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

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Introduction

1.1   General

This manual presents instructions for the installation, operation, and maintenance of Aquanaut Automatic Water Level Recorder (AWLR) installed in the Nile Basin by the FAO Nile Basin Water Resources Project. The monitoring equipment has been procured from AOTT Hydrometrie, Germany. This company has a proven track record in Africa, with a number of automatic and conventional equipments operational in the basin for the last many years.

The project operated an Aquanaut AWLR at its office compound for testing and manual preparation purposes for several months. The new equipment did not show any technical problem in the testing period. Based on this experience the project is multiplying the equipment in the basin with the associated necessary training to the users.

1.2   Aquanaut and its Individual Components

Aquanaut is an electronic sensor integrated with a pressure probe/transducer for measuring well and river water levels. This pressure transducer is designed for measuring a maximum water column of upto 20 meters above it. Aquanaut stores the measured records in its datalogger's non-volatile memory. The measured values are retrieved either using a laptop PC or the supplied OTT HT-525 unit. The pressure transducer is installed in a stilling well with the datalogger installed on a secure place away from the surface of water. Following are the main components associated to Aquanaut:

Pressure transducer with integrated datalogger: While installed in a stilling well, the sensor measures changes in water level/column above the sensor. The sensor transfers the corresponding pressure into an analog signal, which is transferred via the transducer cable to the datalogger as a measured value. Pressure transducer with integrated datalogger has been shown in figure 1.

Connecting Cable: the serial cable shown in the picture below is provided for connecting the datalogger to the PC port or for connecting datalogger to the HT-525 hand-held unit.

HT-525 Data Readout Device: This device shown in figure 1 below is used in the field for programming the datalogger; and retrieving the recorded data from the datalogger into its non-volatile storage memory. The stored data is then transferred to the PC via a 9-pin serial cable.
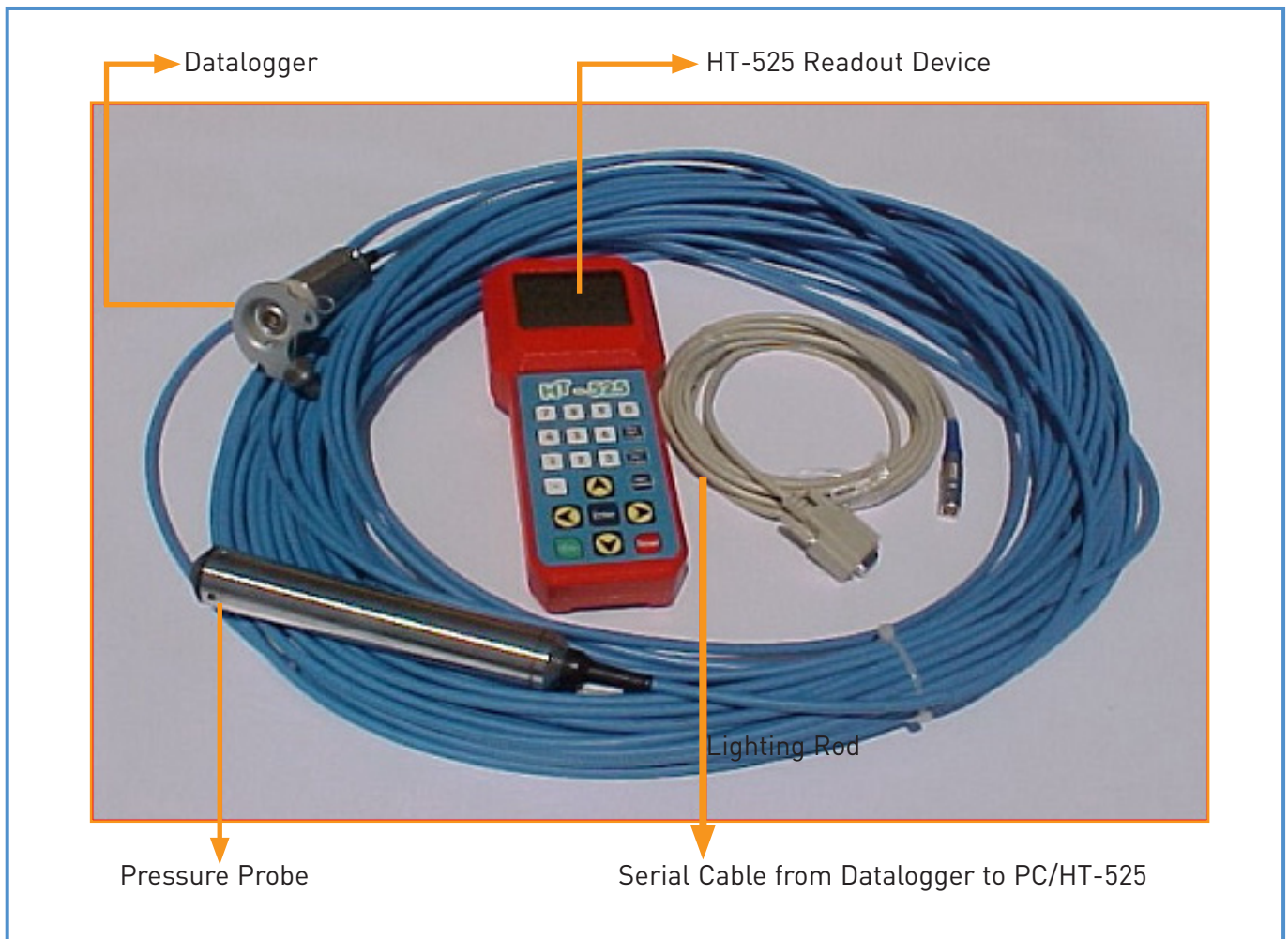
Figure 1: Aquanaut automatic water level recorder and accessories

1.3   Installation of the Aquanaut Pressure Transducer

1.3.1   Design and Installation of the Pressure Transducer Housing

Figure 2 to Figure 4 explains the plan and detailed design of a stilling well for the pressure transducer water level recorder. The exact location of the pressure transducer housing is always determined on site. The project has newly adopted this housing design for wild rivers flow with high silt concentration. The stilling well has no inlets rather it consists of three perforated screened steel pipes of diameter 35, 25 and 10 cm. The space between the 35 and 25 cm round screened pipes is filled with rounded washed gravel of size 5-8 mm.

The stilling well is placed in the crossectional river profile on a concrete foundation plate and is anchored from the side to a solid rock; otherwise an anchoring block needs to be constructed. The stilling well can be submerged but should be easily accessible for maintenance and checking activities. On the other hand, the datalogger being an electronic device, the datalogger housing pipe (25cm) should be installed at a secure dry area above the maximum flood level. Both the transducer housing pipe (25cm) and the datalogger housing pipe (25cm) are capped with OTT supplied caps for security purposes. The cable between the datalogger and the pressure transducer is protected underground in a PVC pipe.

1.3.2 Installation of the Aquanaut Pressure Transducer and Datalogger

Hardware needed for the installation of aquanaut includes (a) stilling well for placement of pressure probe inside it (b) PVC or steel conduit for routing the transducer cable (c) pipe of 6″ diameter with an OTT steel cap for protecting the datalogger; and (d) steel disc for holding the datalogger inside the pipe. Installation of this hardware has been

discussed in the preceding paragraphs and is schematically shown in figure 2.

The datalogger should be installed on a dry location above maximum flood level while the pressure probe is installed at lower level in the crossectional river profile. To achieve this, install a 6" diameter steel pipe of a desired length (with a 2 cm hole drilled to the side of the pipe near its lower end) on a guaranteed dry location above maximum flood level. Pass on the pressure probe inside the hole through the pipe and then through a required length of PVC pipe to the pressure transducer housing located at a lower level in the crossectional river profile. The pressure transducer is permanently connected to a small datalogger through a length of cable. Dig out a trench for putting the PVC pipe underground for protection. The datalogger is now located on the top of this pipe on a metallic disc which is then capped with an OTT supplied steel cap for extra protection. Route the pressure transducer through a 2 centimeter hole of the stilling well/pressure transducer housing (drilled to the side near its upper end) at the crossectional river profile and install it vertically in the smallest pipe inside the housing. The transducer should be positioned in the pipe below the minimum water level.
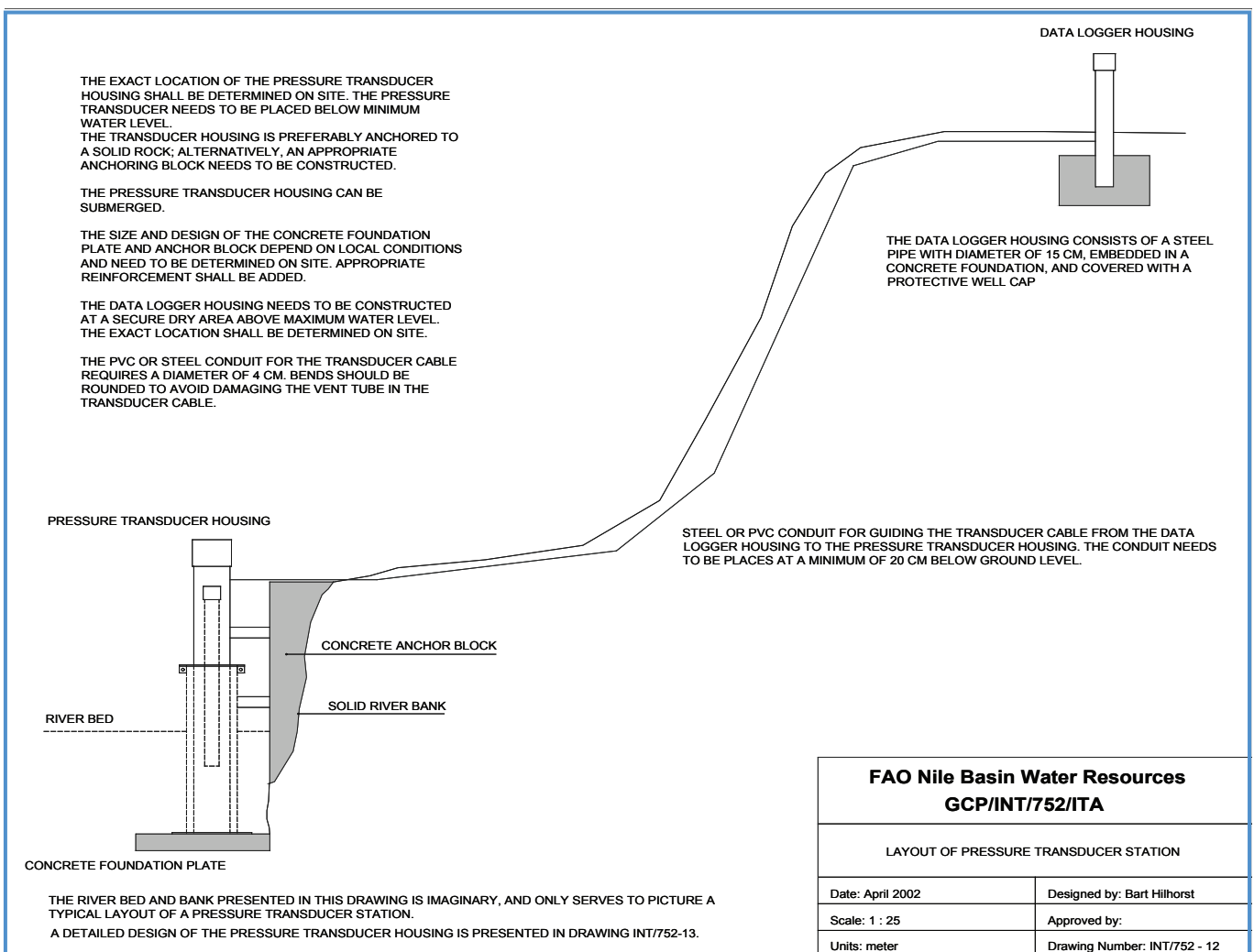
Figure 2: Onsite plan for installation of the Aquanaut automatic water level recorder

WELL CAP FOR PIPE ROUND 25 CM

A   A

STEEL PIPE ROUND 25 CM

WELL CAP FOR PIPE ROUND 10 CM

STEEL WELL SCREEN ROUND 10 CM

0.75

B   B

STEEL WELL SCREEN ROUND 25 CM

STEEL WELL SCREEN ROUND 35 CM

ROUNDED WASHED GRAVEL (5 - 8 MM)

1.25

C   C

D   D

STEEL FOUNDATION PLATE (WIDTH OF 8 MM)

ALL DIMENSIONS IN METERS
QUALITY ALL STEEL ELEMENTS Fe360
CONSTRUCTION DETAILS ARE PRESENTED IN DRAWING INT/752-14
ALL WELL SCREENS SHALL HAVE A SLOT SIZE OF 2 MM OR LESS

SECTION D - D

0.55

0.55

SECTION A - A

PIPE FOR PRESSURE TRANSDUCER CABLE

SECTION C - C

SECTION B - B

FAO Nile Basin Water Resources **GCP/INT/752/ITA**	
PRESSURE TRANSDUCER HOUSING	
Date: March 2002	Designed by: Bart Hilhorst
Scale: 1 : 10	Approved by:
Units: meter	Drawing Number: INT/752 - 13

Figure 3: Design of the pressure transducer housing

Scale: 1 : 50

INNER SCREEN LOCKING

COVER PLATE

WALL ANCHOR

WALL ANCHOR

CONCRETE FOUNDATION

SIZE AND LENGTH OF WALL ANCHORS AND
FOUNDATION DEPENDS ON LOCAL CONDITIONS
AND NEED TO BE DETERMINED ON SITE

CLAMP TIGHTENER
Scale: 1 : 5

ATTACHMENT TO WALL ANCHOR
Scale: 1 : 10

4 MM STEEL PLATE

COVER PLATE
Scale: 1 : 10

4 MM STEEL PLATE

QUALITY ALL STEEL ELEMENTS Fe360 OR BETTER
MODIFY FINAL SIZE ALL ELEMENTS TO ACTUAL PIPE DIAMETERS

INNER SCREEN LOCKING
Scale: 1 : 5

TOP VIEW:
ATTACHMENT PIECE

TOP VIEW:
PROVISIONS IN
OUTER PIPE

SIDE VIEW:
PROVISIONS IN
OUTER PIPE

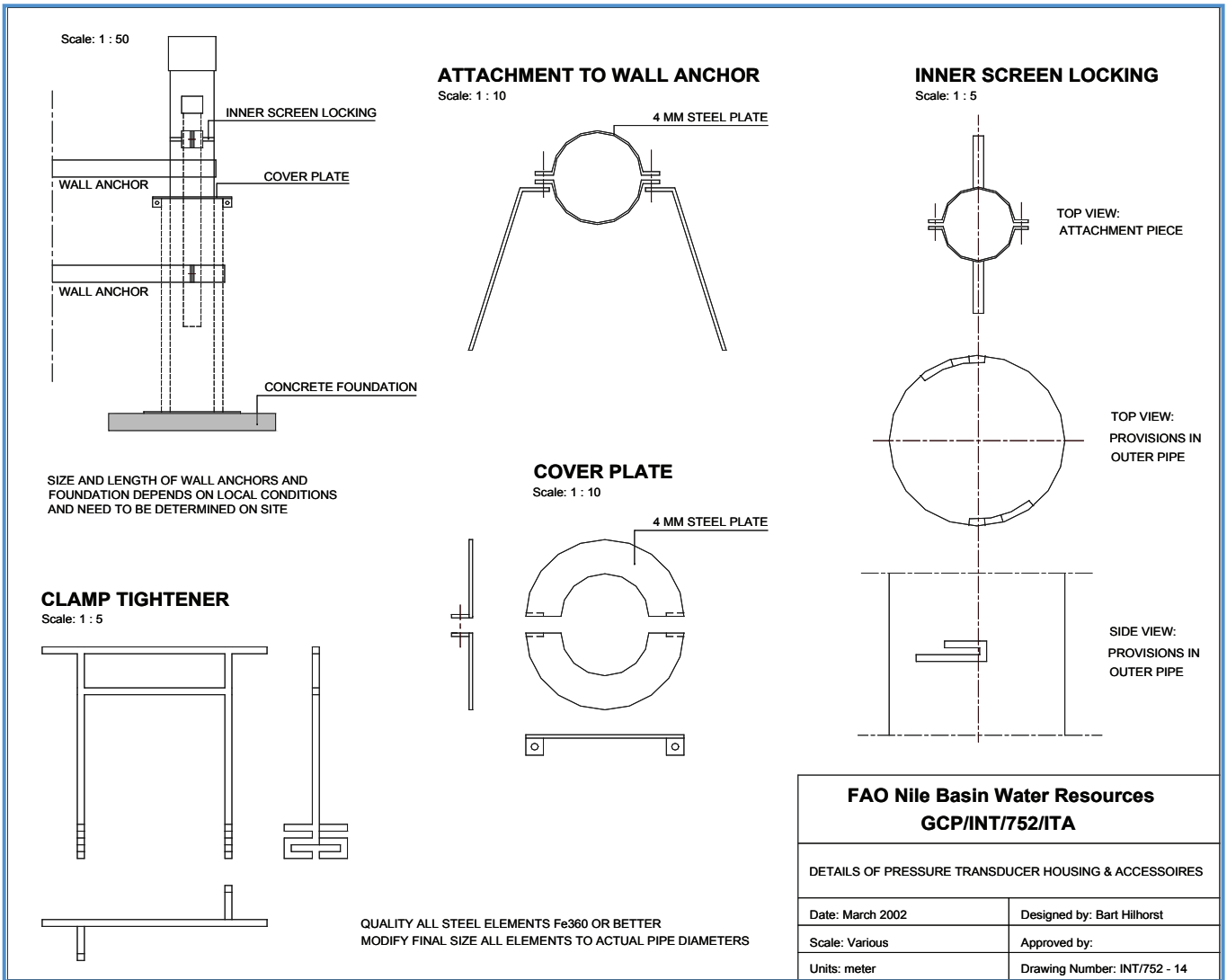| **FAO Nile Basin Water Resources** **GCP/INT/752/ITA**	
DETAILS OF PRESSURE TRANSDUCER HOUSING & ACCESSOIRES	
Date: March 2002	Designed by: Bart Hilhorst
Scale: Various	Approved by:
Units: meter	Drawing Number: INT/752 - 14

Figure 4: Details of the pressure transducer housing and accessories.

