you do not want to use the IO256 output but only the valve, direct the output channel to an output unit not in use.

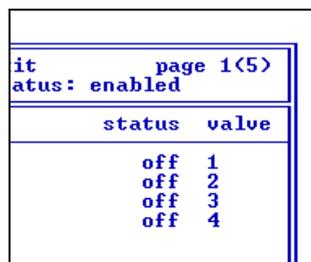


Fig. 4.8. Linking outputs to valves in the calibration unit.

Press **[Esc]** to return to the installation menu.

Warning: As soon as the Output signal setup menu is activated, all timers will stop working, and the outputs will remain at the status they had when the menu was started. The timers will resume working when the menu is abandoned. Starting the IO 256 software from this menu (**[F1]** or **[F2]**), the storage of logger data will also stop working as described in the previous chapter. This menu (and thereby the IO 256 menus) should therefore only be activated during short periods of time.

The layout has nothing to do with data storage, or any other vital function of the DL 256 system. It is just a way to provide the user with an easy to understand overview of the datalogger readings. Note the possibility to:

- reorder the input channels to provide a better and more logical display than the raw data would give.
- not show uninteresting logger channels, like e.g. less important status channels.
- enter explaining texts describing why the channels are there, and what the values are used for.

4.8. Using the flash disk

Note: This section applies only if the DL 256 does not have the ordinary hard disk option installed, but uses a flash disk for permanent storage of data.

In the DL 256 standard and in some DL 256 PRO, the data is stored on a solid-state hard disk, called a flash disk. It is small and has no moving parts, but has limited storage capacity and is very slow when data is written to it. In addition, it survives only a limited number of write cycles, where after the flash disk has to be replaced.

The last two disadvantages are noticeable enough to call for special handling. To circumvent them, data is primarily stored in the volatile primary memory area on a so called RAM disk. However, when power is switched off, any data present on the RAM disk will be lost. It is therefore essential that the flash disk is updated frequently enough to minimise loss of data in case of power failures, but still not too often, minimising idling time waiting for the flash disk to update.

When the DL 256 is started, all data on the flash disk is copied to the RAM disk. Data is primarily stored on the RAM disk, and it is the RAM disk providing data when downloading takes place to an external computer. However, new data is read from the RAM disk and added to the data files on the flash disk at regular time intervals. This time interval is set at Flash disk update in the configuration menu, see figure 4.1.

The update time should be set as high as acceptable, considering the tolerance of losing data in case of a power failure. A recommended value may be 30 minutes, meaning that at the most the last 30 minutes of measurement data will be lost if a power failure occurs. This also restricts write idling time to a reasonable number of times per day (i.e. 48).

If loss of 30 minutes of data is not acceptable, the interval can be shorter, but the wait time for write idling will be more noticeable. In no case should the update time be set below the integration time of the IO 256, since no new data can arrive quicker than this.

CHAPTER 5

Data presentation

Normally, data is read from the DL 256 by a calling computer, which also is used for managing and presenting the data. However, DL 256 also has a built-in function for data presentation, which can be used to study measurement results on site. This section describes the data presentation capabilities of the DL 256 itself.

The data presentation menus also includes routines for erasing data from the permanent storage on the disk.

5.1. The data presentation menu

The data presentation menu is used for viewing historical data, for creating ascii files, for backup and for removal of old data files. It is started by pressing **[F2]** in the Root menu.

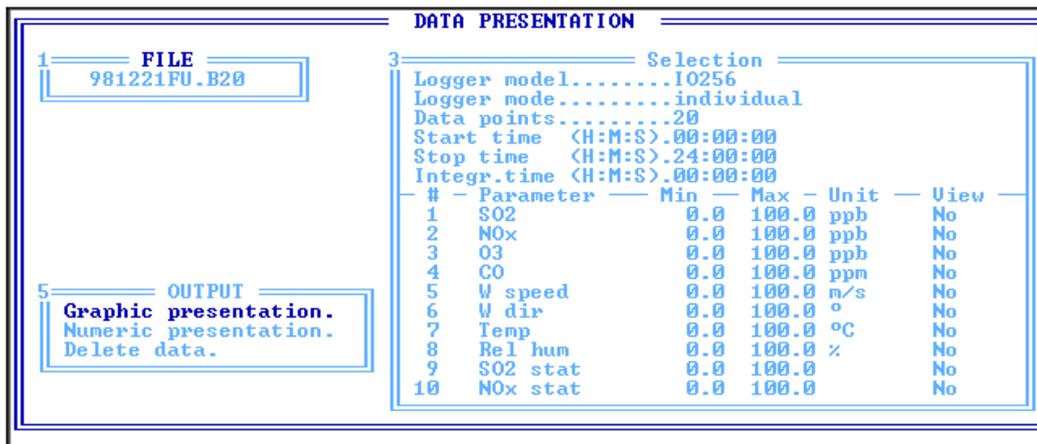


Fig. 5.1. The logger data presentation menu.

