

Manual

Installation, Operation and Maintenance of Thalimedes Automatic Water Level Recorders in The Nile Basin and Processing of the Retrieved Data

Entebbe May 2002



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List of Acronyms

Ahr	Ampere hour
AWLR	Automatic Water Level Recorder
AWS	Automatic Weather Station
CTA	Chief Technical Advisor
FAO	Food an Agriculture Organization of the United Nations
FPI	Focal Point Institution
ID	Identification Code
IrDA	Infrared DuoLink Interface Adapter
LVBD	Lake Victoria Basin Database
NBD	Nile Basin Database
NBI	Nile Basin Initiative
NBWR	Nile Basin Water Resources
RAM	Random Access Memory/Readily Available Memory
RH	Relative Humidity
WRME	Water Resources Monitoring Expert

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Introduction

1.1 General

This manual presents detailed instructions for the installation, operation, and maintenance of the “Thalimedes” Automatic Water Level Recorder (AWLR) installed in the Nile Basin by the FAO Nile Basin Water Resources Project. Manufacturer of the Thalimedes is OTT Hydrometrie, based in Germany, which has provided conventional and automatic hydrometric equipment in the basin for over 50 years.

The reader is advised to study this manual carefully before starting any work with the Thalimedes. We have worked hard to present the user instructions as concise as possible. Background information on the functioning of the various elements is presented at appropriate occasions.

The hydrometric monitoring network in the Nile Basin consists of a large number of water level recording stations. Using a rating curve, the stage measurements are transferred into discharges, representing essential information for water resources planning, management, and design purposes.

The project is a strong advocate of introducing electronic monitoring equipment in the Nile basin. The use of electronic sensors connected to a datalogger is now well established in the world, and carries many advantages. For example, it facilitates automating data processing, which often forms the main obstacle in database development. Another major benefit is the possibility to acquire a continuous set of sub-daily data values. This provides important additional information on the behavior of often highly variable hydro-climatological parameters.

The project installed a Thalimedes at its office for testing and manual preparation purposes for several months. The equipment was then installed onsite at Entebbe Pier: one of the historical water level recording stations on Lake Victoria. The Thalimedes worked impeccably and without any technical problems during the entire testing period. Based on this experience, the project is now introducing this equipment in the whole basin, accompanied with a thorough hands-on training program.

1.2 Thalimedes and its Individual Components

Thalimedes measures water levels using an electronic sensor, and then stores this data in the logger’s non-volatile memory. The records are retrieved using: (a) a laptop PC, or (b) the OTT VOTA data retrieval unit. Thalimedes can either be used as a stand-alone device, or attached to an existing strip chart recorders. The following paragraphs discuss the main components comprising the Thalimedes:

Datalogger with Shaft Encoder: Thalimedes is a float-operated shaft encoder with integrated datalogger. Changes in water level are transferred via a float-cable-counterweight system to a pulley on the encoder unit. The rotation caused by this action is converted into an electrical signal, which is then transferred to the datalogger and saved as a measurement. This mechanism is illustrated in figure 1.

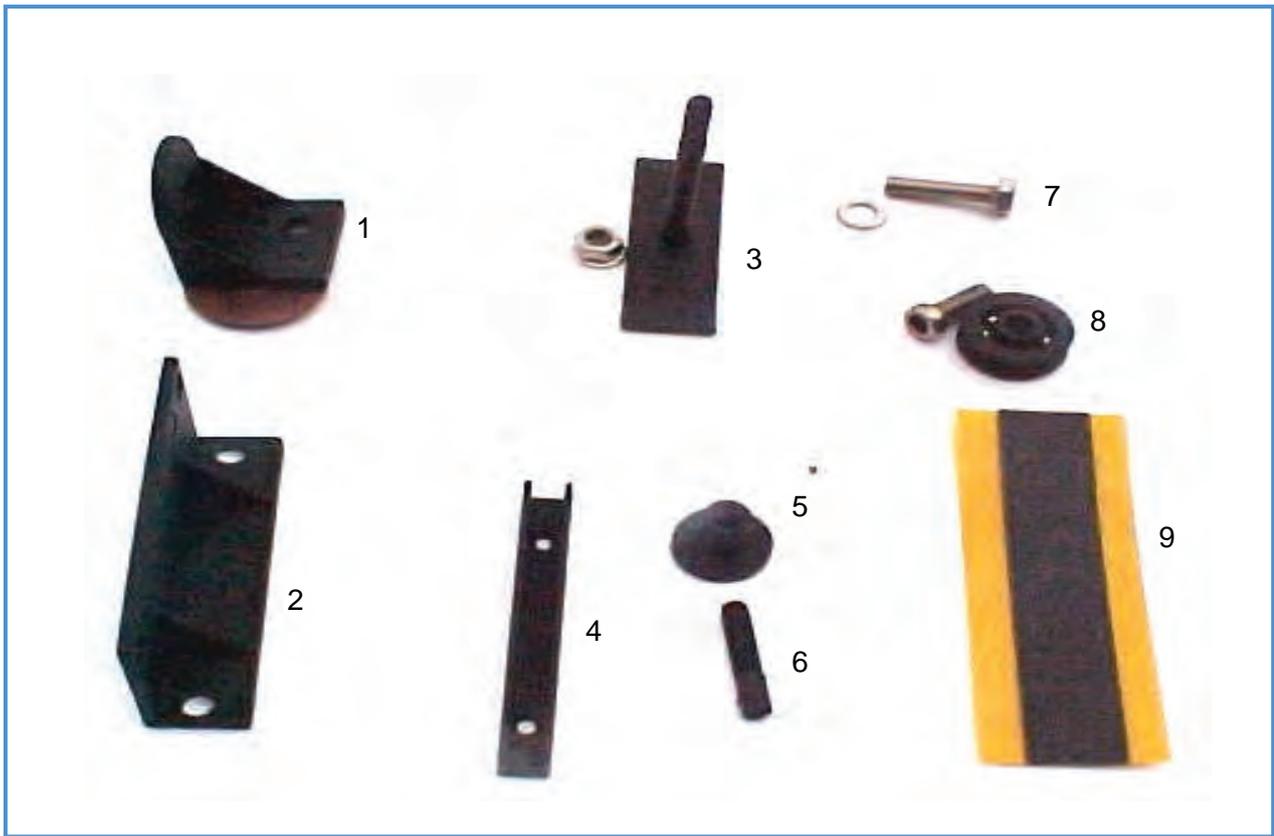


Figure 2: Thalimedes attachment kit

The kit includes:

1. Connection angle A & friction disk
2. Connection angle B
3. Holder
4. Carrier rail
5. Carrier base & nut for holder
6. Carrier pin
7. M6 X 25 screw
8. Guide roller with self locking M6 X 18 screw
9. Adhesive strips

Data Readout Device: Thalimedes requires a serial RS-232 interface to connect to a PC or VOTA. An example of this device is the infrared interface adapter (IrDA) called “Linkit” or “DuoLink”, which enables wireless communication between the datalogger and the data retrieval unit (PC or VOTA). Figure 3 presents two examples of this infrared interface.

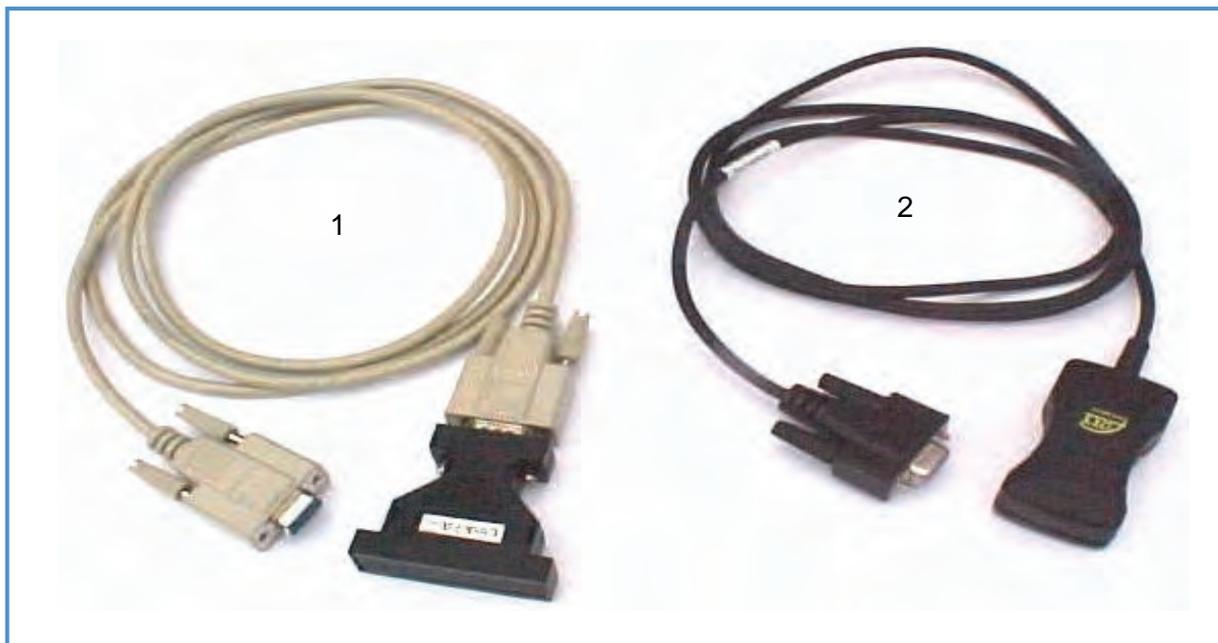


Figure 3: Data readout devices

1. Linkit
2. DuoLink

Data Retrieval Unit: Data is retrieved using either a laptop PC or an OTT VOTA. The VOTA is a ruggedized data programming/retrieval unit for use in the field. Its design is based on PC technology, and all its software is pre-installed. VOTA is operated by a single knob, 'called 'Jog Shuttle''. Figure 4 shows the VOTA.



Figure 4: OTT VOTA programming / retrieval unit

Power Supply: Thalimedes is powered by a single 1.5V alkaline A-type battery, which can be purchased locally.

When measuring at a 5 minutes interval, this battery will last for about 15 months. It is advised, though, to change it on yearly basis.

1.3 Overview of the Contents of the Manual

This manual provides all necessary user-helping information for successful installation, operation, and maintenance of Thalimedes. It also covers the instructions for data retrieval, data processing, and final storage of the Thalimedes recordings into an MS-Access database.

Chapter 2 describes the installation of Thalimedes to an existing OTT strip-chart recorder.

Chapter 3 covers Thalimedes programming and data retrieval when using a PC, while chapter 4 discusses the same issues when using the VOTA. This chapter also includes transferring the accumulated raw data from VOTA to PC.

Chapter 5 describes primary data processing in HYDRAS 3: a proprietary software package specifically developed by OTT for this purpose. This process includes converting raw data files into ASCII text files.

Chapter 6 discusses secondary data processing. This includes importing the ASCII data files into the MS Access, and subsequent final storage in the Nile Basin Database (NBD).

Installation of the Thalimedes

2.1 General

Thalimedes can be installed onsite: (a) as a stand-alone unit, or (b) in combination with an existing mechanical strip chart water level recorder. The installation procedures for both set-ups are discussed in the following paragraphs.

2.2 Installation as Attachment to OTT Strip Chart Recorders

2.2.1 Introduction

Thalimedes represents new electronic technology for water level recording in the Nile Basin, which, very likely, will eventually replace the existing mechanical recorders. However, it is advised to use both instruments side-by-side for several years. In this way, operators will have sufficient time to get used to the new technology, and will also be able to check the performance of Thalimedes by comparing the results from this instrument with the well established, and trusted, mechanical strip-chart recorders.

Attaching Thalimedes to an existing OTT strip-chart recorder is a straightforward exercise, which does not require any changes in the existing stilling well set-up. Thalimedes makes use of one and the same float-cable-counterweight system of the mechanical recorder.

The proper procedures for attaching Thalimedes to various common OTT mechanical chart recorders are discussed in the following paragraphs.

2.2.2 Installation as Attachment to OTT Strip Chart Recorder R20:

OTT R20 is the most common mechanical strip-chart recorder in the Nile Basin. Attaching Thalimedes to R20 requires the following elements of the attachment kit:

1. Connection angle A with a friction disk and a screw;
2. Holder and associated nut;
3. Guide roller with the self locking screw;
4. An adhesive strip.

(The reader is referred to figure 2 for identifying the above parts)

Attach the shaft encoder to the mechanical recorder using "connection angle A". To ensure a firm connection, place the "friction disk" between mechanical recorder and "connection angle A", as shown in figure 5. Tighten the screw to make sure that the position of the shaft encoder does not change due to the float-counter weight tension.

Connect the small guide roller to the lowest corner of the shaft encoder using the "M6X18" self-locking screw. Do not tighten this screw too much. Make sure that the Thalimedes pulley can rotate freely without touching any other surface.

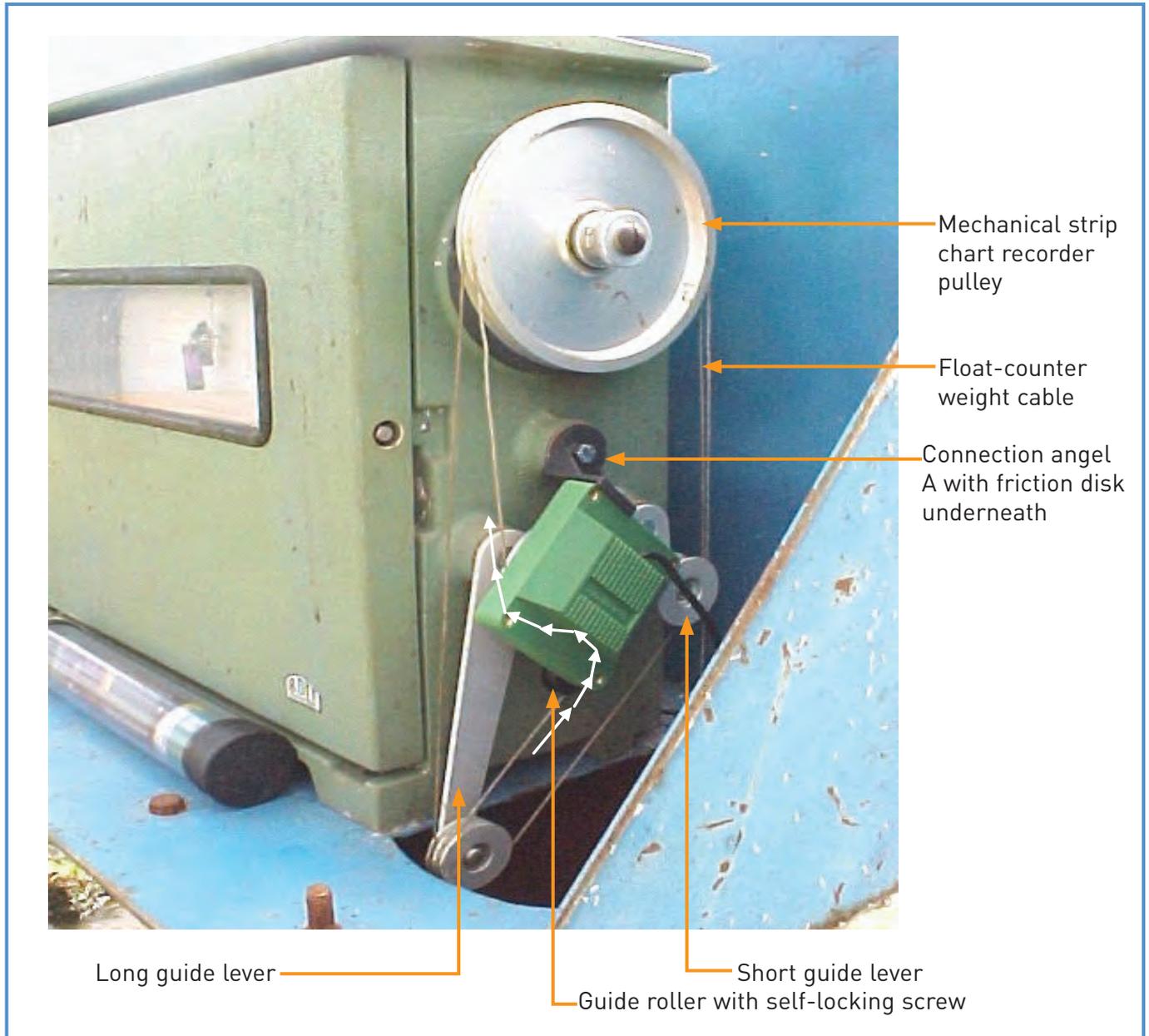
Now route the existing float cable through the Thalimedes pulley and the guide roller, as shown by arrows in figure 5. The process of attaching Thalimedes to the R20 recorder is illustrated in detail in figures 5 and 6.

For security reasons, the Thalimedes datalogger unit is placed inside the mechanical chart recorder. To achieve this, disconnect the transducer cable from the datalogger unit, route the cable through the borehole into the recorder enclosure, and reconnect it to the datalogger. Make sure to reconnect the wires to the right terminals on the datalogger.

If the recorder enclosure has no borehole, place the datalogger unit in any secure place in the stilling well housing. Make sure that the Thalimedes display is clearly visible, and that the infrared sensors are accessible. Attach

the "holder" to a level surface using the double-sided adhesive strip, and fix the datalogger unit onto it by tightening the holder-nut.

Figure 5: Attachment of Thalimedes to OTT R20 Strip Chart Recorder



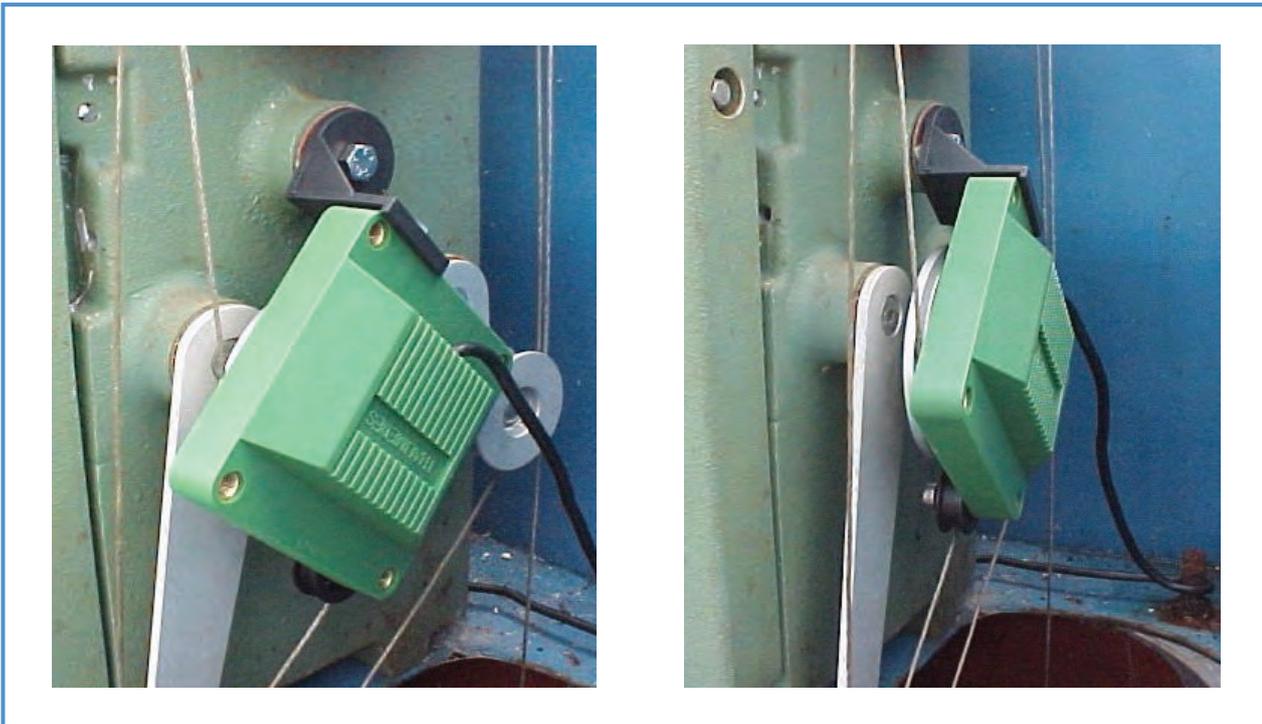


Figure 6: Attachment of Thalimedes shaft encoder to the mechanical chart recorder

2.2.3 Installation as Attachment to OTT Horizontal Water Level Recorder Type X

The installation of Thalimedes to OTT horizontal water level recorder "Type X" is not very different than the installation for OTT "R20" type of strip chart recorder explained in paragraph 2.2.2. The attachment kit needed, include:

- Connection angle A with a friction disk and a screw
- Holder and nut for holder
- Guide roller with self locking screw
- An adhesive strip. All these parts are supplied with every Thalimedes.

For convenience these parts are shown in figure 2.

As shown in figure 7 below, attach the shaft encoder to the mechanical chart recorder using "connection angle A" with a friction disk underneath and tighten the screws. Attach the guide roller to the lower-left corner of the shaft encoder and route the float cable through the shaft encoder pulley (as shown with the arrows in the figure below).

Place the datalogger on top of the chart recorder body using the holder and a double-sided adhesive strip.



Figure 7: Attachment of Thalimedes to OTT Horizontal water level “Type X”

2.2.4 Installation as Attachment to OTT Vertical Water Level Recorder R16

The following attachment kit is needed for installation of Thalimedes with OTT mechanical chart recorder type “R16”

1. Connection angle A with a friction disk and a screw
2. Holder and nut for holder
3. Guide roller with the self locking screw
4. An adhesive strip. All these parts are supplied with every Thalimedes.

For convenience these parts are shown in figure 2.

Attach the Thalimedes to the vertical strip chart recorder as shown in figure 8. Connect the shaft encoder using “connection angle A” with a friction disk underneath and tighten the screw. Connect the “guide roller” to the lower-left corner of the shaft encoder using the “M6X18” self-locking screw. Now route the existing float cable additionally through the Thalimedes pulley and the guide roller (this has been shown as white arrows in figure 8). Attach the “holder” to a level surface with the help of a double-sided adhesive strip and fix the datalogger unit onto the holder by tightening the holder-nut.

Place the datalogger on top of the chart recorder body using the holder and a double-sided adhesive strip.

