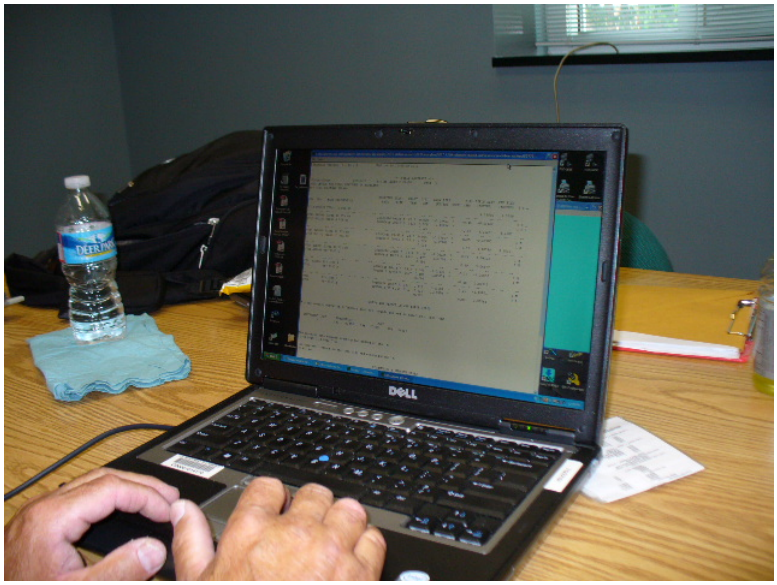
User's Guide for Electronic Levels with



Translev and WinDesc

Version 3.0

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Engineering Division (ED)
Center for Operational Oceanographic Products and Services (CO-OPS)
National Ocean Service (NOS)
National Oceanic and Atmospheric Administration (NOAA)

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Table of Contents

1 Standards and Field Procedures

This document provides the standards and procedures required to perform vertical control levels with the electronic digital/barcode levelling systems at water level stations that adhere to the standards set forth for all Center for Operational Oceanographic Products and Services (CO-OPS) stations. It is intended to supplement Reference 1. This document only addresses those standards and specifications that differ from conventional three wire level methods covered by Reference 1. Electronic levelling performed at water level stations shall adhere to Federal Geodetic Control Subcommittee (FGCS) Standards and Specifications. Any requirement not addressed is unchanged.

1.1 Terminology

In CO-OPS, a station refers to a water level, meteorological, or currents station, but in the NGS Bluebook a station is defined as the level equipment position, level section, or the bench mark. In this document the terms setup(s) and bench mark(s) will be used instead of the NGS preferred "Station".

1.2 Use of Even Number of Setups for Multiple Rods

When two Invar rods are used, the difference of staff zero-point errors must be taken into account. The rod zero-point difference is nullified if levelling for a section between two bench marks is ended (on a bench mark) using the same rod upon which it was started. This is possible only with an even number of levelling setups between the two bench marks. Thus, if feasible, for every section between two bench marks, use the same rod on both bench marks by having an even number of levelling setups. However, if the first mark encountered in the levelling run is in close proximity to the primary sensor, the use of two setups may be impractical.

1.3 Differences with Previous Methods

Field standards and procedures differ from the previous methods for the following:

FGCS standards state that a minimum of 3 readings with a standard deviation equal to or less than 0.1 mm shall be taken to obtain a complete observation. If after 3 readings are taken, the standard deviation exceeds 0.1 mm, the readings shall continue to be taken until the standard deviation decreases to less than 0.1 mm, or the observation shall be repeated with a different or shorter setup.

NOTE: This standard may be impossible to meet when levels are conducted on piers subject to heavy wind or wave action, or other inherently unstable platforms, that can be encountered while levelling at a water level station. Under such conditions, the following procedure shall be followed: Continue to take multiple readings as long as the standard deviation exhibits a decreasing trend. Accept the measurement when the standard deviation levels off and additional readings do not decrease it.

1.4 Install the Required Programs

Appendix A lists the software programs that need to be installed on the personal computers of those generating description files and processing level runs. To provide consistency throughout CO-OPS, including CO-OPS IDIQ contractors, install the software in the folder C:\NGS-Apps. This will facilitate the resolution of any issues that arise regarding the correct operation of the software. Note: Google Earth does not have to be installed in this folder.

1.5 Create a Water Level Station Project Folder

Create a project folder on the laptop for holding all the level files. This is the folder to navigate to when using WinDesc and Translev. The main folder should be named using the station number. Under that folder should be at least two subdirectories: One for levels, and one for photos.

1.6 Register Your Equipment

For Translev to properly process the level data from your instrument and rods, they must be registered with NGS and added to the Inst.dat and Rods.dat files. To do this, submit the following information to CO-OPS through your task manager if you are a CO-OPS contractor, or directly to the Engineering Division.

Ownership: Name of Business
Instrument: Make, Model, Date of Manufacture
Rods: Make, Model, Lengths and Graduations (Bar-code or Optical) and both a paper copy and a digital (electronic) supplied calibration report for each rod.

The Engineering Division will forward this information to the appropriate NGS official who will verify the information and update the instrument and rod data files.

1.7 Internet Connection

Both WinDesc and Translev have a variety of helpful tools that require an internet connection. Since many of the tools are graphics intensive, a high speed connection is recommended. Standard use of the programs for bench mark description and level data processing does not requires an internet connection

1.8 WinDesc & Translev Version Control

This version of the manual along with screen prints is based on WinDesc version 4.17.27, and Translev version 4.17.17, which are/were the current versions available through the update function of each program when this manual was being revised. Likely by the time it is finalized there will be newer versions. Any differences in screen shots should be forwarded to the Engineering Divisions Engineering Development Branch Chief. When sufficient changes are collected, and incremental version of this document will be released.

The author of these programs provides incremental program changes which can be updated without the user requiring administrative privileges on their PC. This ensures that everyone has the latest version of the software. If the user has not used WinDesc or Translev for over a week, the program will prompt the user to upgrade the next time it is executed. The user needs to just choose “Yes” from the pop-up reminder window and the program will check for the latest

version and download and install if a newer version is available. Otherwise, the program is updated through the WebTools drop down menu by choosing Update, then Program.

1.9 Reference Documents

The following reference documents are referred to or provide supplemental information to this User's Guide.

(1) User's Guide for the Installation of Bench Marks and Leveling Requirements for Water Level Stations, October 1987.
(2) Input Formats and Specifications of the National Geodetic Survey Data Base (NGS Bluebook) .
(3) Leica DNA03 User Manual, Version 1.2
(4) User's Guide for Writing Bench Mark Descriptions, Updated January 2011.
(5) Attachment R, Requirements for Digital Photographs of Survey Control, NGS, January 2008.
(6) The WinDesc program Help function
(7) The Translev program Help function
(8) Leica DNA03 Field Manual, Version 1.1

References (1), (4), & (5) are found in the CO-OPS Field Library. References (6) & (7), the help functions for WinDesc and Translev are indispensable in creating this document and in troubleshooting errors that may occur during leveling runs with the DNA03 equipment. They will be kept current as the programs are revised and updated, and are the "Go To" references for help in decoding any of the errors that may occur when creating description files and processing level runs.

1.10 What's New

The following are the significant changes in this version of the User's Guide:

- The WinDesc & Translev programs have been incrementally updated since the previous guide. The software version numbers in Section 1.8 have been updated.
- The microwave water level sensor (MWWL) is now operational. There are two new TBM designations for descriptions: SSN ZZ94 for an existing (old) MWWL and SSN ZZ95for a new or replacement MWWL (Section 2.1.4, Table 1).
- Storing the **`Coll.err.new`**. value is now allowed.
- Procedures for leveling and processing data for the NA3000 Series instruments have been superseded.

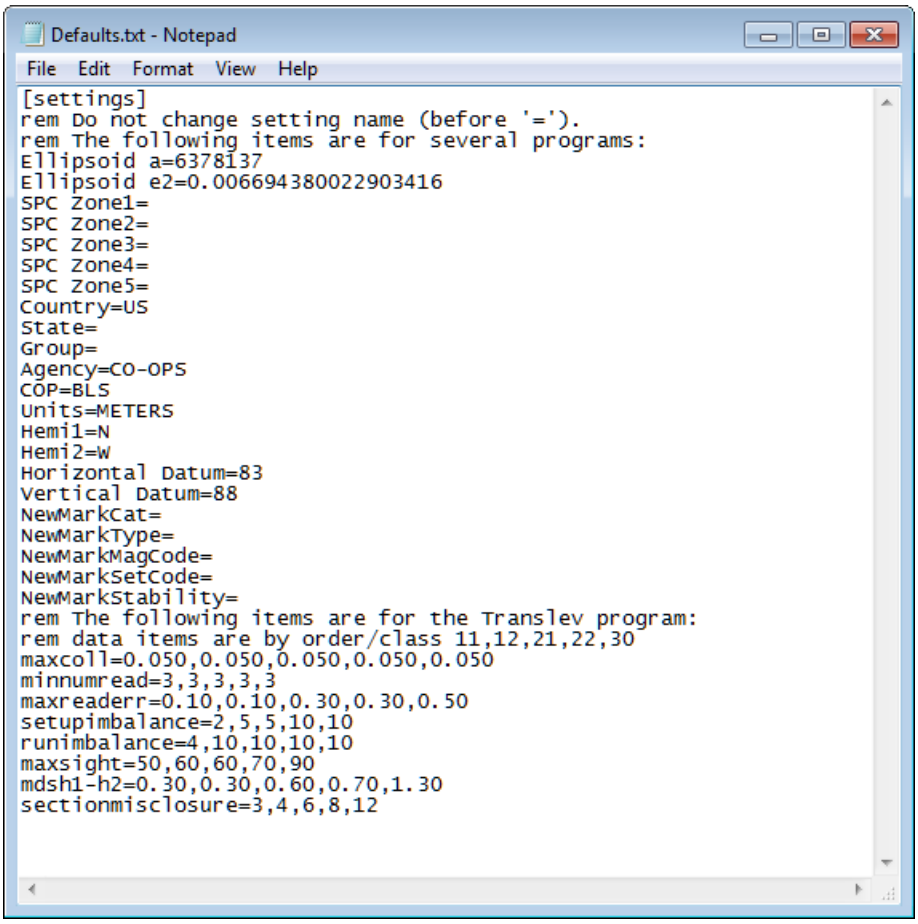
2 Guidelines for Using the NGS Bench Mark Description Program

2.1 The NGS WinDesc Program

WinDesc is the NGS approved software program for Windows-based computers for the purpose of creating, editing, and submitting recovery information for a bench marks(s). All bench mark descriptions for water level stations are required to be generated by this program. This section is a guide to the use of this software program for bench mark description management for all surveying at water level stations which follow CO-OPS standards.

There are many tools available in the WinDesc program. This section will only cover what is necessary to create a description file that can be used to process levels at all CO-OPS stations. The program comes with an extensive help file (See Reference 6) which in itself is a manual on all the functions. As the user gets familiar with WinDesc, they should feel free to explore the many utilities designed to enhance creating a bench mark description file.