- File indicates the selected set of data.
- Selection is a menu for choosing time intervals and what data to look at.
- Output contains among other things routines for data presentation.

The three sub-windows File, Selection and Output are chosen by pressing **[F1]**, **[F3]** and **[F5]** respectively, or by using the arrow keys for selecting the high-lighted window and pressing **[Enter]**.

Press **[Esc]** to return to the root menu.

5.2. Data files

Data is stored in files named YYMMDDxx.Bnn, where YYMMDD is the year, month and day, xx is the system name (see chapter 4), and nn is the number of channels used by the datalogger. For channel numbers above 99, special coding is used: A0 means 100 channels, A1 101, and so on up to A9, corresponding to 109 channels. Then comes B0 for 110 channels, B1 for 111, etc.

Thus, a new data file is generated each day. Data from any day may be displayed.

When File is selected, the following display will appear:

FILE					
Directory: C:\DATA\		Files: 6	Free space: 257088 kB		
#:	Filename:	Date:	Time:	Size:	
» 1...	981221FU.B20	981221	08:45	33600	
2...	981220FU.B20	981221	00:00	92160	
3...	981219FU.B20	981220	00:00	92160	
4...	981218FU.B20	981219	00:00	92160	
5...	981217FU.B20	981218	00:00	55040	
6...	980918TE.B08	980918	17:02	5628	

↑↓-Up/Down. [PgUp]/[PgDn]-Page. [Enter]-Select.

Fig. 5.2. The file selection window.

Binary files containing data will be shown sorted after year, month and day. The most recent file will be shown first. To select a specific day file, use the arrow keys to move the cursor and press **[Enter]**. If more than 10 files are present in the data library, the other files can be displayed by pressing **[PgUp]** or **[PgDn]**. Press **[Esc]** to return to the presentation menu without selecting any file.

5.3. The selection menu

Additional time and channel information required for the data presentation is found in the Selection window.

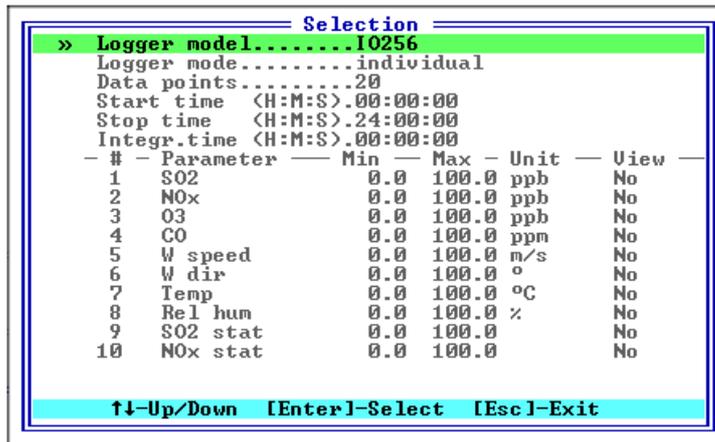


Fig. 5.3. The Selection window.

- Logger model should always be set to IO256. In the same way, Logger mode should always be Individual.
- Data points is the number of channels, and should always correspond to the last two characters in the extension of the file name, see section 5.2.
- Start time and Stop time defines the time interval for some of the operations in the Output menu, see the next section.
- Integr. time is the averaging time used for some of the operations in the Output menu. The integration time should e.g. be set to 01:00:00 to obtain hourly averaged data. Setting it to zero (00:00:00) means that no averaging takes place, and the raw data is treated as it is.

A number of parameters should be set individually for each channel. A channel is selected by moving the cursor and pressing **[Enter]**. The menu shown in figure 5.4. is displayed.

		S02
>>	Show value	Yes
	Min value	0.0
	Max value	10.0
	Value string	S02
	Value unit	ppb
	Value type	scalar

Fig. 5.4. Setting parameters for an individual channel.