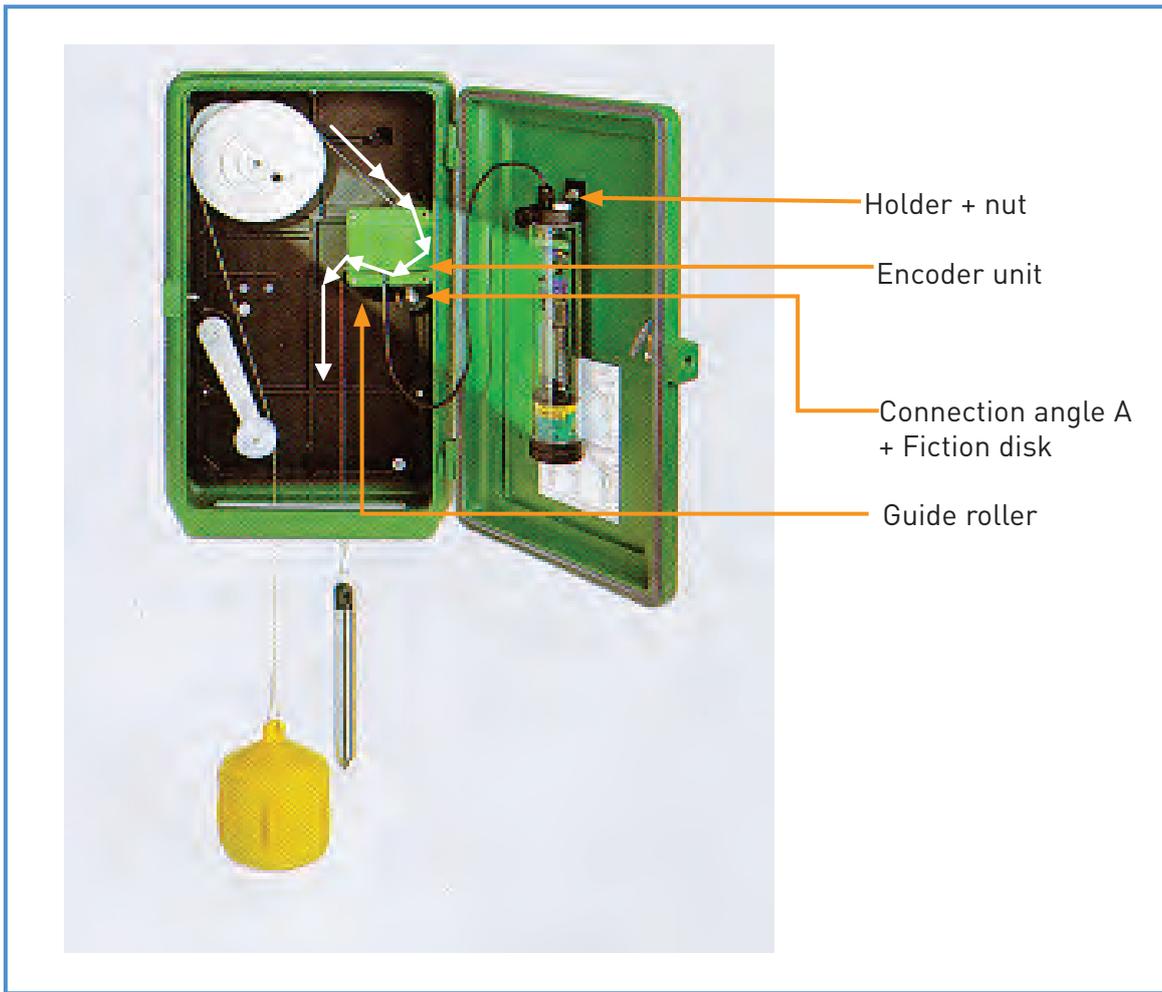


Figure 8: Attachment of Thalimedes to OTT vertical water level recorder "Type16"

2.3 Installation as Stand Alone Unit

When the strip chart recorders do not exist on site, Thalimedes can be installed in a stilling well as a stand-alone device. For this purpose construct a stilling well of 6" diameter with two inlet pipes of diameter 2" each. The installation method is the same as for constructing the stilling well for strip chart recorders with the only difference that it is a 6" diameter pipe and that the top portion of the pipe is threaded. Following are the steps for constructing a stilling well and Thalimedes installation:

- Conduct a field visit to acquire current gauge level incase upgrading an existing staff gauge station. Maximum and minimum water levels over years are also required which can be made available from the office. The current gauge level is important if the recorder needs to be installed immediately and in case there is no big fluctuation in water levels e.g. lake levels or other calm rivers. In case of high fluctuating sites/ rivers, the installation activity should be postponed to obtain the average or minimum flow period over the year.
- Select a suitable site for installation of the stilling well and the inlets, where the stilling well and the equipment remains safe from flood hazards and does not interrupt navigation, if any.
- On the basis of the above collected data, design a stilling well determining an appropriate length of the stilling well and the inlet pipes.
- Identify a suitable workshop for making the stilling well. Depending on the length of the designed well, cut the pipe into two or three sections to make it easy for transportation to the site and for installation. Bore holes in the bottom piece for connecting to the inlet pipes and connect the connectors threaded from inside. Make round flanges and weld them to both the ends of each piece of pipe. Drill three holes in each flange at an equal distance around the circle for combining the three pieces onsite with the help of bolts and nuts. The

top most end of the pipe is, instead, threaded (no flange). Drill some small holes in that portion of the upper pipe which is above ground level. This will allow some aeration in the pipe to protect the Thalimedes pipe from moisture. Also cut the 2" diameter inlet pipes in sections of 2m each, thread both the ends of each piece with one connector attached to one end only.

- After installation of the stilling well with inlet pipes onsite, install the Thalimedes automatic water level recorder according to figure 9 and 10 into the pipe and close the pipe with OTT cap.

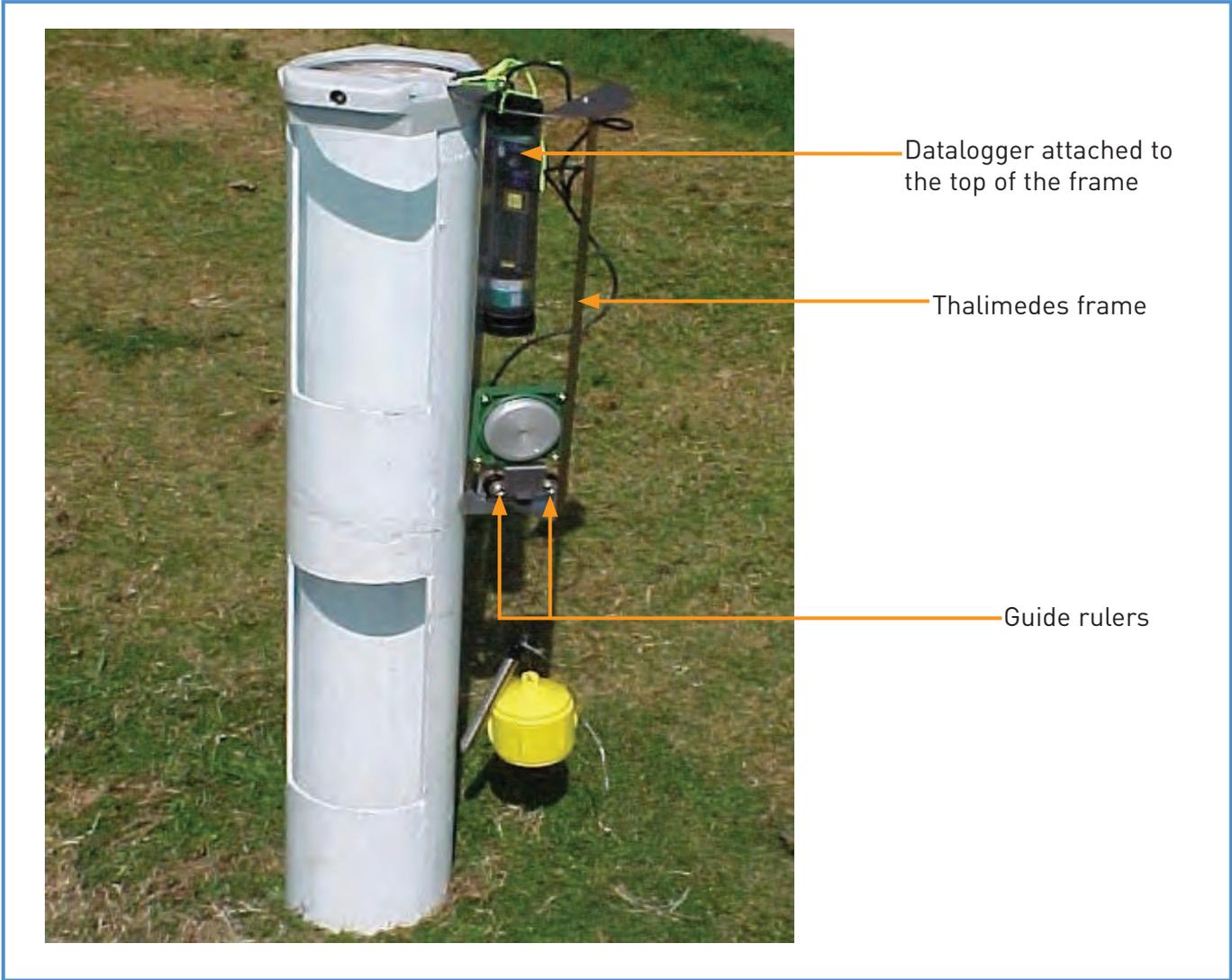


Figure 9: Thalimedes within the frame for installation inside the pipe



Figure 10: Thalimedes installed in a 6" demonstration pipe.

2.4 Maintenance

Maintenance is required as follows:

1. Check that the Thalimedes shaft encoder is not touching any other surface and that it is moving freely with the float-counterweight movement.
2. At every visit check the battery voltage. It should not be less than 1.00 V.

Using Thalimedes

3.1 General

Once the Thalimedes has been installed, either attached to any strip chart recorder or as a stand-alone device, the datalogger needs to be programmed and the required parameters need to be properly set. This is accomplished either using an OTT VOTA unit or using a PC/laptop. Before setting the parameters, Thalimedes needs to be activated by fitting the battery inside it and placing hand over the motion sensor so that the display is activated. Once the Thalimedes has been activated and all the operating parameters are set, the datalogger starts recording according to the datalogger settings. Detailed explanation of how to activate Thalimedes and set the operating parameters has been explained in the following paragraphs:

3.2 Fitting the Batteries and Activating Thalimedes

Thalimedes uses a commonly available alkaline battery i.e. C-cell (1.5 V) (LR 14.C.AM2). The process of inserting the batteries resembles that one for a common torch i.e. the battery case cover at the bottom of the Thalimedes is opened to insert the batteries and is then tightened securely. Thalimedes display is now on and has started measuring calculated values using the factory set up. Since this is a new set up, the operating parameters need to be reset [setting the operating parameters is explained in the proceeding paragraphs]. The battery must be replaced if the battery voltage falls below 1 V but the replacement should happen within 20 minutes of removal of the old battery. In this way the Thalimedes settings remain the same and the operating parameters do not need to be reset. The life of the battery is up to 15 months depending upon the ambient temperature. This duration drops to 50% if the temperature is below zero degrees Celsius. Since this is not the case in the selected stations in the Nile Basin, the battery will work for up to 15 months. However, it is recommended to change the battery once in a year to be sure of proper functioning of the Thalimedes. Changing the battery at a later stage has no effect on the stored data.

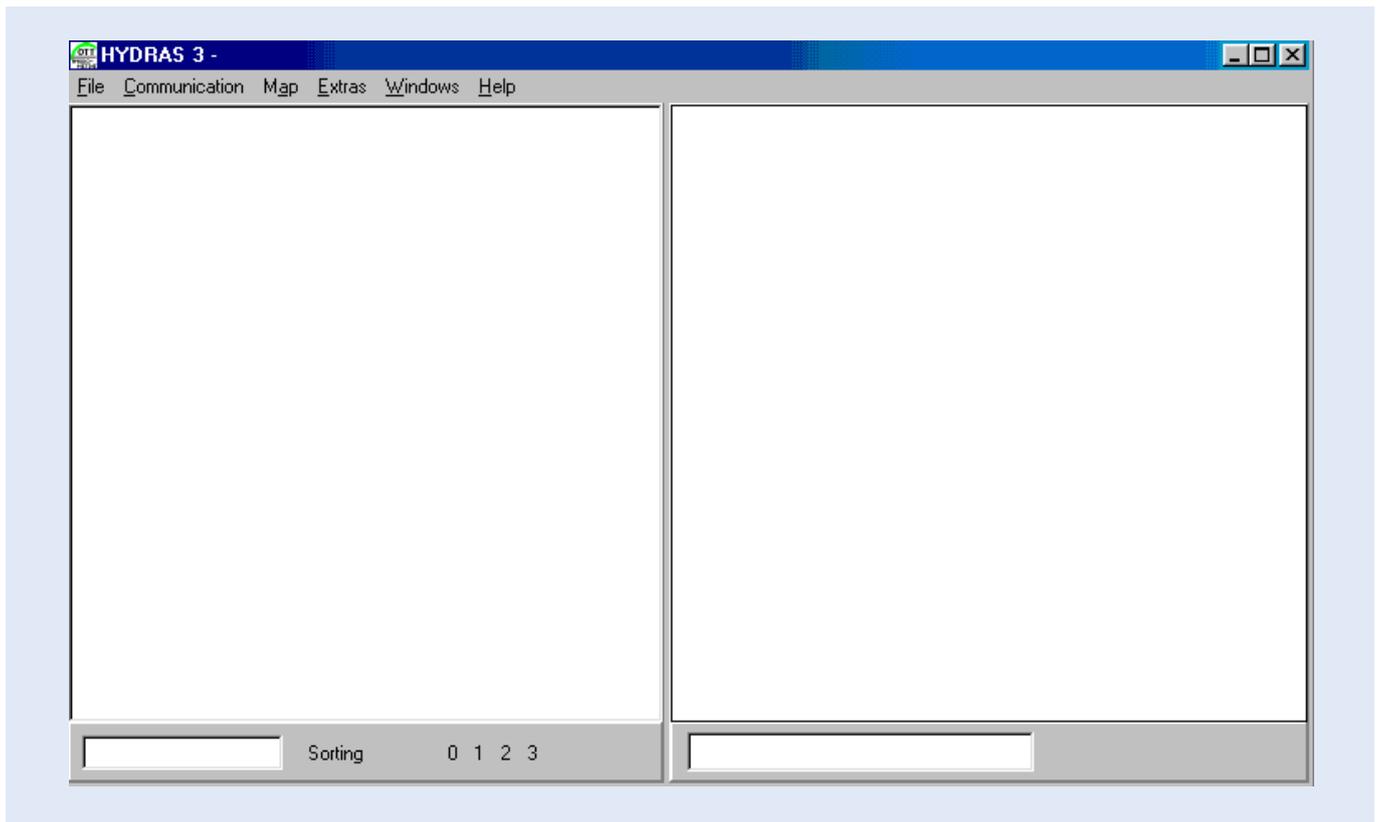
3.3 Creating Workspace, Region, Stations and Sensors in a PC using Hydras3

Software

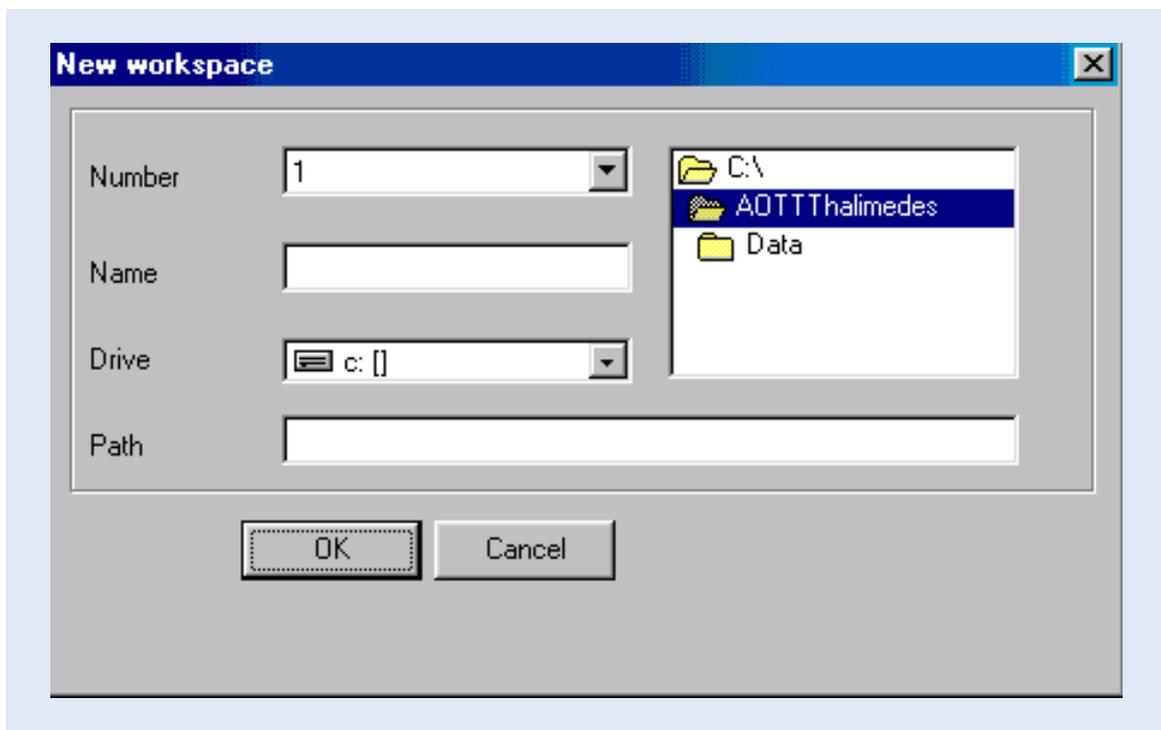
Before starting working with Thalimedes, it is essential to create a workspace in the Hydras 3 software on the PC. A workspace in the PC includes a region(s), a station(s) and a sensor(s). To create these follow the steps below:

Step 1: Make sure the Thalimedes communication software i.e. "HYDRAS 3" has been installed. If not, install it by inserting the CD into the CD drive and follow the instructions given on the CD cover. It is recommended to install the program in the following directory: "C:\AOTTThalimedes" on your PC. Also create programme shortcut on the screen.

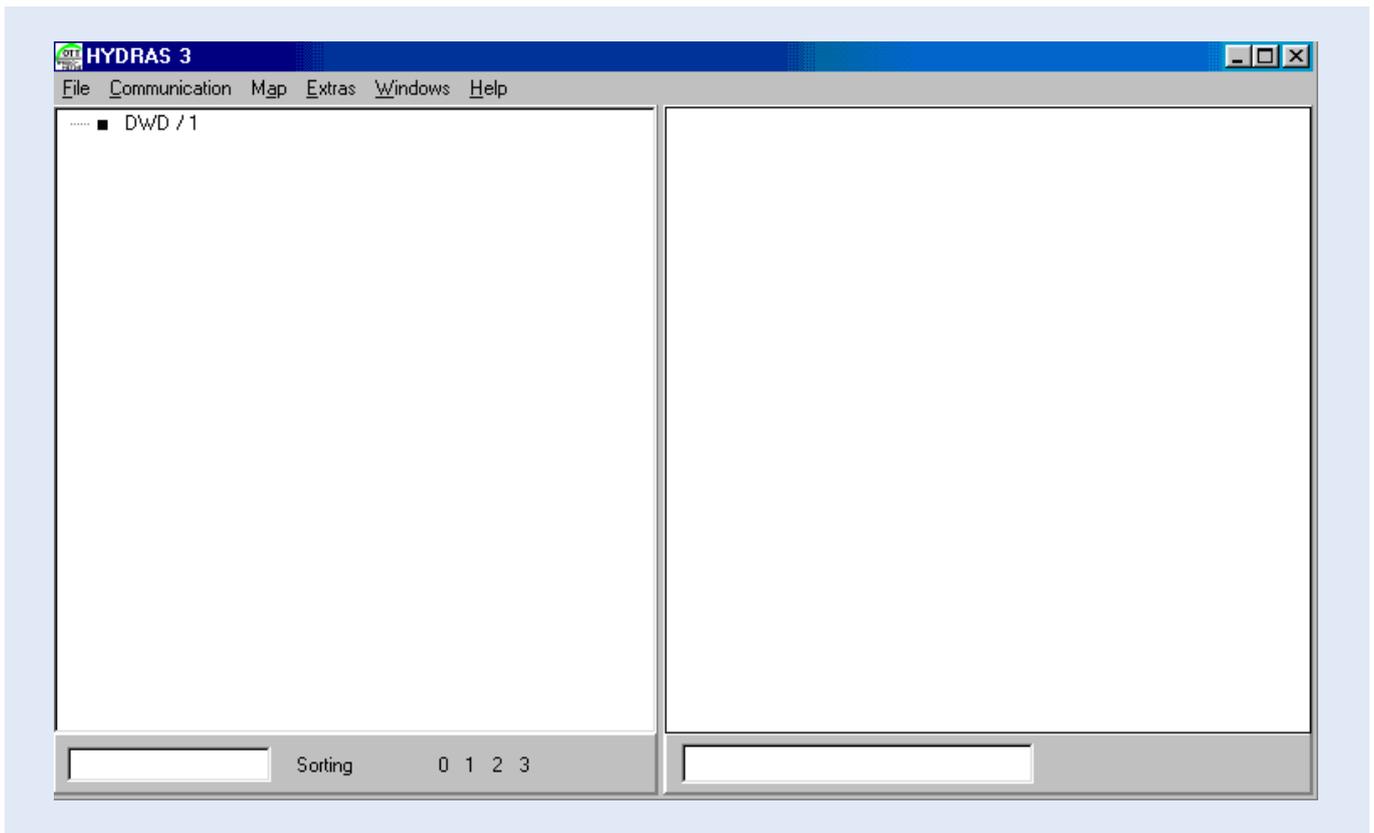
Step 2: Activate the Thalimedes communication program "HYDRAS 3". The resulting program window is empty and will look like as shown below:



Step 3: Create a workspace by clicking on the “New Workspace” from the “File” main menu. The following window appears:

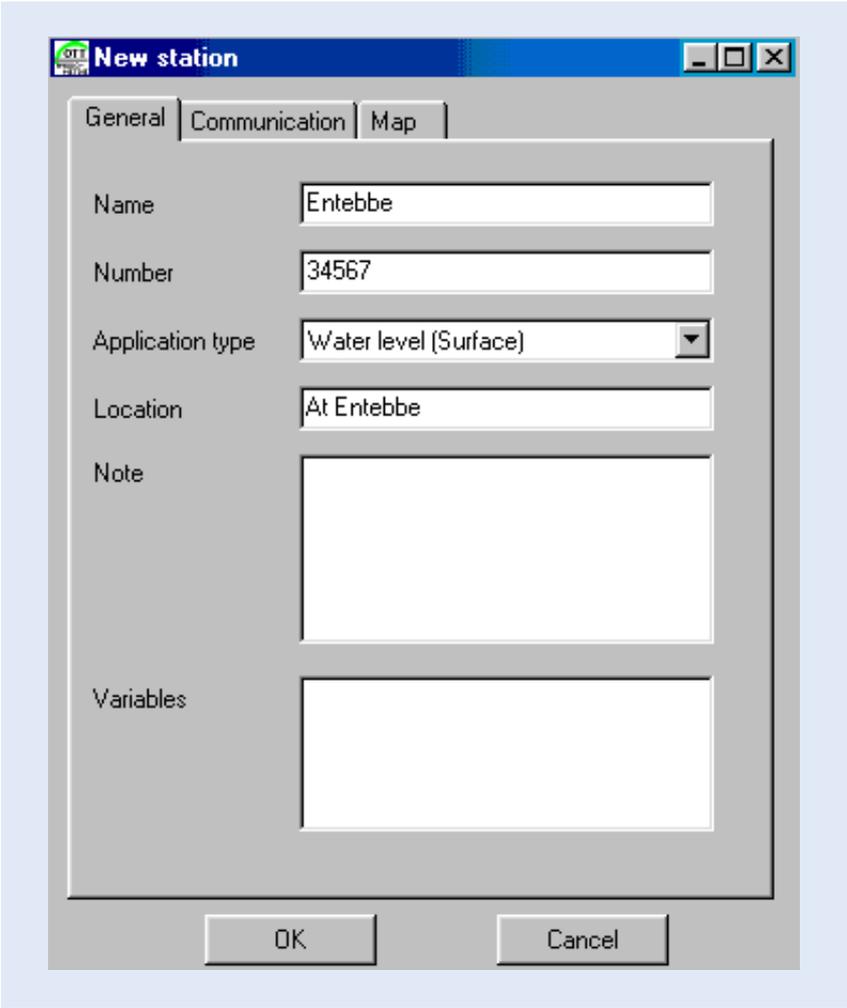


A workspace is a directory that contains a region/regions, stations within a region and sensor/sensors within a station. One can have the workspace with a name e.g. DWD. Path must be set by clicking in the path field and then clicking on the “C:\”, then “AOTTTthalimedes” and then “Data” within the window [Note that right path should be selected otherwise the workspace will not be created]. The resulting window will look like this:



Double click on the black spot of the workspace "DWD". This workspace "DWD\1" has one region with the name "All Stations/999999999999". This region is automatically produced within the workspace, the name of which cannot be changed. Within this region, create the stations with their names and ID numbers where Thalimedes are going to be installed. Every station will have one water level sensor i.e. Thalimedes (in fact a station may have several sensors). To create these stations and sensors proceed with step 4.