Using Aquanaut

2.1 General

Once the Aquanaut has been installed, the datalogger needs to be programmed and the required parameters need to be properly set. This is accomplished either using an OTT HT-525 readout device or using a PC/laptop. Aquanaut does not need any external power to operate; it has got an in-built battery, which runs for a period of ten years if the data sample interval is selected as 3 minutes. Measurements with higher sample intervals increase the battery life. Detailed explanation of how to operate Aquanaut and set its operating parameters have been explained in the following paragraphs:

2.2 Installation of the Required Soft wares

Htmne.exe is a Windows-based software required for editing and controlling the dataloggers. Install the program in the Windows Explorer by clicking on A:\ and then "Install.exe", the software will automatically be installed under "C:\ Htlogger". A "Data" sub-folder is also created where the collected data from the datalogger can be stored.

It is better, to install HT-525.exe software under the same folder "C:\Htlogger", which is needed for programming the datalogger, retrieving data from datalogger to HT-525 and transferring data from the HT-525 hand-held unit to PC (this is discussed in detail in chapter 3).

Any of the above programs could be started either by double clicking on the Htmne.exe or HT-525.exe in the windows explorer, or creating shortcuts on the desktop.

2.3 Operating Aquanaut with a Laptop PC

Following hardware and software are needed for operating Aquanaut from a PC:
Aquanaut, PC, supplied serial cable for connecting datalogger to the ninepin PC port; and the Htmn.exe software.

Step 1: It is assumed that the Aquanaut has been installed onsite. Connect datalogger to the PC via the serial cable supplied by OTT.
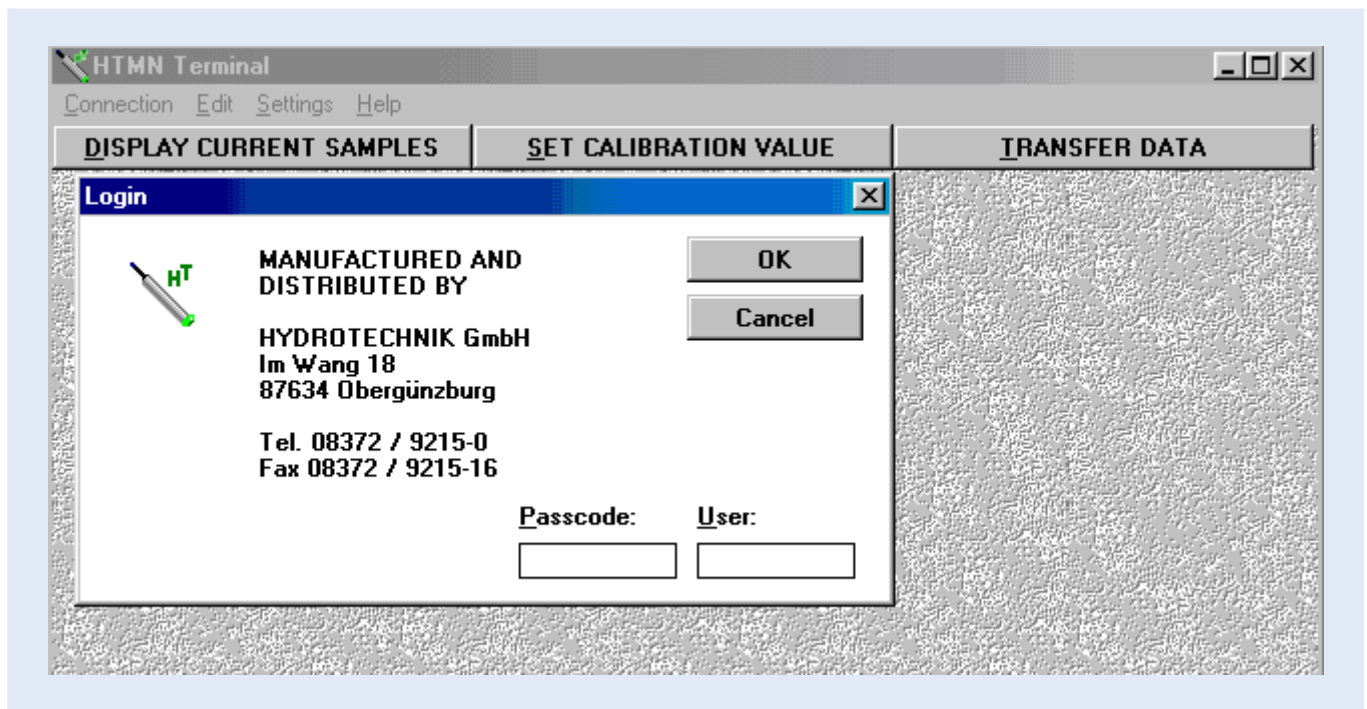
2.3.1 Programming the datalogger:

Step 2: Start the software by double clicking on the Htmn.exe in the windows explorer or Htmn.exe shortcut.
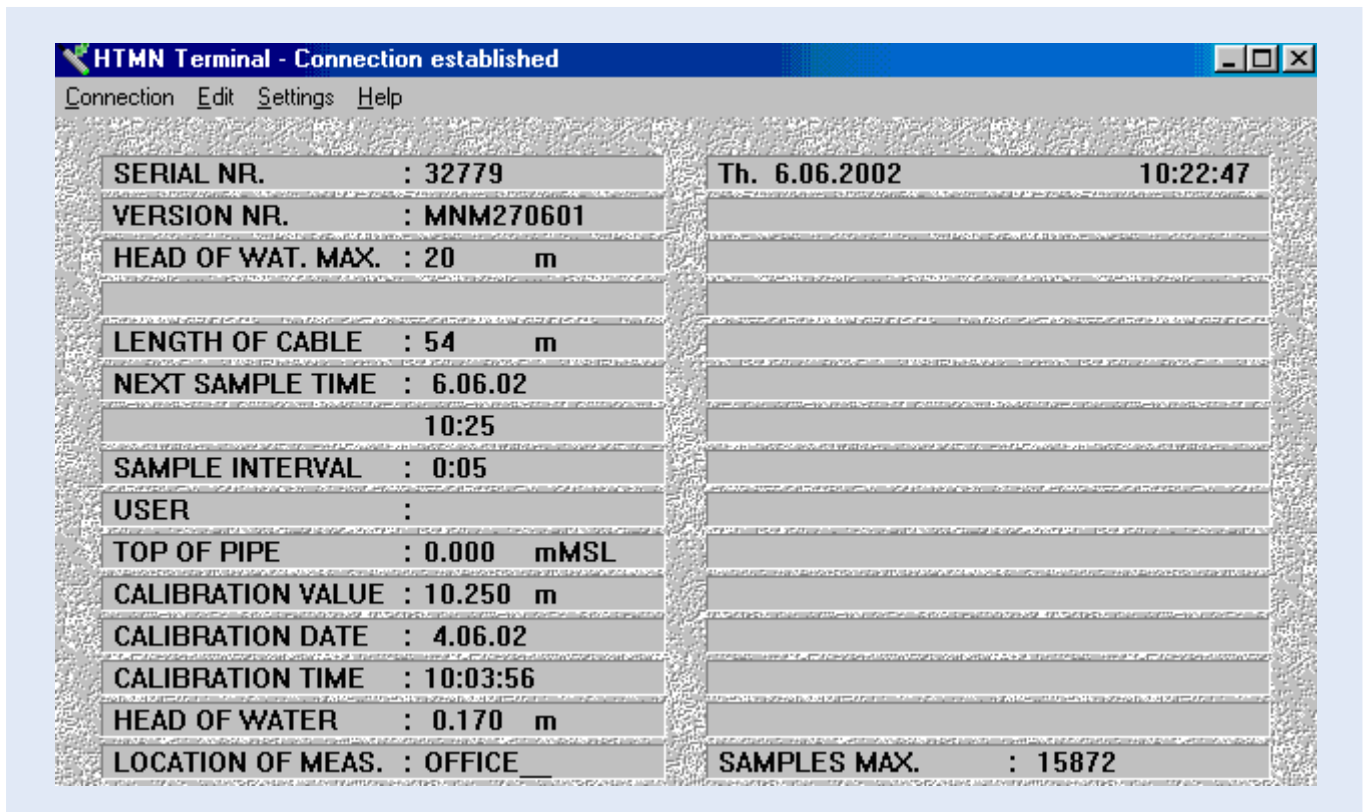
Step 3: Click on "Connection" and then "Establish" from the main menu of the program as shown below:
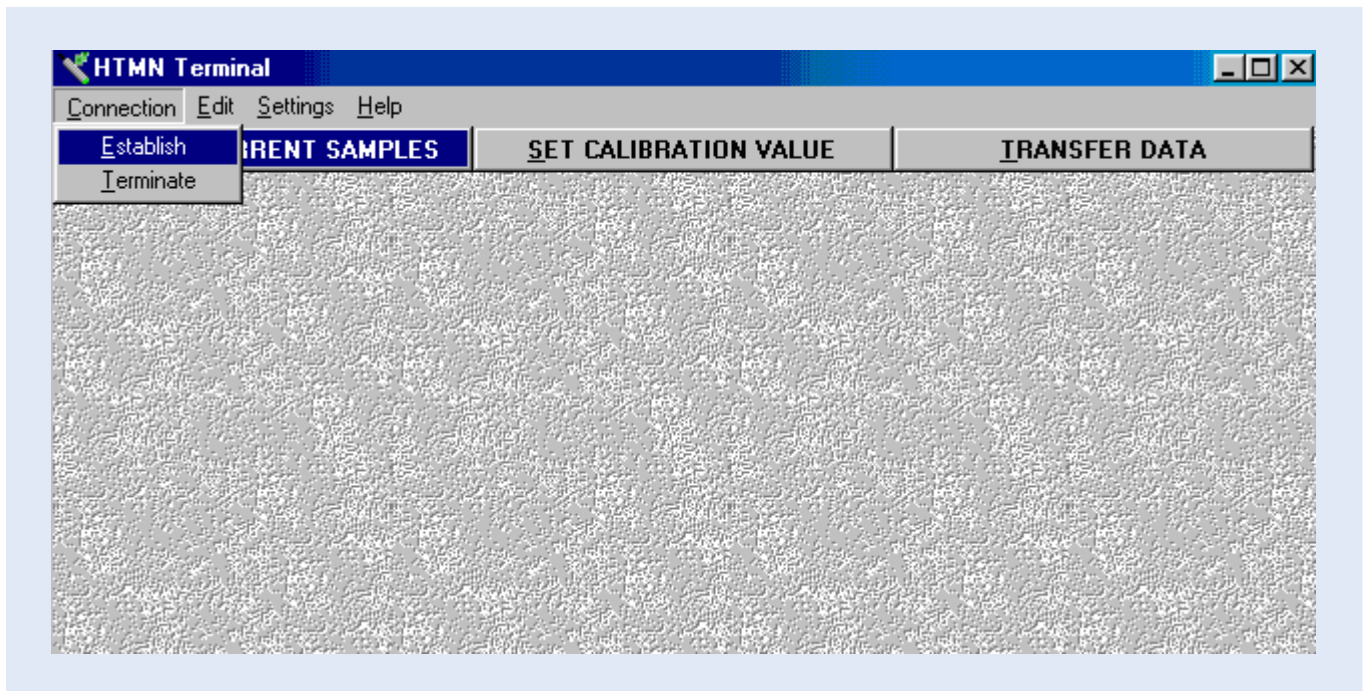
A window will pop as follows:

Enter the passcode as 20000 and a user name (any). This passcode allows changing and manipulating the datalogger for recording the desired data. If the connection is successful, the screen will change as shown below:
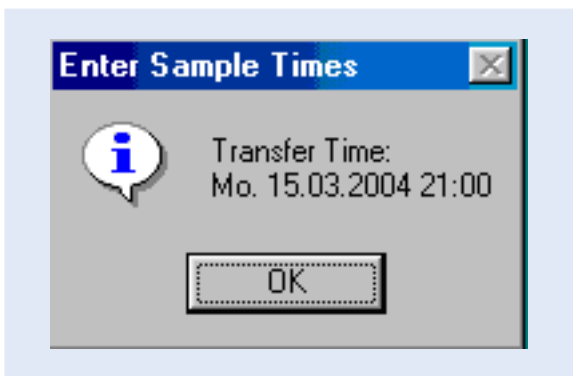
Step 4: Click "Date/Time" from the "Settings" main menu to set the date and time of the datalogger. Either enter the present date/time or click on the "Accept PC time".

Step 5: Select "Sample time" from the "Settings" command of the main menu. Change the "sample time" to the time from where the data recording needs to be started. For example an operator is onsite at 10:00am and he thinks that the datalogger should start recording data at 11:00am because he needs a maximum of one hour for programming the datalogger. The sample time can be given as 11:00. Or, for example the datalogger will be newly installed tomorrow latest by 14:00 but you need to program the logger today in your office from the desktop; then write tomorrow's date and give time as 14:00. Change the sample time as shown in the following window:
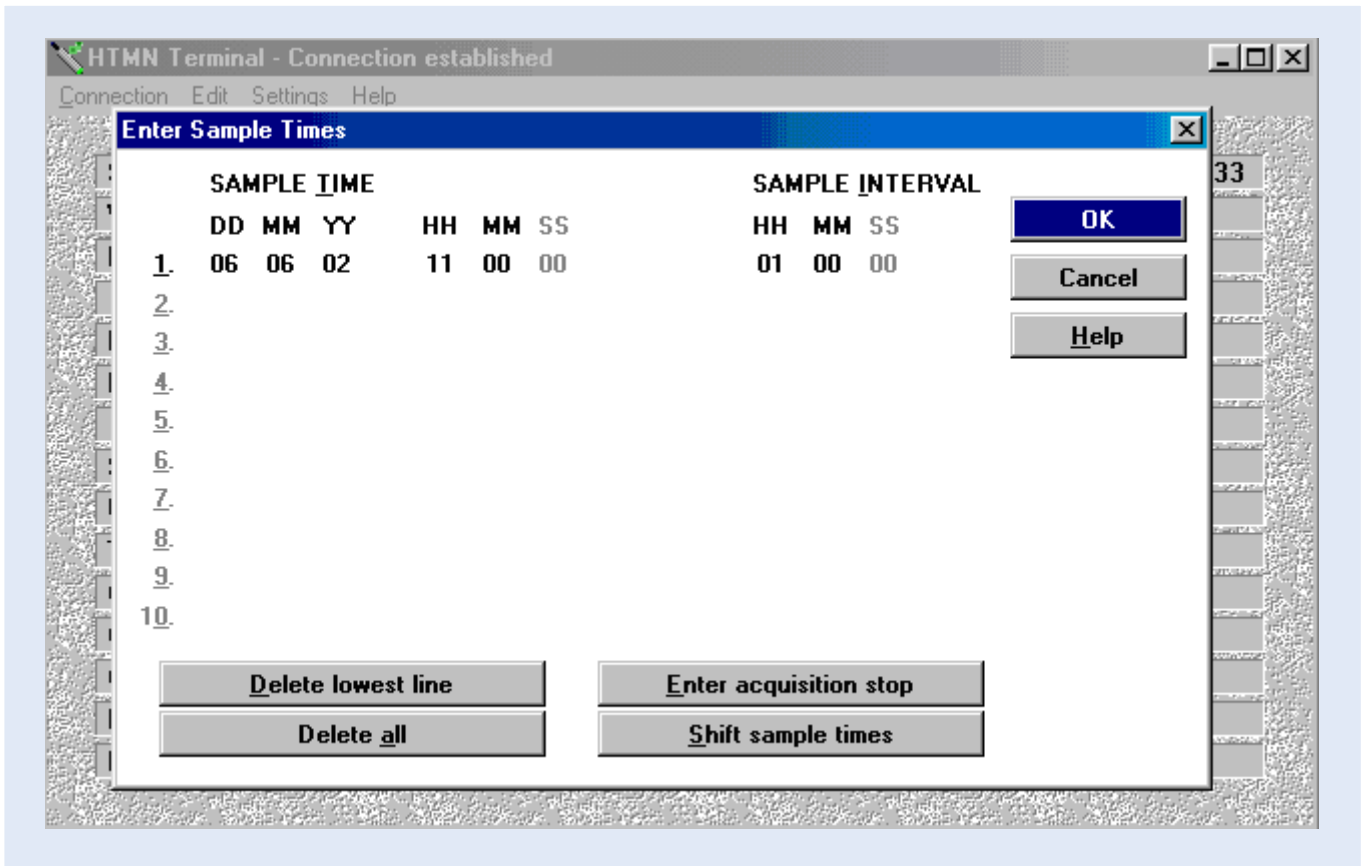
In the above window the author has chosen that the datalogger should start recording on 06 June 2002 at 11:00am (Sample Time); and that the data should be recorded and stored on hourly basis (Sample Interval). Once the sample time and sample interval are selected, click on OK button and the following window will appear, which means that the datalogger has the capacity to measure and store data till 15 March 2004 and that the data should be transferred from the datalogger to the PC or readout device before this date otherwise the datalogger will start overwriting the old data.