- Show value is to be activated if the parameter should be presented in the graph or the table. At the most five parameters can be presented at the same time. If more than five parameters are marked for presentation, only the first five will actually be shown.
- Min value and Max value sets the presentation range for the diagrams. The diagram itself only contains a relative scale (0-100%). The ranges of the selected channels are shown in a separate box next to the diagram, see section 5.4.
- Value string and Value unit is the name and unit for the selected parameter. If IO 256 has been set up properly before going into the data presentation menu, the names and units have automatically been transferred from IO 256.
- Value type, finally, should be set according to the channel type. Scalar is the normal setting. Abs. value and Argument are only used in the special case when wind speed and wind direction are measured by the datalogger. The speed is an absolute value and the direction is an argument. It is necessary to mark those two parameters specially, in order to get the vector averaging function to work properly. The range for the wind direction should always be 0-360.

5.4. Presentation of data

The Output function is used for presenting the selected data.

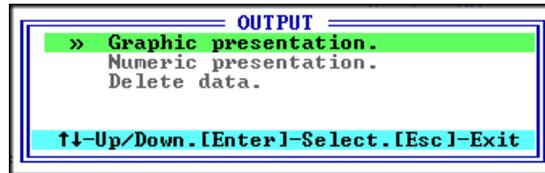


Fig. 5.5. The Output window.

Graphic presentation generates a diagram. The values are represented as curves if the integration time (see section 5.3) is zero, and as bars if the integration time is apart from zero. The time scale is defined by the Start time and Stop time settings. The scales are defined by the Max value and Min value setting for each parameter.

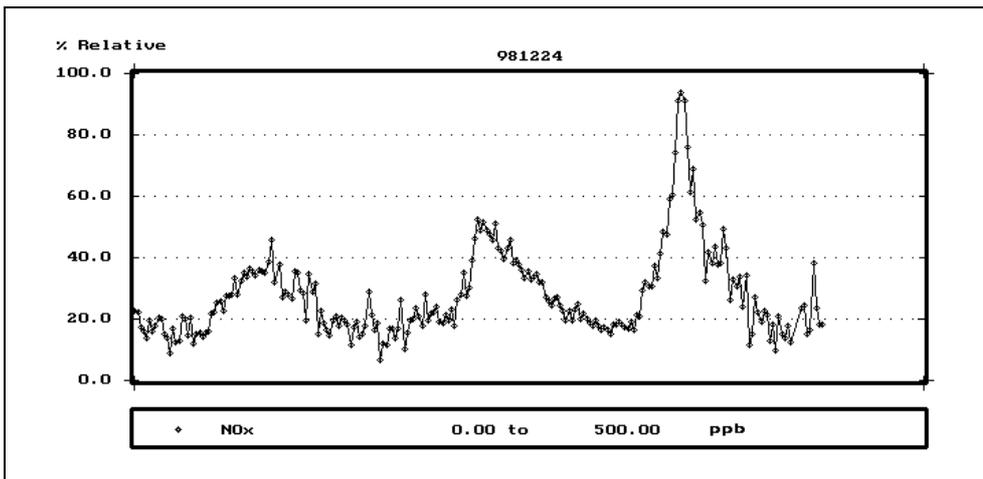


Fig. 5.6. A diagram generated with zero integration time.

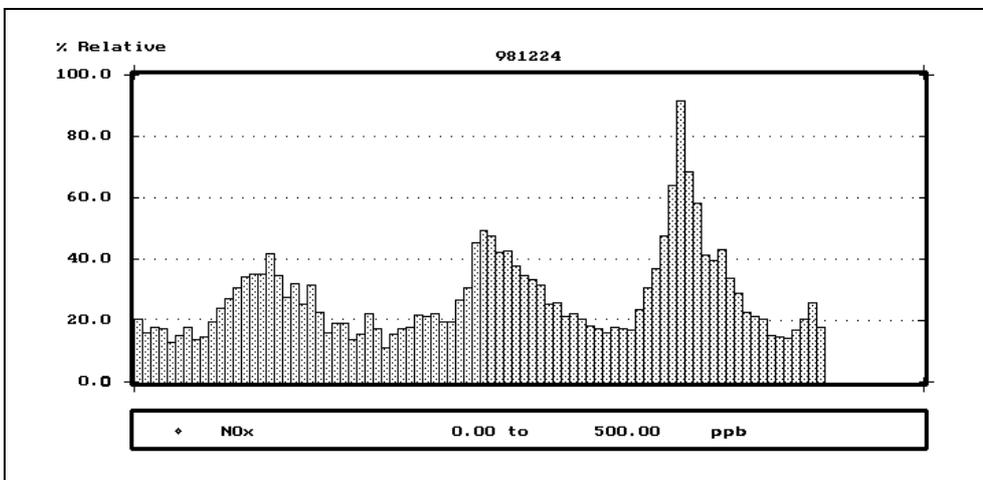


Fig. 5.7. The same diagram, but with a half hour integration time.