Step 4: Right click on the region called "All Stations\999999999999" and select "New Station". A window will appear as shown below. Enter details of the gauging station and click OK.



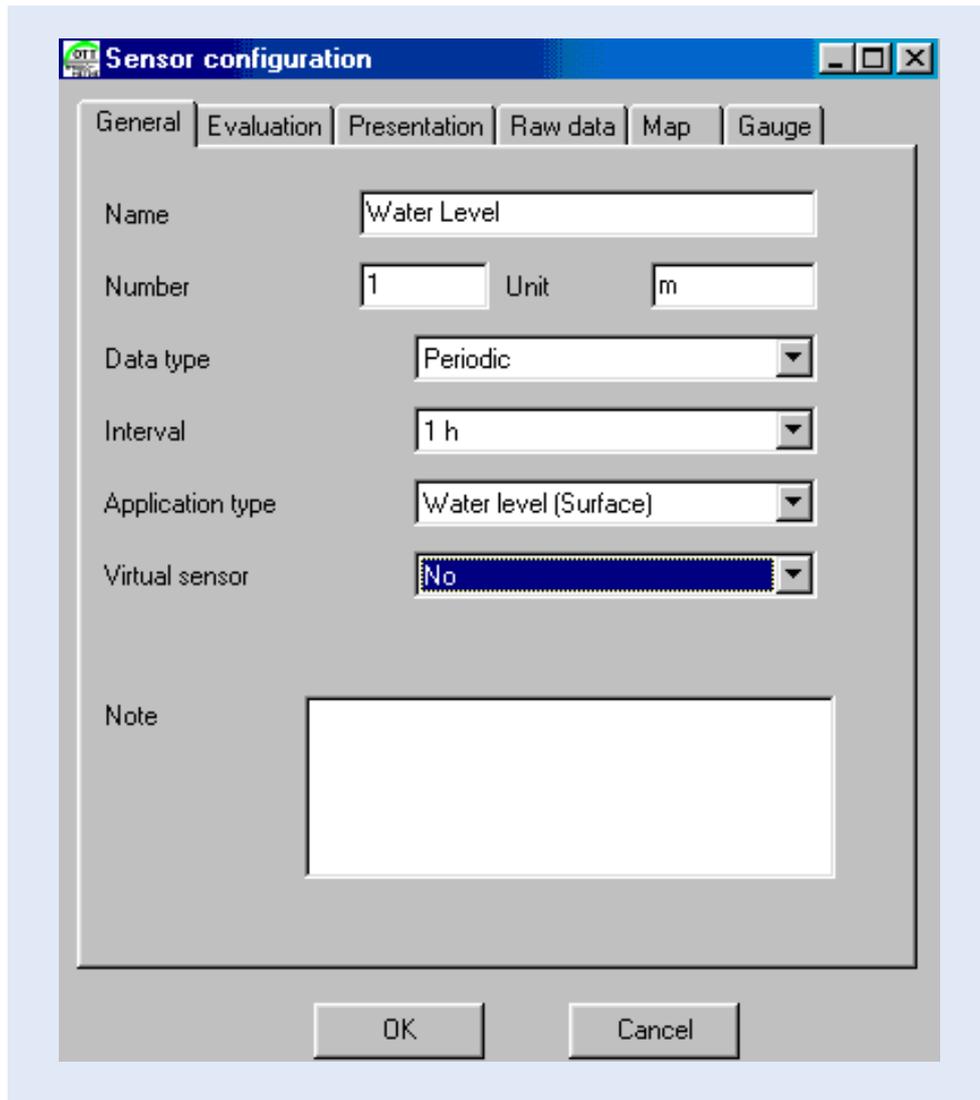
The screenshot shows a software window titled "New station" with three tabs: "General", "Communication", and "Map". The "General" tab is selected. The form contains the following fields:

- Name: Entebbe
- Number: 34567
- Application type: Water level (Surface)
- Location: At Entebbe
- Note: (Empty text area)
- Variables: (Empty text area)

At the bottom of the window are "OK" and "Cancel" buttons.

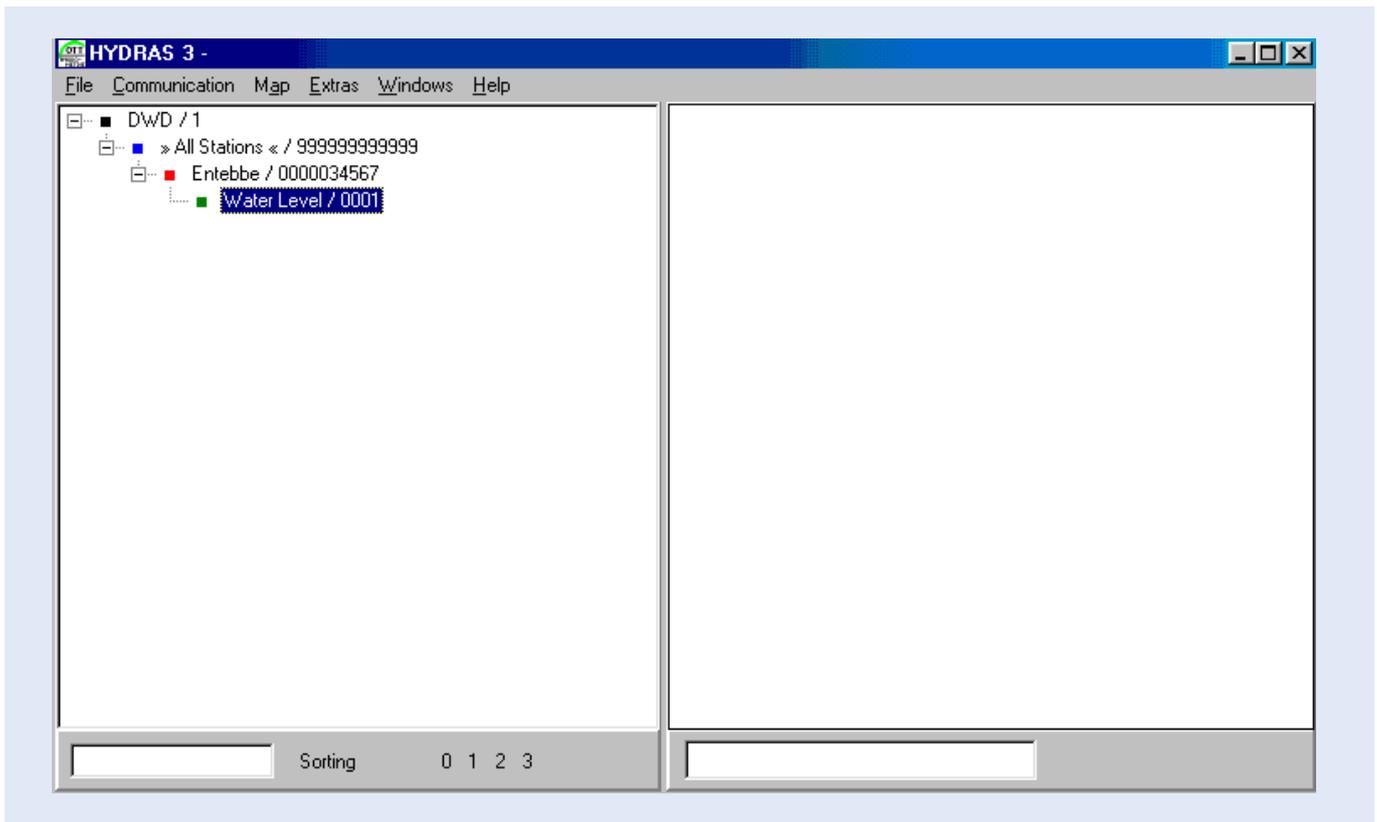
Note: Enter only the hydrometric number of the station and no zeros before.

Step 5: Enter the sensor to the station by right clicking on the station and selecting "New Sensor". This is the sensor (Thalimedes) going to be installed at the gauging site. Enter the sensor details in the resulting window as below:

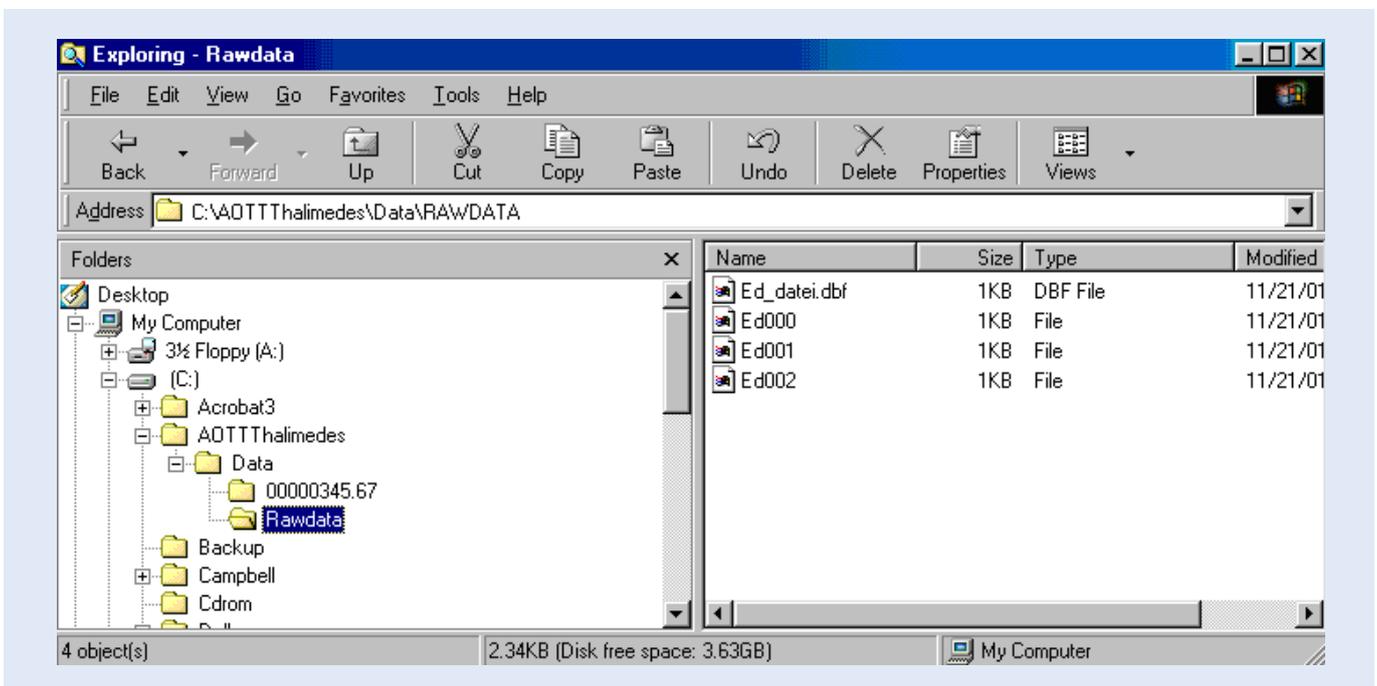


Proceed to the "Evaluation" tab in the same window and click in "Means" check box. In the "Presentation" tab enter the text for Y-axis as "Water Level (m)" and select graph type as "Polygon". In the scaling fields for "Mean Values" enter Y-Minimum as "0". Y-maximum, however, depends on the maximum water level recorded at the station in the past years and should be entered carefully. Ignore the "Raw data", "Map" and "Gauge" tabs.

The resulting program window with the workspace is shown below and can be explained as: the first workspace called "DWD/1" has at present one region called "All Stations/999999999999". This region has, for the time being, one station called "Entebbe/34567" which contains a sensor (Thalimedes) for surface water level recording. Under the same workspace there may be several regions, under a region there may be many stations and under a station there may be several sensors from AOTT Company. If needed there can be several workspaces with different regions, stations and different sensors numbers. To keep it simple and easy to use, in Uganda, for example, the following workspace is found suitable (new stations with the same sensor (Thalimedes) but with different datalogger and station number will be included under the same region).



When a workspace with a region/regions, station/stations and sensor has been created, the folder “AOTTThalimedes” in the Windows Explorer will automatically become like this:



The raw data collected from Thalimedes every time will be saved automatically to the sub-folder “Rawdata” as separate files in form “Ed000, Ed001, Ed002.....”.

Note: Please do not delete or move any of these folders to another location otherwise the data will either not be collected or will become difficult to collect. This setup has been created by the program itself during the station and

sensor configuration.

3.4 Setting the Operating Parameters for Thalimedes

Setting the operating parameters for programming the Thalimedes can be accomplished in two ways i.e.:

- Using the laptop/PC onsite
- Using OTT VOTA unit onsite

Configuring Thalimedes with the laptop/PC has been explained in the proceeding paragraph while using OTT VOTA for the same purpose has been explained in Chapter 4.

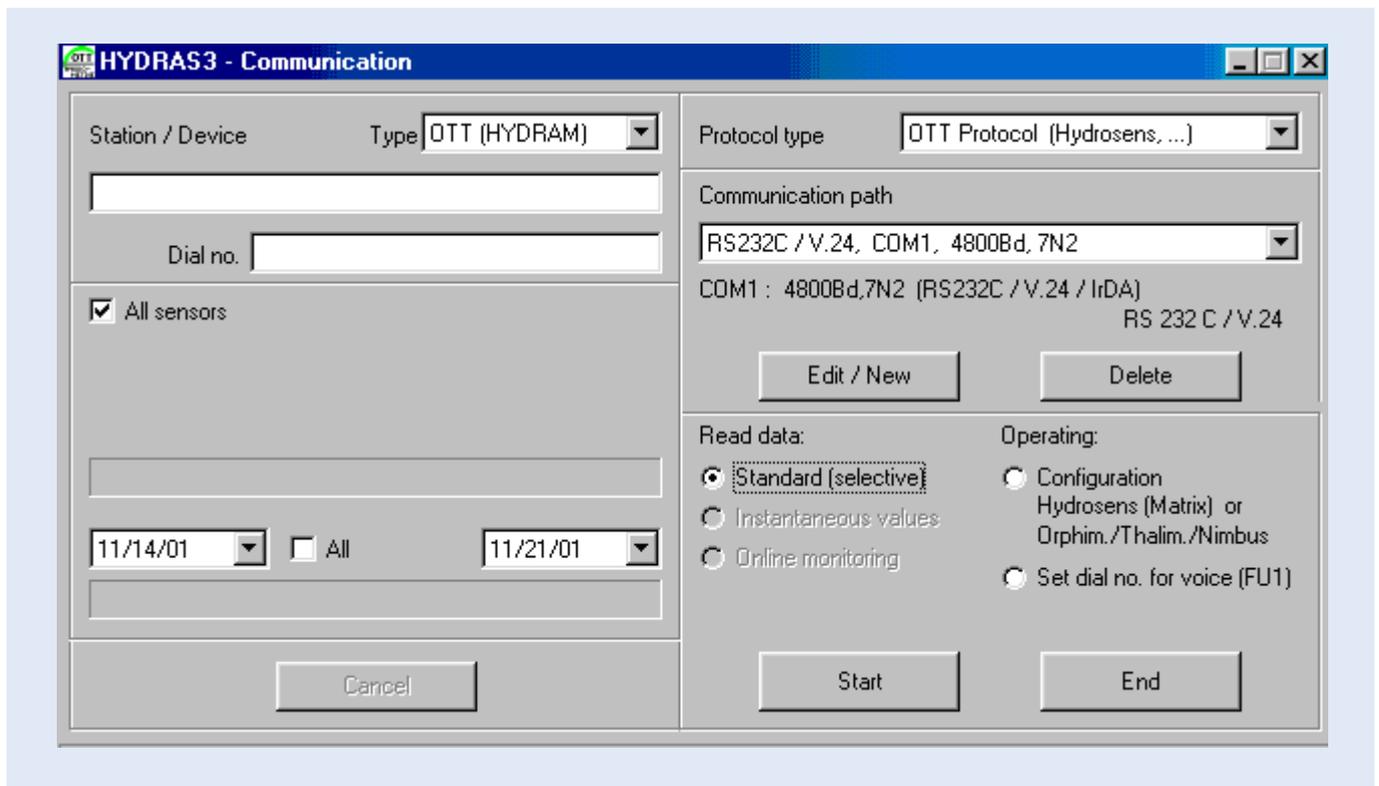
3.4.1 Configuring the Thalimedes with a PC

In normal cases, the Thalimedes display is automatically switched off while measuring the data onsite. To read the current measured value, Thalimedes display needs to be activated. Thalimedes display also needs to be activated while setting the operating parameters. For setting up the operating parameters with a laptop/PC, follow these steps:

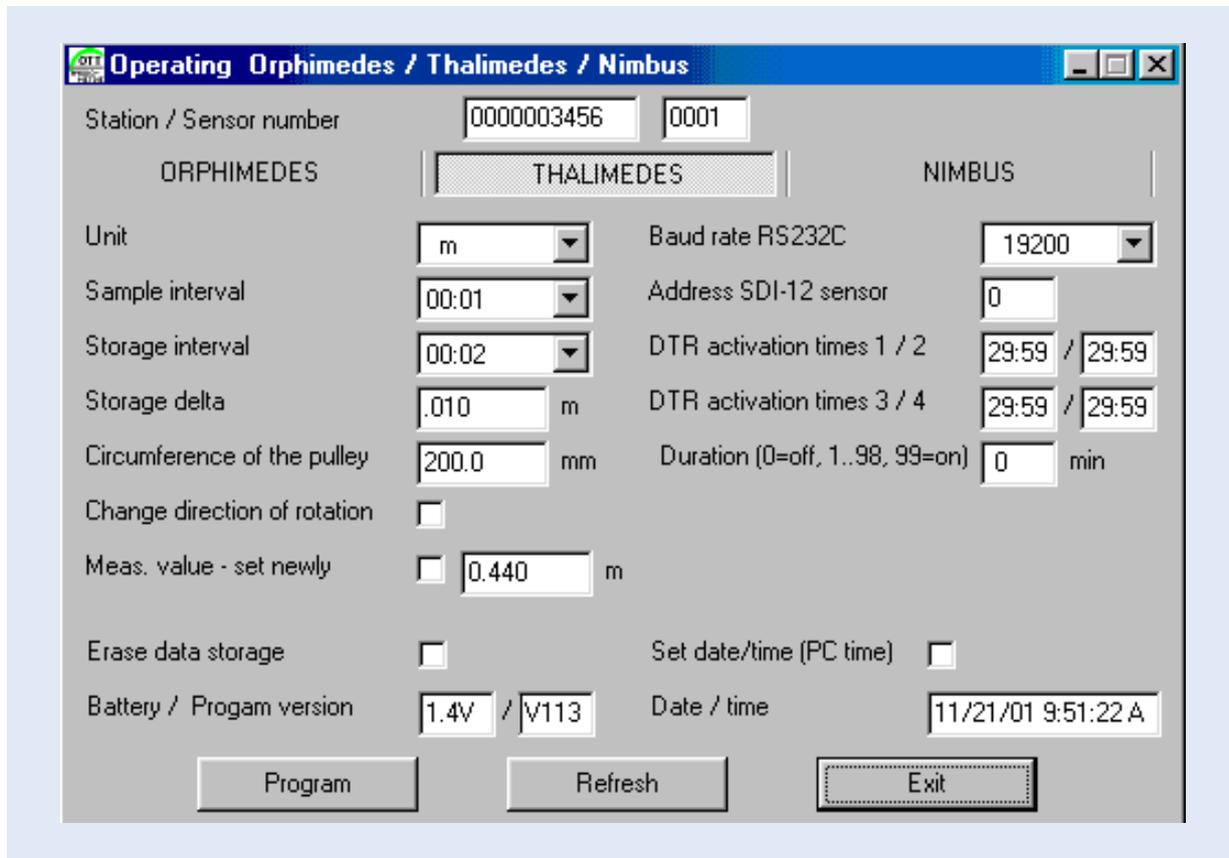
Step 1: It is assumed that Hydras 3 software has been installed successfully in the PC and the workspace, region and stations, where Thalimedes is to be installed, have been created (this is discussed in paragraph 3.3).

Step 2: Activate Thalimedes by placing hand on its motion sensor until the display is visible. The display shows the current measured water level value. You can also display Time, Date and Battery Voltage by placing hand over the motion sensor repeatedly. The display switches off automatically after three minutes of its activation. You can reactivate it in the same way as explained, if needed.

Step 3: After Thalimedes has been activated, point the Infrared (IrDA) Interface, called DuoLink or Linkit, connected to PC towards the Thalimedes [maximum distance 1 meter] and click "Read/Operate" on the "Communication" main menu item of the HYDRAS 3 software. The following window appears:



Change Type to “Thalimedes” and check in the “Configuration” box. The remaining setting on the window should remain the same. Now click on “Start” button while the Thalimedes is activated and the IrDA interface is pointing to the Thalimedes. If the connection with the sensor is successful, the following window appears:



The given values on the window may either be the factory settings or settings from the previous configuration. Change the values carefully according to the requirements that is, some of the values e.g. station and sensor numbers, unit and storage interval should remain the same as were entered during the station and sensor configuration in Step 5 of paragraph 3.3. The unit should remain as “m”, sample interval as “00:15” minutes, storage interval “1h”, and circumference of the Thalimedes shaft encoder pulley remains 200 mm. Selection of appropriate storage delta depends heavily on the hydrological regime of the respective river or lake. This has to be decided for each station separately according to the characteristics of the river or lake. For example a storage delta of 4cm (0.04m) for the lake levels will easily filter the effect of waves. This effect of waves has been observed at Entebbe Pier at around 4cm on average, recorded on a strip chart. A wise selection of the storage delta will save a considerable storage capacity of the datalogger.