Note: To delete the previous sample time and sample interval, click either on "Delete lowest line" or "Delete all" button. Click Ok.

Step 6: Select the "Set Calibration Value" from the "Settings" main menu of the program and the following window will appear:

Enter the gauge reading here (e.g. 10.250) in the box and check "artesian". Then click OK.

Step 7: Click on "Adjusting to MSL" from the "Settings" main menu, enter name (station name) for the location of measurement as required in the resulting window. This will result in another window in which enter "Top of pipe" as 0.000 as shown below:
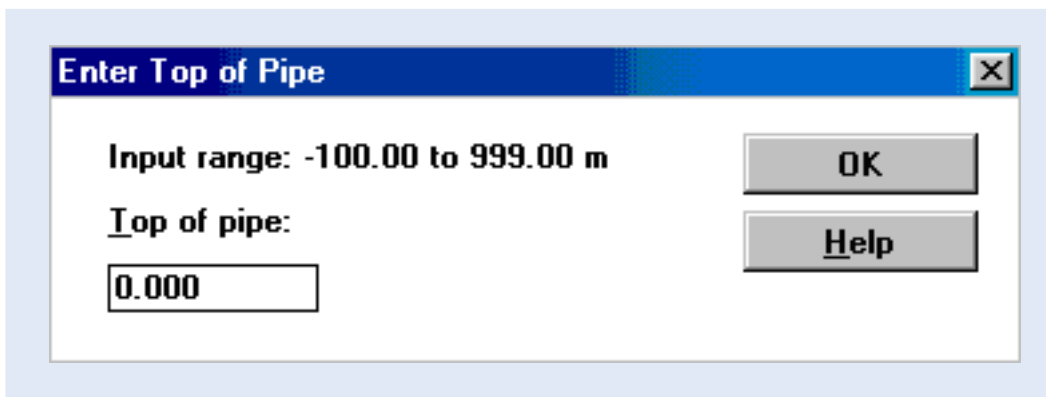
After clicking OK, enter the gauge reading e.g. 10.250 again as the calibration value. Check artesian again; and confirm sample time.

The datalogger has been programmed now successfully and will start recording data according to the given sample time.

2.3.2   Downloading Data from Datalogger to the PC

Step 8:Connect your pc to the datalogger. Open the Htmn.exe program and enter the passcode as 30000. This passcode lets you choose the data format i.e. XLT, DAT or LGD. A data file in Excel format is more convenient in collection and display of data. To select the right data format i.e. Excel, click on the "Transfer data" of the "Edit" main menu and then click on the "Settings" of the resulting window, as shown below:
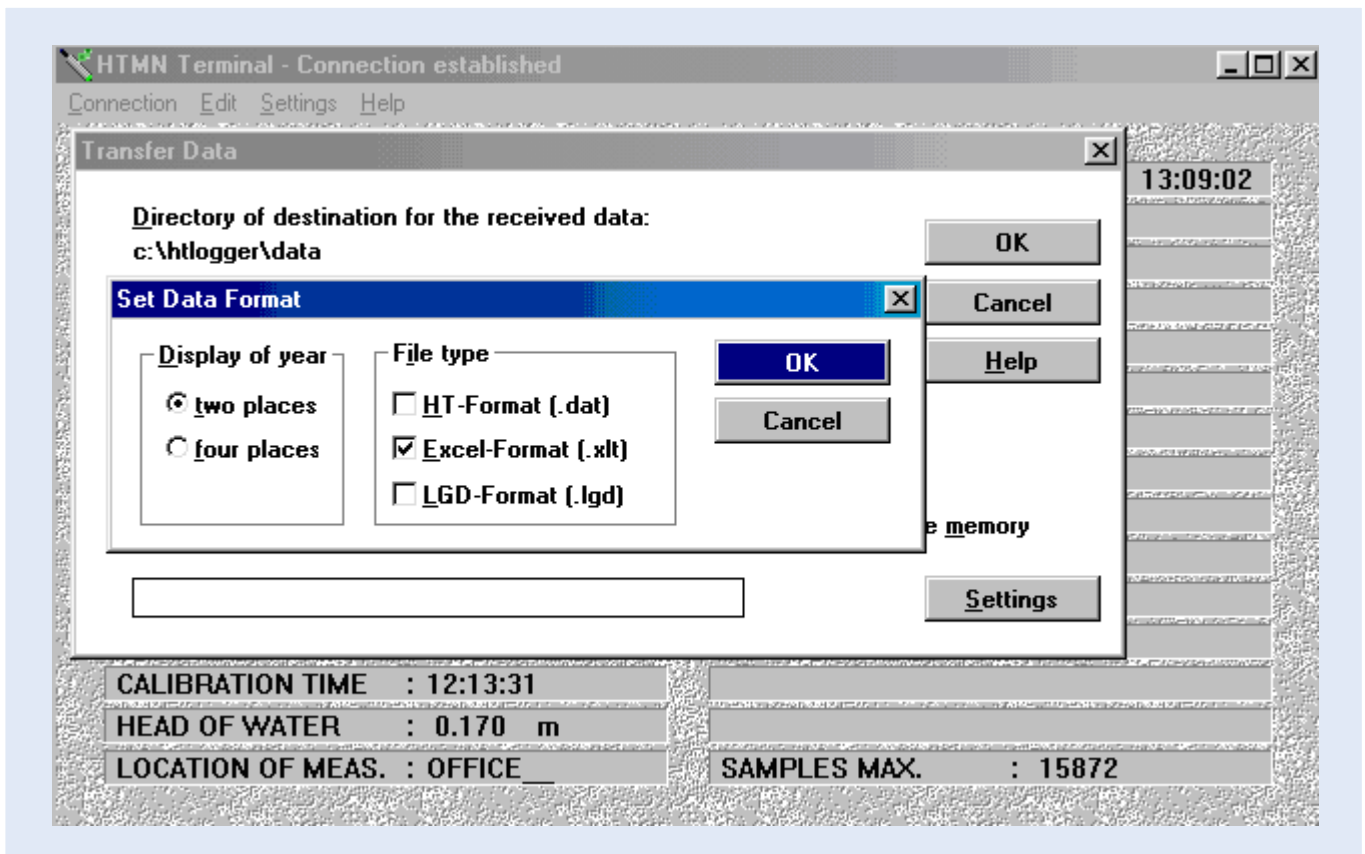
Click OK after selecting the "Excel-Format" and click OK again for transferring data from datalogger to "C:\Htlogger\data" folder of the PC. "Data" sub-folder is created automatically at the time of data transfer.

During the data transfer, three files are created under "Data" sub-folder with the same name as the location of measurement entered in step 7 of paragraph 2.3.1. The text file contains the status board, calibration value and the logbook, while the Excel file contains the required water level data. The third file contains water temperature data, which can be deleted if not required. All these files are updated, by appending the new data; with each data transfer exercise in the future. The Excel data file is a read-only file shown below:

	A	B	C	D	E	F	
311	06.06.2002	11:00:00	24.2	10.245			
312	06.06.2002	13:00:00	23.8	10.25			
313	06.06.2002	14:00:00	23.7	10.25			
314	06.06.2002	15:00:00	23.7	10.25			
315	06.06.2002	16:00:00	23.8	10.25			
316	06.06.2002	17:00:00	23.8	10.25			
317	06.06.2002	18:00:00	23.8	10.25			
318	06.06.2002	19:00:00	23.9	10.25			
319	06.06.2002	20:00:00	23.9	10.25			
320	06.06.2002	21:00:00	23.9	10.25			
321	06.06.2002	22:00:00	23.9	10.25			
322	06.06.2002	23:00:00	23.9	10.245			
323	07.06.2002	0:00:00	24	10.25			
324	07.06.2002	1:00:00	24	10.25			
325	07.06.2002	2:00:00	24	10.25			
326	07.06.2002	3:00:00	24	10.25			
327	07.06.2002	4:00:00	24	10.25			
328	07.06.2002	5:00:00	24	10.25			
329	07.06.2002	6:00:00	24	10.25			
330	07.06.2002	7:00:00	24	10.25			
331	07.06.2002	8:00:00	24	10.25			

OFFICE__

First column of the data file contains the date, second column the time, third column the water temperature in degree Celsius; and the forth column contains the actual water level readings measured in meters. The above Excel data file can only be edited in MS Excel e.g. deleting unwanted data or water temperature (column 3), inserting a column for Station ID. But since the resulting Excel data file (above) is a "read-only file", it cannot be edited; therefore this data file should be opened in MS Excel and saved with a different name as MS Excel Workbook where it can be edited. This is explained in the following steps:

2.3.3 Editing Retrieved Data File

Step 9: Open the retrieved data file in MS Excel and save it as a different name e.g. "Aqua_edit" within the same folder i.e. "C:\Htlogger/data". Do not forget to select "Microsoft Excel Workbook" in the "Save as Type" check box as shown in the following window:
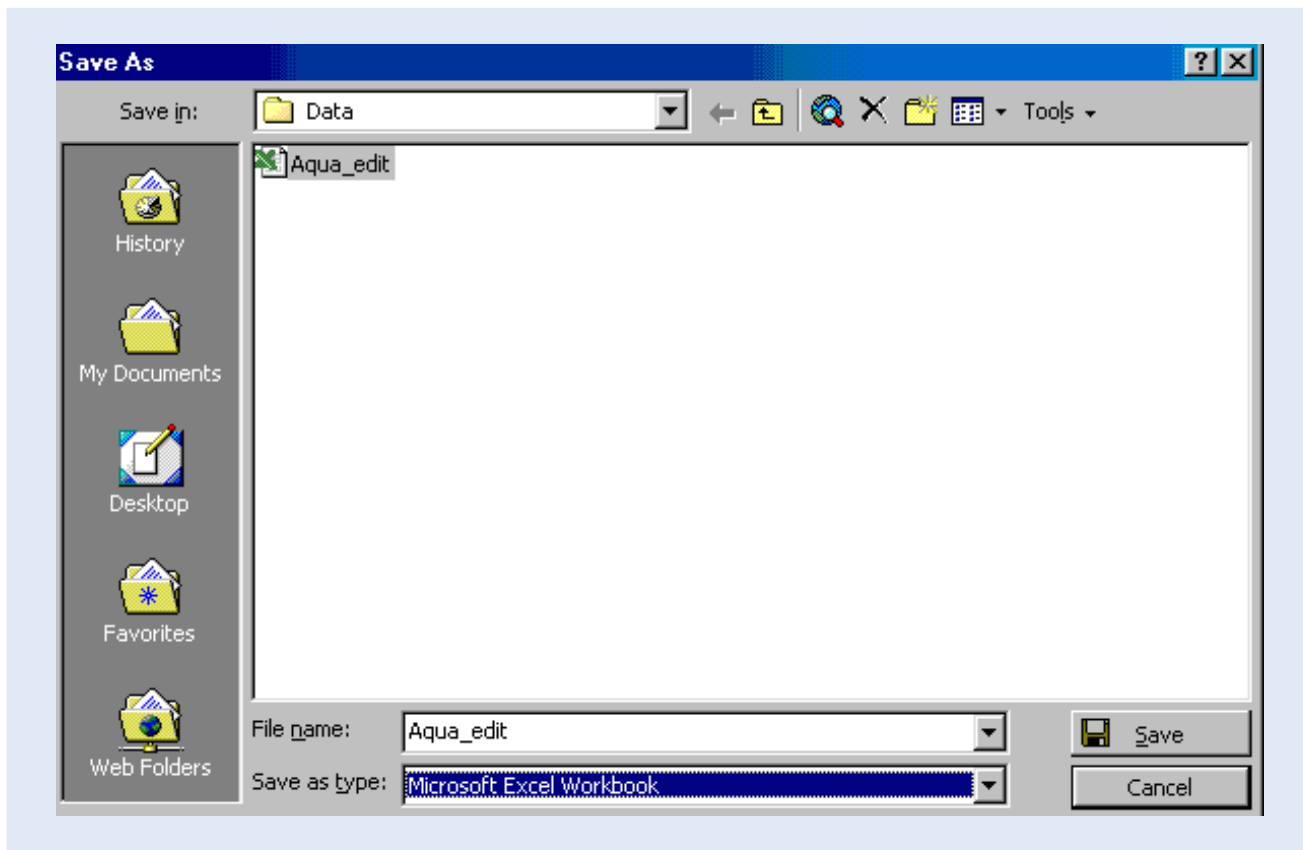
This file can now be edited as required and can easily be imported in MS Access databases.