Prior to using the WinDesc program, the Defaults.txt file should be edited. This will save some data entries in the future by entering information that is redundant each time you use WinDesc. Navigate to the WinDesc folder on your PC. Right click on the Defaults.txt file and click Edit. This will open the Defaults.txt file in Notepad, allowing you to enter data. Navigate to Agency and enter “CO-OPS”, or your agency name. Next, navigate to COP (Chief of Party) and enter your initials. Finally, navigate to Units and enter "METERS". The following screen shows the Defaults.txt with the three lines filled out.

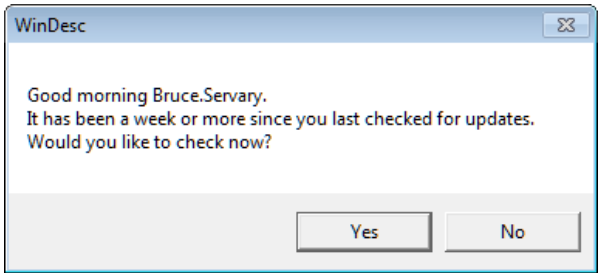


Note: These entries will appear in the Descriptive Data of new Bench Mark descriptions, not current descriptions you are editing. You will still be able to edit this information in the program if you desire.

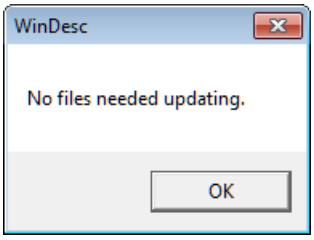
2.1.1 Starting WinDesc

Double click on the WinDesc icon on your PC; or click Start from the Taskbar, hover the cursor over All Programs, then click the WinDesc icon in the All Programs list.

WinDesc is designed to update the program if changes have been made without the user having administrative privileges on their PC. This ensures that everyone has the latest version of the software. If the following pop-up window appears (it should have your name after 'Good Morning'), choose "Yes".



If no changes have been made to the program the following pop-up will appear:



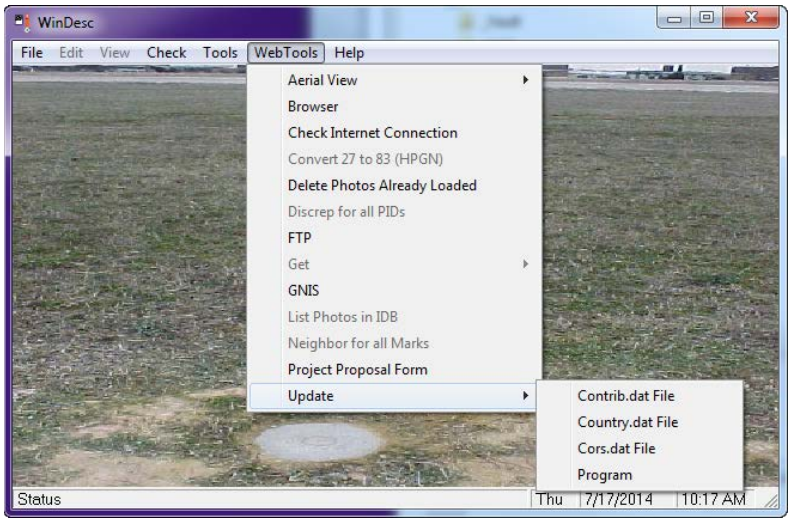
Choose “OK” and the WinDesc start-up screen appear as shown below. Program updates may also be checked in the WebTools drop-down under “Update”.

*2.1.2 Update *.DAT Files*

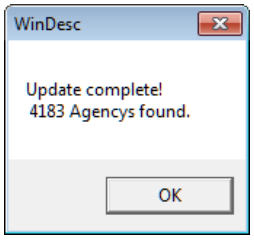
The first time that WinDesc is used after installation, and periodically thereafter, the *.DAT files should be updated to ensure that the most recent information is available to the program. These files are Contrib.dat, Country.dat, and Cors.dat files. To do this:

1. Start WinDesc

2. Select the **WebTools** drop down menu and hover over or click Update and the following is displayed:



3. Click on Contrib.dat File, wait for the following pop-up window:

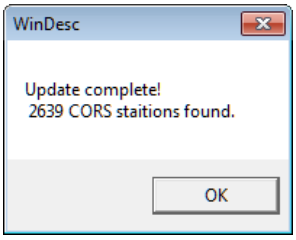


Click **OK**.

4. Repeat Steps 1 and 2 and click on Country.dat File. Wait for the following window:

Click **OK**.

5. Repeat Steps 1 and 2 and click on Cors.dat File. Wait for the following window:



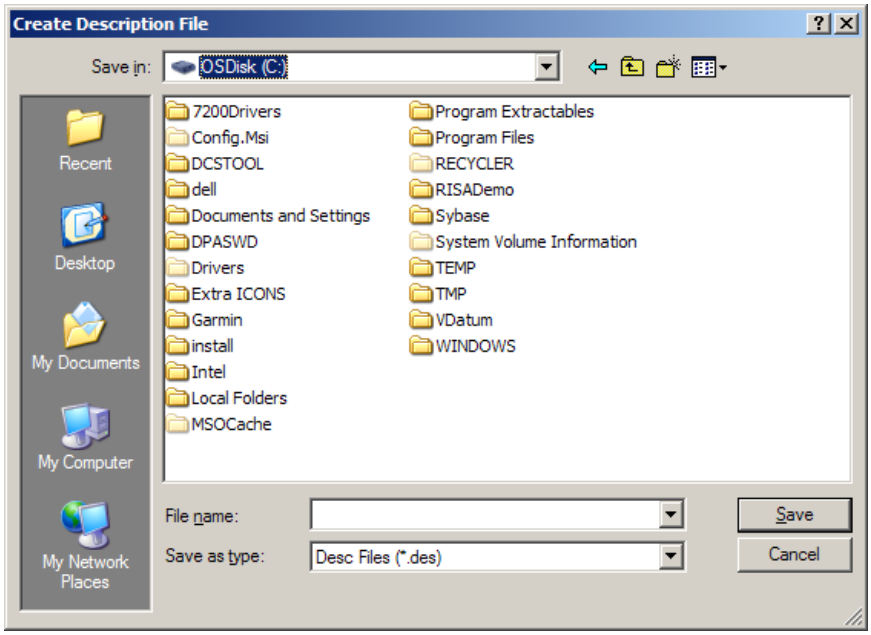
Click **OK**.

2.1.3 Enter/Edit Project Data

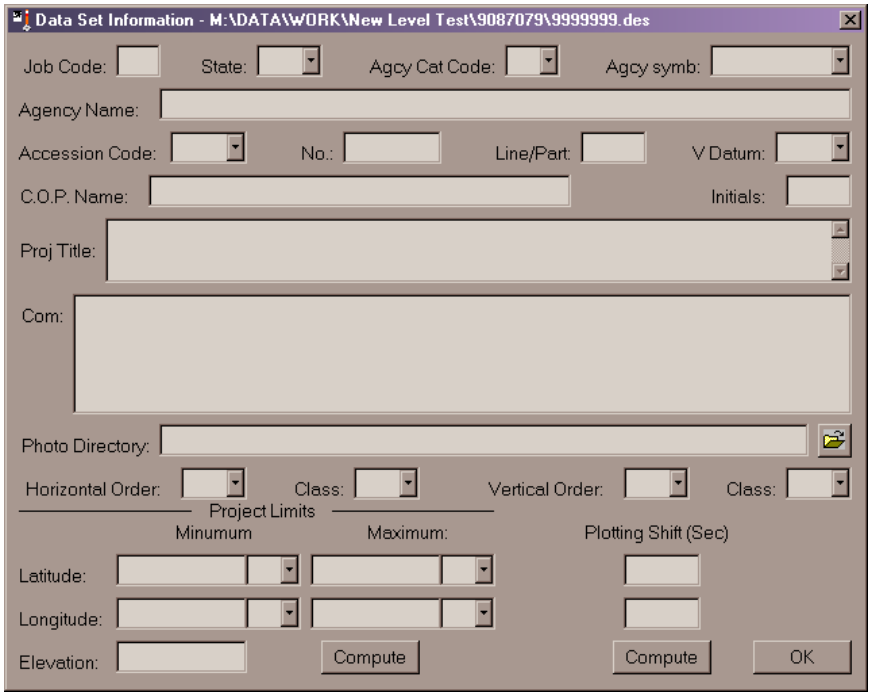
Project data is the information that describes the survey project. To enter or edit Project Data information for a water level station surveying project the following steps are followed:

1. Start WinDesc

2. Select the **File** drop down menu and click **New** if this is to be a description file for a new water level station. Go to Step 6 in this Section if editing an existing description file. A window similar to the following is displayed:



3. Use the drop down in the **Save in:** field to navigate to the drive and folder where the description file is to be created. Type the file name in the **File name:** field and click **Save**. The following Data Set Information window is displayed:



For a new station all these fields will be blank. Navigation is accomplished by a mouse click in the field, the TAB key or the Enter key to the next field. The shift key is not needed as all text entries are automatically capitalized. Use the drop down lists to make choices for those fields with drop down lists. Typing is allowed in all fields, but using the drop downs ensures correct data.

The fields in the above window shall be filled out as follows:

Job Code: SL for tide stations and SI for lake stations

State: Choose the state abbreviation for the project location from the drop down list

Agcy Cat Code: Choose A - National Agencies

Agcy symb: Choose CO-OPS (even if you're a contractor)

Agency Name: Automatically filled out based on Agcy symb selection

Accession Code: Choose L

No.: The Line Number after the "L" (available in Project Instructions or from the annual list received by ED from NGS)

Line/Part: The Part Number (available in Project Instructions)

VDatum: 00 - Unknown Code
29 - National Geodetic Vertical Datum of 1929 (NGVD29)
55 - Superseded International Great Lakes Datum of 1955
85 - International Great Lakes Datum (IGLD) of 1985
88 - North American Vertical Datum of 1988 (NAVD88)
AS - American Samoa Vertical Datum of 2002 (ASVD02)
GU - Guam Vertical Datum of 2004 (GUVD04)
LT - Local Tidal Datum (This will always apply for sea level stations)
NM - Northern Marianas Vertical Datum of 2003
PR - Puerto Rico Vertical Datum 2002 (PRVD02)
VI - Virgin Islands Vertical datum of 2009 (VIVD09)

Enter this code only if certain that a valid tie has been made to one of these datums. Leave blank or enter 00 if unknown.

C.O.P. Name: The name of the Party Chief

Initials: The Party Chief's initials

Proj. Title: On the first line enter:
YYYY LEVELS TO TIDE STATIONS IN <State name>
(for tide stations).

or

YYYY LEVELS TO WATER LEVEL STATIONS ON <body of water> (for lake stations).
(where YYYY is the four digit year e.g.1999.)

Press CTRL-Enter to get to second line, then add:
XXX XXXX Station Name
(where XXX XXXX is the 7 digit station number)

Examples:
2010 LEVELS TO TIDE STATIONS IN MARYLAND
857 4680 BALTIMORE

2010 LEVELS TO WATER LEVEL STATIONS ON LAKE ERIE
906 3038 ERIE

Com: Enter project comments. Government contractors would enter their company name here. Use Enter to get to the second text line. Long text lines will automatically word wrap to the next line.