If the Thalimedes that has been installed onsite, starts recording the rise in water level in descending order, then click in the “Change direction of rotation”. Sometimes this option does not work and the Thalimedes continues to record in descending order with the rise of water level. Then, the second option is to simply change the position of the float on the pulley of the strip chart recorder and to hang it on the opposite side (but do not forget to drive the pin of the strip chart recorder to the end of the shaft until it comes back to its previous position of the chart). The pin is driven on the shaft by rotating the shaft in clockwise direction. After the direction has been set, proceed to “Meas. Value – set newly” option of the window. This is the present gauge value at the site, which is the same as on the strip chart. Check the box and enter this present value. Then check the “set date/time (PC time)” box. After all this has been done, click on the “Program” button while pointing the IrDA interface to the Thalimedes. The Thalimedes has now been configured through the laptop/PC and has started recording. The first water level value will be stored in the Thalimedes after one hour.

Note: Direction of rotation may simply be checked by pulling the counter weight downwards and observing the

value on the display. The value should change in increasing order with the float going upwards; indicating the rise in water level.

3.5 Retrieving Stored Data from Thalimedes

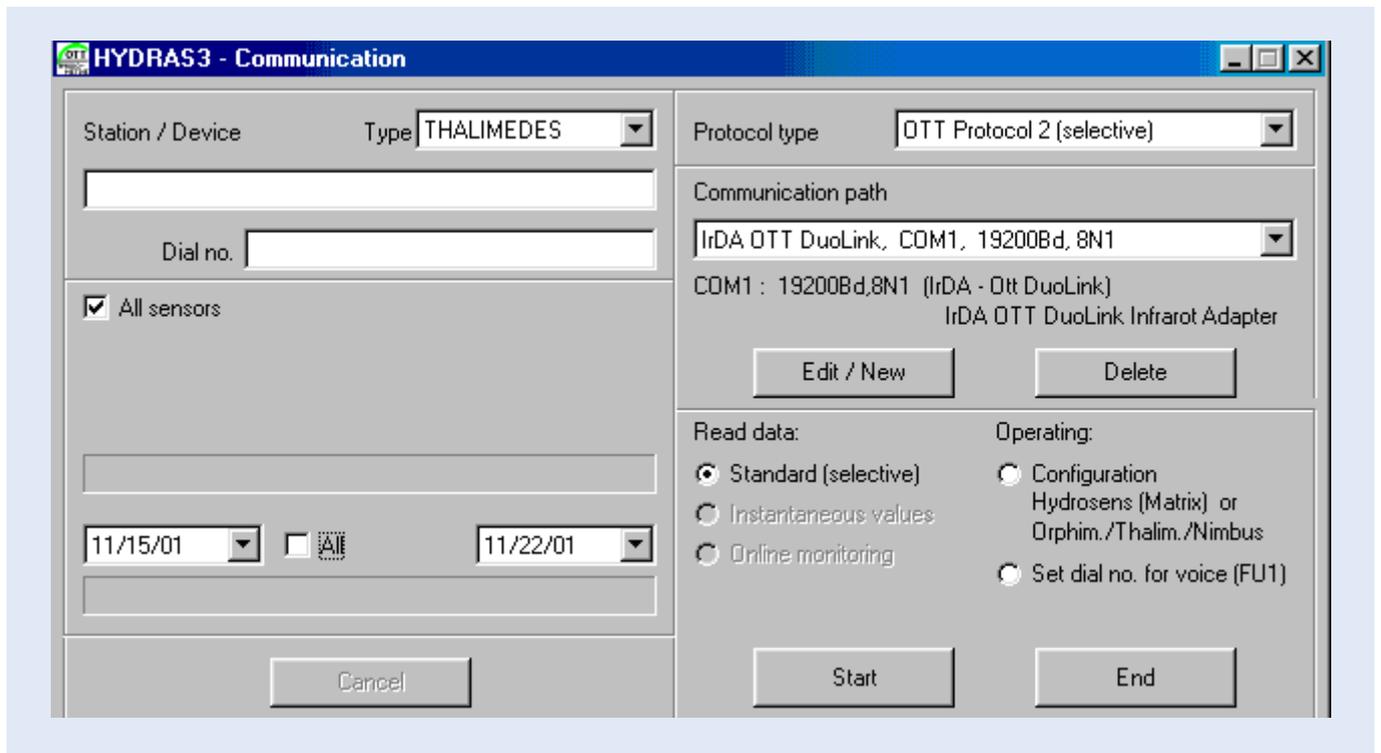
It is assumed that after successful installation, the Thalimedes has been recording data for a long time in the field on regular basis; the stored data needs to be retrieved from the Thalimedes. There are two ways to retrieve this data i.e:

- With a laptop/PC or
- With OTT VOTA unit

Data retrieval from the Thalimedes with a laptop/PC is explained in paragraph 3.5.1 while data retrieval from Thalimedes with OTT VOTA unit will follow in chapter 4.

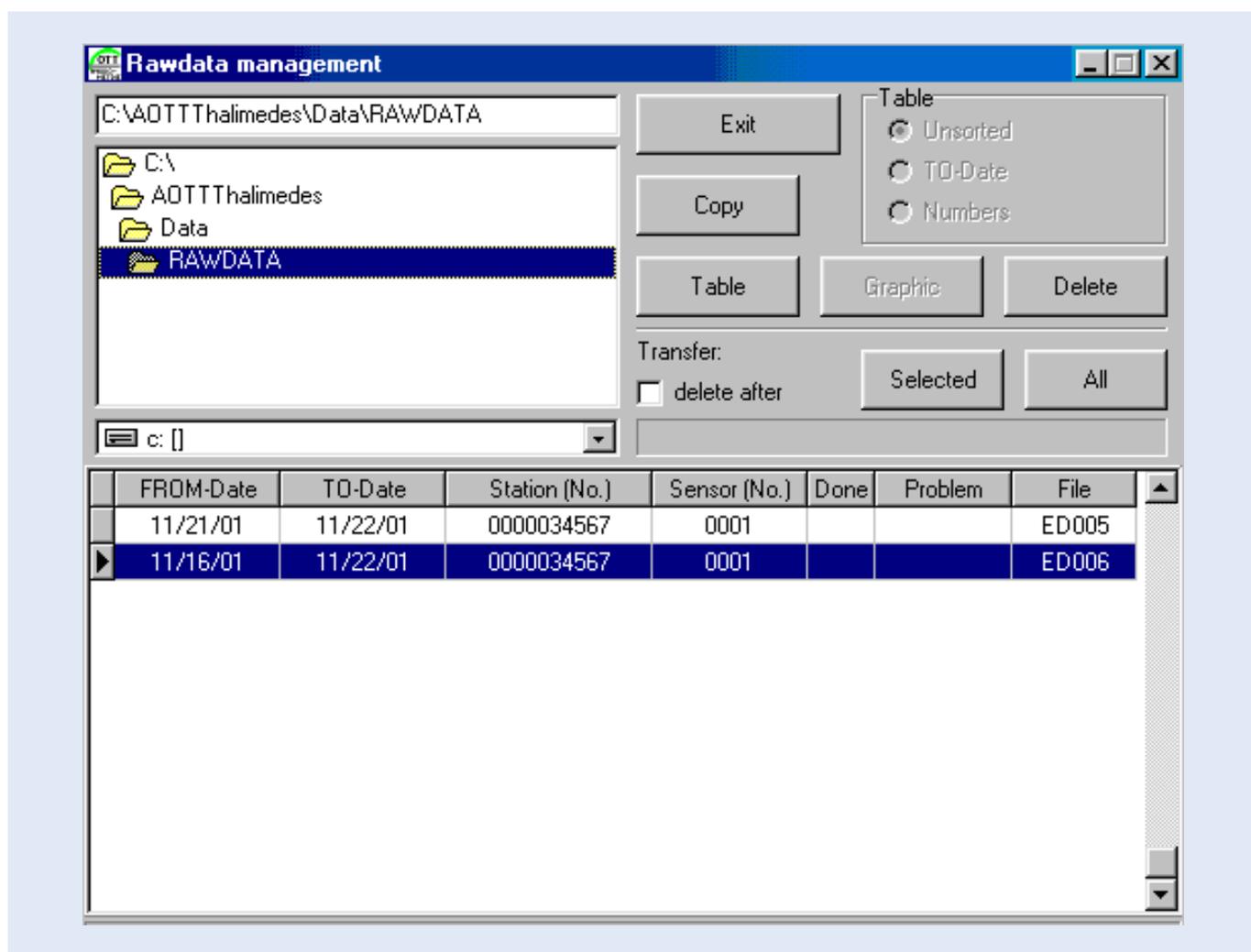
3.5.1 Retrieving Onsite Stored Data from Thalimedes with the Laptop/PC

Step 1: It is supposed that the IrDA interface is connected to the computer port via a 9 to 9 pin serial cable. Activate the Thalimedes program HYDRAS 3 on your computer and double click on the black spot of the workspace "DWD/1". Select the region "All stations/999999999999" which contains your required station and sensor. Click on the "Communication" tab of the HYDRAS 3 main menu and click on "Read/Operate". Make changes in the resulting window as shown below:



If you need data for a specific period, then fill in the "from" and "to" dates fields otherwise check the "All" box which will give all the old and new data available on the Thalimedes memory. Select "Standard [selective]" by checking the box. Click on "Start" button after making sure that the Thalimedes has already been activated and wait till the data is downloaded to the PC. Click on "End" to finish the data transfer. The data has now been downloaded and is stored in "Rawdata" sub-directory as a file "EdXXX" (where XXX shows the files downloaded each time).

Step 2: Retrieved data can be viewed within HYDRAS 3 by selecting "Communication" on the program main menu and clicking on "Raw data management". The following window appears:



There are two files with the names "ED005" and "ED006" in the folder "Rawdata" and the selection shows that this file (Ed006) has been newly downloaded. The top left corner shows directory in which the data has been newly downloaded. The data in the new file "ED006" can be viewed by clicking on the "Table" button. The program understands exactly: the duration of data availability in a file, from which station the data has been downloaded and from which sensor. The "Done" column is empty because this file has not yet been transferred to HYDRAS 3 format. The "Problem" column remains empty if no problems occur during the data conversion into the HYDRAS 3 format. This transfer of data within the same window has been explained in Chapter 5, paragraph 5.2.1.

3.6 Deleting Stored Data From Thalimedes

It is recommended to delete the old data from the Thalimedes memory, at each field visit, in order to create space for the new measurements. This will reduce the risk of loss of data during prolonged and continuous operation of the sensor when not visited by the operator for a long time.

Data from the Thalimedes can be deleted in two ways i.e.:

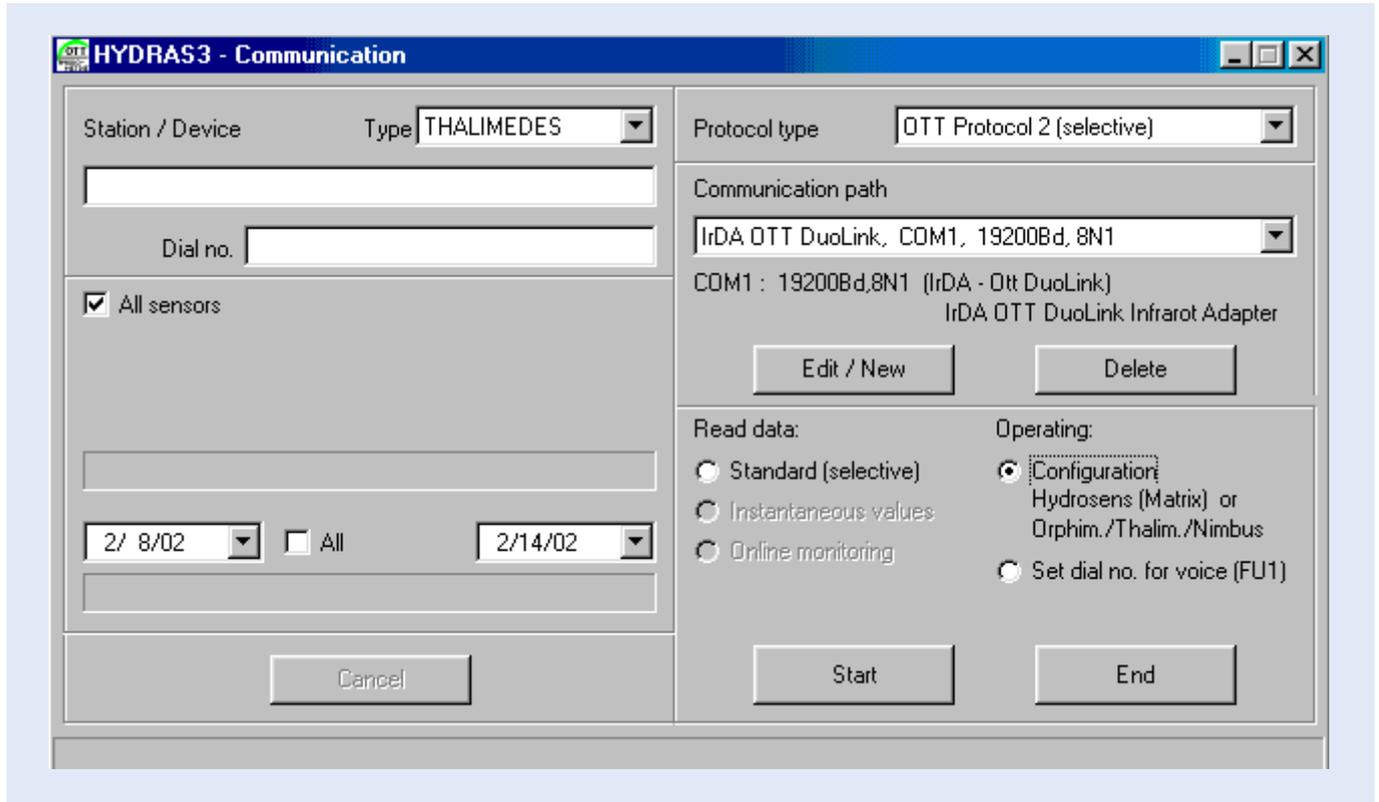
- Using laptop/PC
- Using OTT VOTA unit

3.6.1 Deleting Old Data from the Thalimedes Using a Laptop/PC

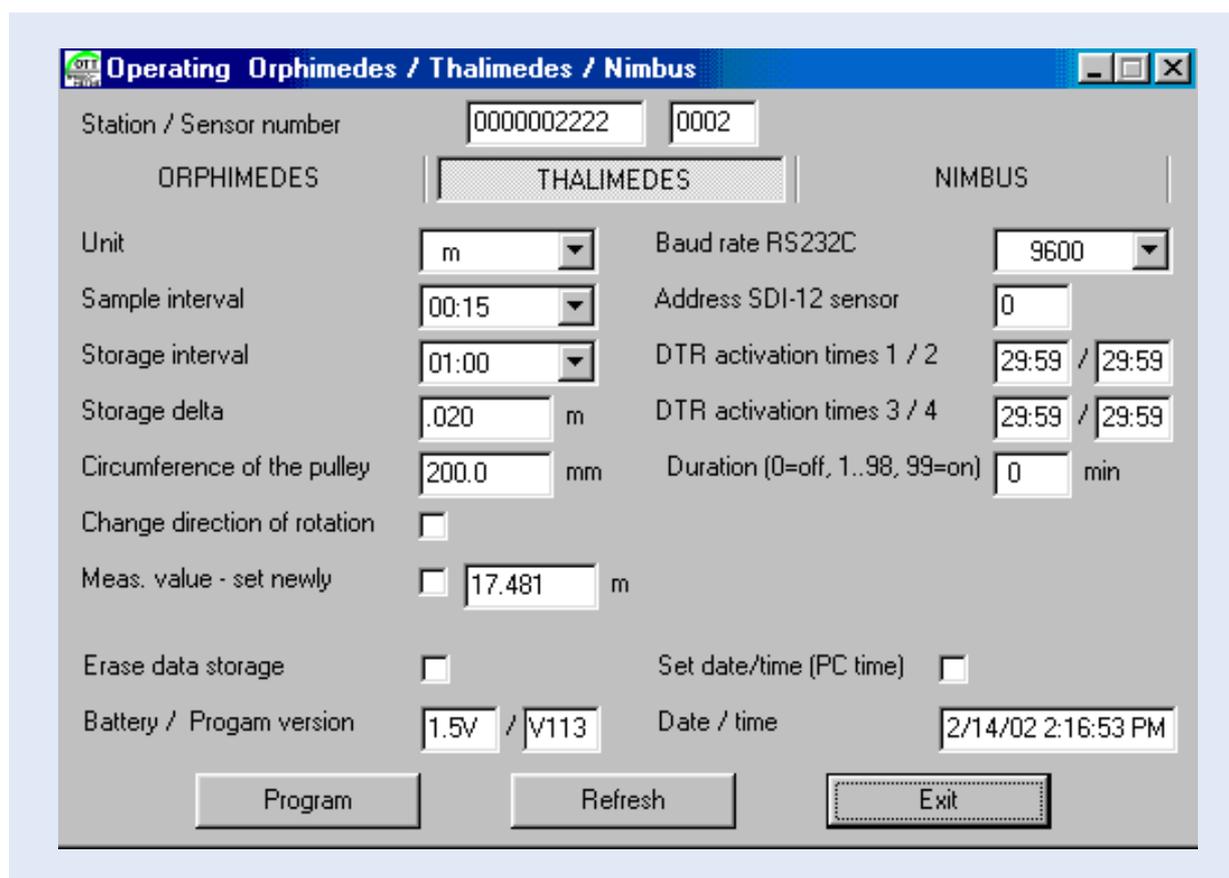
Step 1: Make sure that the present available data in the datalogger is successfully transferred to the PC or VOTA.

Step 2: Activate Thalimedes by placing hand on its motion sensor until the display is visible.

Step 3: After Thalimedes has been activated, point the Infrared (IrDA) Interface, called DuoLink or Linkit, connected to PC towards the Thalimedes [maximum distance 1 meter] and click "Read/Operate" on the "Communication" main menu item of the HYDRAS 3 software. The following window appears:



Change Type to "Thalimedes" and check the "Configuration" box. The remaining settings on the window should remain the same. Now click on "Start" button while the Thalimedes is activated. The PC detects the same operating settings when the sensor was programmed last time and the window appears as follows:



Step 4: Check the “Erase data storage” box and click on the “Program” button while the sensor is still active and the DuoLink is pointing to the Thalimedes. This action will reprogram the datalogger deleting the old data at the same time.

3.6.2 Deleting Old Data from the Thalimedes Using OTT VOTA Unit

Step 1: Connect the DuoLink data readout device to the 9-pin socket of the VOTA and select the VOTA fields in the following order:

“Management”
 “System”
 “Infrared” [select “DuoLink” as the data readout device]

Step 2: Activate the Thalimedes display and point the data readout device i.e. DuoLink towards the IrDA interface of the Thalimedes.

Step 3: Click on “Configuration” on the main menu and select “IrDA”. The message “Connecting datalogger” is briefly displayed. Once the connection has been established, the following window is opened:

Thalimedes Configuration			
Station / Sensor	0000081201 /		0001
Sample / Storage Interval	00 : 15		01 : 00
Unit	m		
Storage delta [m]	0.040		
Pulley circumference [mm]	200.0		
Value [m]	11.271		
Set Date/Time	No		
<hr/>			
Date/Time	08.02.2002	11:33:14	
Battery	1.5V	Version	V113
<input type="button" value="Write"/> <input type="button" value="Extend"/> <input type="button" value="Back"/>			

VOTA will read Thalimedes previous settings as shown in the above window. Select and press "Extend" in the above window. In the resulting window press in the "Erase data storage" field and select "Yes". Press "Write" to reprogram the datalogger and to erase the old data.

Using OTT VOTA Unit for Configuring Thalimedes and Data Retrieval from the Thalimedes

4.1 Introduction

The VOTA multifunctional unit is based on a PC designed for field service and includes preinstalled software and an illuminated VGA display. It is designed to record hydrological measured values onsite and, is an alternative to notebooks. The VOTA has no keyboard; rather an operating knob called “jog shuttle”, makes operation of the VOTA very easy. VOTA is activated by pressing the jog shuttle. A field/value is selected by turning the jog shuttle and is confirmed and activated by pressing the jog shuttle. VOTA is very easy to operate. No special computer knowledge is required.

An infrared duolink interface adapter (IrDA) called Duolink makes a wireless communication between an OTT datalogger and VOTA. The voltage supply is provided by means of four commercially available 1.5 V alkaline batteries. This is discussed later in this chapter.

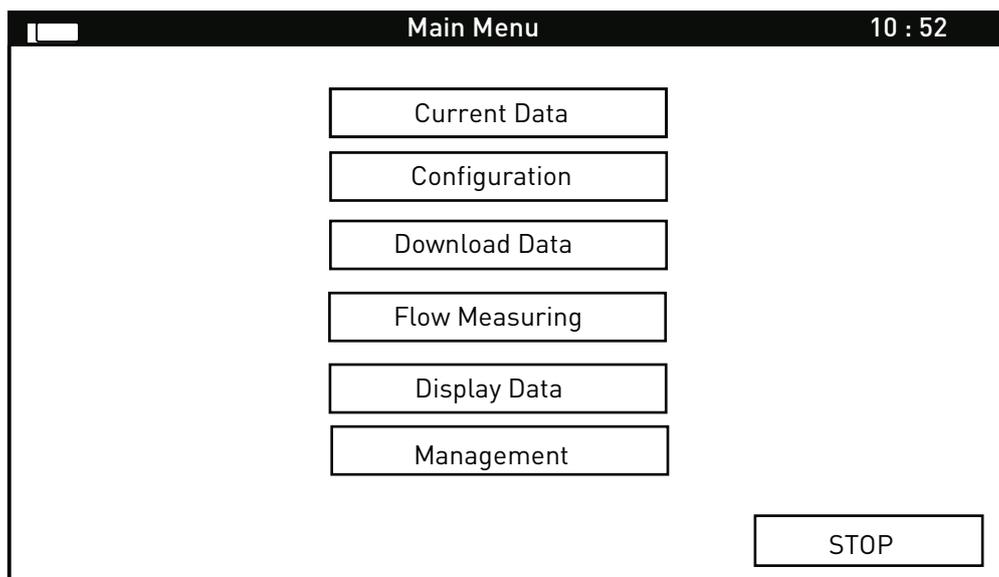
4.2 Initial set-up and operation of the VOTA

Follow the steps below to insert the locally available 1.5 V alkaline batteries:

- Unscrew the battery casing lock by using a coin.
- Insert four batteries and tighten the battery casing lock.

The VOTA is now automatically in stand-by mode. Activate it by pressing the “jog shuttle”. When VOTA is activated for the first time, it runs through a boot sequence, which includes several hardware and software tests. Several messages appear during this test and the VOTA logo is also visible for a brief period. Finally the “Set Date/Time” window is displayed as shown in the Window below.