Step 10: Open the newly saved "Aqua_edit" file, select column C by clicking on "C", then click the right mouse button by putting the cursor anywhere on column C and select "Delete" to delete the column C which contains water temperature data.
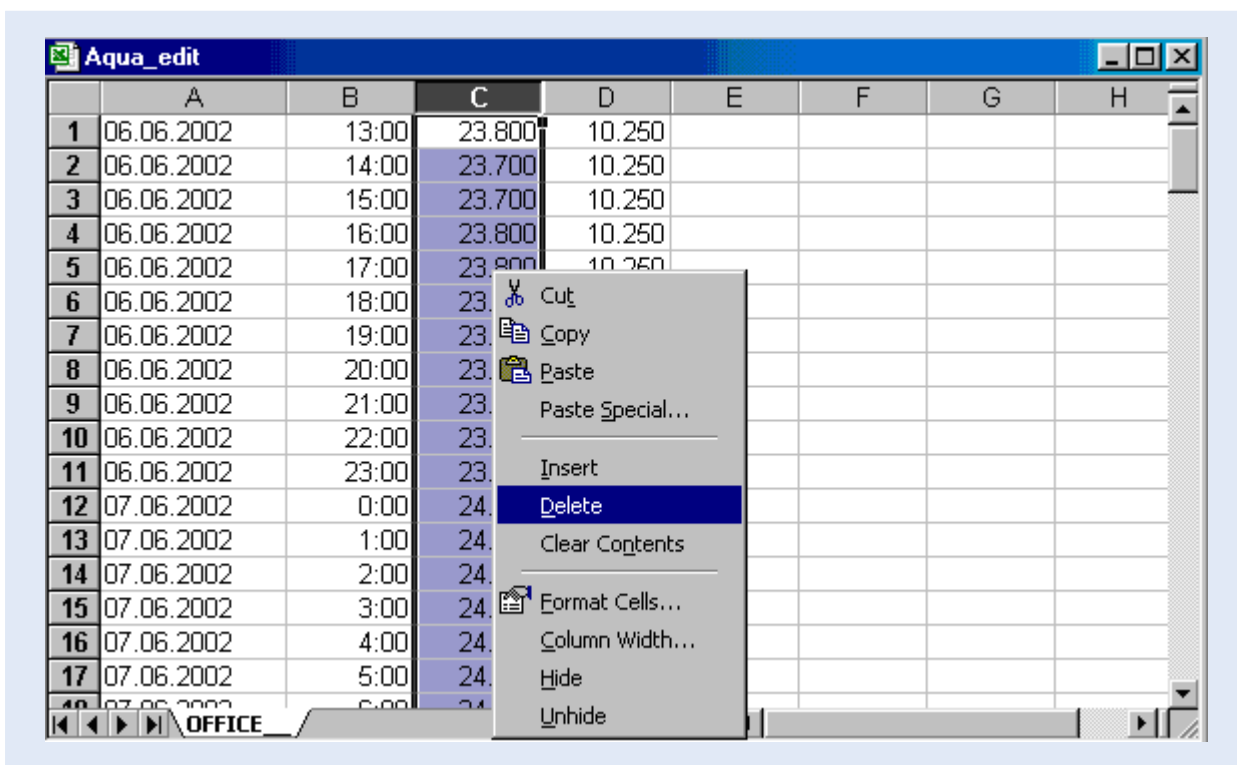
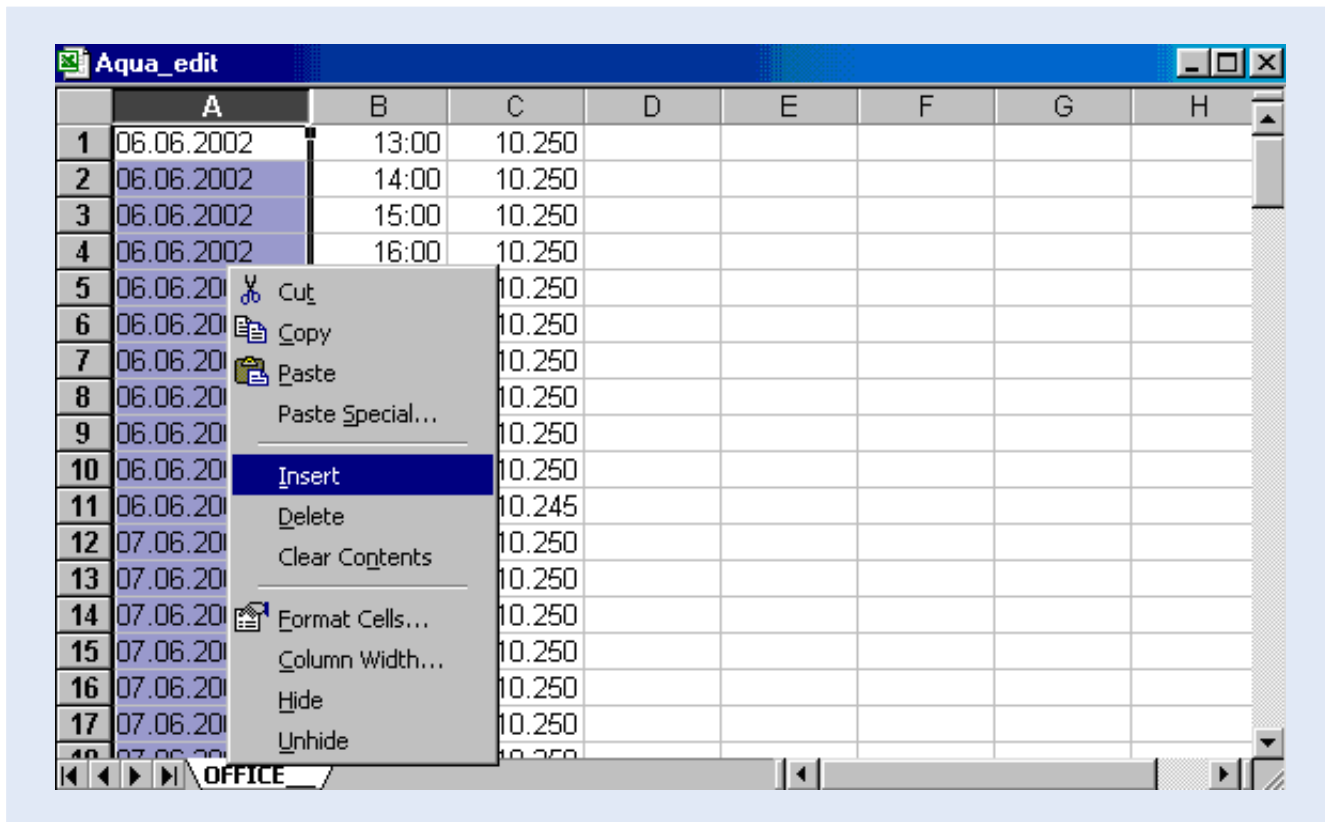Now create a new column at the left-most corner, which would contain the Station ID (code of the station from where the data has been recorded and retrieved). To do this, select column A, right click anywhere in column A and select "Insert". A new column will be created. This is shown below:

Enter the Station ID/Code in the first cell of this column and copy it to the required number of cells by selecting the first cell and dragging from the bottom right of the cell upto the last one required as shown below:
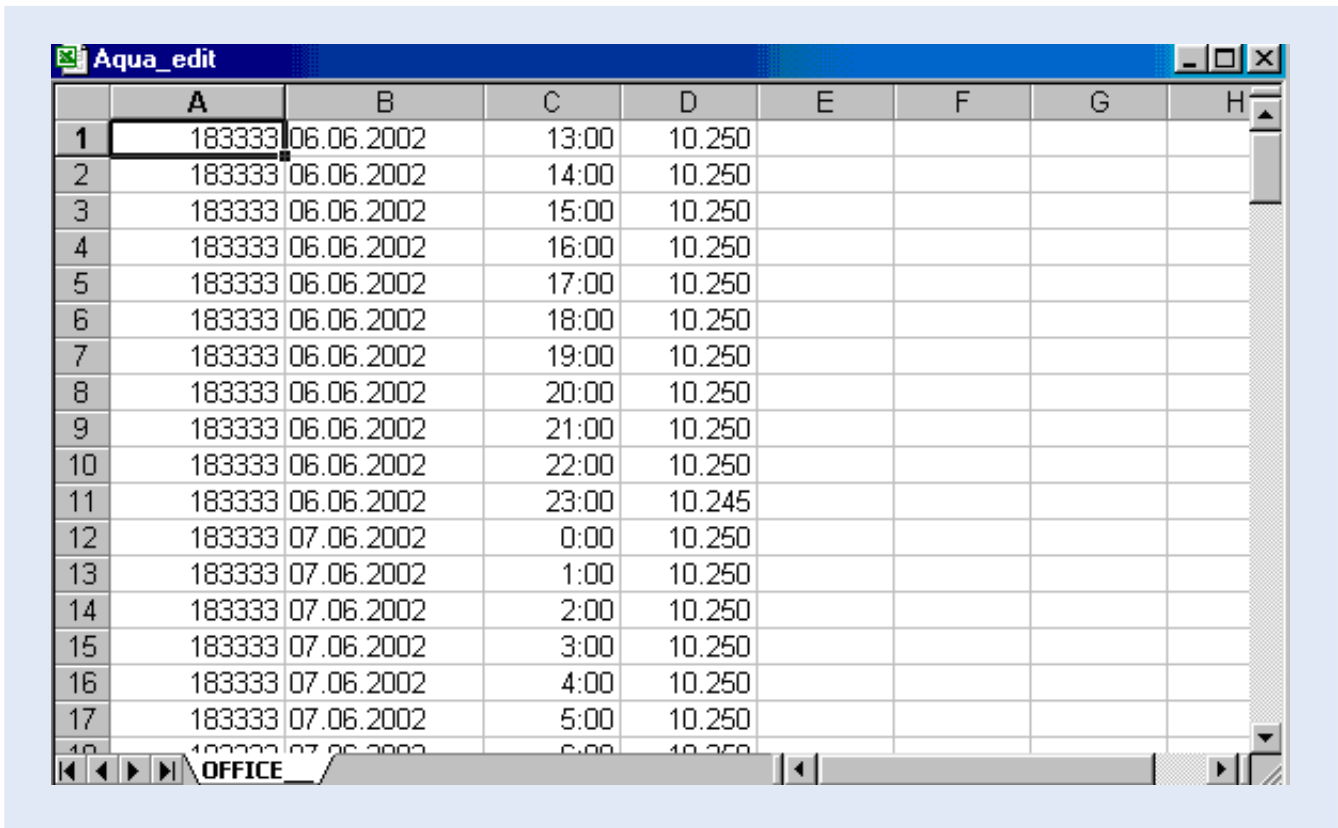
The data file has now been edited and is ready to be imported in MS Access database.

2.4   Maintenance

Aquanaut does not need regular maintenance once it is installed, however, the following safety measures should be taken all the time:

- Do not touch the plug contacts or the sensor surface with pointed or metal objects.
- Since it is a precision instrument, handle it carefully.
- The dataloggers are provided with built-in batteries. This is sufficient for about two million measurements, which means a sample interval of 3 minutes and a battery service life of about 10 years. Once the battery is expires/exhausts, the instrument has to be returned to the supplier for a battery change.
- The instrument may be damaged if the instrument shell is opened. So do not open the instrument shell otherwise the guarantee will expire.

Operating Aquanaut Using HT-525 Readout Device

3.1   General

The datalogger can also be programmed and the required parameters properly set using the HT-525 readout device. Because of the size and data storage capacity, the device makes operation of the Aquanaut easier than using a PC while in the field. Detailed explanation of how to operate Aquanaut using the HT-525 readout device has been explained in the following sections:

3.2   Operating HT-525 Readout Device and Checking the Battery Level

As shown in figure 5, the device has a keyboard and a small screen. By pressing the start key "-Ein-", the main menu shows the following menus on the screen:

- Battery status bar
- BACK TO DOS
- START DATALOGGER
- PC TRANSFER

The HT-525 device can be started and operated in one of the three levels with three different passwords i.e. Level 1 has a password of 10000, Level 2 has a password of 20000 and Level 3 has a password of 30000. So far Level 2 with password 20000 has been found best where one can change the operating parameters of the datalogger during programming of the datalogger. The battery status bar shows the current status of the batter. A fully charged battery will have a full black bar. Only the START DATALOGGER AND PC TRANSFER commands are of the interest here. START DATALOGGER option is used while programming the datalogger and downloading data from the datalogger to the HT-525 device. PC TRANSFER option is used when the downloaded data is transferred from HT-525 device to PC. Always ignore BACK TO DOS command from the main menu.

Display unit

Charger

Keyboard

Cursor direction keys
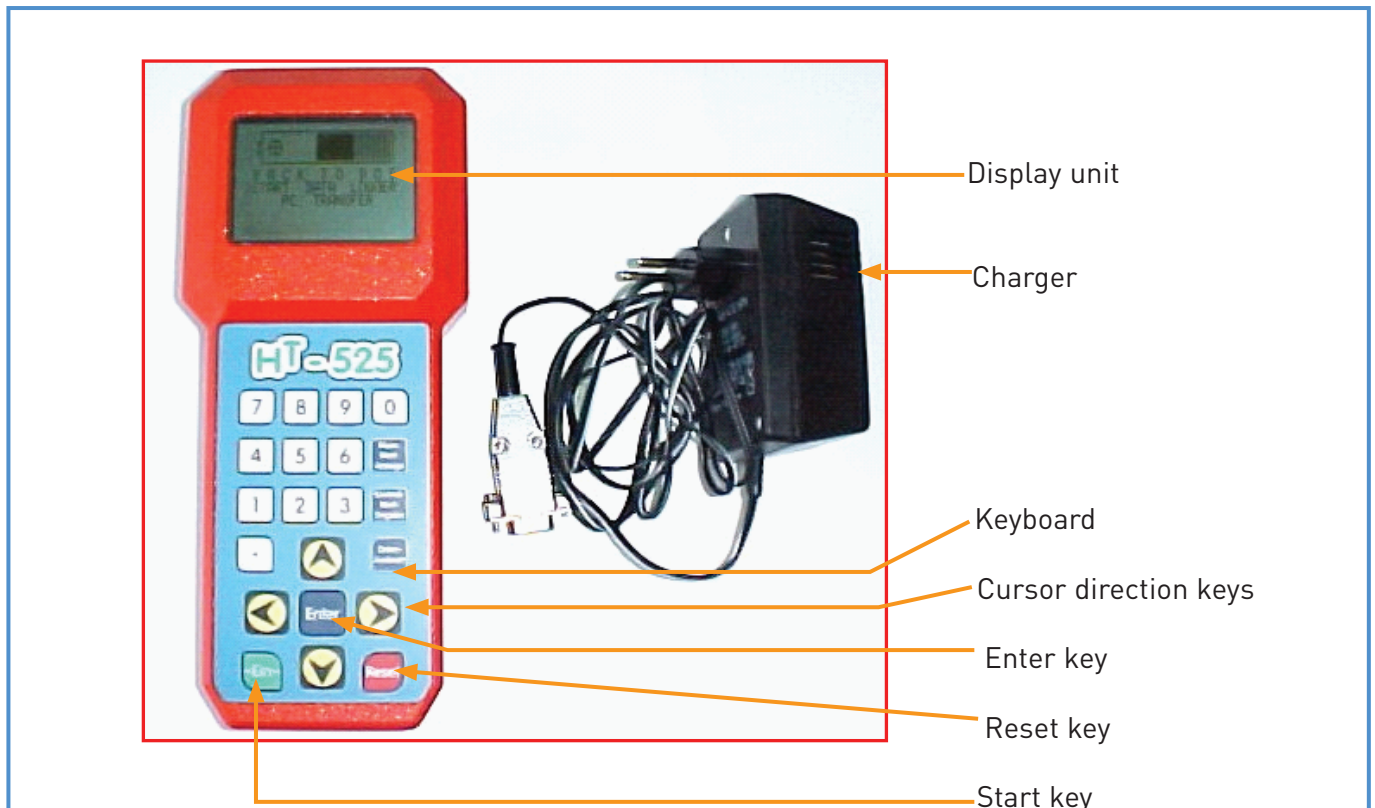
Enter key

Reset key

Start key

Figure 5: HT-525 readout device

The cursor ">" among the main menu fields is moved by the direction keys and selected by the "Enter" key.

Note: The device has an in-built battery that is charged from the mains by using the supplied charger. It is always advised to fully charge the device for use in the field.

While operating the device, the screen display goes off after each 30 seconds if a key is not pressed. Press start key i.e. "-Ein-" key to make the display active.

Like any other computer, the readout device is stuck some times and needs to be restarted. To restart, follow the following instructions:
-press "Restart" button once
-press "Enter" key twice
-press "1"
-press "0" and then wait.
The device will go through its boot system and the main menu will appear.

3.2.1 Programming the Datalogger

Step 1: Connect the HT-525 readout device to the data logger using the provided serial cable and press start key on the keyboard. Bring the curser to select "START DATA LOGGER" with the help of the up and down direction keys and press "Enter". Enter pass code as 20000, write the user name and enter. Writing a user name requires the cursor to be moved within the given script and then entering the required alphabet. When finished with writing the user name,

press enter. A sub window/menu appears as follows:

- DISPLAY STATUS BOARD
- SET CALIBRATION VAL.
- SHOW CURRENT SAMPLES
- TRANSFER DATA
- * ACQUISITION MODE *
- BACK TO DOS
- ENTER DATE / TIME
- ENTER SAMPLE TIME
- MEASUREMENT LOCATION
- ADJUSTING TO M.S.L.
- STOP ACQUISITION

Since all of the above commands cannot be seen on the screen at a time, press the right direction key to see the remaining commands.

Step 2: Point the cursor to "SET CALIBRATION VAL." and press "Enter". Next enter the present gauge reading e.g. 10.250a; and press "Enter" again. Go back to the MENU by selecting it and then pressing the "Enter" key. Now press the right direction key, select "ENTER DATE / TIME" and press "Enter". The following will appear:

DD	MM	YY		HH	MM	SS	e.g.
05	08	02		12	30	30	

Write the present date and time and then press "Enter". Select MENU and "Enter" to go back to the menu.

Now select "ENTER SAMPLE TIME" and press "Enter" key. Write the date and the time from when the datalogger should start recording the new data. After entering the sample time, another window will appear asking for the sample interval. Enter the time interval for the data recording. For example for hourly data enter the sample interval as "01 00" and press "Enter". Another window with the name "Transfer Time" will appear instructing the user to

retrieve the new data before that future date and time otherwise the datalogger will start deleting the oldest data replacing it with the most recent data. In other words, at this date and time the datalogger storage memory will be full. Now "Enter" to go to the menu.