Photo Directory: This identifies where photos are located on the computer, and is helpful when renaming and labelling the photos. The user

may have to click on any one of the photos to have the location identified by WinDesc. Field crews should ensure this field is blank before submittal, as the folder on the crew laptop will be different than the folder on the HQ desktop. If data exists in this field, please highlight it and delete it.

Horizontal Order: & Class:
Leave blank. Highlight and delete if not blank.

Vertical Order: Choose 2 for 2nd order levels or 3 for 3rd order levels

Class: Choose 1 for 2nd Order; leave blank for 3rd Order

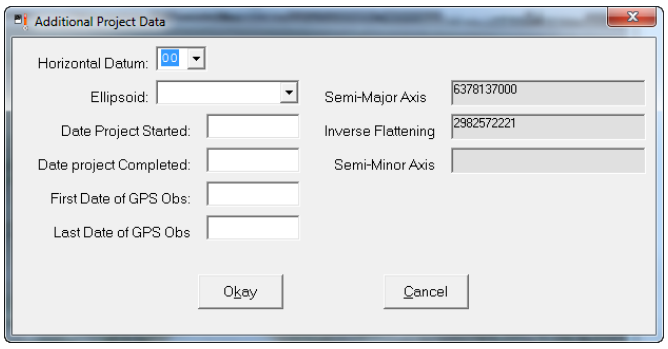
Latitude/Longitude Minimum/Maximum:
If these fields are blank and there are bench marks with latitudes and longitude associated with this *.des file, press compute and the fields will be automatically filled out. If this is a new station, there are no bench mark descriptions with latitude and longitude, so leave blank. After entering descriptions with valid latitudes and longitudes, edit this screen and press compute to fill these fields.

Plotting Shift (sec):
Leave blank

Elevation: Leave blank

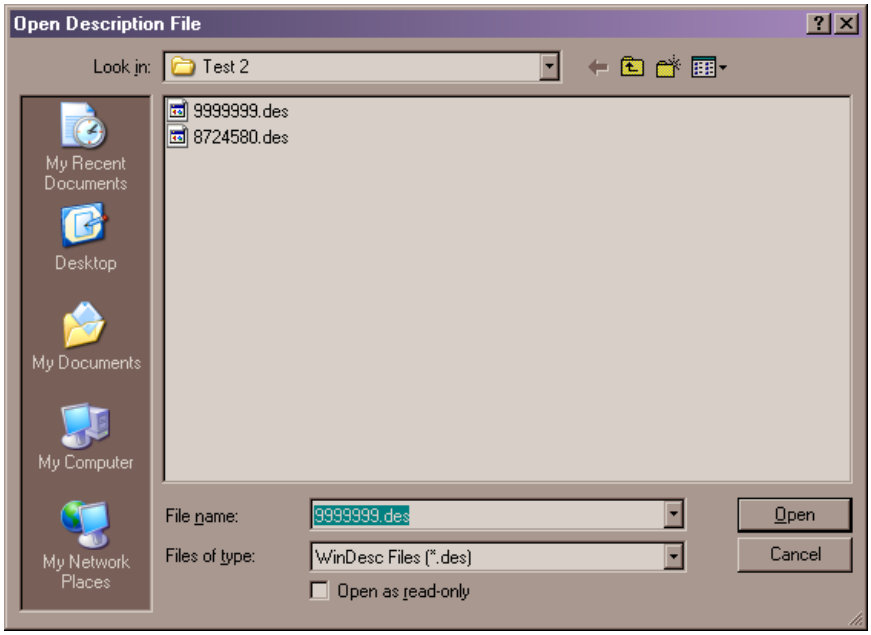
4. Click **OK**

5. The Additional Project Data window opens:



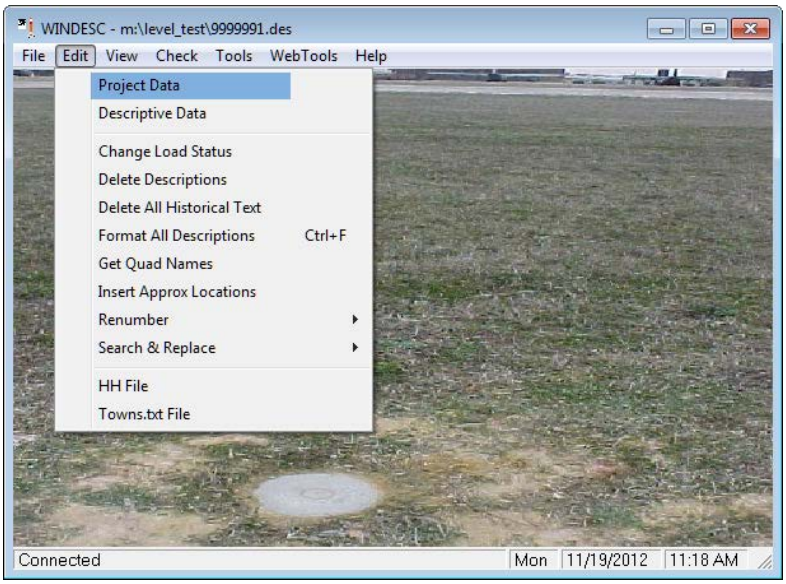
If this is a new station, leave these fields blank. If this is a project for an existing station, enter the following: Horizontal Datum-83, Ellipsoid-GRS-80, Dates the levels were run, and the Dates of First and Last GPS Observation (if known). Click **Okay**. Do not click **Cancel** as all the information entered in the previous screen is discarded. Go to Section 2.2.4

6. If editing the description file for an existing water level station select the **File** drop down menu and click **Open**. A window similar to the following is displayed:



Use the drop down in the **Look in:** field to navigate to the drive and folder where the description file is to be retrieved. Type the file name in the **File name:** field and click **Open**, or select the desired file in the large window and click **Open**.

7. Select the **Edit** drop down menu as shown below and click **Project Data**.



The Data Set Information window described in Step 3 of this Section is displayed.

8. Many of the fields in the Data Set Information window will be filled out. Correct those entries that are applicable for the current survey project following the format detailed in Step 3 above.

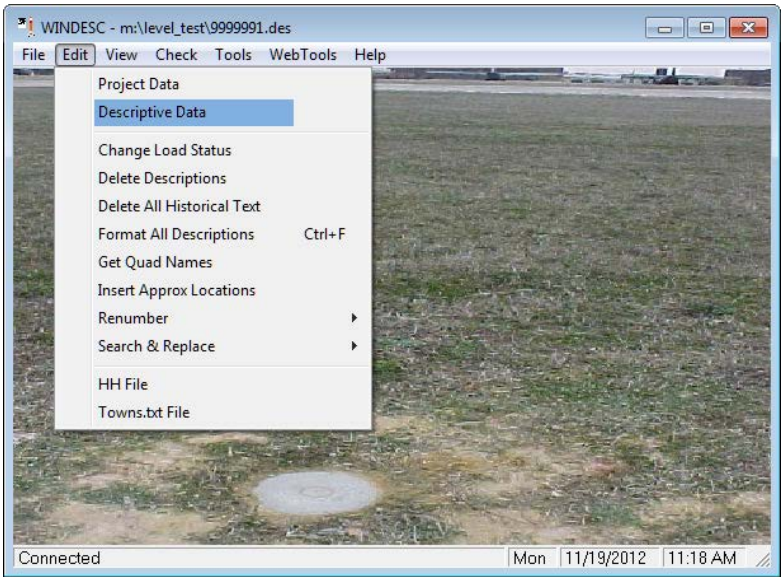
9. Repeat Steps 4 and 5.

2.1.4 Entering Descriptive Data

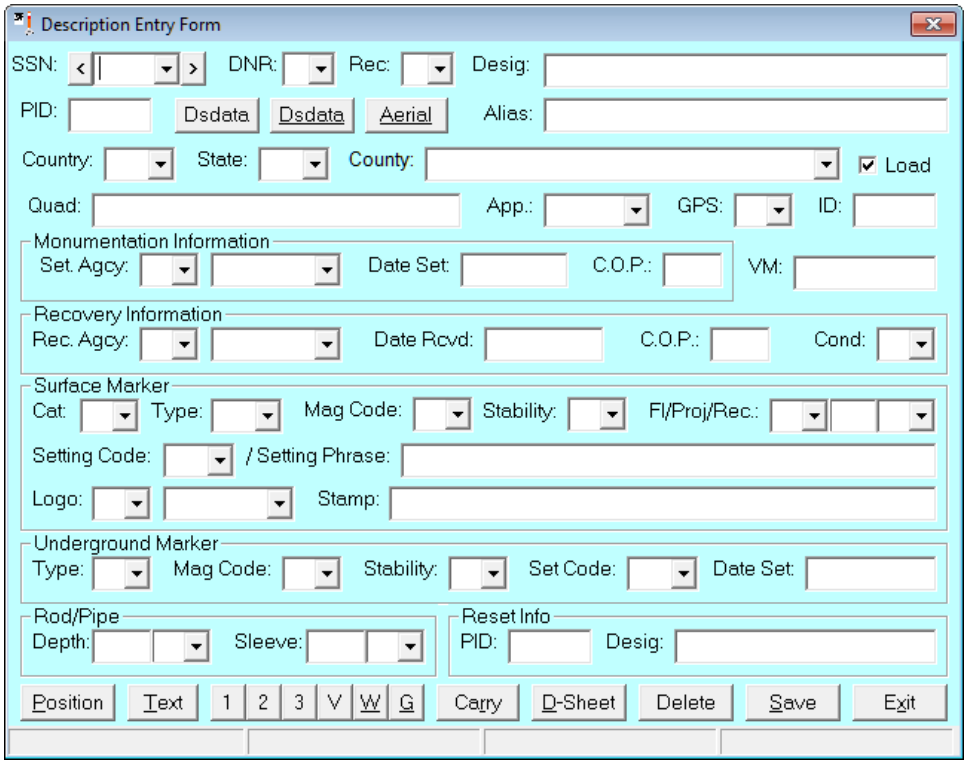
Descriptive Data is the specific information that fully describes a bench mark. This includes location, type of bench mark, and "How To Reach" directions. This section covers entering bench mark descriptive data for each bench mark installed and levelled during a water level station installation.

1. Start WinDesc and open the description file as in Step 6 in Section 2.2.3 if not still open from entering Project Data.

2. Select the **Edit** drop down menu and click **Descriptive Data**.



The Description Entry Form window is then displayed:



The following convention is used for numbering bench marks at water level stations: The SSNs at a station shall be numbered ZZ## where ZZ is the station part number from the current year's project instructions, and ## is an incremental ID number increasing by 1 with additional SSN at a station. ID numbers below ten are preceded with a zero, e.g. 01, 02, etc. The first ten SSNs (ZZ01 - ZZ10) have been standardized as ETGs, staffs, spikes, acoustic sensor levelling points, Barometer, etc. SSN ZZ11 shall always be used for the PBM. Station Bench Marks after the PBM begin with ZZ12 and increase by 1 for each new bench mark. See Table 1 for a listing.