Main menu with STOP field.



Once the VOTA is set up for the first time, it will always display main menu upon switching on. The individual menu items have the following functions:

Current Data: calls up current values such as level, depth, temperature, date and time in the data logger system.

Configuration: sets the operating parameters when setting up a datalogger for the first time.

Download Data: Transfers the measured values stored in a datalogger to the VOTA.

Flow Measuring: Carries out discharge measurement using OTT current meters.

Display Data: Provides a graphical display of measured values downloaded to the VOTA.

Management: Adjusts VOTA operating parameters i.e.

- sets operating language, date and time
- selects data readout device i.e DuoLink
- displays ambient temperature
- displays available data memory
- deletes data etc.

STOP: Switches the VOTA to stand-by mode and activates the turn-on delay.

The important individual menu items shown in the window above are discussed in detail in the following paragraphs.

4.3 Configuration:

This option is needed if the datalogger has to be programmed/configured for the first time. Following is an example on how to initially set or program the Thalimedes using VOTA:

Connect the data readout device i.e DuoLink to the 9-pin socket on the rear of the VOTA.

Select "Management" from the main menu, select "System" and select "DuoLink" under "Infrared".

Point the DuoLink towards the optical interface of the datalogger and select "IrDA" under "Configuration". The message "Connecting datalogger" is briefly displayed. Once the connection has been established, the following window appears on the screen:

Setting operating parameters.

Thalimedes Configuration			
Station / Sensor /		0000081201	0001
Sample / Storage Interval		00 : 15	01 : 00
Unit			m
Storage delta [m]			0.040
Pulley circumference [mm]			200.0
Value [m]			11.271
Set Date/Time			No
Date/Time		08.02.2002	11:33:14
Battery	1.5V	Version	V113
<input type="button" value="Write"/> <input type="button" value="Extend"/> <input type="button" value="Back"/>			

Enter the desired parameters in the upper section of the window. Refer to chapter 3 for the meanings of the individual fields.

Check if the Thalimedes display is active, if so then press "Write" in order to transfer the entered parameters from VOTA to the Thalimedes. Thalimedes has now been programmed and has started operating.

It is very important to create the station and sensor in the workspace of the HYDRAS 3 software on your PC with the same parameters/values as stated in the above window. Otherwise, the software will not be able to read the data files transferred from VOTA to the PC. Creating stations and sensors in the workspace has been explained in chapter 3.

4.4 Download Data

This menu item is used to retrieve all or part of the data measured by the Thalimedes to the VOTA. Retrieving this new data to VOTA is straight forward and is accomplished in the following way:

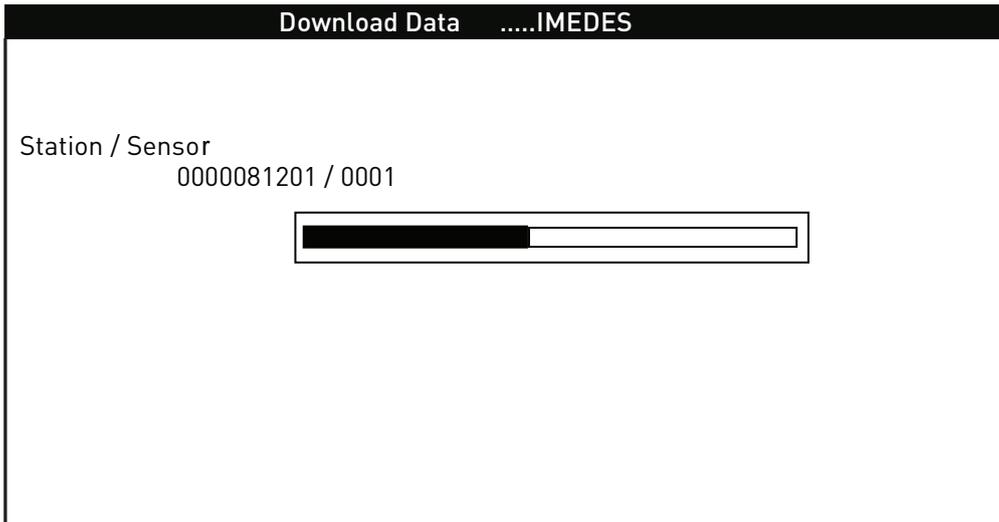
Connect the DuoLink data readout device to the 9-pin socket of the VOTA and select the VOTA fields in the following order:

- "Management"
- "System"
- "Infrared" [select "DuoLink" as the data readout device]

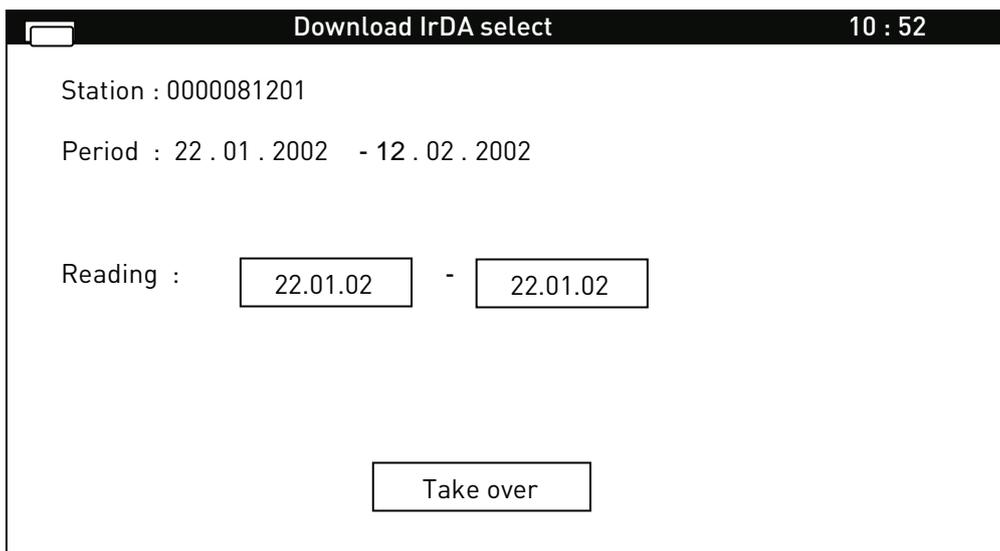
Activate the Thalimedes display and point the data readout device i.e. DuoLink towards the IrDA interface of the Thalimedes.

Click on "Download Data" on the main menu and select "IrDA". The message "Connecting datalogger" is briefly displayed. Once the connection has been established, the following window is opened which contains a progress indicator showing data download from the Thalimedes to VOTA. The progress indicator confirms the data download from the datalogger.

Download data via VOTA DuoLink.



During this exercise, a window appears where you can select the download period as shown below. The period since the last download reading is preset. After you have decided the data period, click on the "Take over". Now the messages "Data being processed" and "Data download successful" are displayed.



4.5 Display Data

For a quick onsite check, the recently retrieved data from the Thalimedes to the VOTA can be displayed graphically on the VOTA in the following way:

Click on "Display Data" on the VOTA main menu and a window similar to the following will appear:

Station : 0000081201
Thalimedes
Sensor : 0001
Period : 22 . 01 . 2002 - 12 . 02 . 2002

002 / 015

Graphics Back

The above window shows that a total of 15 data files have been downloaded from one or more stations and that at present, data file No. 2 is selected. We are interested to display the recent file i.e. file No. 015 so change the field with data file No. 002 to 015 in the window and press "Graphics" to display the data graphically. The following window then appears:

Station : 0000081201 Thalimedes
Sensor : 0001
Period : 22 . 01 . 2002 - 12 . 02 . 2002

12.072 22.01.02 - 12.02.02

08.502

Graphics Back

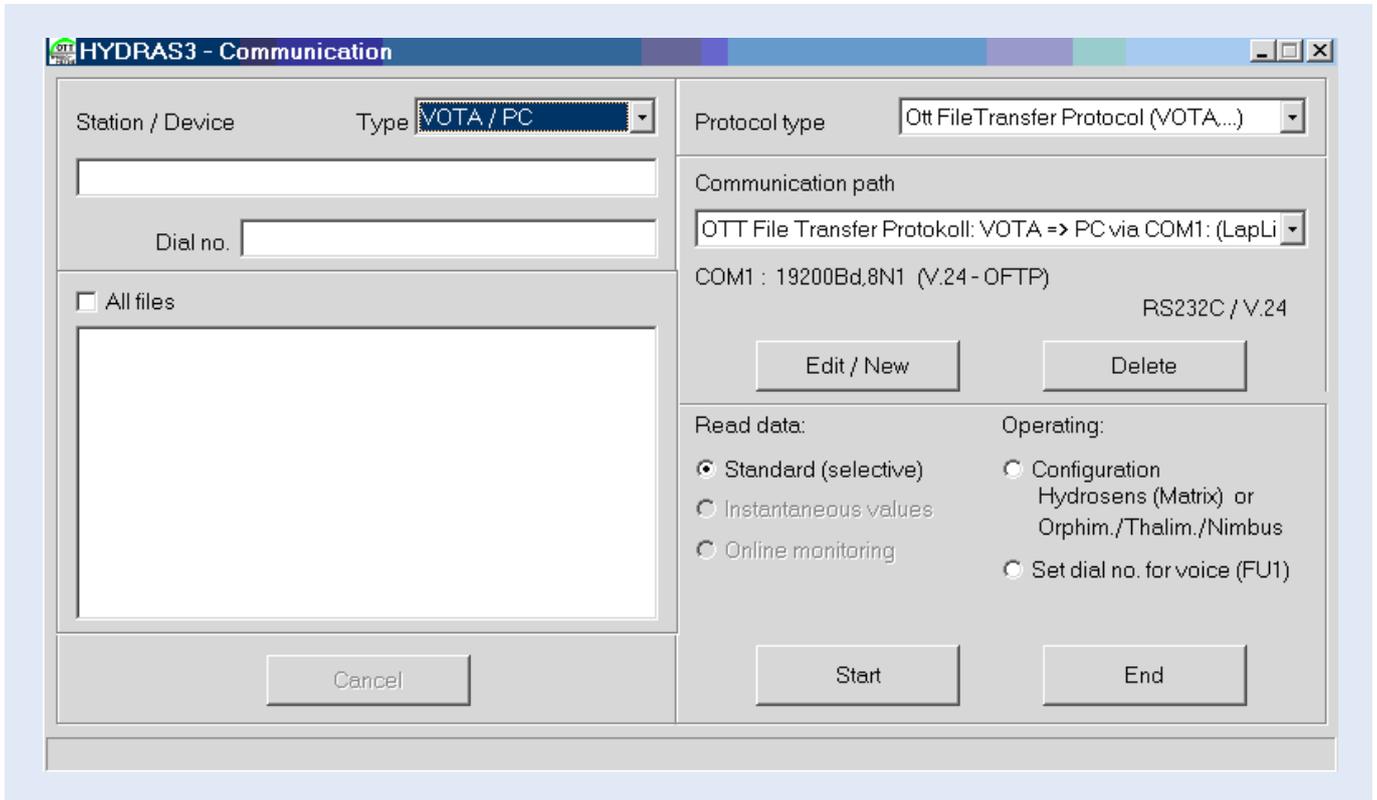
After selecting the range of the level in meters, i.e. the minimum and maximum level (top left and bottom left) and the display period, click on the "Graphics" and the graph will appear on the screen in the window shown above. The graph displays the level as a function of time.

4.6 Transferring Data Files from VOTA to PC

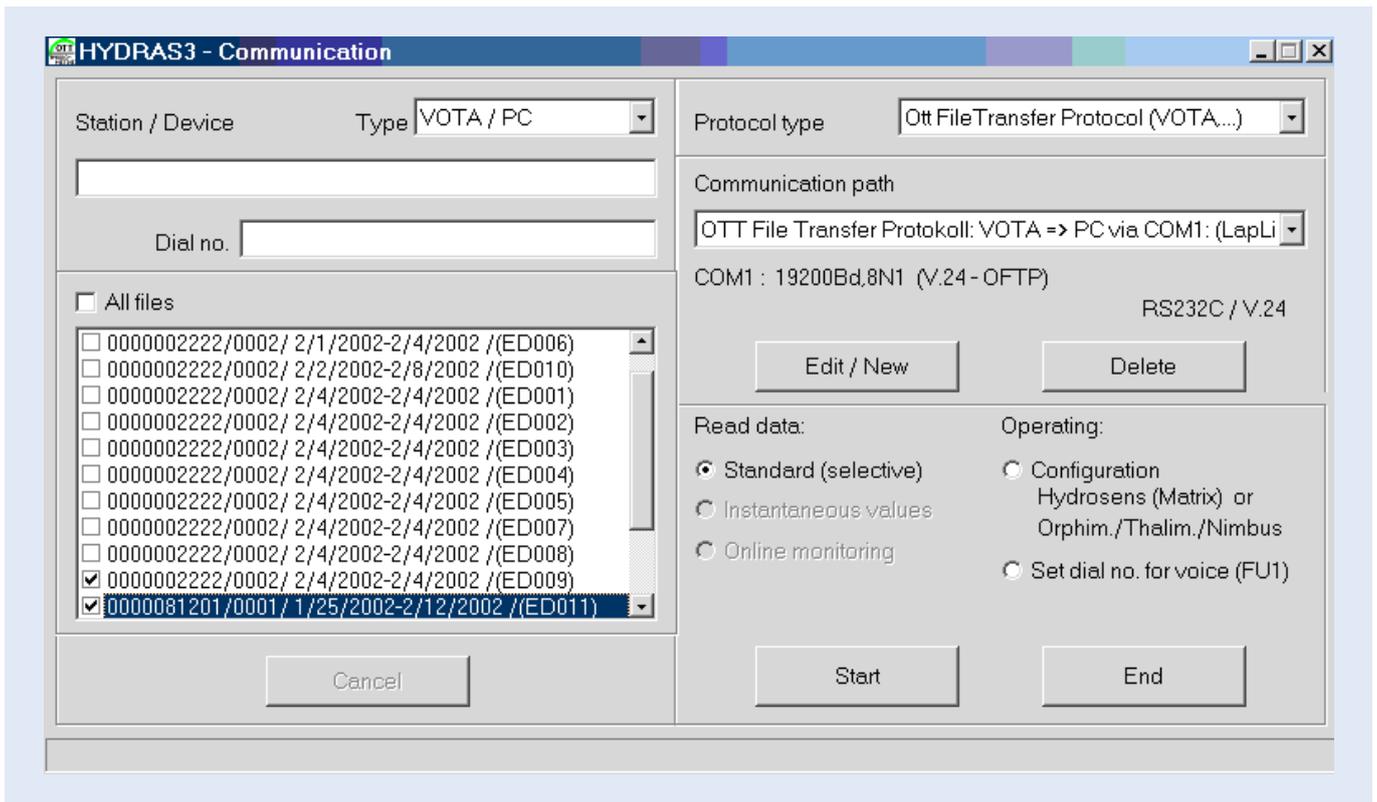
After retrieval from the datalogger, the data needs to be transferred from VOTA to PC. The following setup is required to accomplish this data transfer:

- 9 -9 pin female serial cable connecting VOTA to PC.
- Communication software “Hydras 3” already installed on your PC.
- Start the program on PC and select “Read/Operate” from the “Communication” on the main menu.

Change the setup of the resulting window as shown below:



After clicking on “Start” in this window, another window will appear showing a list of data files on the VOTA. Select the desired data files, which need to be transferred from VOTA to PC by checking the box of the data files. This window is shown below:



Click on “Start” again to start the selected data transfer from VOTA to PC. The window will show the progress of data transfer and the following message “Erase all copied raw- data files in VOTA now?” will appear. Click on “Yes” if so required.

This newly transferred data file(s) can be checked to confirm the successful transfer in the same way as discussed in Chapter 3 (step 2 of the paragraph 3.2.1).

4.7 Deleting Data from VOTA

It is important to delete old data from VOTA in order to create memory space for the new data to be retrieved from the dataloggers. Data from VOTA can be deleted in two ways i.e.

- At the time of data transfer from VOTA to PC (this has been discussed in the above paragraph 4.5).
- Via the “Delete data” function in the “Management” menu item in the VOTA. This can be done in the following way:

Press on the “Delete data” function of the main menu item “Management” on the VOTA. Select “Delete all” if all the data has to be deleted from the VOTA or otherwise select “Selective delete” if some of the data files are required to be deleted. If the “Delete all” option is selected, a question “Do you really want to delete all data?” is displayed on the screen. Press in the “Yes” or “No” box.

4.8 Restarting VOTA

Sometimes the VOTA responds very slow or then the display is freezes. This shows that the VOTA has stopped functioning. If the device is slow to respond then follow the following steps:

- Press on the commands in the order as given:

“Management”

“System”

“Reset”

The VOTA will restart.

If the display is frozen then follow these instructions:

- Unscrew the battery casing lock using a coin.
- Wait for approximately 5 seconds
- Tighten the battery casing lock.

The VOTA is thus restarted.

If it still does not work then follow the following instructions:

- Open the three screws in the left hand side cover of the VOTA
- Remove the cover and press the reset key (red color). The VOTA is now restarted.
- Replace the cover on the VOTA and tighten the screws.

Note: The measured values are stored in the VOTA permanently and do not change with the change of batteries or when the device is stored over a longer period without batteries.

Initial Raw Data Processing

5.1 General

When the collected data from the field is transferred to the PC, it needs to be processed using the Hydras 3 software. This chapter discusses how the data from Thalimedes in the PC is converted into specific Hydras 3 format enabling the software to export it to ASCII text format. Most of the programmers need the data in this format. The resulting text files can also be easily imported in MS Access, which is discussed in chapter 6.

5.2 Processing of the Retrieved Raw Data

The retrieved data (File: ED006) located in "Rawdata" subfolder needs to be processed in order to transfer it to HYDRAS 3 format and then to convert it to ASCII text format (this ASCII text file will then be ready to be imported in MS Access final data base). These processes are discussed in the following paragraphs:

5.2.1 Converting Retrieved Data into HYDRAS 3 Format using "Raw Data Management" Utility

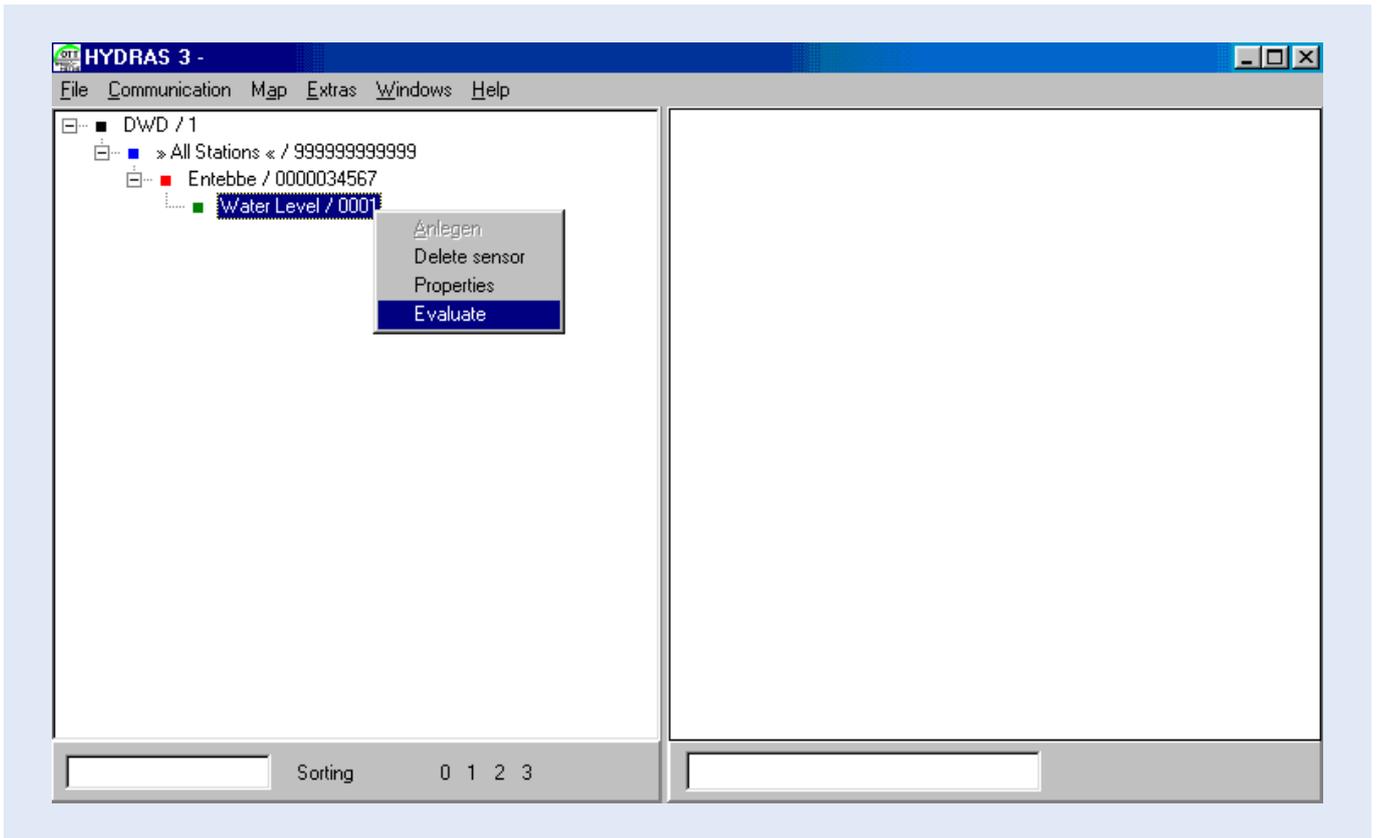
Step 1: In the window given in step 2 of the paragraph 3.2.1, select the file that needs to be transferred to the HYDRAS 3 format, and click on "Selected" button. The file is now automatically transferred into the required format and the "Done" column is filled automatically by a "/". If no problem is encountered during this transfer, the "Problem" column will remain empty. This file should not be deleted at this point, as it is now ready to be converted into text ASCII file format. The text file is then imported into MS Access final database, discussed in detail in chapter 6.

P5: Problem P5 occurs if a sensor has been programmed repeatedly or if there is an old data with different operating parameters than the recent one. If, so happens, that the user sometimes changes the operating parameters and reprograms the Thalimedes, but forgets to delete the old data. Now a file has data with different data intervals, units and storage delta. The problem also occurs when these parameters are entered differently during programming the Thalimedes than when the station and sensor were created in the workspace.