Now select "ADJUSTING TO M.S.L." and press "Enter". Write 0.000 and press "Enter" key. The HT-525 now starts beeping and shows the recent water column and water temperature. Now press "Enter" again, the resulting window will ask again for the CALIBRATION VALUE. Write the present gauge reading i.e. 10.250a and press "Enter" key. The resulting window is now showing the actual result i.e.:

"PIPE TOP" = 0.000mMSL
CAL. VALUE: 10.250m
LEVEL: 10.250 mMSL

Press the right direction key to view the Water column above the pressure probe and the probe position. Press "Enter" to go to the MENU.

Now point the cursor to "MEASUREMENT LOCATION" and enter a name for the location of the station. This should be the station name. The data file, which will be retrieved later from the datalogger, will have the same name.

All the parameters are now set properly but the datalogger has not yet started recording. For this purpose, point the cursor to "*ACQUISITION MODE *" and press "Enter" key. The resulting window is now showing the present water level, water column, water temperature and the datalogger battery capacity.

The datalogger has now been programmed successfully and has started recording data on hourly basis. Select "BACK TO DOS" command and press "Enter" to go to the main menu and disconnect the cable.

3.2.2   Downloading Data from Datalogger to HT-525

Step 3: Connect the HT-525 readout device to the data logger using the provided serial cable and press start key i.e. "–Ein-" on the keyboard. Bring the curser to select "START DATA LOGGER" with the help of the up and down direction keys and press "Enter". Enter pass code as 20000. When finished with writing the user name, press enter. A sub window/menu appears as shown in paragraph 3.2.1 step 1.

Step 4:   Select "TRANSFER DATA" from the sub-menu. Again select "TRANSFER DATA" from the resulting window and press "Enter". The transfer of data from the datalogger to HT-525 will start with a progress bar on the screen. If the data download is successful, a message "DATA HAS BEEN TRANSFERRED SUCCESSFULLY" will appear on the screen. HT-525 now contains the new data file and is ready for transfer to PC.

3.2.3   Data Transfer from HT-525 to PC

Step 5: Connect HT-525 to PC COM port via the supplied serial cable and click on the HT-525 Transfer software to open. The software on the PC screen will look like this:
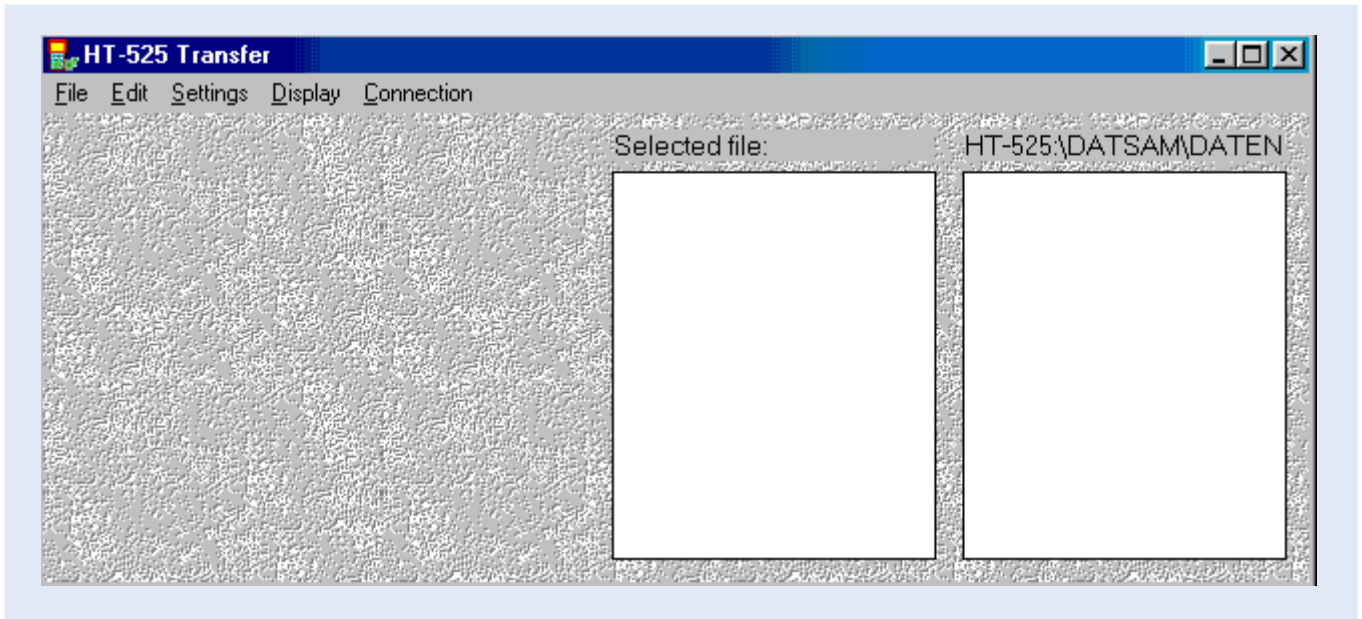
Now start the HT-525 readout device, select "PC TRANSFER" and "Enter". When "Bereit..." appears on the screen, click "Establish" from the "Connection" main menu of the above window on the PC. If the connection is successful, the above window will be changed like the one given below. If the connection fails then check the COM port, which is checked by clicking the "COM Port" from the "Connection" main menu. In most cases it is COM1, otherwise change it to "COM2". Baud rate is adjusted automatically.
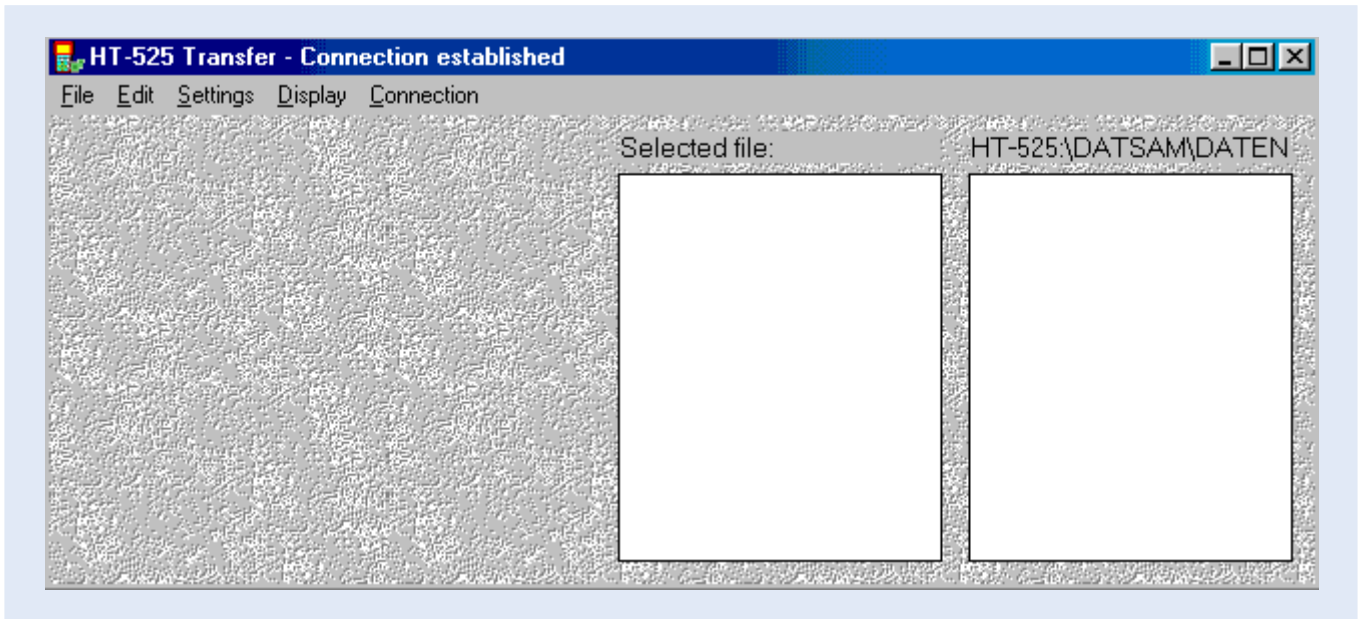
Select "Format" from the "Settings" main menu, a window appears as follows:
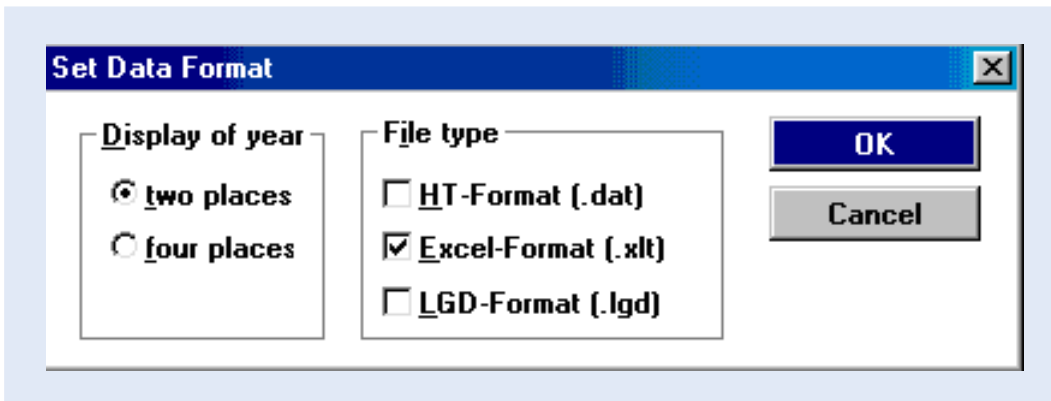
Select the "two places" and "Excel-Format [.xlt]" and click OK. This is to enable the PC to get the data file in Excel format.

Step 6: Now click on "File" then "Select" and then "Select files to receive" as shown in the following window;
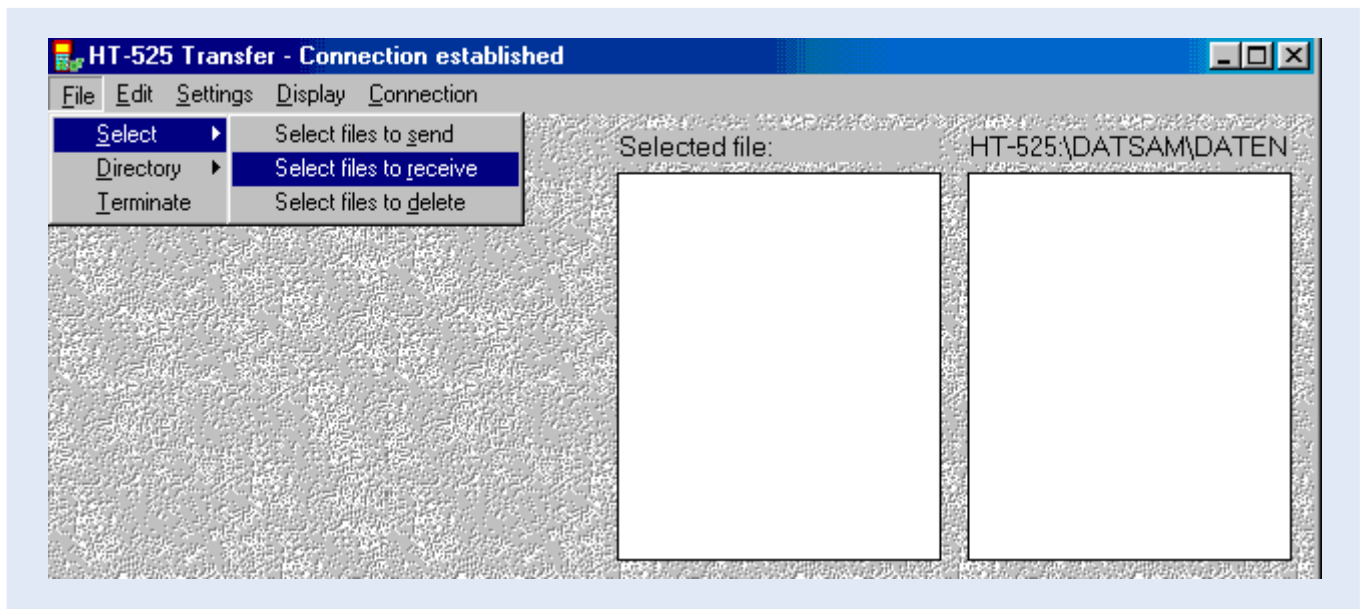
All the previous and new files stored in HT-525 will appear on the right side of the window. Select the new files with extensions .TXT and .DAT and click on "Receive" of the "Edit" main menu as shown.
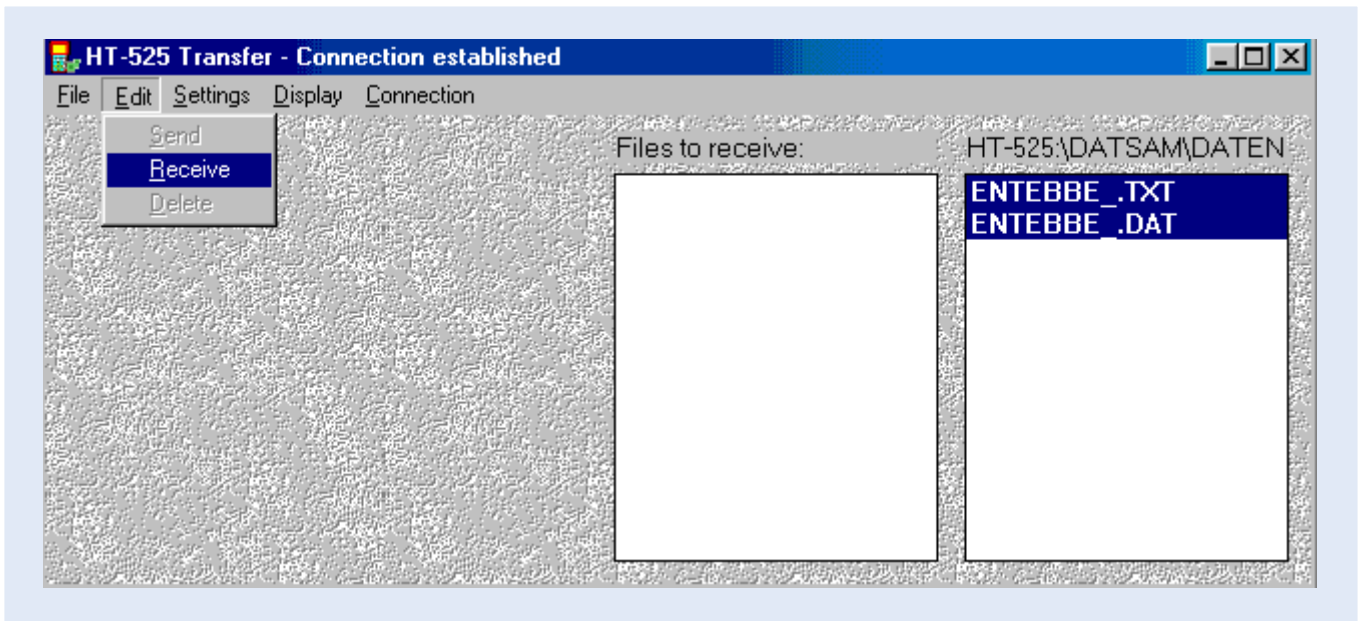
Another window will appear, showing the selected path for the files in the PC. The selected path C:\htlogger\data is a default path and by clicking OK , the new data files will be automatically transferred from HT-525 to PC. This is shown in the following window:
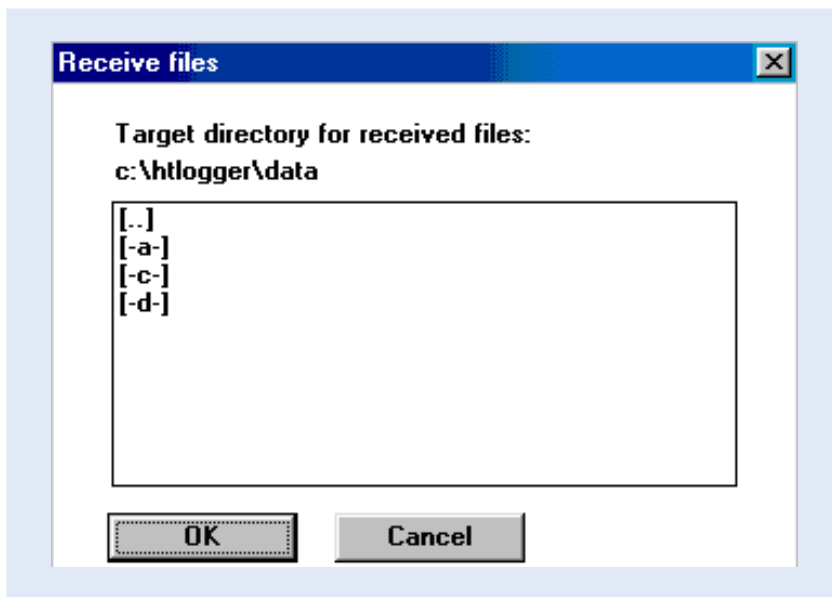
When the data transfer is complete, the following window will appear:

Another window will appear, showing the selected path for the files in the PC. The selected path C:\htlogger\data is a default path and by clicking OK , the new data files will be automatically transferred from HT-525 to PC. This is
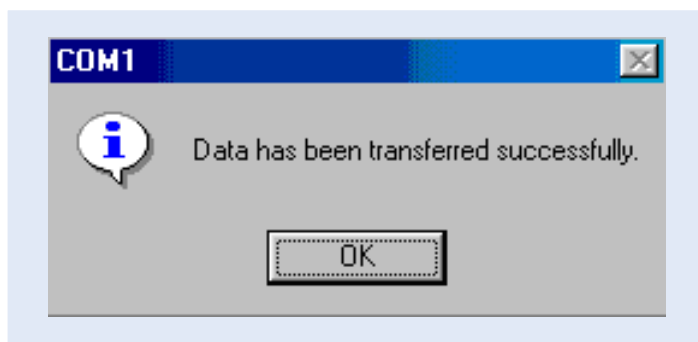
The data file is now stored in the C:\htlogger\data folder and is in Excel format. Double click on the file name to open and view the new transferred data file. Remember that the folder "Data" now contains two files with the same name, one with the "XLT" extension which contains the actual water level data and another with .TXT which contains the Status Board and the Logbook. The data file, when opened, is shown as follows:

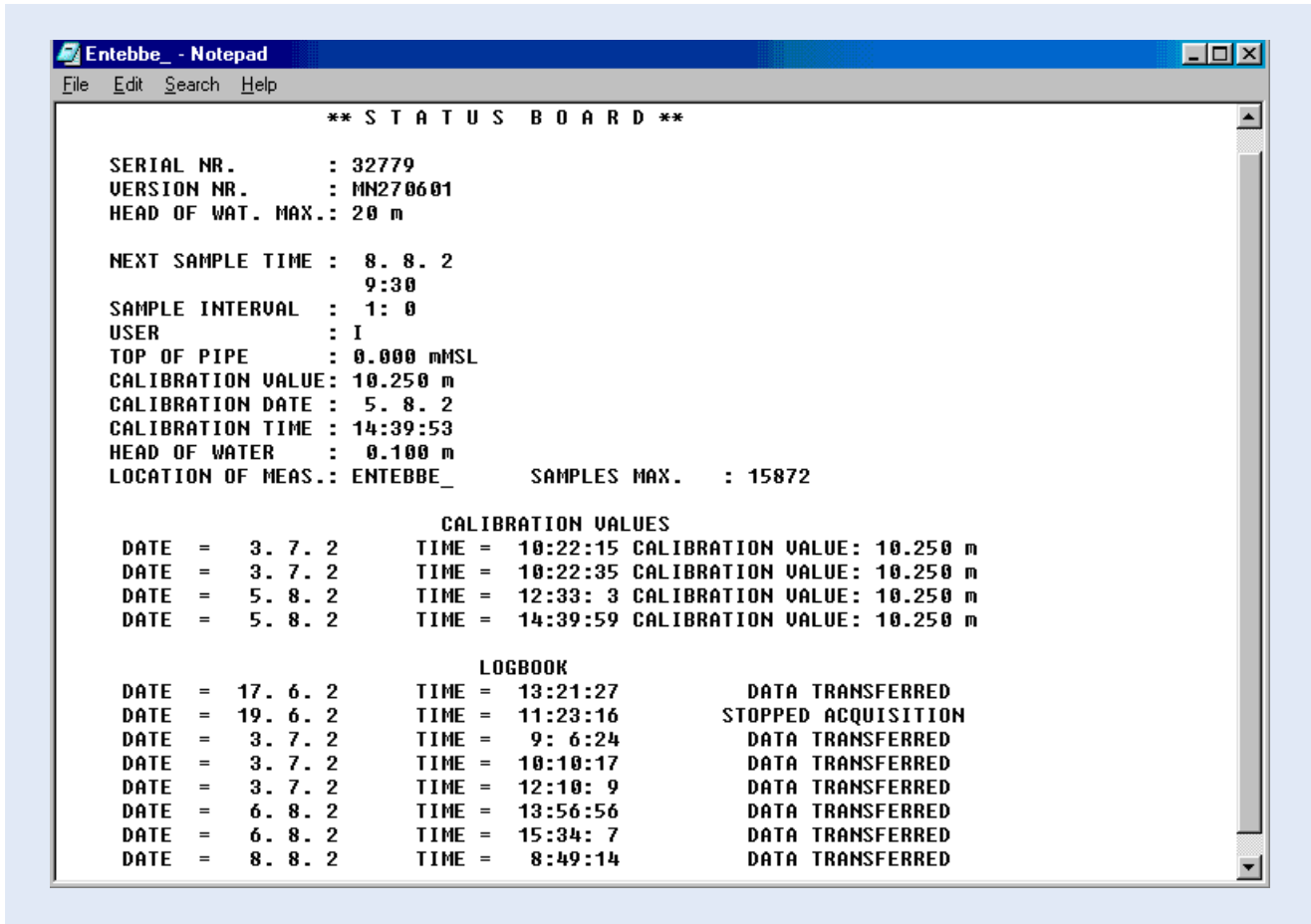|	A	B	C	D	E	F
1	06.08.2002	16:30:00	22,8	10,245		
2	06.08.2002	17:30:00	22,8	10,245		
3	06.08.2002	18:30:00	22,8	10,245		
4	06.08.2002	19:30:00	22,9	10,245		
5	06.08.2002	20:30:00	23,0	10,245		
6	06.08.2002	21:30:00	23,0	10,245		
7	06.08.2002	22:30:00	23,1	10,245		
8	06.08.2002	23:30:00	23,2	10,240		
9	07.08.2002	0:30:00	23,2	10,240		
10	07.08.2002	1:30:00	23,2	10,240		
11	07.08.2002	2:30:00	23,2	10,245		
12	07.08.2002	3:30:00	23,2	10,240		
13	07.08.2002	4:30:00	23,2	10,240		
14	07.08.2002	5:30:00	23,1	10,245		
15	07.08.2002	6:30:00	23,1	10,245		
16	07.08.2002	7:30:00	23,1	10,240		
17	07.08.2002	8:30:00	23,0	10,245		
18	07.08.2002	9:30:00	23,0	10,245		

Entebbe_ [Read-Only] — ENTEBBE_

First column contains date, second column contains time (hourly), third column contains water temperature data and the forth column contains water level data. This data file can be edited as needed and is explained in section 2.3.3 of chapter 2.

The text file containing the Status Board and the Logbook is shown below:

```
Entebbe_ - Notepad                                                    _ □ ×
File   Edit   Search   Help
                  ** S T A T U S   B O A R D **

   SERIAL NR.        : 32779
   VERSION NR.       : MN270601
   HEAD OF WAT. MAX.: 20 m

   NEXT SAMPLE TIME :  8. 8. 2
                          9:30
   SAMPLE INTERVAL  :  1: 0
   USER             : I
   TOP OF PIPE      : 0.000 mMSL
   CALIBRATION VALUE: 10.250 m
   CALIBRATION DATE :  5. 8. 2
   CALIBRATION TIME : 14:39:53
   HEAD OF WATER    :  0.100 m
   LOCATION OF MEAS.: ENTEBBE_        SAMPLES MAX.   : 15872

                         CALIBRATION VALUES
      DATE  =    3. 7. 2     TIME =  10:22:15 CALIBRATION VALUE: 10.250 m
      DATE  =    3. 7. 2     TIME =  10:22:35 CALIBRATION VALUE: 10.250 m
      DATE  =    5. 8. 2     TIME =  12:33: 3 CALIBRATION VALUE: 10.250 m
      DATE  =    5. 8. 2     TIME =  14:39:59 CALIBRATION VALUE: 10.250 m

                            LOGBOOK
      DATE  =   17. 6. 2     TIME =  13:21:27        DATA TRANSFERRED
      DATE  =   19. 6. 2     TIME =  11:23:16      STOPPED ACQUISITION
      DATE  =    3. 7. 2     TIME =   9: 6:24        DATA TRANSFERRED
      DATE  =    3. 7. 2     TIME =  10:10:17        DATA TRANSFERRED
      DATE  =    3. 7. 2     TIME =  12:10: 9        DATA TRANSFERRED
      DATE  =    6. 8. 2     TIME =  13:56:56        DATA TRANSFERRED
      DATE  =    6. 8. 2     TIME =  15:34: 7        DATA TRANSFERRED
      DATE  =    8. 8. 2     TIME =   8:49:14        DATA TRANSFERRED
```

Apart from this there is a third file with the name "temp" which contains water temperature data. This file can be deleted, if not needed. All these three files are updated at each data transfer exercise. The new water level data is also appended to the data of the same file.

These files can be seen in the windows explorer as follows:
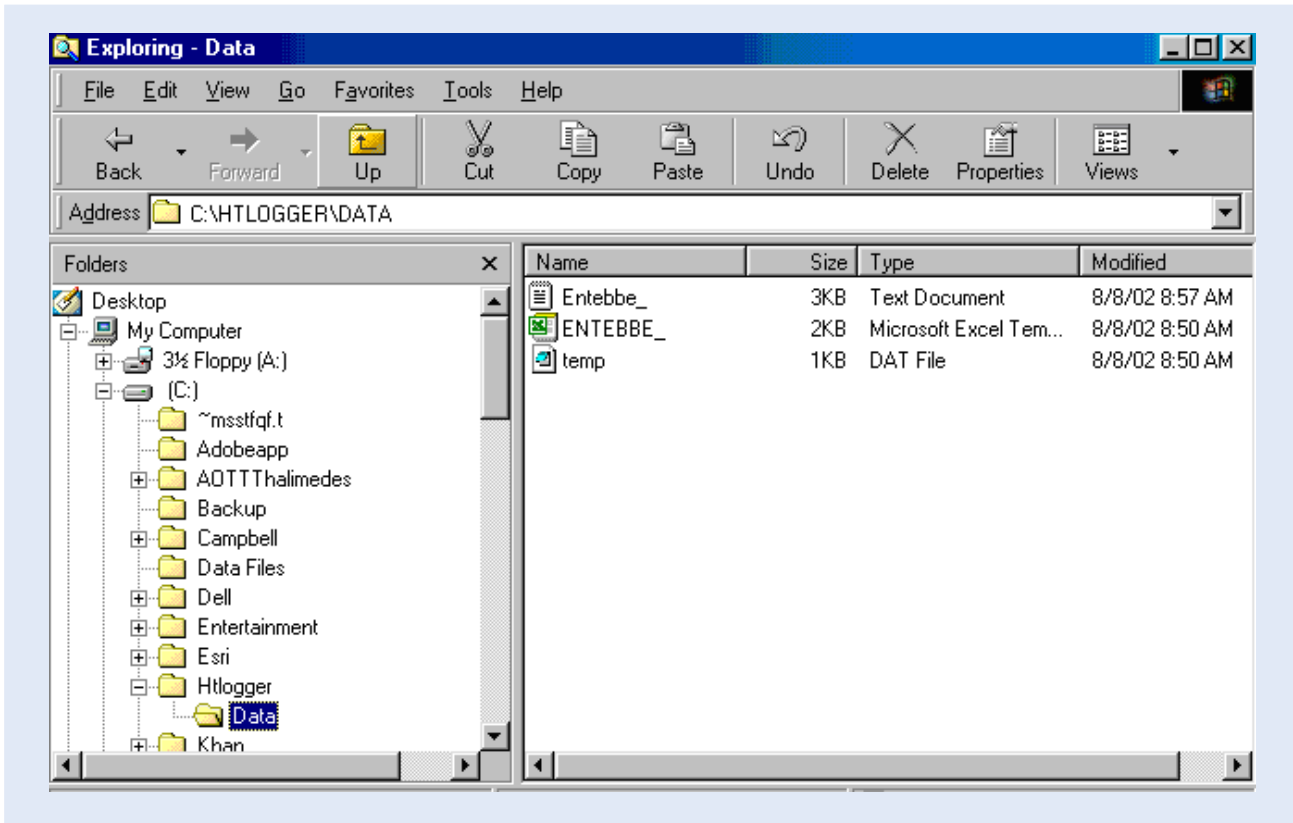
3.2.4 Deleting Old Data Files from HT-525

It is important to delete data files from HT-525, after these have been transferred to PC, before going to the field for collecting new data files from the data loggers to HT-525. To delete old data files from HT-525, follow the instructions below:

 Step 7: Select "File" from the main menu of the software, then "Select" and then "Select files to delete" as shown in the window below.
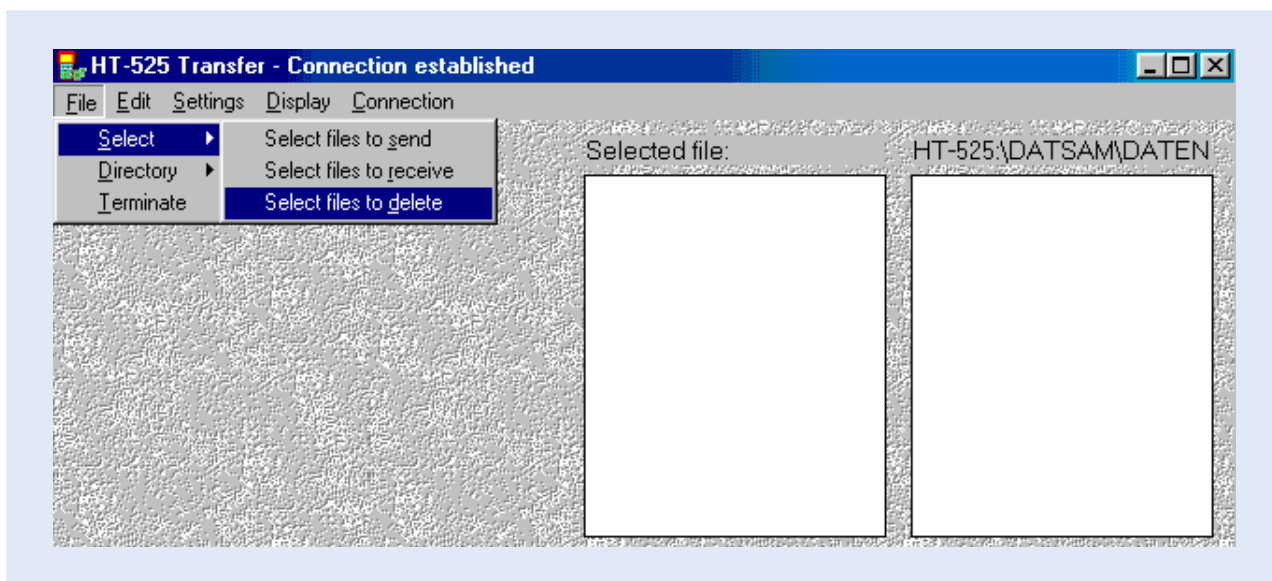
The list of data files that are stored on HT-525 readout device will appear on the right side of the window. Select these files, click on "Edit" from the main menu and then click on "Delete". This has been shown in the window below:
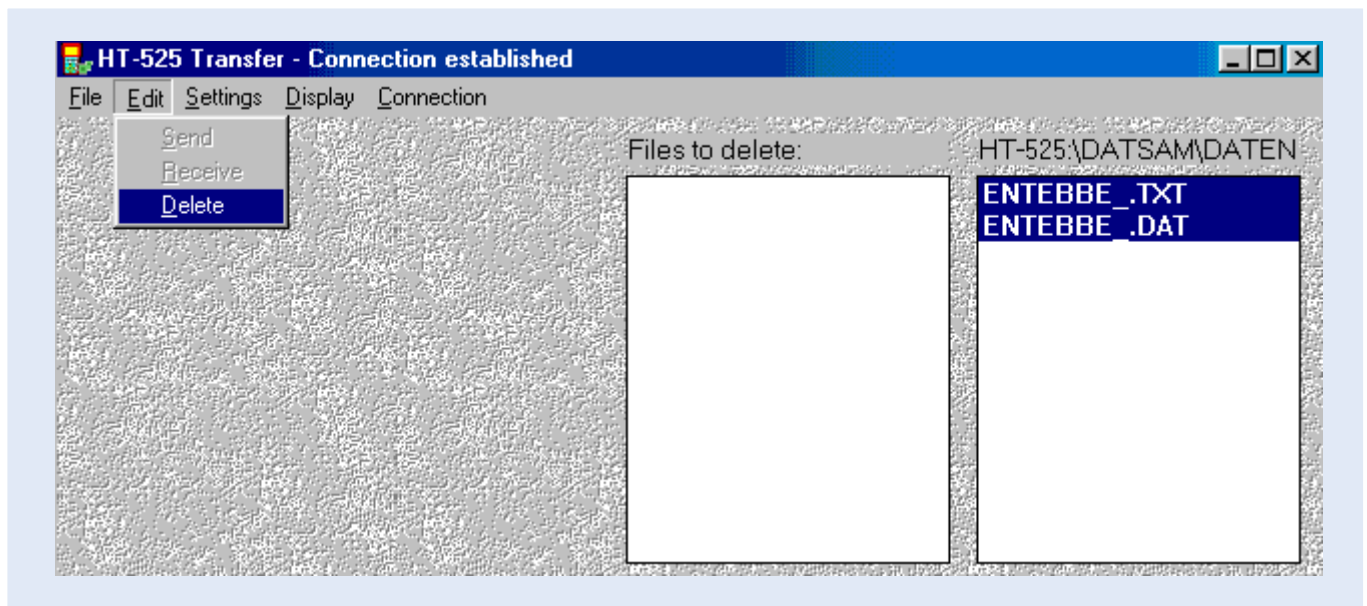
After performing the above action, another window appears asking for confirmation if these data files need to be deleted. Click on "Yes" to delete the selected files from HT-525 readout device.
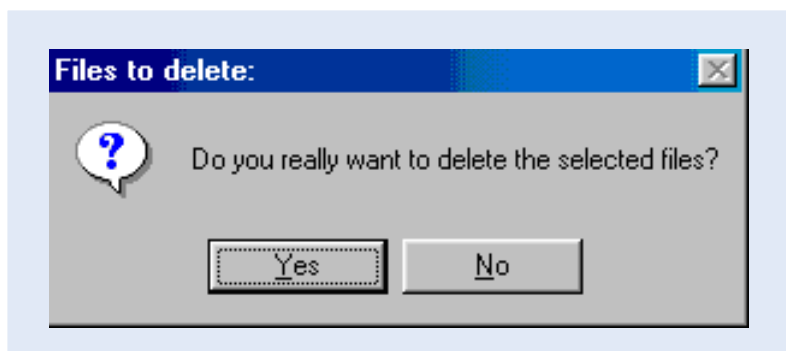
After selecting "Yes" the data has now been deleted and the HT-525 device is now ready for field use and data storage.