SSN ZZ01	**TBM XXX XXXX ETG READ MK** - Existing (old) ETG or ETG to be replaced.
SSN ZZ02	**TBM XXX XXXX ETG READ MK** - New or replacement ETG.
SSN ZZ03	**TBM XXX XXXX Staff** - Existing (old) staff or staff to be replaced.
SSN ZZ04	**TBM XXX XXXX Staff** - New or replacement staff.
SSN ZZ05	**TBM XXX XXXX Spike/SRM** - Existing (old) spike or spike to be replaced (lakes only); or SRM -temporary sensor reference mark (tides only) that is not a bench mark.
SSN ZZ06	**TBM XXX XXXX Spike** - New or replacement spike (lakes only)
SSN ZZ07	**TBM XXX XXXX Aquatrak** - Existing (old) Aquatrak or Aquatrak to be replaced.
SSN ZZ08	**TBM XXX XXXX Aquatrak** - New or replacement Aquatrak.
SSN ZZ09	**TBM XXX XXXX Aquatrak level fix or Barometer** - Aquatrak bullet-shaped levelling fixture held on old Aquatrak or Aquatrak sensor head to be replaced; or Barometer.
SSN ZZ10	**TBM XXX XXXX Aquatrak level fix** - Aquatrak levelling fixture held on new or replacement Aquatrak sensor head.
SSN ZZ94	**TBM XXX XXXX MWWL** - Existing (old) MWWL or MWWL to be replaced.
SSN ZZ95	**TBM XXX XXXX MWWL** - New or replacement MWWL.
SSN ZZ96	**TBM XXX XXXX NO1** - Generic TBM for breaking up long level runs.
SSN ZZ97	**TBM XXX XXXX NO2** - Generic TBM for breaking up long level runs.
SSN ZZ98	**TBM XXX XXXX Dual Bubbler Orifice** - New or replacement orifice.
SSN ZZ99	**TBM XXX XXXX Single Bubbler Orifice** - New or replacement orifice.
SSN ZZ11	Primary bench mark for a station

Table 1 Standardized SSN List

3. For a new *.des file, there will be no bench marks to select in the **SSN:** drop down menu. Navigation is accomplished by mouse click in the field, TAB key, or Enter key to the next field. Use the drop down lists to make choices for those fields with drop down lists. Typing is allowed in all fields, but using the drop downs ensures correct data.

   The fields in the above window shall be filled out as follows:

   SSN: See Standardized SSN List above; each bench mark added past the PBM is incremented by one, e.g. ZZ12, ZZ13, etc. This drop down box allows the user to select bench marks already entered in this description file for further editing or recovery notation. Conversely, the < and > boxes on either side of the drop down box will save the current description and move to the previous or next description, respectively.

DNR: **D** for new bench mark information, **N** for bench marks with a PID# not recovered, or **R** for bench mark recovery. Instead of **N** for bench marks without a PID#, enter '**R**' in **DNR**, '**F**' in **Rec:**, and in the Text enter 'FOUND DESTROYED' or 'NOT RECOVERED' with Cond: of 'O' See Appendix C for screen shots of the Description Entry Form as it changes based on which DNR code is selected.

Rec: **F** - Select this option when submitting a full description for a bench mark not in the NGS database (no PID# - see PID field below).
M - Select this option when a survey point is already in the NGS database and has been recovered as described (no changes to descriptive fields or text).
T - Select this option when a survey point already in the NGS database requires changes to the descriptive fields or text.
See Appendix C for screen shots of the Description Entry Form as it changes based on which DNR code is selected.

Desig: Enter the bench mark designation. For a new mark, this will be the station number plus the letter from the stamping, for example: 999 9999 A. Do not change a designation already assigned by NGS.

PID: The NGS PID (**not** the OPUS DB PID) for the bench mark. There will be no PID for a new mark.

Dsdata — This button imports the description and data for a bench mark from a DSDATA sheet file.

Dsdata — This button imports the description and data for a bench mark directly from the NGS website. This function requires that a PID, or the State and County, be filled out in the Description Entry Form window.

Aerial — This button views the bench mark location in Google Earth. This function requires that the position be filled out in the Description Entry Form window.

Alias: This field is used when a bench mark is stamped and designated with one name but commonly or locally known by another name. Fill in this field only if necessary for improved identification of the bench mark.

Country: The Country where the bench mark is located. Use drop down list to choose the country.

State: The State where the bench mark is located. Use drop down list to choose the state.

County: The County where the bench mark is located. The drop down list is populated with the counties available for the state chosen in **State:** Use this list to choose the county.

Load Uncheck this field. For use when data is to be submitted to NGS. This will only be done when a two mark tie has been verified by field or HQ personnel.

Quad: Leave blank. Quad is filled in after entering horizontal position.

App: Enter **T** for all non-Great Lakes stations. Enter **W** for Great Lakes stations.

GPS: Use the drop down list to choose **Y - yes, mark is suitable for GPS use**; **N - no, mark is not suitable for GPS use**, or **- unknown GPS usage for mark**

ID: Leave blank

Monumentation Information

Set. Agcy: The agency that set the bench mark, if known. If there is an agency name cast in the bench mark, use that for setting agency. This field has a drop down list which should have most setting agencies possible.

Date Set: The date the bench mark was set, if known. The current date is already displayed. Change if mark set on a different date, or clear this field if the date is unknown.

C.O.P.: The Party Chief's initials, if known.

VMNum: Enter the CO-OPS vertical mark number as given on the published bench mark sheet, or from the CO-OPS Data Management System (DMS). For a new bench mark leave the field blank. Leaving the field blank will create an error which will be found when checking/creating a *.dsc file, but the error does not prevent an abstract from being created. The error is generated because **App:** indicates that this is a water level or tidal station and should have a VM Number generated by DMS; however, new bench marks have yet to be entered into DMS.

Recovery Information

Rec. Agcy:	Choose A - National Agencies; in the adjacent field choose CO-OPS.
Date Rcvd:	Enter the date of the bench mark recovery.
C.O.P.:	The Party Chief's initials.
Cond:	Choose the bench mark's condition from the drop down list.

Surface Marker

Cat:	Bench mark category. Choose **D** for disk; **R** for rod, or **O** for other from the drop down list. CO-OPS does not use **L**.
Type:	Bench mark type. Choose from the drop down list.
Mag Code:	Choose the bench mark magnetic code from the drop down list.
Stability:	Choose the bench mark stability from the drop down list.
Flush/Proj/Rec.:	Choose F for a bench mark flush with the ground; P for a mark projecting above the ground; or R for a mark recessed into the ground. For P & R, enter the distance the mark is projected or recessed with respect to the ground in the next field, and then choose the units for that distance in the last field from the drop down list. This field is for rod, pipe, or concrete monument settings. Leave blank for all other types of marks. If a surface mark is set such that it is above or below the surrounding area, make note in the description in the vertical reference to grade (Part 4 of bench mark descriptive text, see reference 4).
Setting Code:	Choose the bench mark setting code from the drop down list.
Setting Phrase:	Type a more specific setting description as appropriate.
Logo:	This is the agency that is cast in the bench mark or on the logo cap. Choose A - National Agencies and in the adjacent field choose the agency cast in the mark. Ensure this is blank for all temporary bench marks (TBM).
Stamp:	Type the bench mark stamping.

Underground Marker

Type: Bench mark type. Choose from the drop down list.

Mag Code: Choose the bench mark magnetic code from the drop down list.

Stability: Choose the bench mark stability from the drop down list.

Set Code: Choose the bench mark setting code from the drop down list.

Date Set: The date the bench mark was set. Double clicking in the field will display the current date.

Rod/Pipe

Depth: The depth the rod or pipe has been driven in tenths of meters.

Sleeve: The length of the greased sleeve of a 3D mark in tenths of meters.

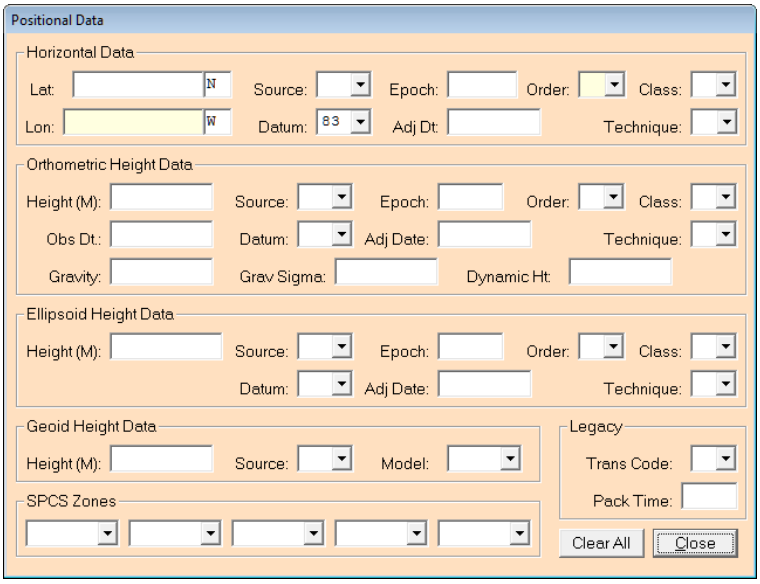
Reset Info

PID: The NGS PID (**not** OPUS DB PID) for the bench mark.

Desig: The new designation of the reset bench mark.

Position

This button opens the Positional Data Window similar to the figure below.

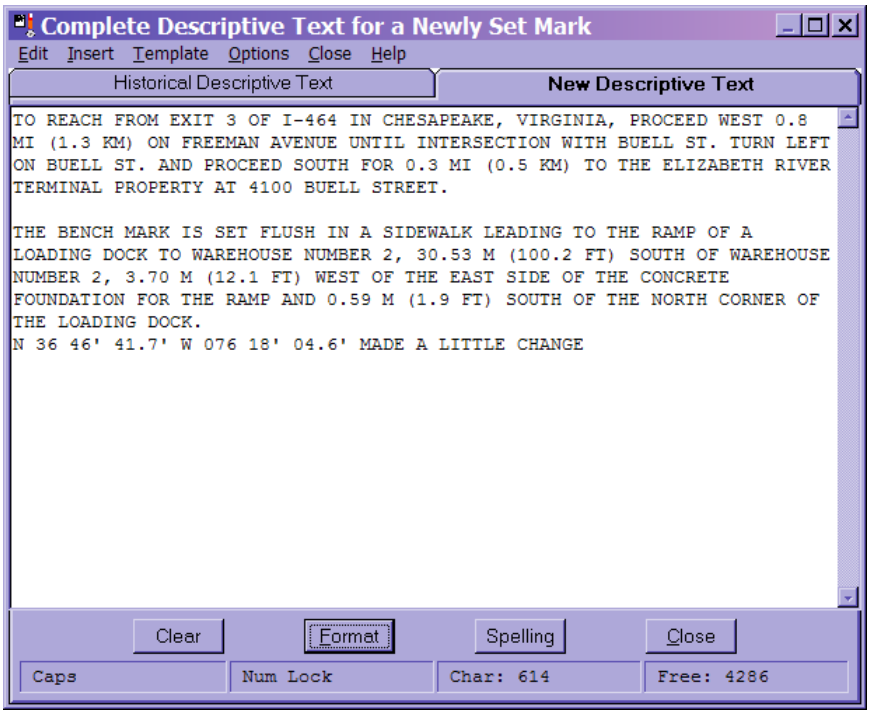


Enter latitude and longitude information in the Horizontal Data window to the tenth of a second from a handheld GPS. Handheld GPS units come with either patch antennas or

quadrifilar antennas. The proper method for holding the GPS unit is vertically if the unit has a quadrifilar antenna, or horizontally if the unit has a patch antenna. Holding the unit otherwise will degrade the reception of the satellite signals and reduce the accuracy of the position obtained. The Garmin GPSmap 76S units used by CO-OPS have quadrifilar antennas. The latitude format is **DDMMSS.s** in the first field and **N/S** in the second field. The longitude format is **DDDMMSS.s** in the first field and **W/E** in the second field. Newer handheld GPS units may get positions to the hundredth of a second. If the hand held GPS unit being used allows this, enter the positions in hundredths of a second, e.g. **DDMMSS.ss**. Always select **O-Other** from the Source: drop down list. The DATUM field should be entered as "83" (otherwise a message will appear requesting an entry. An entry for the datum is always needed.) The ORDER field should be "4 (fourth order)". Technique should be "W" for hand-held GPS positions, and "X" for static GPS positions. Click **Close**.