Numeric presentation generates a table using the selected Integration time, Start time and Stop time. Press **[Esc]** to abort showing data from the current date, or any other key to continue showing the next page.

981231 (HH:MM:SS)	S02 ppb	NOx ppb	O3 ppb
10:18:00	1.557	45.45	57.26
10:19:00	1.604	44.24	57.26
10:20:00	1.533	34.26	57.26
10:21:00	1.602	31.44	57.26
10:22:00	1.535	27.68	57.26
10:23:00	1.476	38.90	57.26
10:24:00	1.516	31.60	57.26
10:25:00	1.430	35.84	56.04
10:26:00	1.530	40.67	57.26
10:27:00	1.778	40.08	56.04
10:28:00	1.676	29.87	56.04
10:29:00	1.485	27.43	57.26
10:30:00	1.468	17.88	57.26
10:31:00	1.531	33.37	57.26
10:32:00	1.527	24.64	57.26
10:33:00	1.725	25.74	56.04
10:34:00	1.616	41.47	57.26

Fig. 5.8. An example of a numeric presentation

5.5. Deleting data files

As data is stored on the hard disk of the datalogger, the available disk space decreases. To avoid problems due to lack of disk space, old data files should be removed when they are no longer needed, e.g. when the corresponding data already has been downloaded. The amount of available disk space is shown in the display screen, see chapter 3. It is recommended that the available disk space is checked regularly.

Note: Using a flash disk (DL 256 standard and some versions of DL 256 PRO), old data files will be erased automatically when the disk space decreases. See section 3.4.

Data files are erased from the hard disk by selecting Delete data in the Output menu. A list of all available files will be displayed. Select the file to delete by moving the cursor with the arrow keys and press **[Enter]**. Type **[Y]** to confirm that the selected file should be erased. If more than 10 files are present, the other files will be displayed by using the **[PgUp]** and **[PgDn]** keys.

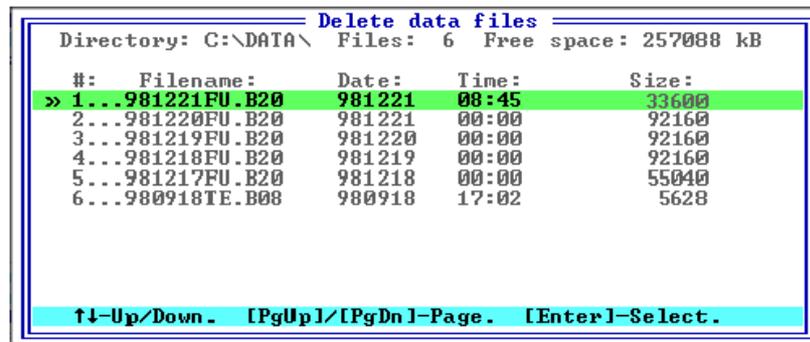


Fig. 5.9. The Delete data menu.

Note: The Delete data function does not depend on what file or time interval has been chosen in the other presentation menus.

CHAPTER 6

Serial Communication

DL 256 can be configured to use one or more serial ports for different purposes. The DL 256 software uses one or two ports for communication with calling computers. The IO 256 software can use one or more ports for various real time communication protocols connecting to different sensors.

To make the ports work, it is important that the port addresses and interrupt request numbers do not collide. Upon delivery, the settings should be correct, but the specifications are repeated in this chapter for information purposes. In addition, the optional cards SC 104 and MC 104 are described in detail.

6.1. Communication in DL 256

The table below shows the different serial ports possible to use in a DL 256.

Table 6.1. Serial port summary, standard configuration.