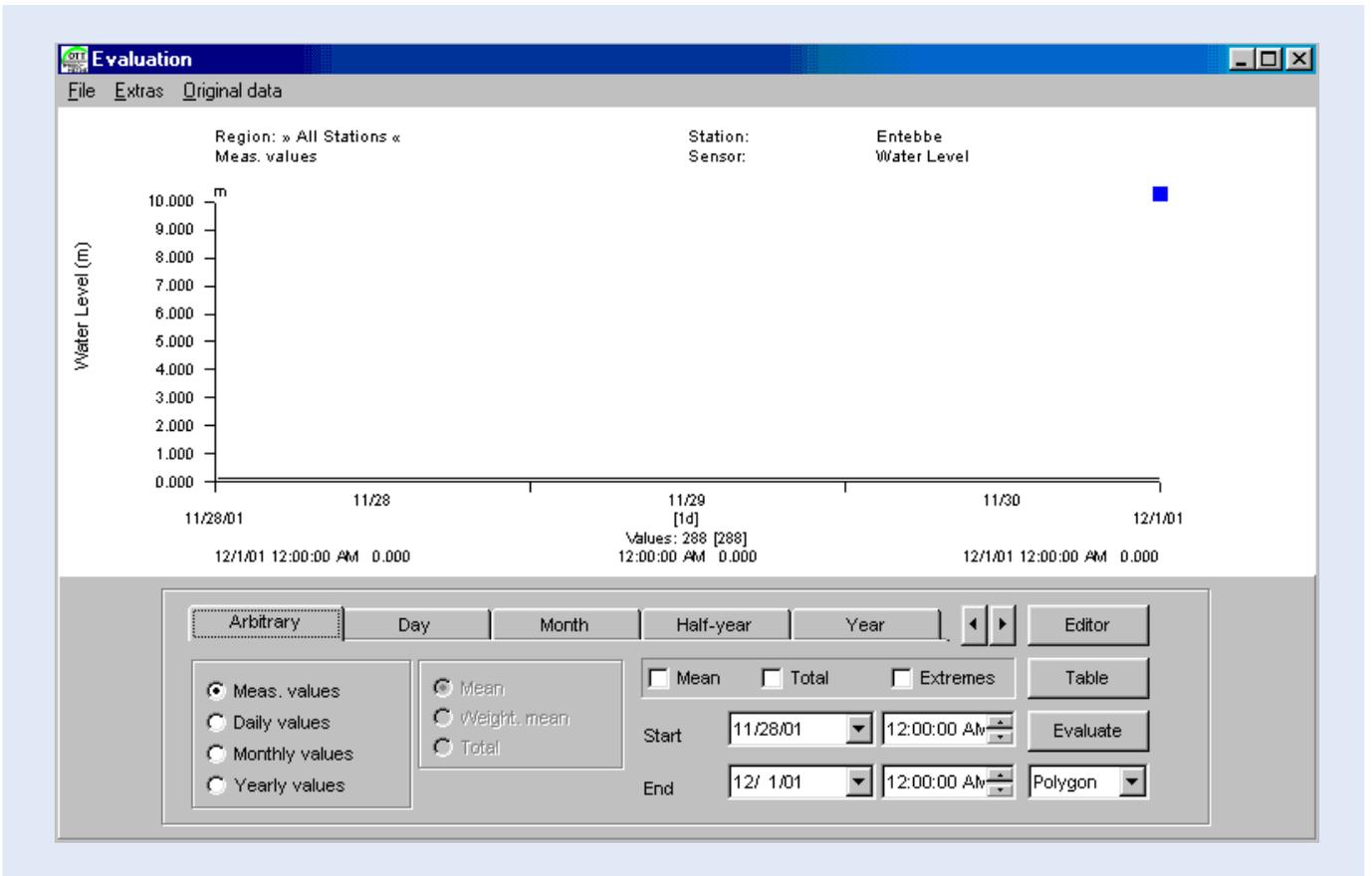
5.2.2 Converting HYDRAS 3 Raw Data File into Text File Format using "Evaluate" Utility

The retrieved data file from HYDRAS 3 format needs to be converted into ASCII text file format because a text file then can easily be imported in MS Access. The following steps are to be followed:

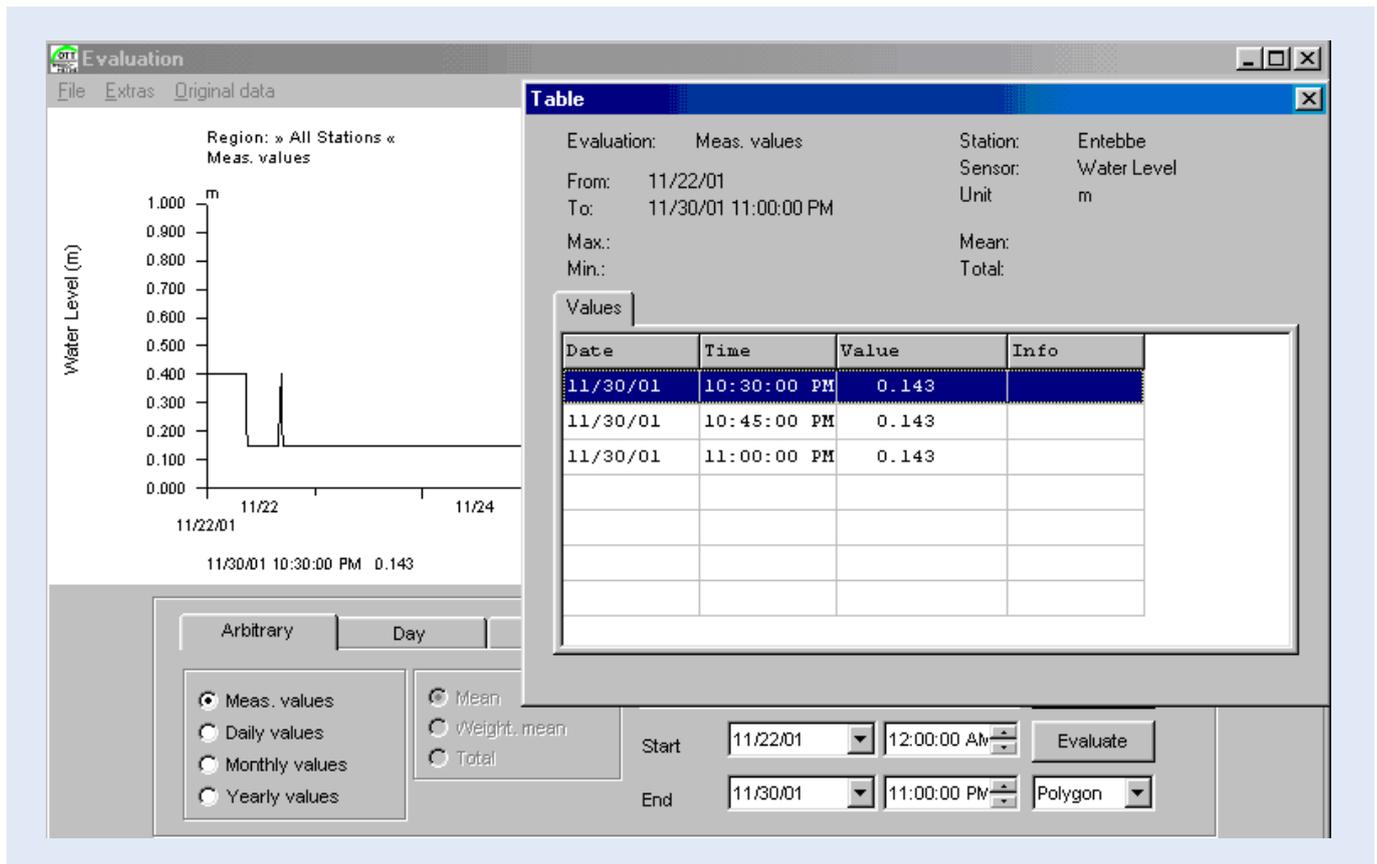
Step 1: Select the sensor of the respective station in the workspace and right click on the mouse to select "Evaluate". This has been graphically shown in the windows below:



The resulting window will look like this:

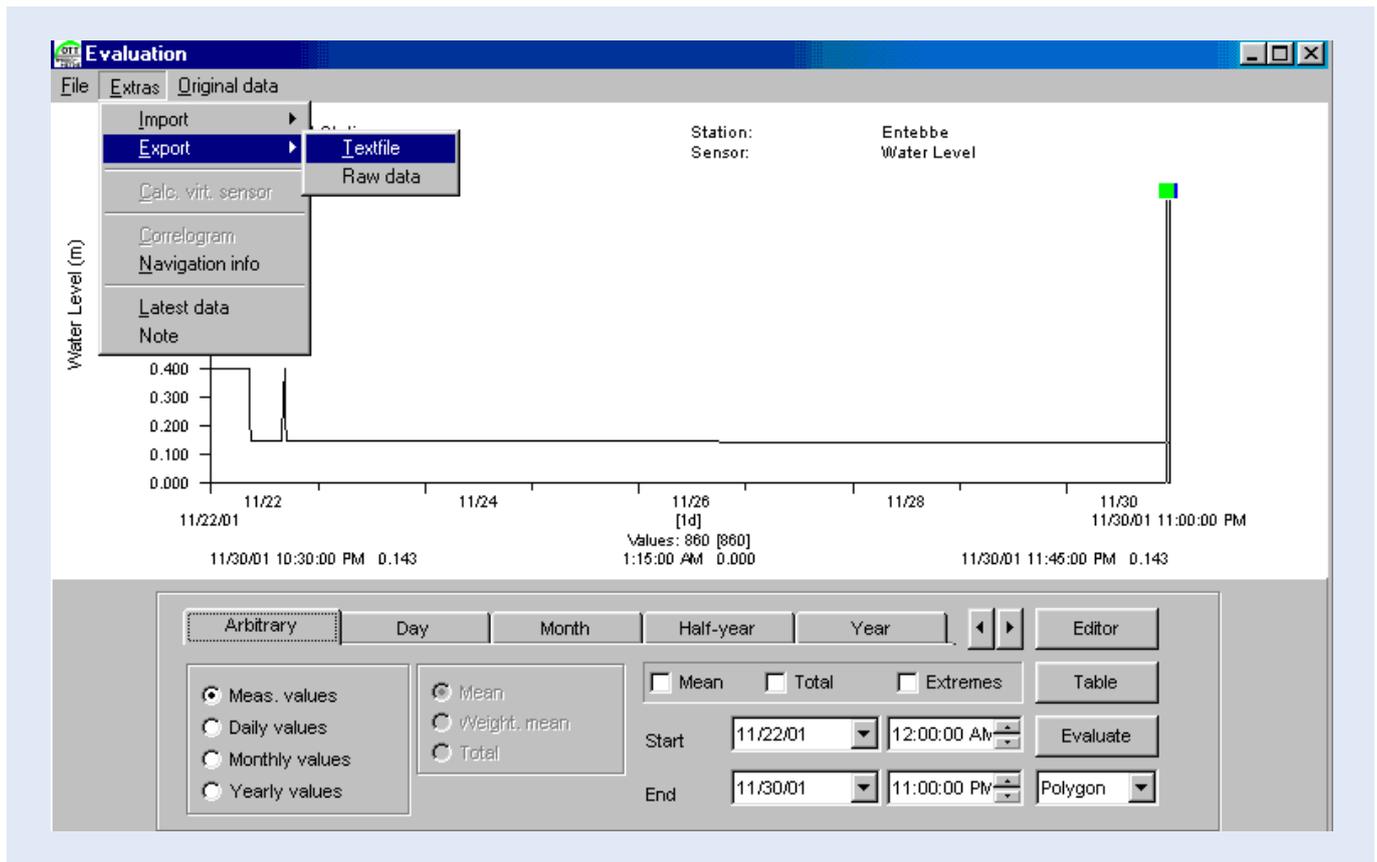


Step 2: The above window has a main menu, a graphical representation of the raw data that needs to be converted to text format, and the duration of the data in the raw data file. For example the file "ED013" has the start date 22 November 2001 and the end date 30 November 2001. Specify the start and end dates in the above window and check the "Meas.values" box as the measured values need to be extracted. The time of the last data retrieval and the present data retrieval can also be specified. Next click on the "Evaluate" button to select the specified data both graphically and numerically. If the water level on the graph is not very clear, scale down the water level on the graph by clicking on the "10.000m" accordingly. The specified data can be seen numerically by clicking on the "Table" button of the window (a sub window with the name "Table" will also appear). All these have been shown in the windows below:

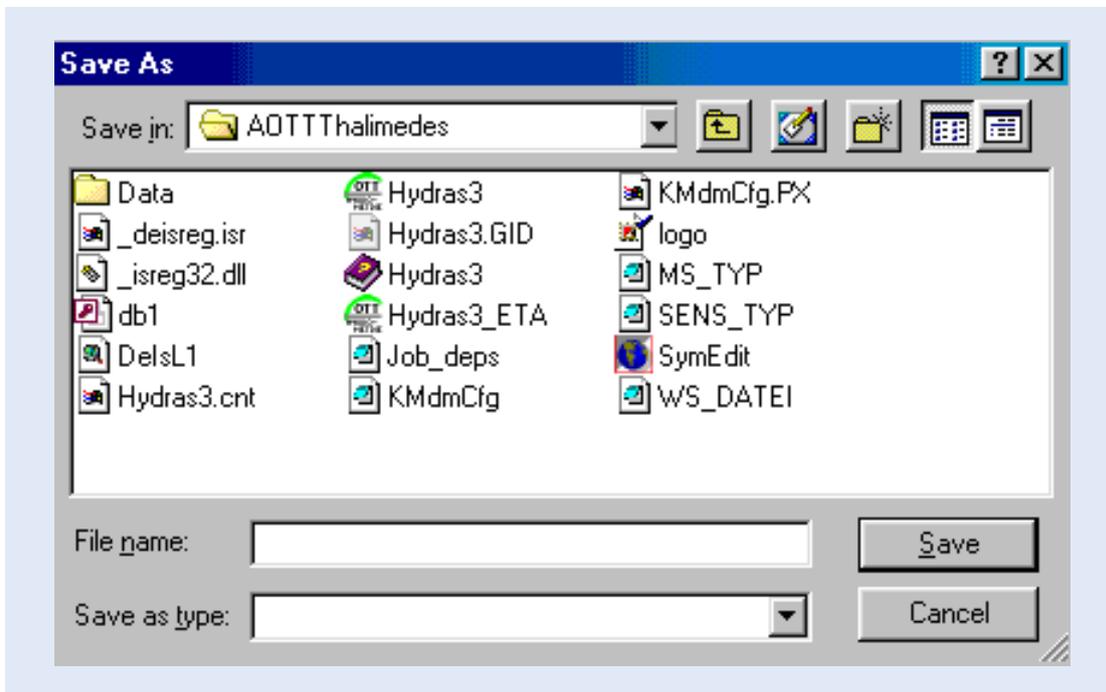


Step 3: Since the range of the data has been selected in the file "ED013" as shown in the above step, it is now ready for conversion to text format. For this conversion, follow these instructions:

Click on "Extras" of the main menu of the Evaluation window and select "Textfile" under "Export" as shown below:



The following window will appear:



Name the resulting text data file (e.g. "Text13"). It is advised to give this file the same number as in the Rawdata file. To save this new text file in the "Rawdata" sub folder of the "Data" folder as well, specify the path by double clicking on the "Data" folder and "Rawdata" subfolder subsequently. Conclude the process by clicking on the "Save" button.

This text file could be viewed in the windows explorer as follows:

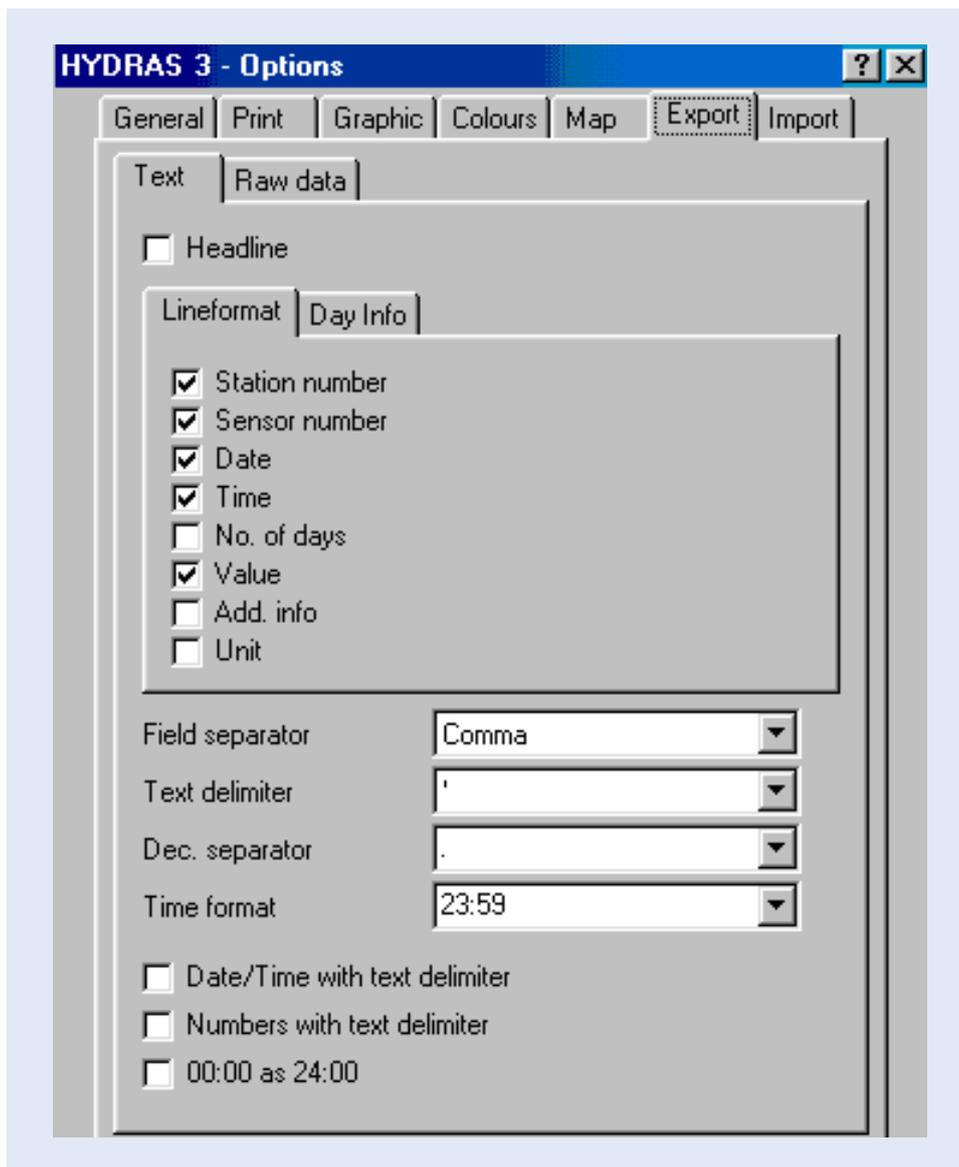
```

0000034567,0001,11/22/01,07:15,0.405
0000034567,0001,11/22/01,07:30,0.405
0000034567,0001,11/22/01,07:45,0.405
0000034567,0001,11/22/01,08:00,0.405
0000034567,0001,11/22/01,08:15,0.405
0000034567,0001,11/22/01,08:30,0.405
0000034567,0001,11/22/01,08:45,0.235
0000034567,0001,11/22/01,09:00,0.150
0000034567,0001,11/22/01,09:15,0.150
0000034567,0001,11/22/01,09:30,0.150
0000034567,0001,11/22/01,09:45,0.150
0000034567,0001,11/22/01,10:00,0.150
0000034567,0001,11/22/01,10:15,0.150
0000034567,0001,11/22/01,10:30,0.150
0000034567,0001,11/22/01,10:45,0.150
0000034567,0001,11/22/01,11:00,0.150
0000034567,0001,11/22/01,11:15,0.150
0000034567,0001,11/22/01,11:30,0.150
0000034567,0001,11/22/01,11:45,0.150
0000034567,0001,11/22/01,12:00,0.150
0000034567,0001,11/22/01,12:15,0.150
0000034567,0001,11/22/01,12:30,0.150
0000034567,0001,11/22/01,12:45,0.150
0000034567,0001,11/22/01,13:00,0.150
0000034567,0001,11/22/01,13:15,0.150
0000034567,0001,11/22/01,13:30,0.150
0000034567,0001,11/22/01,13:45,0.150
0000034567,0001,11/22/01,14:00,0.150
0000034567,0001,11/22/01,14:15,0.150
0000034567,0001,11/22/01,14:30,0.150
0000034567,0001,11/22/01,14:45,0.150
0000034567,0001,11/22/01,15:00,0.150

```

The first column shows the station ID, the second column: the sensor number, third column: the complete date, fourth column: time, and the fifth column contains the water levels. This file is now ready to be imported in MS Access to the final database as discussed in chapter 6.

Important Note: Text files created above are easy to be imported in MS Access databases. The fourth column in the window above shows the time of measurement. Since MS Access recognizes 00:00 as 24:00 hours, so care should be taken that the 24:00 should be selected as 00:00 before exporting the raw data file (Ed000) obtained from the datalogger to Text file format. This is done by opening the “Options” window under “File” menu of the HYDRAS 3 software and leaving the “00:00 as 24:00” box of the “Export” sub-window as unchecked. This is shown in the following window:



Data Processing in MS Access and Final Storage into the Nile Basin Database

6.1 General

The Project, in the past, has established several types of automatic meteorological and automatic hydrological stations throughout the basin; it has been tried that the raw data obtained from the Thalimedes be processed to its final destination in almost the same way. This will, up to a great extent, decrease confusion among the users who are already dealing with the management of the new data obtained from such equipment.

Final destination of the meteorological and hydrological data obtained from such Automatic Stations [including Thalimedes stations] in The Nile Basin Monitoring Network is the NBD: The Nile Basin Database developed in MS Access. But prior to reaching the final step of adding newly observed data to this database, one more intermediate operation has to be performed: importing the ASCII files generated by “Evaluate” function of the HYDRAS 3 (as described in chapter 5 of this Manual) into MS Access and restructuring them into a final NBD format.

Figure 11 shows the remaining part of the data trajectory, i.e. the preprocessing actions in MS Access.

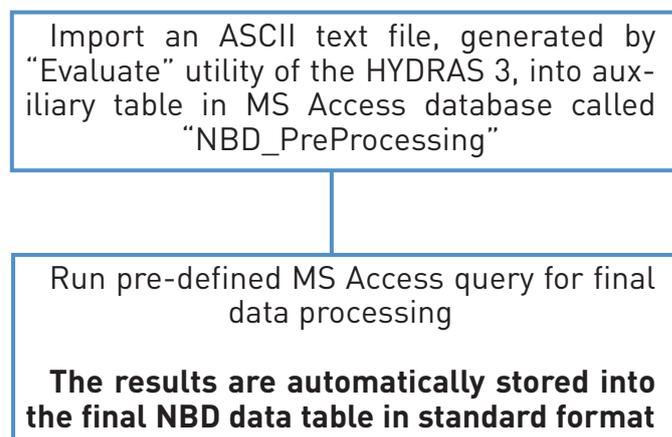


Figure 11: Final data processing steps in MS Access and subsequent removal and storage of raw files as backups.

The following paragraphs will present the detailed instructions for performing the tasks indicated in this figure.