Text

This button opens the Descriptive Text window. A window similar to the following is displayed:



There are two tabs to this window – Historical Descriptive Text and New Descriptive Text. If text has been imported from a DSDATA sheet or from NGS via the internet, there will be historical text. For a new bench mark both will be blank. Enter

the bench mark description as detailed in Reference 4. Before leaving this window it is good practice to format and spell check the text. These are performed by pressing the buttons at the bottom of the Descriptive Text window.

1 2 3 V W G — These buttons allow pictures of the bench mark to be selected, labelled, and viewed using the photo directory entered in the Data Set Information window in Section 2.2.3 Step 3. The photos must be named according to Reference (5).

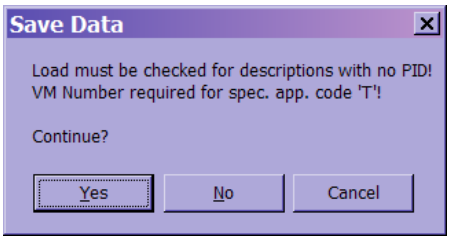
web — This button will retrieve bench mark photos from the NGS database if the bench mark has a PID and photos had been submitted to NGS during a previous recovery.

Carry — This button carries some of the descriptive information to a new bench mark to speed up the entry of new bench marks for a water level station in WinDesc.

D-Sheet — This button displays the information for this bench mark in an NGS data sheet format which can then be printed or saved to a file.

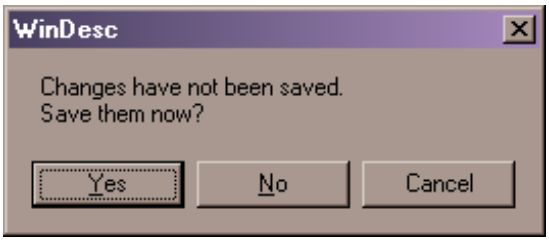
Delete — This button deletes the particular description from the file.

Save — This button saves the bench mark information. The following window opens if the bench mark does not have a PID or VM number:



Click **Yes** to save the bench mark information without checking Load or entering a VM number. If the bench mark has a PID, the above window will not appear and the description is saved and the form clears.

Exit — This button exits the current description and the Description Entry Form. If a description is present in the form, and has not been altered, pressing Exit clears the form. If changes have been made, the following window appears, allowing the mark to be saved.



Follow the Save button procedures above to save the changes or click **No** to exit without saving.
If the form is empty, clicking Exit closes the Description Entry Form and returns to the main WinDesc window.

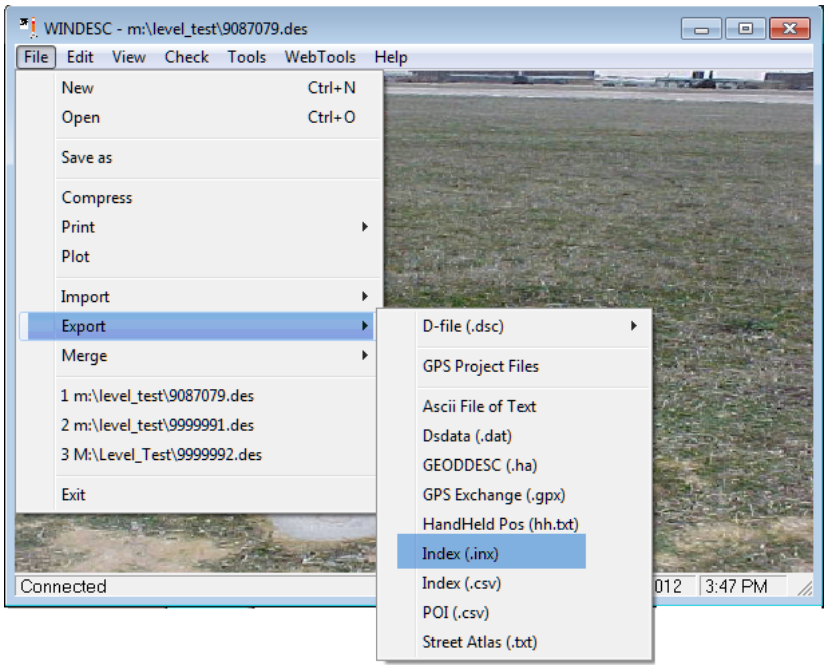
4. There are also some helpful function keys available during the entry of the bench mark information in this window. The following function keys are available once data has been entered in the SSN: and D/R: fields for a new mark or a previously described mark that has been selected from the SSN: list.

F1	The F1 key opens the WinDesc help file. The help file is comprehensive and provides greater detail for many of the items discussed in this manual.
F4	The F4 key will show the Err file generated after the *.dsc has been created. This eases making corrections to the bench mark description
F5	Once the position has been entered for a mark, this function will display the neighboring bench marks found in the NGS database. This function requires an internet connection.
F6	This function displays the discrepancies between the *.des file being worked on and the NGS database for bench marks with a PID#. This uses the latest saved copy of the *.des file so if changes have been made to the bench mark description, they must be saved to be used in this discrepancy check.
F7	Produces the same output as **F6**, but in a table format.
F10	This function displays the sections of the Description Entry Form that disappear when the **D/R:** and **RecCode:** codes are entered.

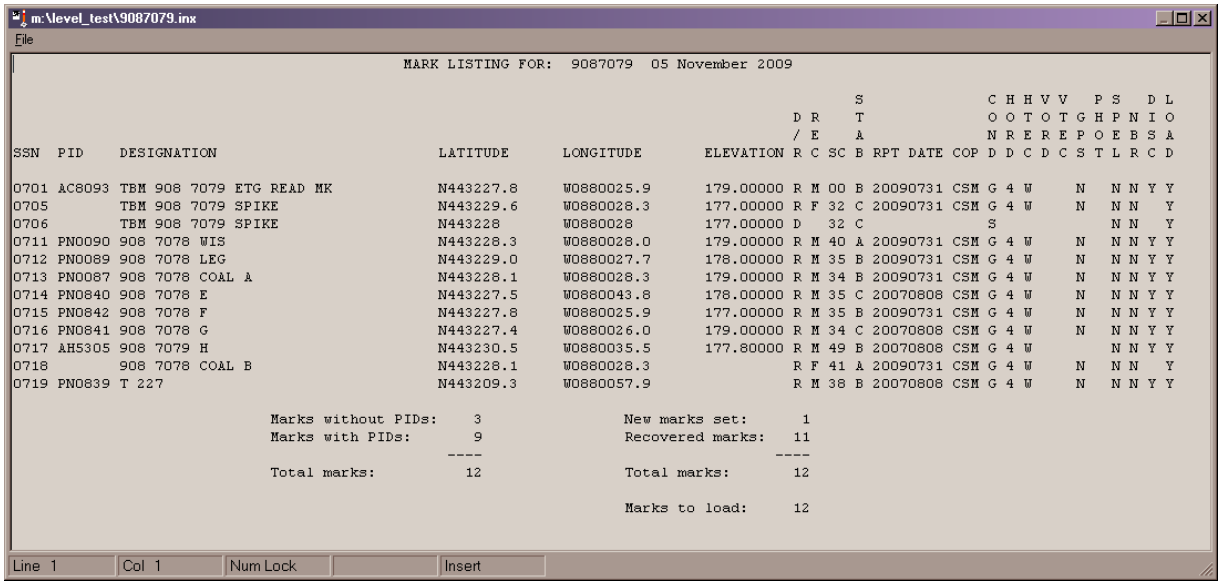
*2.1.5 Create *.Inx File*

After entering and recovering all the bench marks at a water level station, generate a *.inx file. This is done by:

1. From the main WinDesc select the **File** drop down menu and click **Export** the Index (.inx) as shown below:



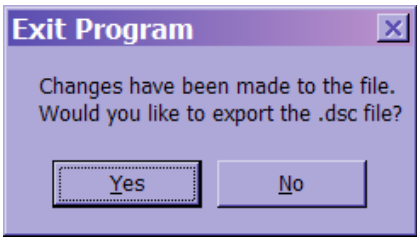
2. A window similar to the following is displayed:



The *.inx file has been created, the upper left corner of the window displaying the name and location of the file. Select the **File** drop down menu and click **Close**.

2.1.6 Exit WinDesc

To exit WinDesc select the **File** drop down menu and click **Exit**. If changes have been made to the *.des file, the following window will appear:



A *.dsc file is needed only if the levels are to be submitted to NGS. At this time, this is a CO-OPS headquarters function, so it is unnecessary to generate this file. Click **No** and the WinDesc program is terminated.

3 (SUPERSEDED) Procedures for Levelling with the Wild NA3000 Series

This section is superseded with this version of the User's Guide. Please refer to the previous version of this User's Guide or the Translev Help File for information previously covered.

4 Procedures for levelling with the Wild/Leica DNA03 series

This section supplements the User Manual provided with the Wild DNA03. A copy of the manual should always be kept with the level and all observers should have read it before using the level instrument. Consult the manual for basic information on how to operate the level, the function of each key on the keypad, the programs, etc. This section provides specifics on navigating the keypad, configuration parameters, collimation procedures, code formats, and operational procedures. Figure 2 shows the level instrument panel.

4.1 Navigating the DNA03 Keypad

Figure 1 Wild/Leica DNA03 Keypad

Press and release SHIFT (an up arrow appears on the bottom right of the display) to change the button function to the label above the button (in the case of , the label is below the button). Do not hold SHIFT down while pressing another button as this does nothing.

Many menu choices are numbered. Specific menu items can be selected by pressing that number, which then brings up the screen for that item. Or the up and down arrow buttons (,) can be used to scroll through the menu choices in the display. If a setting is selected and there are multiple choices available, the left and right arrows (,) are used to move through the choices.