Port	Address	IRQ	Owner	Usage and remarks
COM1	standard (3F8h)	standard (4)	PC 104 (mother-board)	DL 256 software primary communication port, when MC 104 is not used. DL 256 software secondary communication port when MC 104 is used.
COM2	standard (2F8h)	standard (3)	PC 104 (mother-board)	IO 256 communication with IOMan modules, alternatively non-IOMan protocols when IOMan is not used, alternatively DL 256 software secondary communication port when MC 104 is not used.
COM3	standard (3E8h)	5	MC 104	DL 256 software primary communication port. See also COM1.
COM4	320h	10	SC 104	IO 256 communication protocols, normally non-IOMan.
COM5	328h	11	SC 104	IO 256 communication protocols, normally non-IOMan.
COM6	330h	7	SC 104	IO 256 communication protocols, normally non-IOMan. (LPT1 disabled.)
COM7	338h	15	SC 104	IO 256 communication protocols, normally non-IOMan.

Note: Other serial port configurations may be used in certain cases. Please refer to the individual datalogger documentation.

6.2. Serial communication card SC 104

The SC 104 serial communication card is used when IO 256 requires more ports than are available on the PC 104 motherboard. When installed, the following port names, addresses and IRQs are normally used:

Table 6.2. Normal port usage with SC 104.

ID	Port	Address	IRQ
1	COM4	320h	10
2	COM5	328h	11
3	COM6	330h	12
4	COM7	338h	15

Figure 6.1 shows the layout of the card and the necessary jumper and dip switch settings. The connectors 1-4 (COM4 to COM7) are terminated on a special connection pad, found at the rear of the DL 256 PRO.

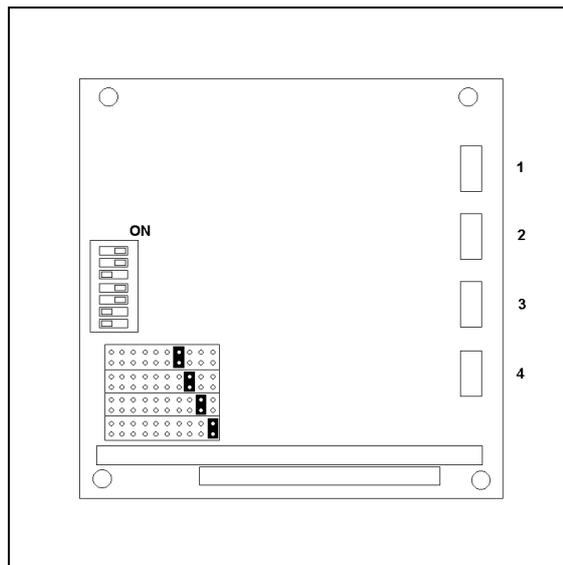


Figure 6.1. The SC 104 card.

Note: Always check the address and IRQ settings in the hardware documentation before enabling the ports. The above stated addresses and IRQs may be different because of hardware restrictions.

Warning: Make sure to set the serial ports in the IO 256 software according to table 6.2. Failure to do so may result in malfunction of the datalogger and loss of data.

6.3. Built-in modem MC 104

The MC 104 is a Hayes compatible modem, mounted directly on the PC 104 motherboard. It normally operates on COM3 and IRQ 5. Figure 6.2 shows the card layout and the necessary jumper settings. The modem is normally used as the primary communication port in the DL 256 software.

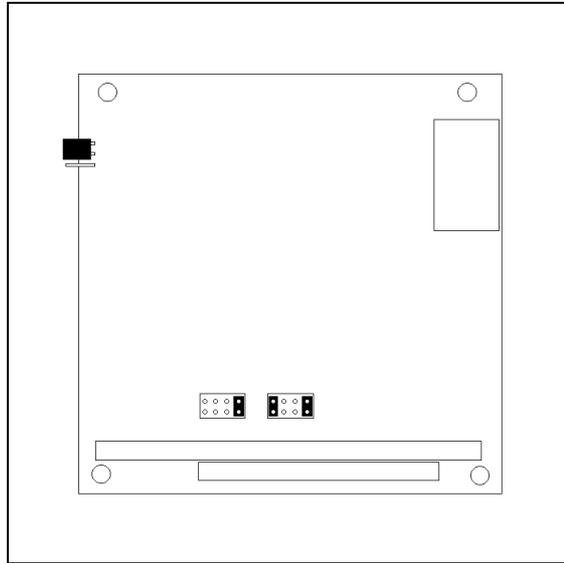


Figure 6.2. the MC 104 card.

Note: Always check the address and IRQ settings in the hardware documentation before enabling the modem. The above stated address and IRQ may be different because of hardware restrictions.

Warning: Make sure to set the port and IRQ correctly. Failure to do so may result in malfunction of the datalogger and loss of data.