6.2 MS Access Database “NBD_NEW DATA”

The data processing activities are carried out in an MS Access database file called “NBD_PreProcessing.mdb”. The users will find this file in one of the following folders, given with full path name, depending on the country where used (this file structure is to be kept unchanged at all times):

- Users in Kenya: C:\MyDbase\NBD NEW DATA\Kenya Preprocessing
- Users in Rwanda: C:\MyDbase\NBD NEW DATA\Rwanda Preprocessing
- Users in Uganda: C:\MyDbase\NBD NEW DATA\Uganda Preprocessing
- Users in Burundi: C:\MyDbase\NBD NEW DATA\Burundi Preprocessing
- Users in Tanzania: C:\MyDbase\NBD NEW DATA\Tanzania Preprocessing
- Users in DR Congo: C:\MyDbase\NBD NEW DATA\DR Congo Preprocessing
- Users in Sudan: C:\MyDbase\NBD NEW DATA\Sudan Preprocessing
- Users in Egypt: C:\MyDbase\NBD NEW DATA\Egypt Preprocessing

This database file (NBD_Pre Processing.mdb) contains several pre-defined objects including tables and process-

append queries. The database tables and queries names are listed in table 1 together with a brief description of their function.

Table 1: Database objects and their function in MS Access database file "NBD_Pre Processing.mdb".			
Group	Object Name	Type	Function
Group 1			
1.1	Hydro_Hourly_Aqua	Table	Pre-defined table in which to import comma separated ASCII file "TextXXX.txt"
Group 2			
3.1	Hydro_Hourly_Aqua	Query	A pre-defined query used to process data from the respective auxiliary table "Hydro_Hourly_Thal" in order to generate records in the NBD format, and to automatically append/store such records in the NBD table "AWLRS Hourly Water Levels"

As indicated by their numbering, the database objects listed in table 1 are divided into two different groups.

- Group 1 consists of an auxiliary table, in which to import the respective comma separated ASCII Text files generated by "Evaluate" utility of the HYDRAS 3 software.
- Group 2 consists of a process-append database query, specifically designed to generate records in the final NBD database format from data in the auxiliary table in Group 1 and to automatically append these records into the appropriate file and table of the NBD database.

The final NBD table in which the processed data will ultimately be stored/appended are located in the following database files (including the whole folder/directory path):

NBD table "AWLRS Hourly Water Levels" is located in:

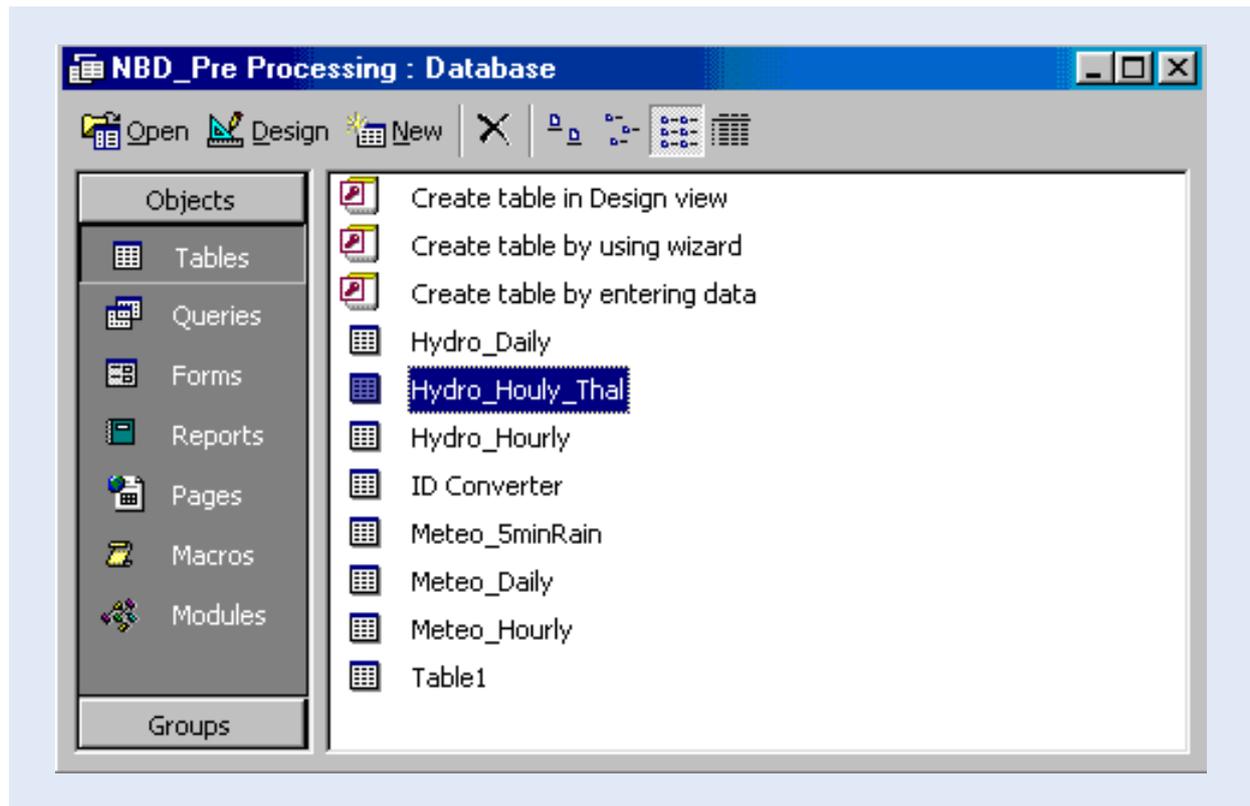
- C:\MyDbase\NBD\Daily Hydro-Meteorological Data\Daily Runoff Uganda.mdb – for data observed at the automatic meteorological and automatic water level recording stations in Uganda (there are now several such stations upgraded by the Project in Uganda)
- C:\MyDbase\NBD\Daily Hydro-Meteorological Data\Daily Runoff Rwanda.mdb – for data observed at the automatic meteorological and automatic water level recording stations in Rwanda (the project aims to establish such stations in Rwanda).
- C:\MyDbase\NBD\Daily Hydro-Meteorological Data\Daily Runoff Burundi.mdb – for data observed at the automatic meteorological and automatic water level recording stations in Burundi (the project aims to establish such stations in Burundi).

The above paths (folder/directory structure) are included into the respective pre-designed MS Access queries indicated in table 1 and should not be changed by the user as any change of the folder/directory structure will result in loss of the processed data.

6.3 Importing ASCII Text Files Generated by "Evaluate" into MS Access

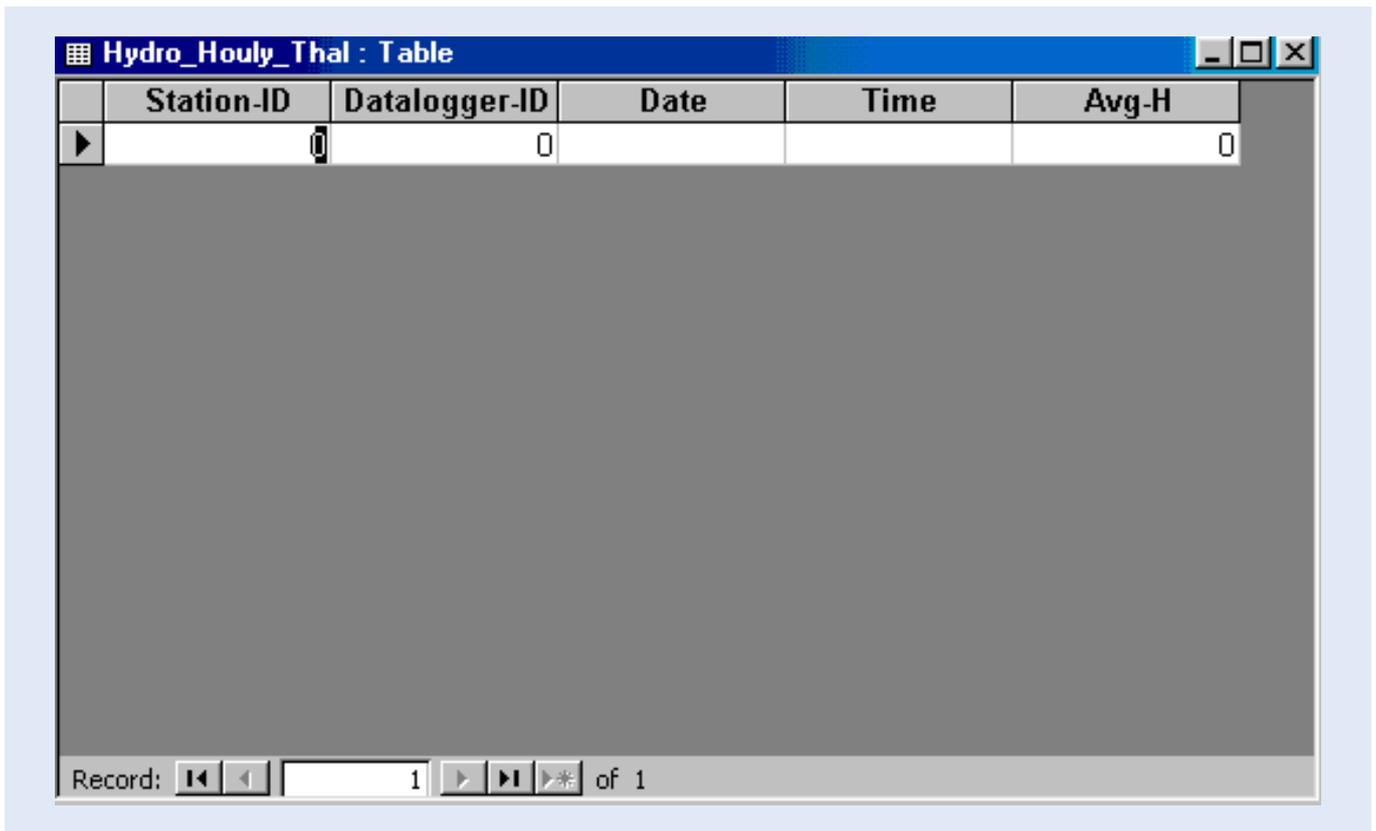
This paragraph describes procedures for importing ASCII text file "TextXXX.txt" into MS Access file "NBD_Pre Processing.mdb".

Step 1: Open the MS Access file "NBD_Pre Processing.mdb"; consult paragraph 6.2 above to locate the appropriate folder/directory path of the file, which is country-dependent. In table view, the following database window appears:



The above view shows a pre-defined auxiliary table "Hydro_Hourly_Thal" where to import text data files obtained from Thalimedes AWLR. The other auxiliary tables have been created previously where to import text data files obtained from another kind of automatic water level recording stations and automatic weather stations.

Step 2: Highlight the auxiliary table "Hydro_Hourly_Thal" and click "Open". The results is illustrated in the following screen:

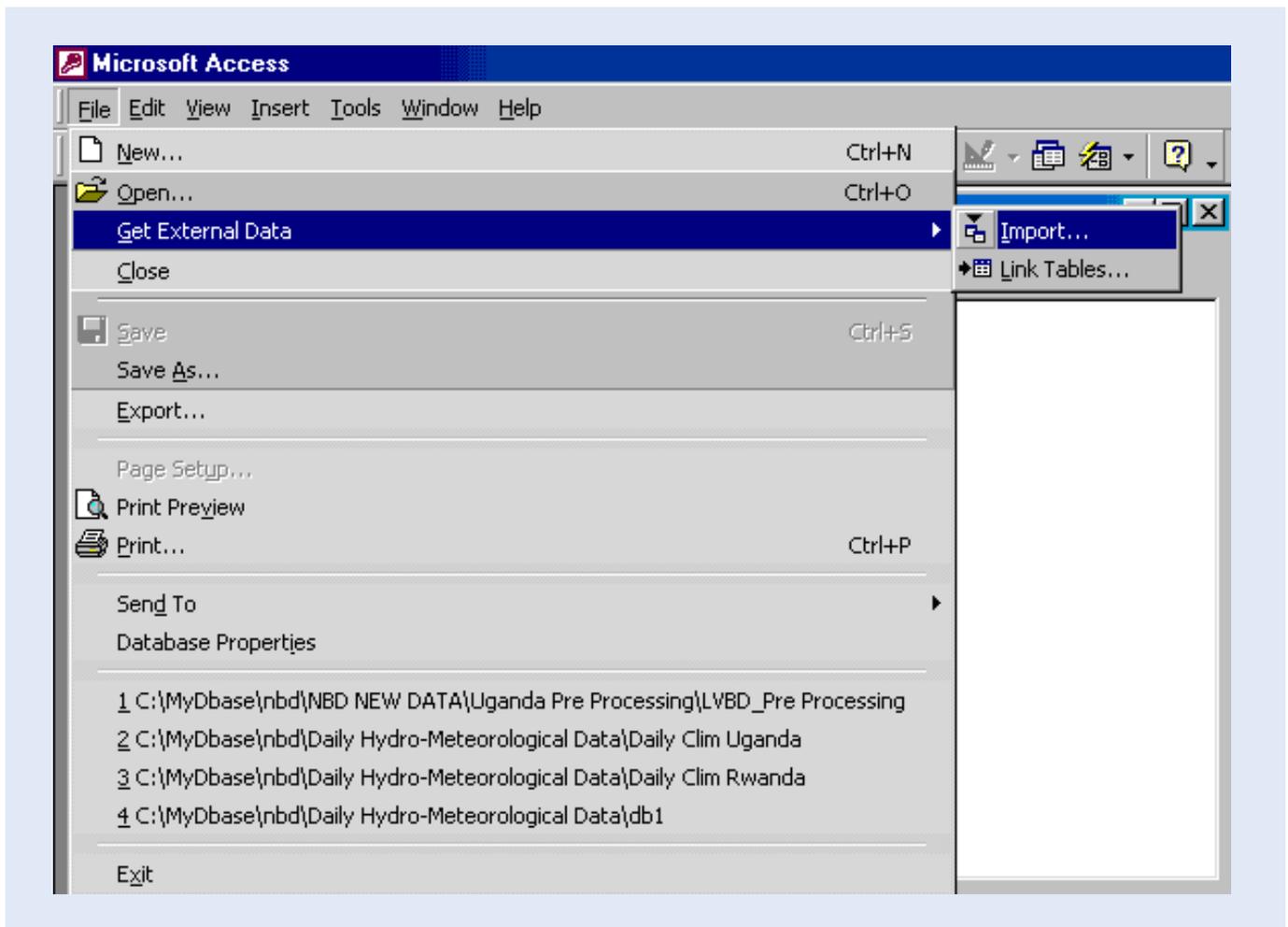


The table at present has no data. Most probably the “Hydro_Hourly_Thal” table will contain some old data from a previous transfer exercise. If so, delete this old data by clicking “Select All Records” in the Edit menu and then by choosing “Delete Records” from the Edit menu. Although primary key setting in the final NBD tables does not allow for data duplication, it is good policy to delete all records from the auxiliary tables.

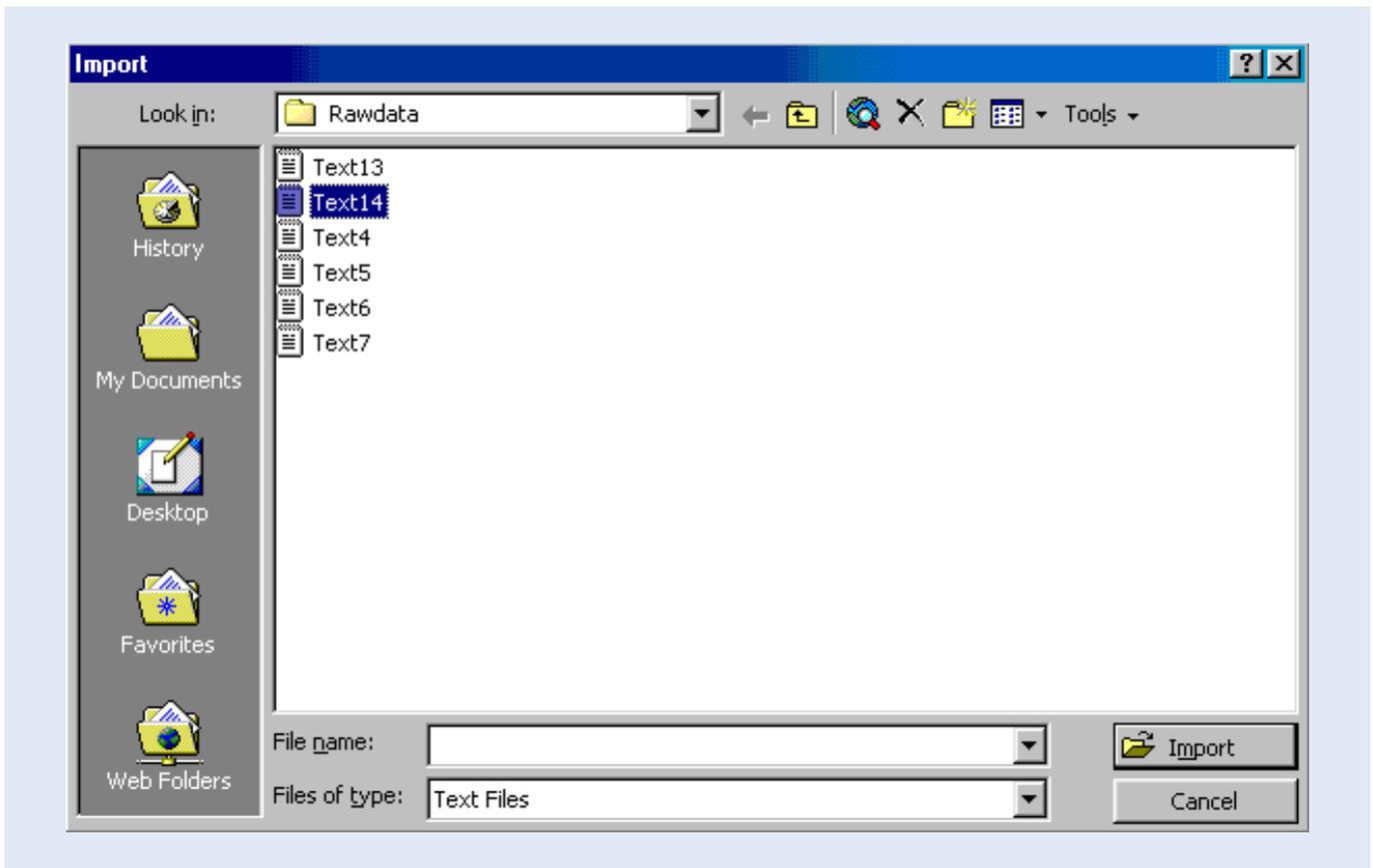
Step 3: Close “Hydro_Hourly_Thal” table.

This auxiliary table is now empty. No data duplication will occur during data import process unless the user imports a certain data set twice. Although this would eventually be refused by MS Access due to ‘key violation’, it is recommended not to enter this situation. Continue with step 4.

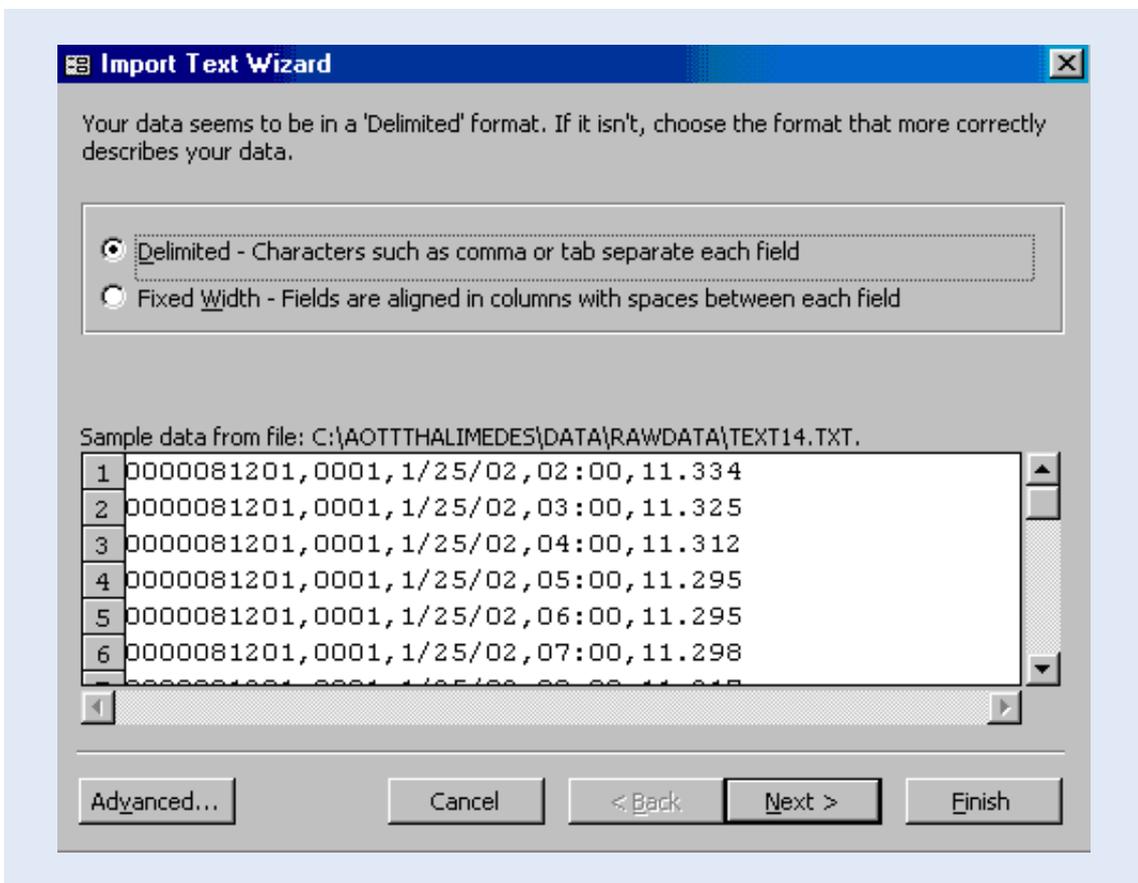
Step 4: In the database window, select “Get External Data” from the File menu. Choose the sub command “Import”, as presented below.