4.2 Navigating the DNA03 Screens

To power on the DNA03, press the power button . The DNA03 should start up in the MEAS & REC screen. The display should look similar to this:

```
-------MEAS & REC-----BF
PtBS:                A1↑
Rem :              ------
H0  :          0.00000 m
HCol:       ---.----- m
Staf:       ---.----- m
Dist:          ---.-- m
<JOB/LINE>        <REC>
```

There are five major screens where configurations, settings, and levelling are performed. They are the PROGRAMS screen, the MENU screen, the DATA MANAGER screen, the MEASURE MODE screen, and the FUNCTIONS screen.

4.2.1 Programs Screen

To get into the Programs screen, press PROG at the MEAS & REC screen. The following will be displayed:

```
        PROGRAMS
------------------------
1 MEAS & REC
2 LINE LEVELLING
3 LINE ADJUSTMENT
4 CHECK & ADJUST
```

This screen is used to run the “C” shot, set up the level run, set level run tolerances, and start/continue the level run.

4.2.2 Menu Screen

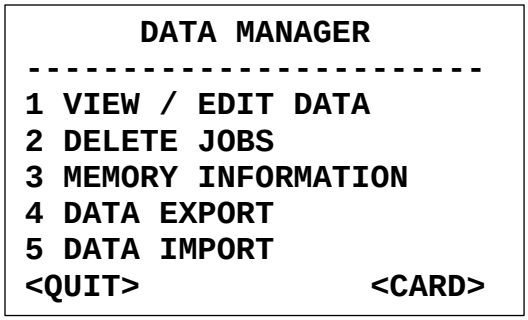
To get into the MENU screen, press SHIFT, release, and then press PROG at the MEAS & REC screen. The following screen will be displayed:

```
          MENU
------------------------
1 QUICK SETTINGS
2 ALL SETTINGS
3 SYSTEM INFO
4 CHECK WITH COLLIMATOR
<QUIT>
```

This screen is used to configure the DNA03.

4.2.3 Data Manager Screen

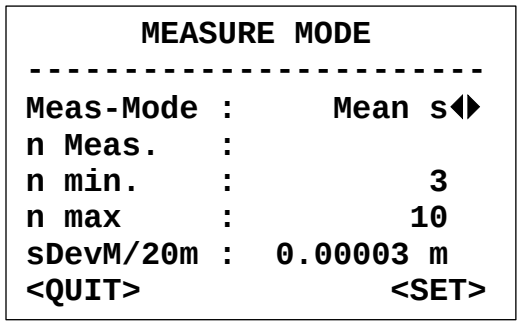
To get into the DATA MANAGER screen, press DATA at the MEAS & REC screen. The following will be displayed:



This screen is used to work with the data stored in the level instrument or on the PCMCIA-card.

4.2.4 Measure Mode Screen

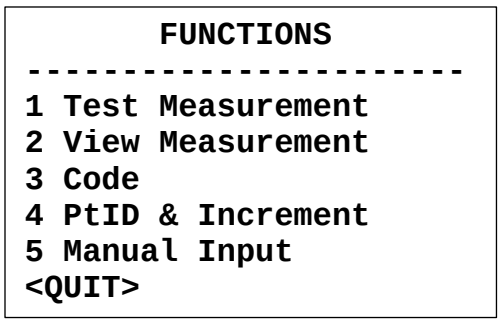
To get into the MEASURE MODE screen, press MODE at the MEAS & REC screen. A screen similar to the following will be displayed:



This screen is used to specify the method used to compile rod measurements and the criteria used to accept the measurements into a single BS or FS reading.

4.2.5 Functions Screen

To get into the FUNCTIONS screen, press SHIFT, release, and then press USER at the MEAS & REC or PROGRAMS screen. The following will be displayed:



This screen is used to check the distance between the tripod and the level rod , view last measurement, enter codes, enter the BS number for multiple setups or SSN numbers before taking foresight with level rod on the bench mark, and enter manual elevations.

4.3 Setting Configuration Parameters

These configuration parameters should remain set after the initial configuration and require only a quick check. If the DNA03 has been used by a different field party or has just been returned from maintenance at Leica, it would be a good idea to go through each step in this section. If the configuration has not been changed, jump to Section 4.4.

4.3.1 Configure All Settings

4.3.1.1 System Settings

1. Enter the MENU screen as shown in Section 4.2.2.

2. Press "2"; or scroll using  to **2 ALL SETTINGS** and press  .
3. Press "**1**"; or scroll using  to **1 SYSTEM** and press  . Move to each new setting using  or  and change each setting as necessary by pressing  or  to read as follows:

```
   SYSTEM SETTINGS   1/2
-------------------------
Beep        :   Normal◆▶
Data Output:   IntMem◆▶
Auto OFF    :   Enable◆▶
Contrast    :      60%◆▶
<QUIT>              <SET>
```

Scroll to **<SET>** and press  . The following is displayed for a few seconds:

```
Complete…
```

This saves any changes.

4.3.1.2 Measuring Settings

1. Enter the MENU screen as shown in Section 4.2.2.

2. Press "2"; or scroll using  to **2 ALL SETTINGS** and press  .

3. Press "**2**"; or scroll using  to **2 MEASURING** and press  . Move to each new setting using  or  and change each setting as necessary by pressing  or  to read as follows:

```
   MEASURING SETTINGS
------------------------
CodeSet   :    Before◆▶
Decimals  :  0.00001m◆▶
GSI-Format:     GSI-8◆▶
EarthCurv :        No◆▶
<QUIT>              <SET>
```

Scroll to **<SET>** and press  .

4.3.1.3 Communication Settings

1. Enter the MENU screen as shown in Section 4.2.2.
2. Press "2"; or scroll using  to **2 ALL SETTINGS** and press  .
3. Press "**3**"; or scroll using  to **3 COMMUNICATION** and press  . Change each setting as necessary by pressing  or  to read as follows:

```
     COMMUNICATION
------------------------
Baudrate:       19200◆▶
Databits :          8◆▶
Parity   :       None◆▶
Endmark  :      CR/LF◆▶
Stopbits :          1
<QUIT>              <SET>
```

You will be unable to change the Stopbits.

Scroll to **<SET>** and press  .

4.3.1.4 Units Settings

1. Enter the MENU screen as shown in Section 4.2.2.
2. Press "2"; or scroll using  to **2 ALL SETTINGS** and press  .
3. Press "**4**"; or scroll using  to **4 UNITS** and press  . Change each setting as necessary by pressing  or  to read as follows:

```
        SET UNITS
------------------------
Distance :       metre◆▶
Temp.    :          °C◆▶
<QUIT>                <SET>
```

Scroll to **<SET>** and press  .

4.3.1.5 Date/Time Settings

1. Enter the MENU screen as shown in Section 4.2.2.

2. Press "2"; or scroll using  to **2 ALL SETTINGS** and press  .

3. Press "**5**"; or scroll using  to **5 DATE/TIME** and press  . The following is displayed, where DD is the day, MM is the month, YYYY is the year, HH is the hour, MM are the minutes, and SS are the seconds:

```
    SET DATE / TIME
------------------------
Date     :    DD.MM.YYYY
Time<24h>:      HH:MM:SS
<QUIT>              <SET>
```

Change the date or time as necessary. Date must be entered as DD.MM.YYYY. Time must be entered as HH:MM:SS. Use the number keys to enter the values. The cursor jumps over the period/colon between day/month/year or hour/minute/second, so do not press the period or colon. Enter a future time, scroll to **<SET>** and press  when that time is reached.

4.3.2 Measure Mode Settings

1. Enter the MEASURE MODE screen as shown in Section 4.2.4.

2. Move to each new setting using  or  and change each setting as necessary by pressing  or  , or entering the value to read as follows:

```
      MEASURE MODE
------------------------
Meas-Mode :     Mean s◆▶
n Meas.   :
n min.    :          3
n max     :         10
sDevM/20m :  0.00003 m
<QUIT>              <SET>
```

Scroll to **<SET>** and press  .

4.3.3 PtID & INCREMENT Settings

1. Enter the FUNCTIONS screen as shown in Section 4.2.5.

2. Press "**4**"; or scroll using  to **4 PtID & Increment** and press  . Change each setting as necessary by pressing  or  to read as follows:

```
   PtID & INCREMENT
-----------------------
Running PtID
PtID:              1
Incr:              1

<QUIT>           <SET>
```

4.4 Erase Data from Memory

At the start of levelling of each surveying job you may erase the data from memory to avoid confusion between other jobs. However, if you name your jobs based on Station ID, and add an 8th digit for day of levelling at this station, you should avoid confusion. For example, Day one levelling at Eastport, the Job Name would be 84101401; Day 2 would be 84101402; and so on. A good practice to get into would be to delete the job files from the level instrument/PCMCIA card after having transferred the data to your notebook PC and processing the abstract. To erase data from memory, use the following procedure:

1. Enter the DATA MANAGER screen as shown in Section 4.2.3.

2. Press "**2**"; or scroll using the  button to **2 DELETE JOBS** and press  .
   The following screen will be displayed, where xxxxxxx is the name of the last surveying job:

```
   DELETE DATA / JOBS
-----------------------

Job :          xxxxxxx
Data:     MEASUREMENTS

<QUIT>  <DEL-ALL>  <DEL>
```

3. Scroll using the  , and  or  button to **<DEL-ALL>** and press  .
   The following screen will be displayed:

```
   Deletes all Jobs
    And Codelist of
   Internal Memory!
<can last up to 2 min.>

<NO>              <YES>
```

4. Scroll using the  or  button to **<YES>** and press  **.**

4.5 Run Rod Level Bubble and Level Collimation Checks

4.5.1 Rod Level Bubble Check

The procedures for performing the Rod Level Bubble Check are detailed in Section 3.3.

4.5.2 Level Collimation Check

The level shall have a collimation check performed:

- at the start of each day's levelling;
- at the start of each new station level run;
- any time the level is subjected to substantial shock, vibration, etc.

When bringing the level out into a significantly different thermal environment, allow at least a half-hour for adjustment to ambient temperature, as a sudden thermal change can affect the collimation check. The temperature may be checked by comparing the **Instr. Temp** under **SYSTEM INFO** below to the upper thermistor. If the temperatures are within 2º the instrument has acclimated to the outside air.

Lay out a course following the Förstner procedure as illustrated in the Reference 3, page 94, or the Reference 8, page 24. This method is also known as the 1/3-2/3 procedure. The level rods should be separated at least 45 meters for the best results. This places the instrument setups at 15 m and 30 m.

The operator should check instrument temperature and battery capacity if this hasn't been checked up to this point. This is done by the following:

1. Enter the MENU screen as shown in Section 4.2.2.

2. Press "3"; or scroll using  to **3 SYSTEM INFO** and press  .The following screen will be displayed, where XX% is the amount of battery capacity left and XX ºC is the temperature of the DNA03:

```
------SYSTEM INFO-------
Free Jobs :          15
USER-Key  :        Code
Battery   :         XX%
Instr.Temp:       XX ºC
DSP Heater:         Off
Coll.Err. :        0.0”

<QUIT>          <SW-Vers>
```

This is also a good screen for checking the amount of battery power left while running levels (although there is a battery capacity icon showing on many screens); ensuring that the USER-Key is set to code; and checking that the temperature of the DNA03 has acclimated to the ambient temperature. The instrument temperature should be within a few degrees of the upper tripod temperature sensor.