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

4.1   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 data obtained from the Aquanaut in MS Excel format 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 and Aquanaut 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 edited MS Excel files (as described in chapter 3 of this document) into MS Access and restructuring them into a final NBD format.

   Figure 4 shows the remaining part of the data trajectory, i.e. the preprocessing actions in MS Access.

<div style="border:1px solid #2e74b5; padding:10px; text-align:center;">
Import the edited MS Excel data file into auxiliary table in MS Access database called "NBD_PreProcessing"
</div>

<div style="border:1px solid #2e74b5; padding:10px; text-align:center;">
Run pre-defined MS Access query for final data processing

The results are automatically stored into the final NBD data table in standard format
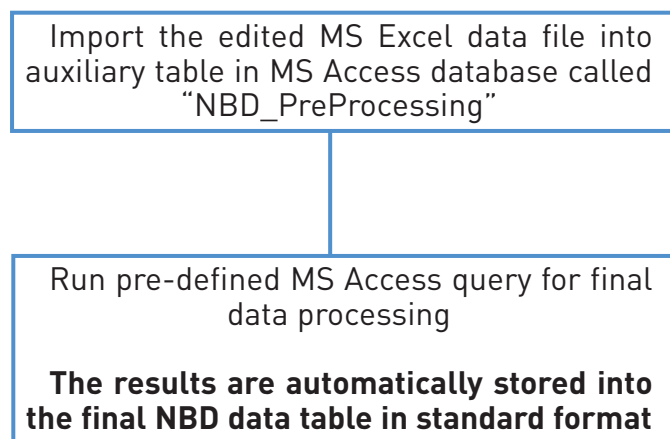</div>

Figure 4: Final data processing steps in MS Access

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

4.2   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 and this file structure is required 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 are created for processing data obtained from:
1.   Automatic Weather Stations (Campbell Scientific, USA)
2.   Thalimedes Automatic Water Level Recording Stations (OTT-Hydrometrie, Germany)
3.   Aquanaut Automatic Water Level Recording Stations (OTT-Hydrometrie)

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.

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 "Aqua_edit" MS Excel file.
Group 2			
3.1	Hydro_Hourly_Aqua	Query	A pre-defined query used to process data from the respective auxiliary table "Hydro_Hourly_Aqua" in order to generate records in the NBD format, and to automatically append/store such records in the NBD table "AWLRS Hourly Water Levels"

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 Tanzania.mdb – for data observed at the automatic meteorological and automatic water level recording stations in Tanzania (The project aims to establish more stations in Tanzania).
•   C:\MyDbase\NBD\Daily Hydro-Meteorological Data\Daily Runoff Sudan.mdb – for data observed at the automatic meteorological and automatic water level recording stations in Sudan (the project aims to establish such stations in Sudan).

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.

## 4.3   Importing Edited Excel Data Files into MS Access
This paragraph describes procedures for importing the edited MS Excel data file "Aqua_edit" into MS Access file "NBD_Pre Processing.mdb".

Step 1: Open the MS Access file "NBD_Pre Processing.mdb"; consult paragraph 3.2 above to locate the appropriate folder/directory path of the file, which is country-dependent. In table view, the following database window appears:
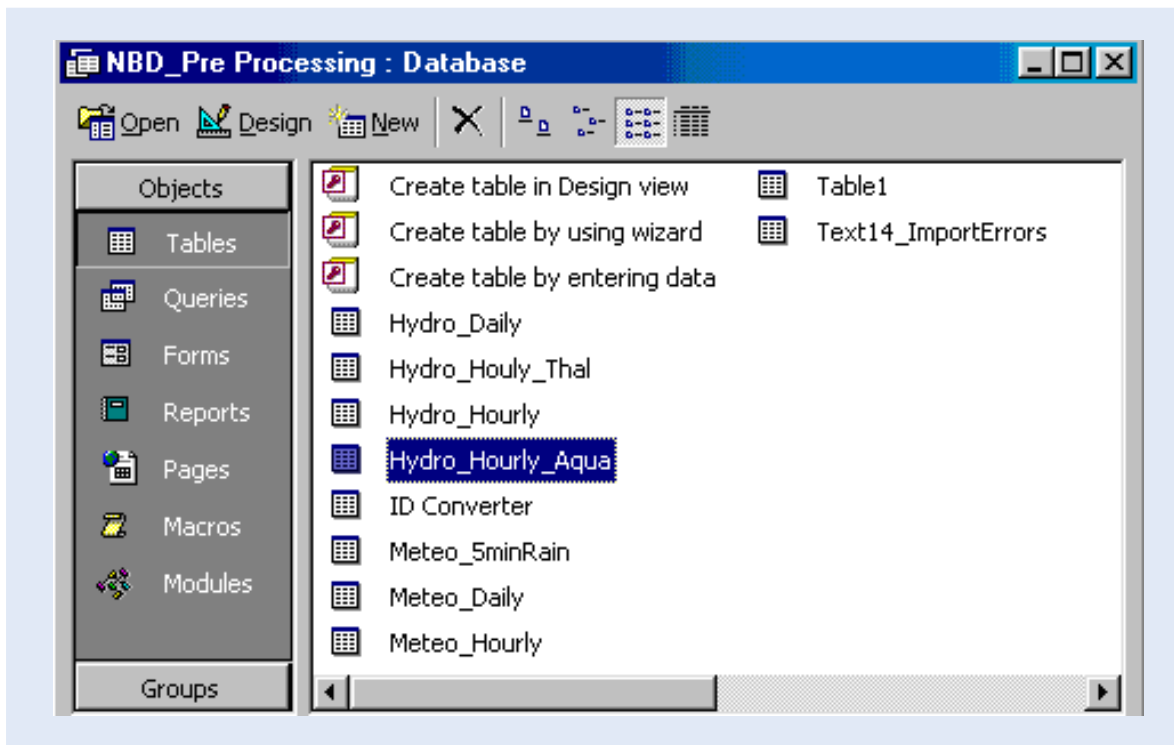
The above view shows, among others, a pre-defined auxiliary table "Hydro_Hourly_Aqua" where to import the edited Excel data files obtained from Aquanaut AWLR. The other auxiliary tables have been created previously where to import text data files obtained from another kind of automatic water level recording stations and automatic weather stations.

Step 2: Highlight the auxiliary table "Hydro_Hourly_Aqua" and click "Open". The results is illustrated in the following screen:
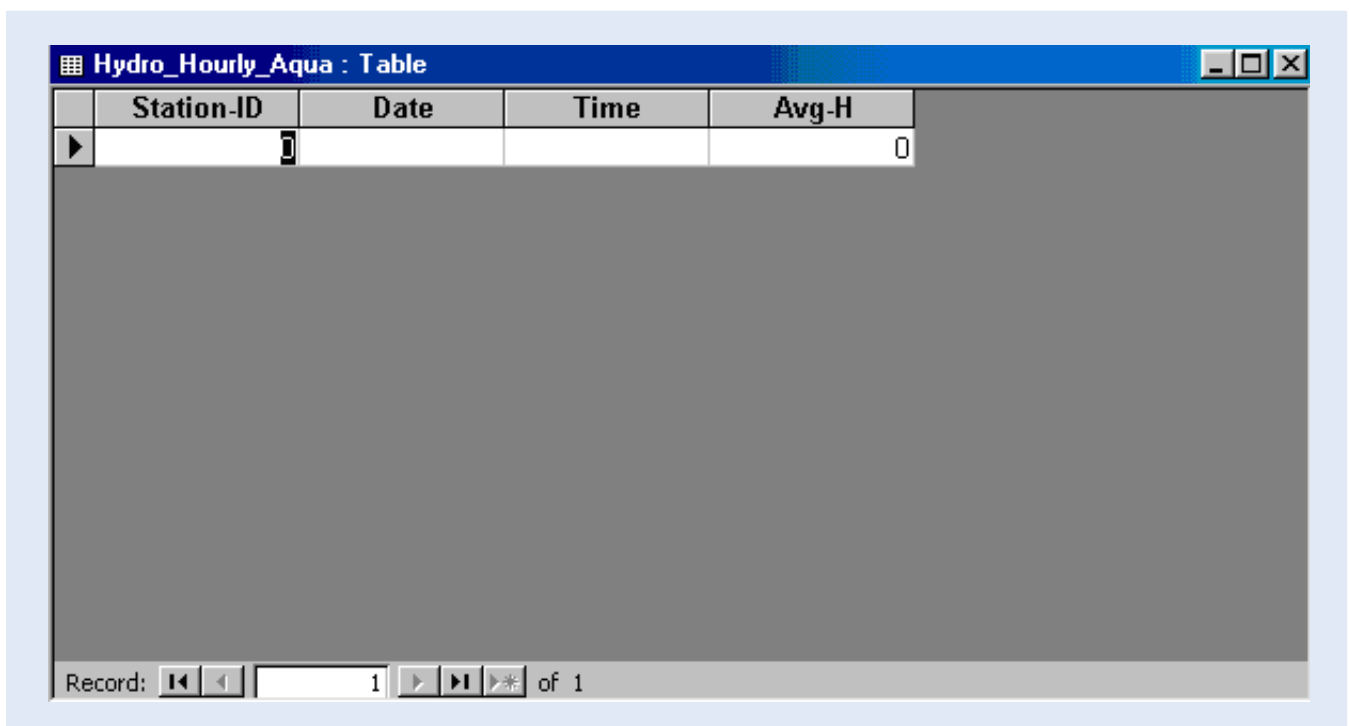
The table at present has no data. Most probably the "Hydro_Hourly_Aqua" table will contain some old data from a previous transfer exercise. If so, delete this old data by clicking "Select All Records" in the Edit menu and then by choosing "Delete Records" from the Edit menu. Although primary key setting in the final NBD tables do 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.
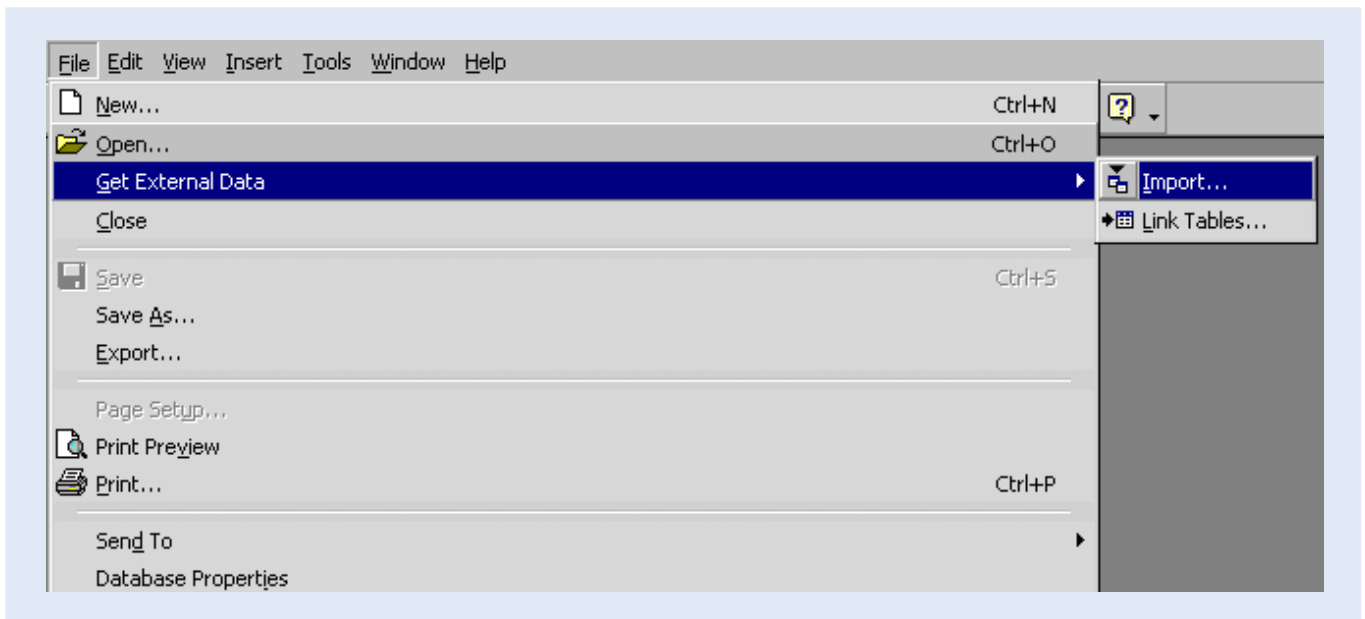