Step 5: In the subsequent window, navigate to the folder from where to import the concerned text data file of the type "TextXXX.txt". Use the appropriate Windows Explorer operations. If the recommended directory structure is used, "TextXXX.txt" is stored in folder C:\AOTTTalimedes\Data\Rawdata. Make sure the "Files of type" (box below-left) is set to Text Files. The screen is depicted as below:

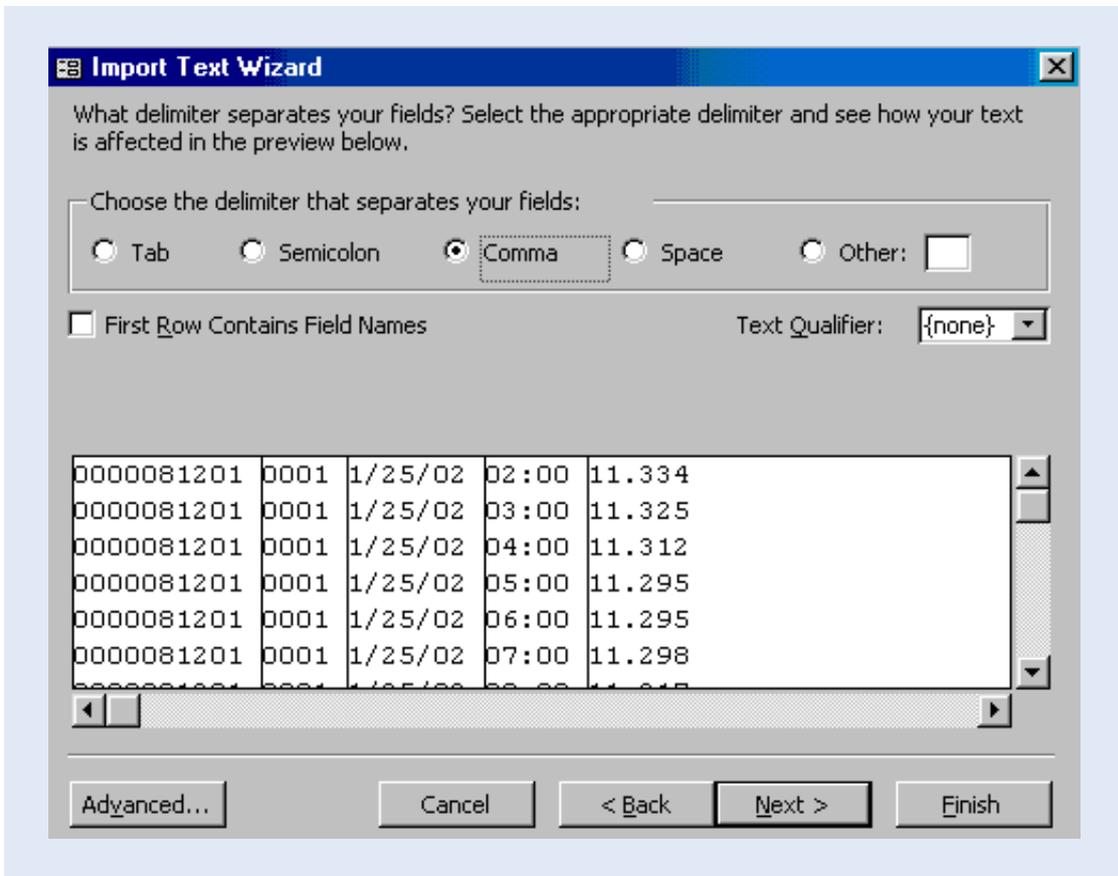


Step 6: Click "Import".
 The following "Import Text Wizard" pops up.



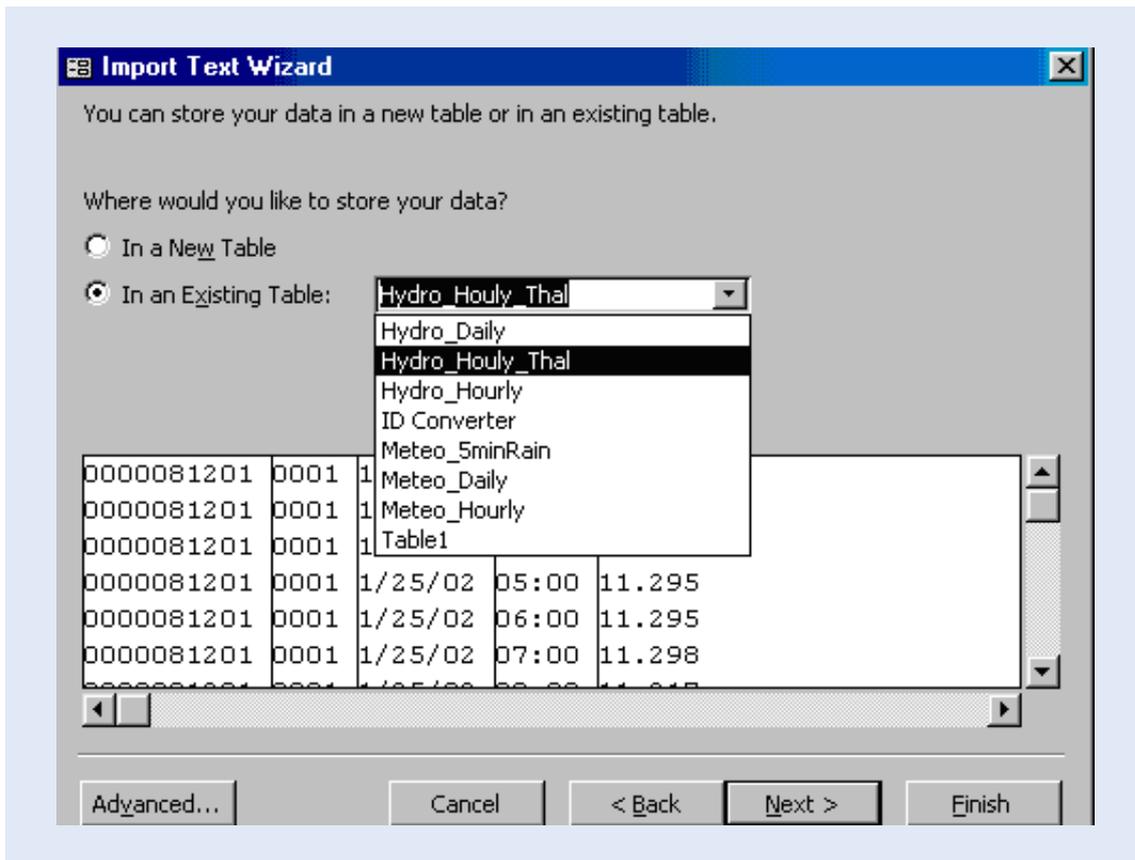
The Text file is comma-separated and thus falls into the category 'delimited'. This has been done on purpose since importing this format into MS Access has proved to be straightforward and flawless.

Step 7: Select 'Delimited' and click 'Next'. The screen illustrated below appears; it shows how the imported text will be divided into various columns according to the applied delimiter.



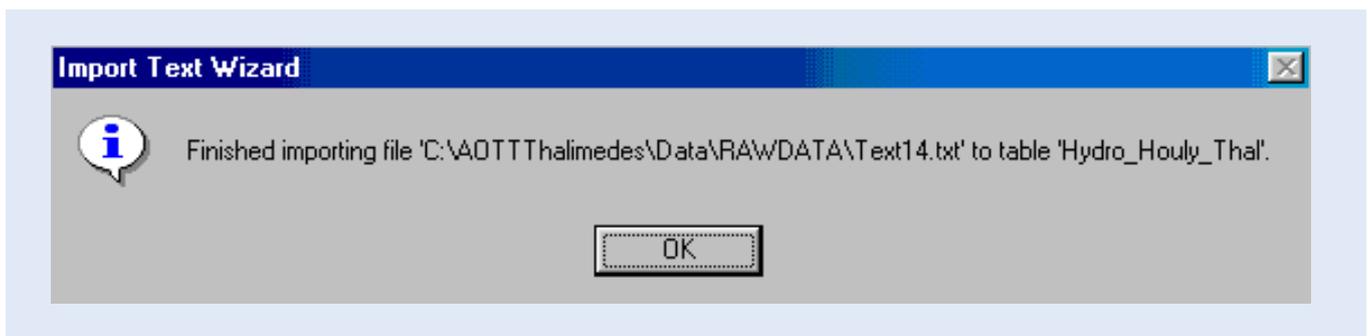
Step 8: Select "comma" and click "Next".

The subsequent window (shown below) is used to define the output location for the imported data. In this particular case, the new information is to be imported into an existing pre-defined auxiliary table Hydro_Hourly_Thal.



Step 9: Check "In an Existing Table" and navigate in the related list box to the Hydro_Hourly_Thal table. Click "Next".

This constitutes the final step in importing the "TextXXX.txt" ASCII file into the appropriate pre-defined MS Access table. If no importing errors are encountered, the Text Import Wizard finishes the process by giving the following message:



Step 10: Click OK.

The text file is now imported into the desired auxiliary MS Access table "Hydro_Hourly_Thal". View the results by opening the "Hydro_Hourly_Thal" table in the database window. Check on the integrity of data, in particular, the datalogger ID values and make corrections if necessary. The result is presented on the screen given below:

Station-ID	Datalogger-ID	Date	Time	Avg-H
81201	1	1/25/02	1:00	11.33
81201	1	1/25/02	2:00	11.334
81201	1	1/25/02	3:00	11.325
81201	1	1/25/02	4:00	11.312
81201	1	1/25/02	5:00	11.295
81201	1	1/25/02	6:00	11.295
81201	1	1/25/02	7:00	11.298
81201	1	1/25/02	8:00	11.317
81201	1	1/25/02	9:00	11.327
81201	1	1/25/02	10:00	11.301
81201	1	1/25/02	11:00	11.276
81201	1	1/25/02	12:00	11.274
81201	1	1/25/02	13:00	11.26
81201	1	1/25/02	14:00	11.28
81201	1	1/25/02	15:00	11.293
81201	1	1/25/02	16:00	11.311
81201	1	1/25/02	17:00	11.32
81201	1	1/25/02	18:00	11.308
81201	1	1/25/02	19:00	11.308
81201	1	1/25/02	20:00	11.317
81201	1	1/25/02	21:00	11.324
81201	1	1/25/02	22:00	11.345
81201	1	1/25/02	23:00	11.35
81201	1	1/26/02	0:00	11.331

This step concludes description of procedures for transfer of the contents of the Text file “TextXXX.txt” into the appropriate location in MS Access in preparation for final processing of data.

6.4 Processing of Imported Data in MS Access and Final Transfer into the NBD

After being imported into an auxiliary table in MS Access, the processed new data sets are subject to automatic final storage into the appropriate NBD file and table. This is performed in one go with a pre-defined query. When the Queries tab is activated in the database view, the “Hydro_Hourly_Thal” pre-defined query appears, as shown in the window below:

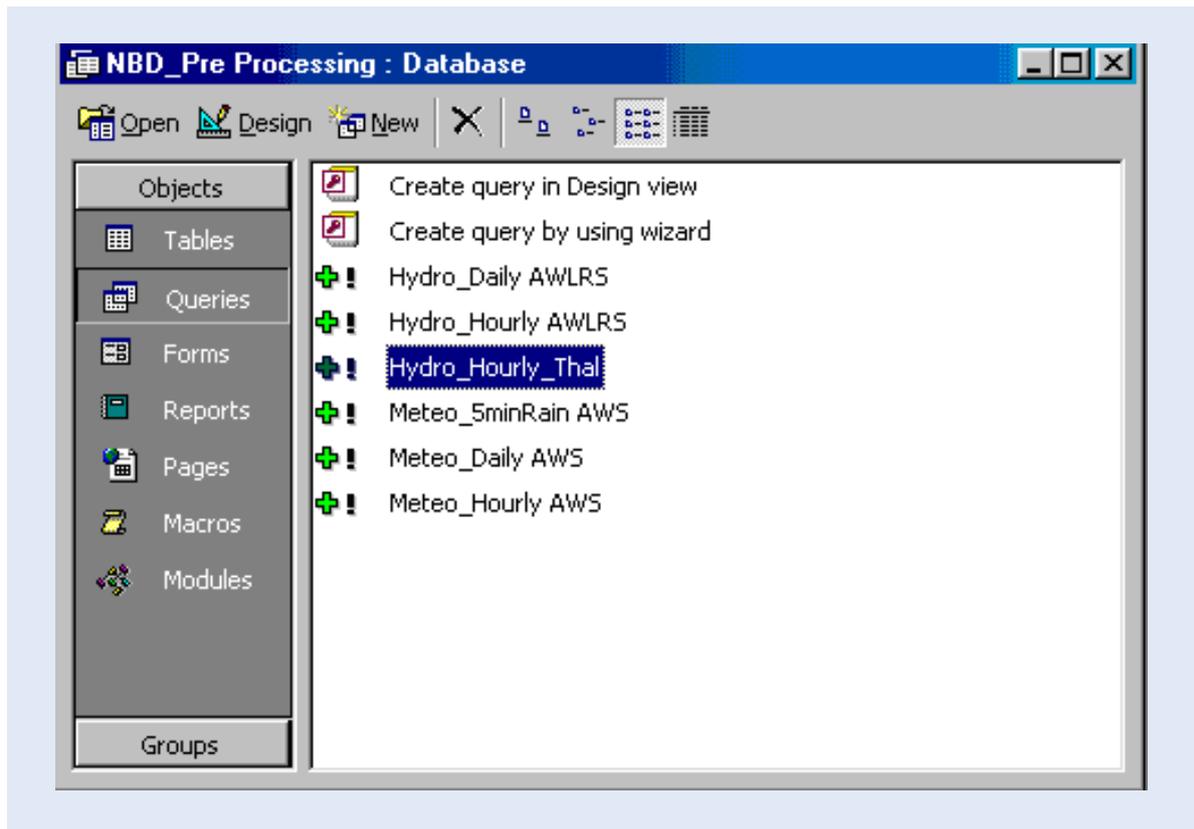
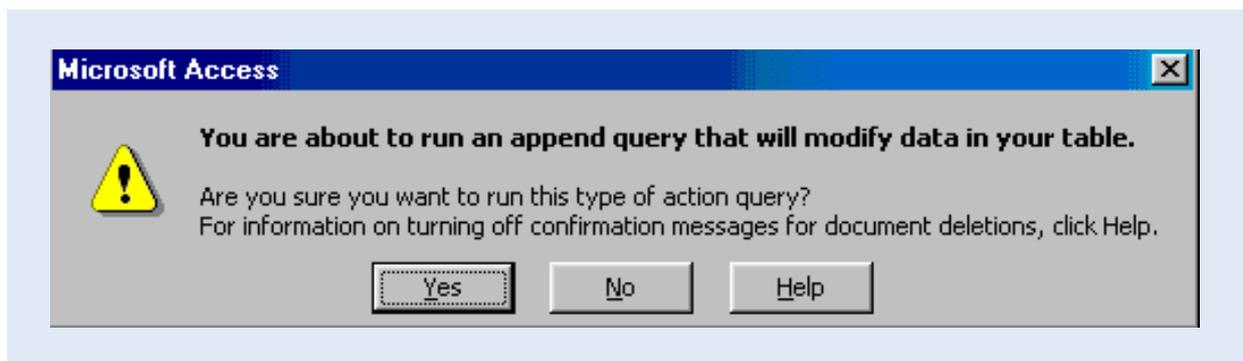


Table 2 presents the input and output tables for the above query “Hydro_Hourly_Thal”. “Thal” stands for Thalimedes Automatic Water Level Recording Stations, which have been established in the region within the GCP/INT/752/ITA project.

Table 2: Designated Input and Destination table for the pre-defined append query.		
Input Auxiliary MS Access Table	Query for Data Processing and Final Transfer into NBD	Final NBD Destination Table
Hydro_Hourly_Thal	Hydro_Hourly_Thal	AWLRS_Thal_Hourly Water Levels

Finalize data processing by activating the appropriate query. For example, highlight and double click the “Hydro_Hourly_Thal” append query to process the newly imported data set from the “Hydro_Hourly_Thal” auxiliary MS Access table to the final “AWLRS_Thal_Hourly Water Levels”. By this operation data records in “Meteo_Hourly” table will be processed as appropriate and final results will be automatically stored/appended into the final NBD destination table “AWLRS_Thal_Hourly Water Levels”.

The following message box pops up:



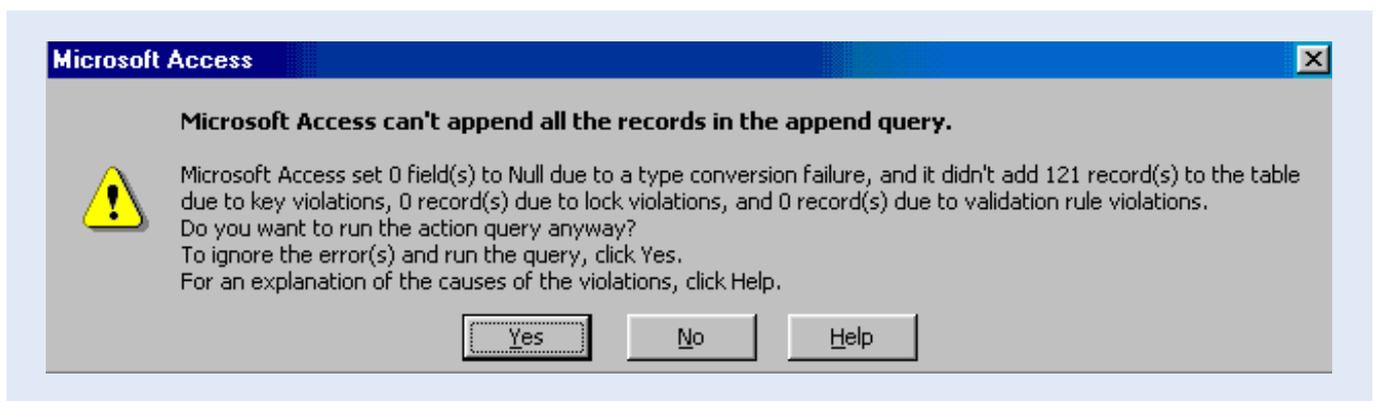
Click "Yes".

A message box similar to the one below follows.



Click "Yes".

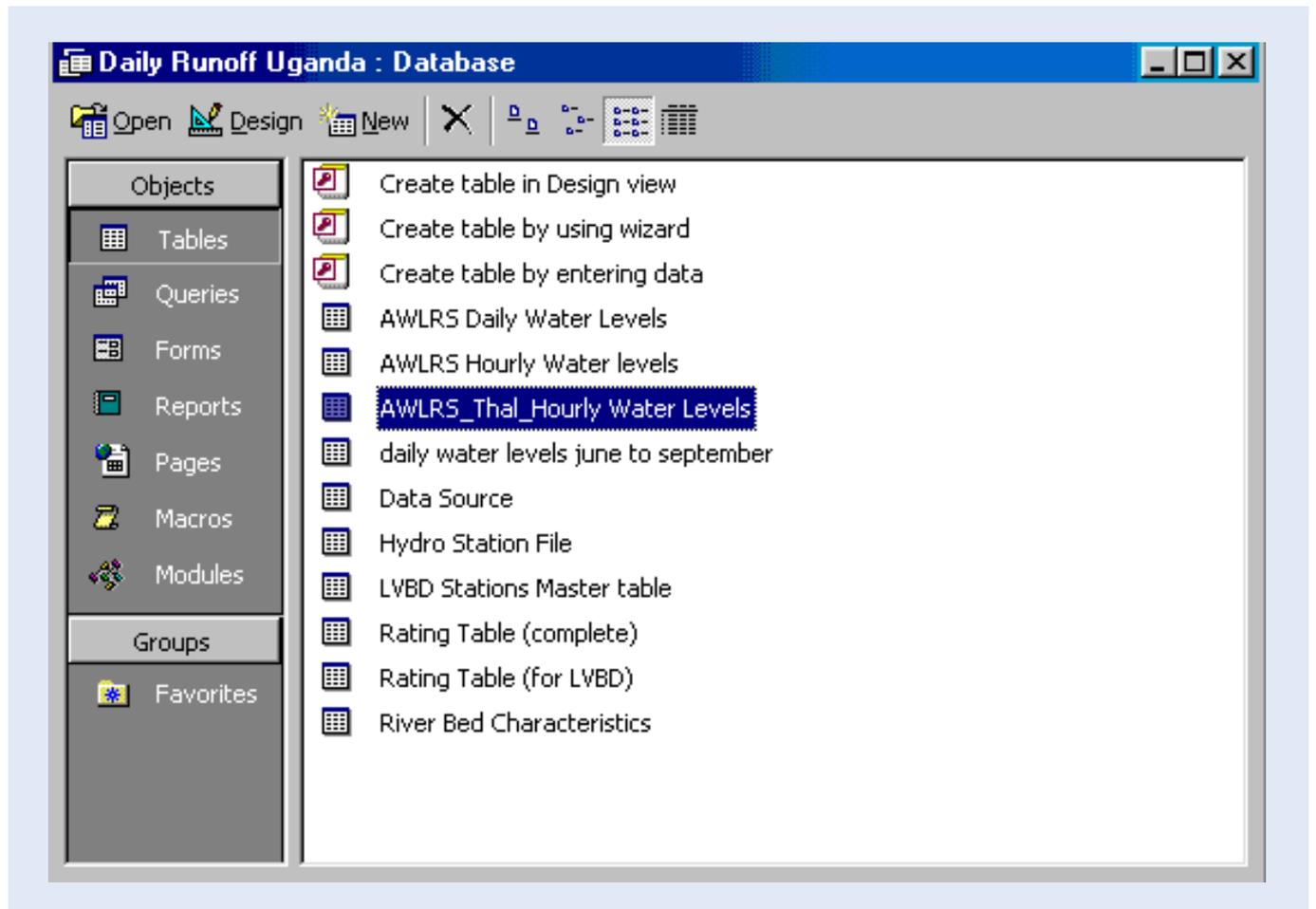
This step finalizes the data processing in MS Access. The destination NBD table is by its primary key settings protected against duplicate records. If a certain record would be added for the second time, the following message box shows up:



It indicates that the processing operation is carried out but that any double rows will not be added due to 'key violations'. Click "Yes" to perform the query to process the genuinely new data.

In order to visualize the final results appended in the NBD destination table "AWLRS_Thal_Hourly Water Levels", locate this table in the appropriate NBD folder and file for this purpose and open the table in the database view.

Highlight the "AWLRS_Thal_Hourly Water Levels" table from the NBD file "Daily Clim Uganda.mdb".



The following screen presents the fully processed data set in the NBD format.

Station-ID	Date	Time	Source	Avg-H
81201	1/25/02	1:00	104	11.33
81201	1/25/02	2:00	104	11.334
81201	1/25/02	3:00	104	11.325
81201	1/25/02	4:00	104	11.312
81201	1/25/02	5:00	104	11.295
81201	1/25/02	6:00	104	11.295
81201	1/25/02	7:00	104	11.298
81201	1/25/02	8:00	104	11.317
81201	1/25/02	9:00	104	11.327
81201	1/25/02	10:00	104	11.301
81201	1/25/02	11:00	104	11.276
81201	1/25/02	12:00	104	11.274
81201	1/25/02	13:00	104	11.26
81201	1/25/02	14:00	104	11.28
81201	1/25/02	15:00	104	11.293
81201	1/25/02	16:00	104	11.311
81201	1/25/02	17:00	104	11.32

The above step concludes description of the procedures for data processing in MS Access and final storage of processed data records into the appropriate NBD destination table.

Once the hydrological data series are successfully processed in MS Access, the raw data files of the type "Ed000.dat" and the respective extracted output ASCII text files "TextXXX.txt", processed by using the Evaluate utility, have for all purposes, become obsolete.

For security reasons, these files are recommended not to be deleted but temporarily stored in the same folder C:\AOTThalimedes\Data\Rawdata; once the user is sure that these files are no longer needed, they may eventually be deleted from hard disk or stored on other computer media if felt of interest.