Next, run the collimation check following the instructions contained in the manual and the prompts provided by the levels' A X X B collimation program.

1. Enter the PROGRAM screen as shown in Section 4.2.1.

2. Press “**4**”; or scroll using  to **4 CHECK & ADJUST** and press  . The following screen will be displayed:

```
     CHECK & ADJUST
------------------------
1 Job  :             ------
2 Meth.:           A x x B
3 START

<END>
```

3. Press “**1**”; or scroll using  to **1 Job** and press  . The following screen will be displayed, where XXX is a 3 digit number, DD.MM.YYYY is the current date, and HH:MM:SS is the current time:

```
        NEW JOB
------------------------
Job :             ------
Oper:                XXX
Cmt1:             ------
Cmt2:             ------
DD.MM.YYYY    HH:MM:SS
<QUIT>              <SET>
```

Job is automatically selected. Type the station number using the numeric keys, for example 8410140. Press  , and the selection is moved down to **Oper**. Type in the Observer's three digit code, for example 018. Press  , and the selection is moved down to **Cmt1**. Scroll to **<SET>** and press  . The following is displayed for a few seconds:

```
Job Set!
```

4. The **CHECK & ADJUST** Menu is back on the screen. Press "**2**"; or scroll using  to **2 Meth.** and press  .

   The following screen will be displayed:

```
      SELECT METHOD
----------------------

Meth.:        A x x B◄►
Stf1 :           ------
Stf2 :           ------

<QUIT>            <SET>
```

   Use  or  to select the method shown above (**A x x B**), then press  . You are now positioned over **<SET>.** Press  again. The following is displayed for a few seconds:

```
Method set!
```

5. The **CHECK & ADJUST** Menu is back on the screen. Press "**3**"; or scroll using  to **3 START** and press  . The following screen will be displayed:

```
    CHECK & ADJUST
---------------------

  Set instrument to
   station 1 (x) !
    A   x   .   B

                      <OK>
```

6. Position and level the instrument at the first setup, point to Rod A, focus on the rod, scroll to **<OK>**, and press  . The following screen is displayed:

```
CHECK & ADJUST    A X  B
----------------------
      Station 1
A1  :    ----.---- m
Dist:       ---.-- m


<END>             <CONT>
```

7. Press the Measuring Button on the right side of the instrument. After the instrument has finished taking readings, the display from Step 6 will have values next to A1 and Dist. Scroll to **<CONT>** and press  . Turn the instrument to Rod B, focus on the rod, and press the Measuring Button. When the instrument has finished taking readings, the following will be displayed:

```
CHECK & ADJUST    A X  B
----------------------
      Station 1
A1  :    ----.---- m
Dist:       ---.-- m
B1  :    ----.---- m
Dist:       ---.-- m
<END>             <CONT>
```

All the lines in the display above will have values. Scroll to **<CONT>** and press  .

8. The following screen will be displayed:

```
    CHECK & ADJUST
----------------------

  Set instrument to
   station 2 (x) !
     A   .  x  B

                  <OK>
```

9. Position and level the instrument at the second setup, point to Rod B, focus on the rod, scroll to **<OK>**, and press  . The following screen is displayed:

```
CHECK & ADJUST    A  X B
----------------------
      Station 2
B2  :    ----.---- m
Dist:       ---.-- m


<END>             <CONT>
```

10. Press the Measuring Button on the right side of the instrument. After the instrument has finished taking readings, the display from Step 9 will have values next to B2 and Dist. Scroll to **<CONT>** and press  . Turn the instrument to Rod A, focus on the rod, and press the Measuring Button. When the instrument has finished taking readings, the following will be displayed:

```
CHECK & ADJUST    A  X B
----------------------
      Station 2
B2  :    ----.---- m
Dist:       ---.-- m
A2  :    ----.---- m
Dist:       ---.-- m
<END>             <CONT>
```

All the lines in the display above will have values. Scroll to **<CONT>** and press  .

11. The following screen will be displayed:

```
    CHECK & ADJUST
----------------------
Coll.err.old:    X.X "
Coll.err.new:    X.X "
Difference  :    X.X "
Reticle:     X.XXXXX m
<QUIT>             <SET>
```

Make sure that **Coll.err.new**. is less than or equal to +/- 10.0 arc seconds. This meets the standard. Scroll to **<SET>** and press  .

If the collimation check fails - that is, **Coll.err.new**. is greater than or equal to +/- 10.0 arc seconds - rerun it for verification. First, double-check the course setup for proper layout. If the instrument was recently brought out from a much different thermal environment, give it additional time to adjust to the ambient temperature.

If the level continues to fail the collimation check, note the last value determined, continue on with the levels, and notify OET. There is no way to adjust the level in the field, it must be returned to Leica for adjustment.

4.6 Levelling to Bench Marks

4.6.1 Set/Check Instrument Tolerances

Before levelling is started, the instrument tolerances must be set/checked.

1. Enter the PROGRAMS screen as shown in Section 4.2.1.

2. Press "**2**"; or scroll using  to **2 LINE LEVELLING** and press  . The following screen will be displayed:

```
LINE LEVELLING - START
----------------------
1 Job  :         8410140
2 Line :       LINE00001
3 Set  :      Tolerances
4 START/CONT
```

3. Press "**3**"; or scroll using  to **3 Set : Tolerances** and press  . The following screen should displayed:

```
----- SET TOLERANCES -----
Precise :            ON◆▶
DistBal :            ON◆▶
MaxDist :            ON◆▶
StafEnds:            ON◆▶

<QUIT>   <LIMITS>   <SET>
```

If **OFF**, scroll to each item using  , and use  or  to change the tolerance from **OFF** to **ON**. All tolerances should be **ON** when finished.

4. Use  to scroll over to **<LIMITS>**. Press  and the following screen is displayed:

For 2nd Order, Class 1:

```
---- ENTER TOLERANCES ----
TDistBal:          5.00 m
MaxDist :         60.00 m
StafHigh:       2.90000 m
StafLow :       0.50000 m


<BACK>    <DEFLT>    <SET>
```

For 3rd Order:

```
---- ENTER TOLERANCES ----
TDistBal:         10.00 m
MaxDist :         90.00 m
StafHigh:       2.90000 m
StafLow :       0.50000 m


<BACK>    <DEFLT>    <SET>
```

If your display screen does not match this for the order of levels you are running, scroll to the values that are different using  and change the value to the one shown above. Scroll to **<SET>** and press  . You are returned to the **SET TOLERANCES** display. Again, scroll to **<SET>** and press  . The following is displayed for a few seconds:

```
Tolerances set!
```

4.6.2 Set Up First Line

The first line of the day needs to be set up. A line is the section run between 2 bench marks.

1. If not already in the **LINE LEVELLING - START** screen, enter the PROGRAMS screen as shown in Section 4.2.1, then press "**2**"; or scroll using  to **2 LINE LEVELLING** and press  **.** The following screen will be displayed:

```
LINE LEVELLING - START
----------------------
1 Job  :          8410140
2 Line :        LINE00001
3 Set  :       Tolerances
4 START/CONT
```

2. Press "**2**"; or scroll using to **2 Line : LINE00001** and press . The **Name** field is automatically selected. Type in the starting and ending SPSN numbers for the section between two bench marks that you are about to run. In the screen below the starting SPSN is 1011, and the ending SPSN is 1012. Press , and the selection is moved down to **Meth**. Use or to select the method shown below (**BF**), then press . The selection is moved down to **PtID**. Type in the starting SPSN (1011 for this example). Press , and the selection is moved down to **H0**. This is the ground height. If not 0.00000 m, type in 0.0 and press . **Staf1** and **Staf2** remain blank. The following screen shows how these entries will be displayed:

```
--------NEW LINE--------
Name :          10111012
Meth :                BF◆▶
PtID :              1011
H0   :         0.00000 m
Staf1:            ------
Staf2:            ------
<QUIT>  <PtSearch>   <SET>
```

Scroll to **<SET>** and press . The following is displayed for a few seconds:

```
Line set!
```

4.6.3 Enter Start of Day Codes

After setting up the first line you are back at the **LINE LEVELLING - START** screen. Code 1 and Code 2, the start of day codes, need to be entered. Note that these codes are the requirements for processing the level data using Translev and may be different than those codes used for the superseded DOS programs used to process levels.

1. Enter the FUNCTIONS screen as shown in Section 4.2.5.

2. Press "**3**"; or scroll using to **3 Code** and press . The following screen will be displayed:

```
CODE & ATTR ENTRY  1/2
----------------------
Code :         ------
Info1:         ------
Info2:         ------
Info3:         ------
Info4:         ------
<QUIT>            <REC>
```

3. Scroll to each item using , and enter information from the keypad. Enter the following information for each line, pressing after each entry. For letters, press SHIFT, and using the letter labels above each number key, enter the letter needed by pressing each key multiple times until the correct letter is shown. For example “DNA03” is entered by pressing SHIFT, the number 8, the number 5 twice, the number 7, SHIFT, the number 0, and finally the number 3. Shift will remain active for entering as many letters as needed, and is deactivated by pressing SHIFT again. The keypad then goes back to numeric mode.

Code 1 - Date/Observer/Instrument/Temp Scale. Info 1 - Date (MMDDYY) Info 2 - Observer number (1 to 999) Info 3 - Instrument model number (DNA03) Info 4 - Temperature scale (0 for C., 1 for F.)

After entering **`Info4`** and pressing , the cursor is positioned over **<REC>**. Press . The following is displayed for a few seconds:

`Code recorded!`

4. Repeat Steps 1, 2, and 3 and enter the following information for Code 2:

Code 2 - Equipment Used/Collimation Info 1 - Instrument serial number. Info 2 - ± Collimation error in seconds (without decimal point, e.g. 9.0 is entered as 90). Info 3 - Rod 1 serial number. Info 4 - Rod 2 serial number.

After entering **`Info4`** and pressing , the cursor is positioned over **<REC>**. Press . The following is displayed for a few seconds:

`Code recorded!`

4.6.4 Start Levelling

Tolerances and the first line have been set up; you are now ready to begin levelling.

NOTE: If the backsight or foresight is to an inverted bar code rode, press SHIFT MODE to put the gun in Invert mode. The "T" symbol appears on the screen as long as INV is active. Revert to normal measurements with a renewed press on SHIFT MODE.

1. Position the instrument for measuring the backsight.

2. If the instrument is in the **LINE LEVELLING - START** screen, jump to Step 4. If not, enter the PROGRAMS screen as shown in Section 4.2.1.

3. Press "**2**"; or scroll using  to **2 LINE LEVELLING** and press  . The following screen will be displayed:

```
LINE LEVELLING - START
----------------------
1 Job  :          8410140
2 Line :         10111012
3 Set  :      Tolerances
4 START/CONT
```

4. Press "**4**"; or scroll using  to **4 START/CONT** and press  . The following screen will be displayed:

```
------- CHECK LIST -------
Meas-Mode:        Mean s
n Meas   :          3-10
SDevM/20m:     0.00003 m
USER-Key :          Code
Pt-Incr  :             1
Method   :            BF
                    <OK>
```

Verify that the above check list screen is correct. **<OK>** is highlighted so press  . The following screen is then displayed:

```
LINE LEV              BF  BF
ST.1--------BACK ---↑-----
PtID:                1011
Rem :               ------

H   :        0.00000 m

<END>                    QC
```

This screen shows (1) that you are Line Levelling using the Backsight/Foresight (BF) method; (2) you are ready to shoot the backsight at the uneven setup (arrow pointing to B on the first BF in row one, BACK in row 2); (3) that the backsight rod is on bench mark SPSN 1011; and that the ground height is 0.00000 m (H).