Step 5: In the subsequent window, navigate to the folder from where to import the concerned edited Excel data file i.e. "Aqua_edit". Use the appropriate Windows Explorer operations. If the recommended directory structure is used, "Aqua_edit" is stored in folder C:\Htlogger\Data. Make sure the "Files of type" (box below-left) is set to Microsoft Excel. The resulting screen is depicted below:
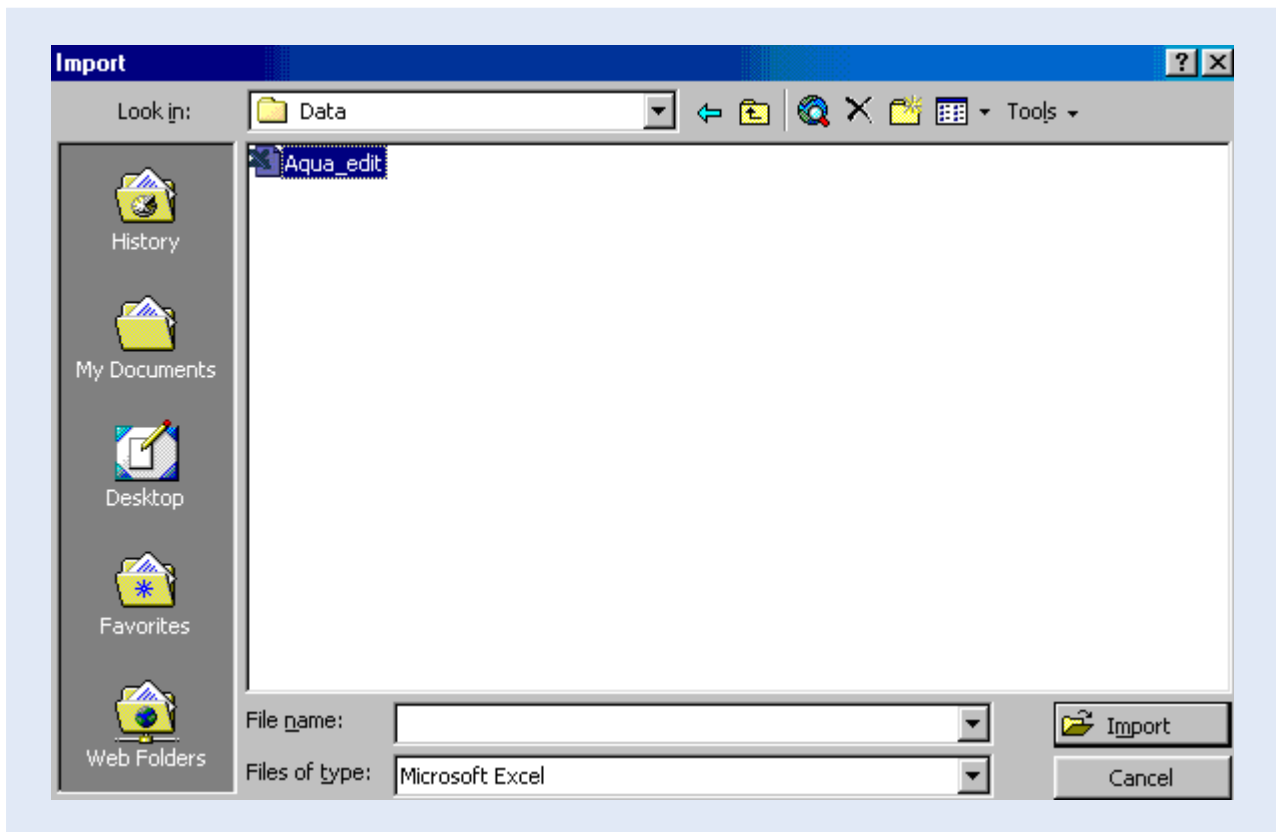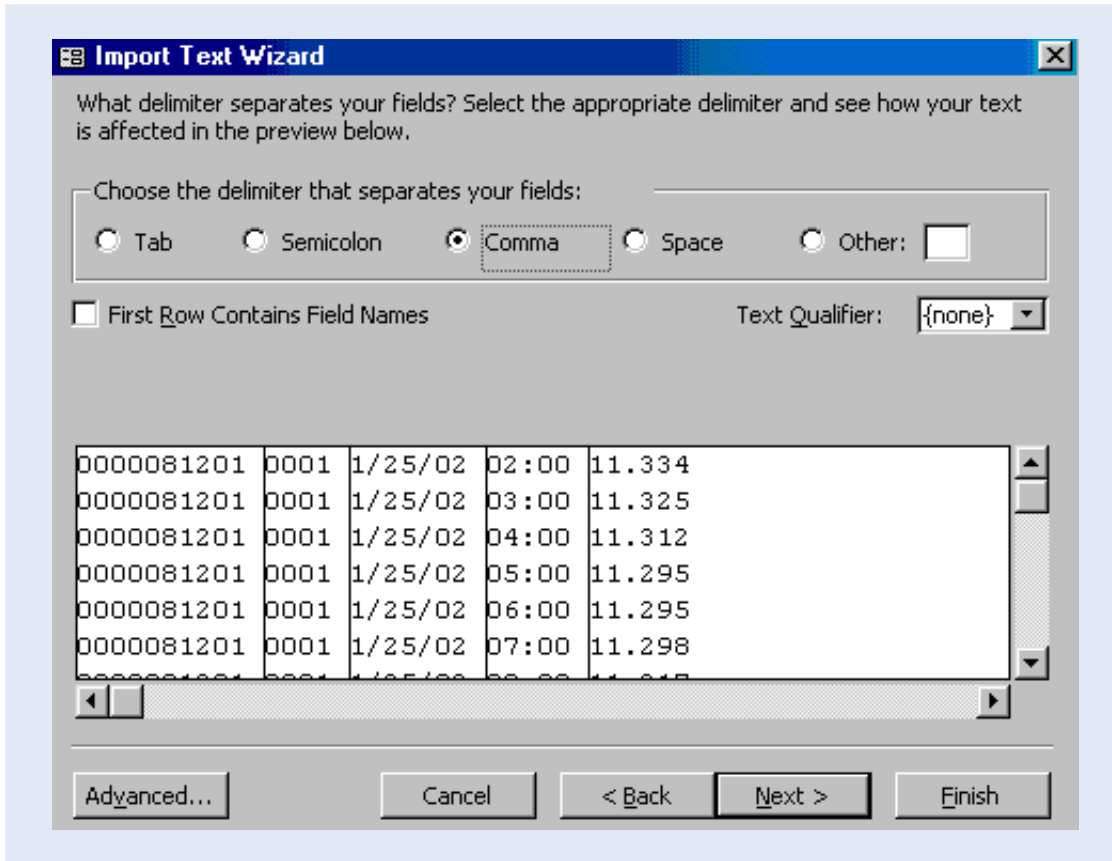
Step 6: Click "Import".

The following "Import Text Wizard" pops up.
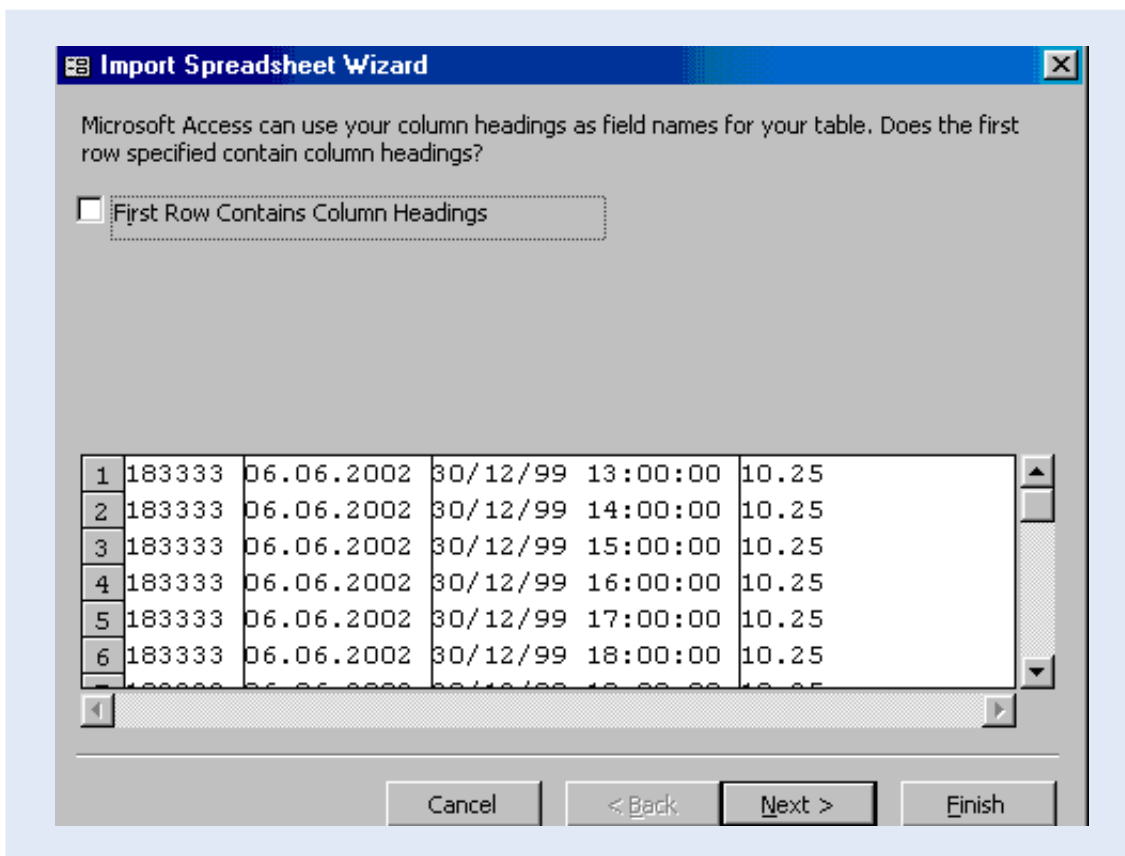
Do not select the check box as the table in which we are going to import the Excel data contains the headings. Select "Next"

Step 8: 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 9: 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.
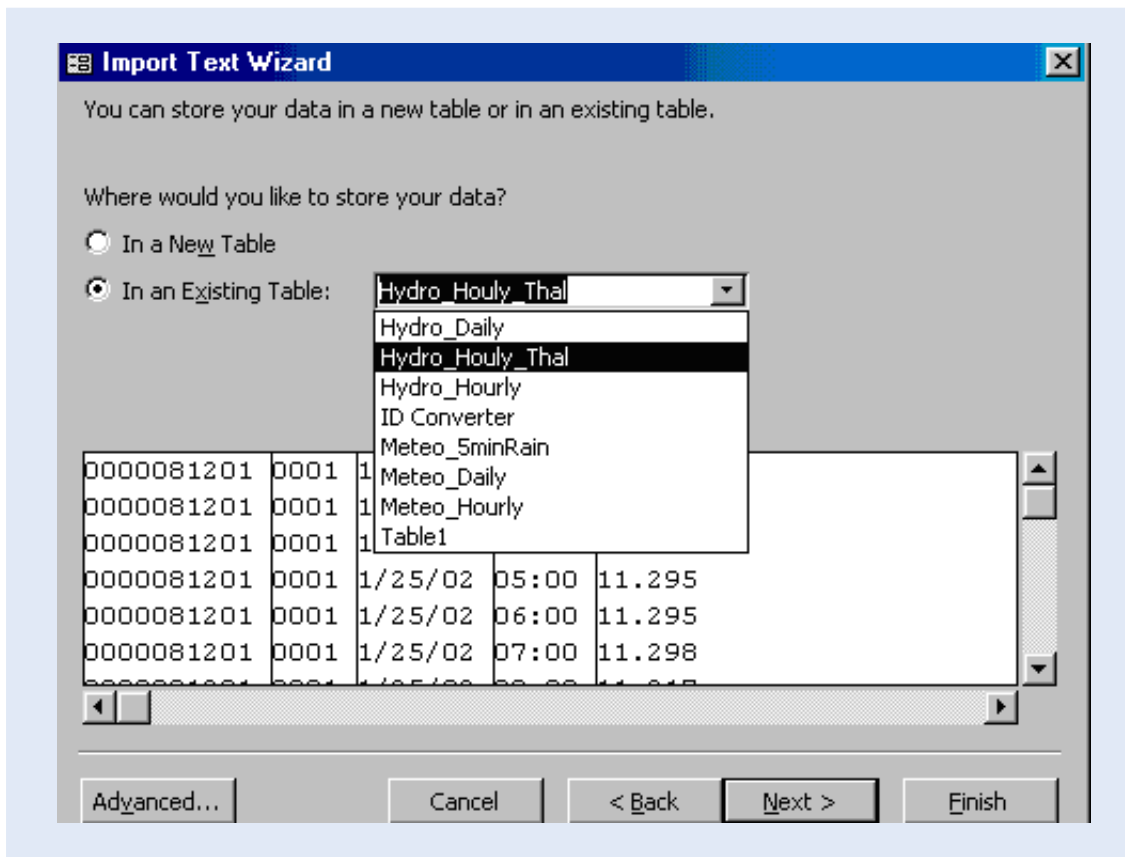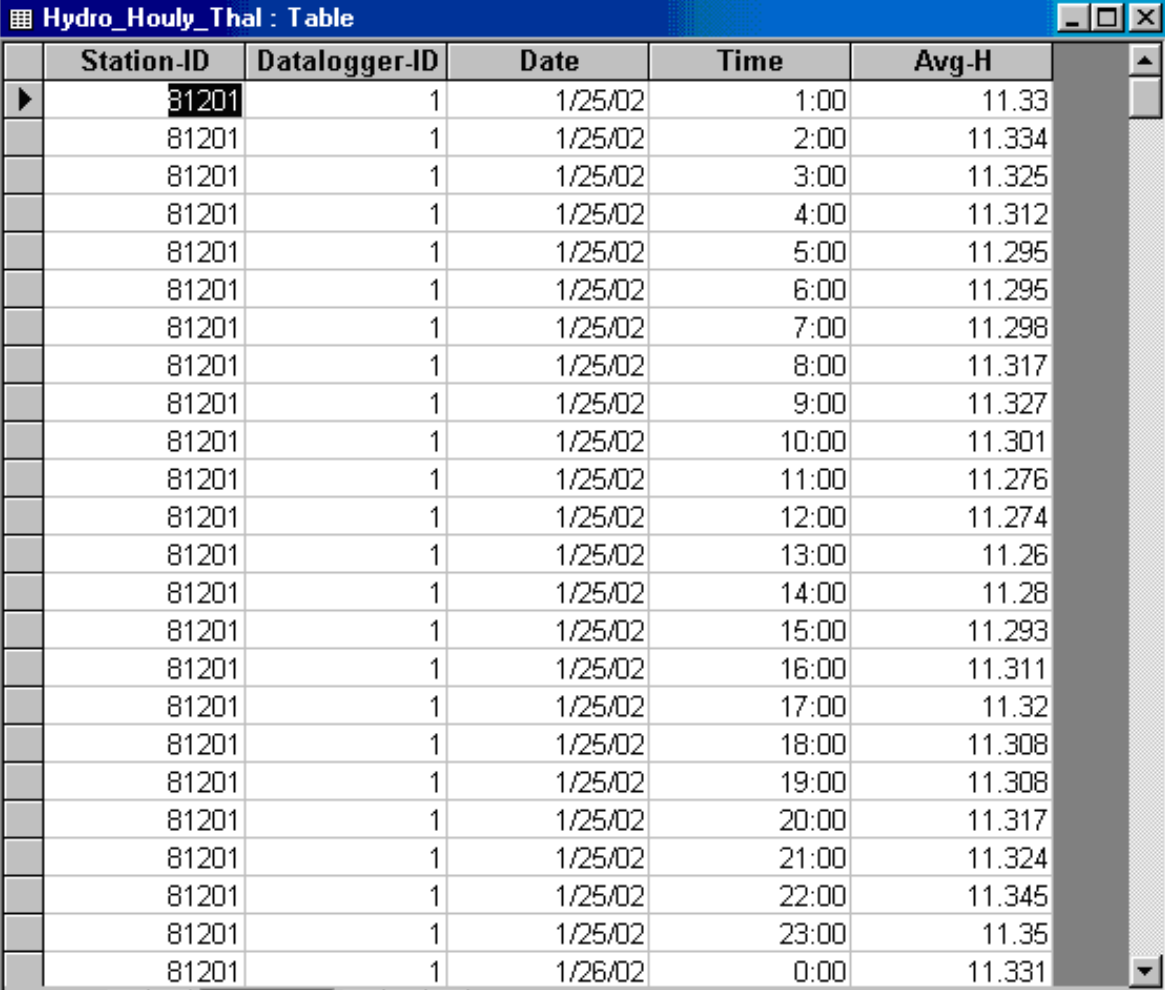
Step 10: Check "In an Existing Table:" and navigate in the related list box to the Hydro_Hourly_Thal table. Click 'Next'.

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.
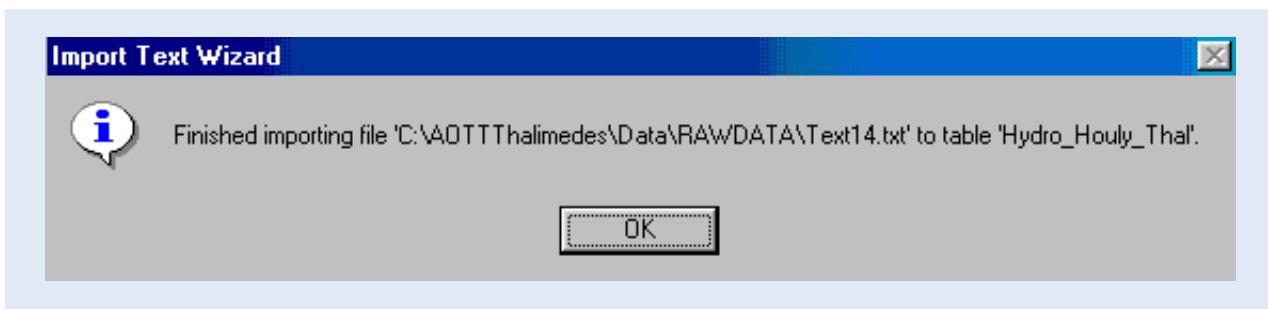
Step 11: Click OK.

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

Record: 1 of 454

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