5. Enter Code 11 for Start of Section. At this point you can access the **CODE & ATTR ENTRY** screen by pressing  . You can also access the **CODE & ATTR ENTRY**

screen by following Steps 1 and 2 in Section 4.6.3. Enter the data below for Code 11 as in Step 3 from Section 4.6.3.

Code 11 – Start of Section
Info 1 - Time (HHMM)
Info 2 - Rod number on starting mark
Info 3 - Top Probe (no decimal point)
Info 4 - Weather codes (see below)

Wind codes
0 < 10 km/hr
1 = 10-25 km/hr
2 > 25 km/hr
Sun Codes (sunny to cloudy)
0 < 25%
1 = 25 - 75 %
2 > 75 %

After entering **Info4** and pressing  , the cursor is positioned over **<REC>**. Press  . The following is displayed for a few seconds:

```
Code recorded!
```

6. Focus the instrument on the backsight rod and press the Measuring Button. The following screen is displayed:

```
Measuring...
Mode :              Mean s
Count:                   1
Staff:          x.xxxxx m
sDev :       ----.----- m
sDevM:       ----.----- m
Spread:      ----.----- m
```

When this screen appears, there is a value on the staff line (represented by x.xxxxx above). As the Count - the number of readings being taken by the instrument - increments by 1, numbers will appear on the sDev, sDevM, and Spread lines. sDev is the standard deviation of a single measurement, sDevM is the standard deviation of the mean of all the current measurements, and Spread is the difference between the maximum and minimum readings of all the current measurements. The Count will range from 3 to 10, depending on sDevM. In Section 4.3.2 the allowable sDevM/20m is set to 0.00003 m. This means that for a full 60 m shot, the sDevM has to be less than or equal to 0.00009 m (0.00003 m x 60/20). This meets the FGCS standards requirement stated in Section 3.5 Geodetic Leveling, FGCSVERT ver. 4.1 5/27/2004

(http://www.ngs.noaa.gov/FGCS/tech_pub/Fgcsvert.v41.specs.pdf) of 0.1 mm for a minimum of 3 readings.

After the minimum number of readings and sDevM agree with the settings entered in the instrument the following screen will appear:

```
LINE LEV              BF  BF
ST.1--------FORE ----↑----
PtID:                   1
Rem :               ------
DTot:               x.xx m
LDst:               x.xx m
TBal:               x.xx m
                  <LAST>  QC
```

This screen shows (1) that you are Line Levelling using the Backsight/Foresight (BF) method; (2) you are ready to shoot the foresight (FORE in row 2) at the uneven setup (arrow pointing to F on the first BF in row one); (3) that the foresight rod is on turning point 1. Unless the foresight is to a bench mark, ensure that the PtID is set to 1 for the first turning point. If it is not, set it to 1 by following the procedures in Section 4.3.3. You also know DTot – the total section distance; LDst – the last distance measured, and TBal – the total ± section imbalance.

7. If the foresight rod is on a bench mark, skip to Step 9. Otherwise, focus the instrument on the foresight rod and press the Measuring Button. The same **`Measuring...`** screen as shown in Step 6 above is displayed.

   After the minimum number of readings and sDevM agree with the settings entered in the instrument the following screen will appear:

```
LINE LEV              BF  BF
ST.2--------BACK -------↑-
PtID:                   1
Rem :               ------
DTot:               x.xx m
LDst:               x.xx m
TBal:               x.xx m
<END>   <CL>    <LAST>  QC
```

   This screen shows (1) that you are BF Line Levelling; (2) you are ready to shoot the backsight at the even setup (arrow pointing to B on the second BF in row one); (3) that the backsight rod is on turning point 1. You also know DTot; LDst, and TBal (which should be small, but at least less than ± 5 m). You may now have the backsight rod person move to the next turning point. Before moving the tripod and instrument to the next setup, enter the temperature data as described in Step 8.

8. To enter the temperature information, or Code 33, you can access the **CODE & ATTR ENTRY** screen as described in Step 5 of this section.

Code 33 - Thermistor Readings Info 1 - Bottom probe (no decimal point) Info 2 - Top probe (no decimal point) Info 3 - blank Info 4 - blank

After entering **Info4** and pressing  , the cursor is positioned over **<REC>**. Press  . The following is displayed for a few seconds:

Code recorded!

Pick up the tripod and move to the next setup.

9. Repeat Steps 6 through 8 of this section until you reach the bench mark that is the end of this line. At this point, you must change the PtID of the foresight to that of the end of line bench mark. To do this, enter the FUNCTIONS screen as shown in Section 4.2.5. Press "**4**"; or scroll using  to **4 PtID & Increment** and press  . Scroll to PtID and enter the bench mark SPSN – in this case 1012. Scroll to **<SET>** and press  . The following screen should be displayed:

```
LINE LEV              BF  BF
ST.1--------FORE --------↑
PtID:               1012
Rem :              ------
DTot:              x.xx m
LDst:              x.xx m
TBal:              x.xx m
                  <LAST>  QC
```

Focus the instrument on the foresight rod and press the Measuring Button. The same **Measuring...** screen as shown in Step 6 above is displayed.

10. Enter temperature information as in Step 8 above. This is the end of a section (or line) between two bench marks so the end of section code (Code 99) must be entered. To enter this code, access the **CODE & ATTR ENTRY** screen as described in Step 5 of this section and enter the following information in Info 1 to 4.

Code 99 - End of Section
Info 1 - Time (HHMM)
Info 2 - Rod number on starting mark
Info 3 - Ending temperature (upper probe)
Info 4 - Weather codes (see below)

Wind codes
0 < 10 km/hr
1 = 10-25 km/hr
2 > 25 km/hr
Sun Codes (sunny to cloudy)
0 < 25%
1 = 25 - 75 %
2 > 75 %

After entering **Info4** and pressing  , the cursor is positioned over **<REC>**. Press  . The following is displayed for a few seconds:

Code recorded!

At this point the Observer may wish to record the ground height between the two bench marks. The ground height is the value on the LINE LEV screen next to dH T: If the value is not showing on this screen, scroll to **<CL>**, press  , then record the value next to dH T: from the LINE INFO screen.

11. Repeat Steps 1 through 10 for each section between bench marks to be run at the station. For the Backward Run, Line Names will be opposite that of the Forward Run, e.g. Forward Run of 10111012 will be Backward Run of 10121011. **NOTE:** Unlike the procedure for the previous version of digital levelling with the NA3000 & NA3003, do not enter Codes 33/99/11 in succession before starting the next section. Steps 2 through 4 must be performed before Step 5 – entering Code 11.

12. At the end of the day, or if the Observer or instrument is changed, Code 9999 must be entered. To enter this code, access the **CODE & ATTR ENTRY** screen as described in Step 5 of this section and enter the following information in Info 1 to 4.

Code 9999 - End of Day/Change Observer or Instrument
Info 1 - blank
Info 2 - blank
Info 3 - blank
Info 4 - blank

After entering **Info4** and pressing  , the cursor is positioned over **<REC>**. Press  . The following is displayed for a few seconds:

```
Code recorded!
```

4.6.5 Manual Entries

In the event a backsight or foresight is read manually from a steel tape or calibrated scale and has to be entered manually in the DNA03 level instrument the following procedure must be followed:

1. If the manual input to be performed is a backsight, go to step 2. If the input is a foresight, proceed by measuring the backsight using the bar code rode and the digital levelling procedures.

2. Enter the Functions Screen as shown in Section 4.2.5 Press "**5**"; or scroll using  to **5 Manual Input** and press  .

3. The following screen is displayed:

```
     Manual Input
----------------------
Staff:       0.00000 m
Dist :          0.00 m


<QUIT>           <CONT>
```

4. Hold the zero point of the steel tape or scale on the point an elevation is desired. It is suggested that a metric tape or scale be used to minimize calculations. Remember the input to the gun has to be in meters.

5. Observe and make note of the elevations at each of the three wires. Average these three readings. This will be the "Staff" value to be manually input into the gun. If the tape/staff is inverted, the value is entered as a negative number.

6. Subtract the top wire reading from the bottom wire reading. This is the Stadia Interval as described in Reference 1, page 40-41. Multiply the stadia interval by the stadia factor, which is 100 for the DNA03. The resulting value is the distance to the tape/scale in the units of the tape/scale. This means if the scale is in inches, your distance is in inches, etc. Perform any additional calculations needed to convert the value into meters. This value is the "Dist" to be manually input into the gun.

7. Enter the **Staff:** value, scroll down with  , and enter the **Dist :** value. Scroll to **<CONT>** and press  .

8. Enter the temperatures, then continue the level run using digital levelling procedures.

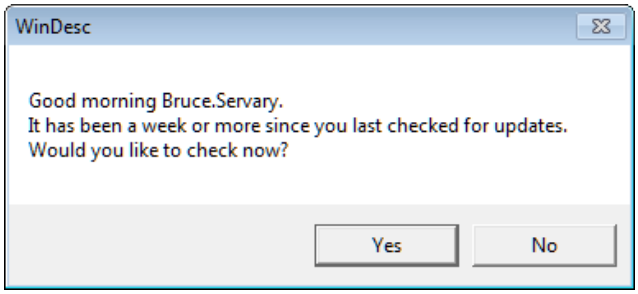
5 Procedures for Processing Level Data with Translev

5.1 The NGS Translev Program

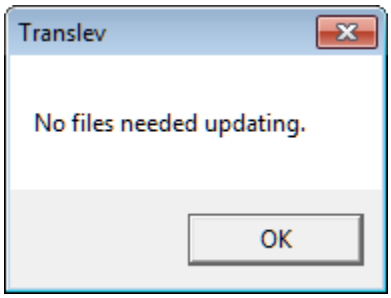
Translev is the NGS approved software program for Windows based computers for the purpose of processing digital levelling observation data and creating abstracts, bok files, and VERTOBS datasets that are acceptablefor submission to the National Geodetic Survey (NGS). All digital levelling observation data for water level stations are required to be processed by this program. This section is a guide to the use of Translev for processing digital levels from the Wild/Leica DNA03 and Wild NA3000 series level instruments.

There are many tools available in the Translev program. This section only covers what is necessary to process the level data at all CO-OPS stations to CO-OPS standards. The program comes with an extensive help file (See Reference 7) which in itself is a manual on all the functions. As the user gets familiar with Translev, they should feel free to explore the many utilities designed to enhance creating a bench mark description file.

Translev is designed to update the program if changes have been made without the user having administrative privileges on their PC. This ensures that everyone has the latest version of the software. If the following pop-up window appears (it should have your name after 'Good Morning'), choose "Yes".



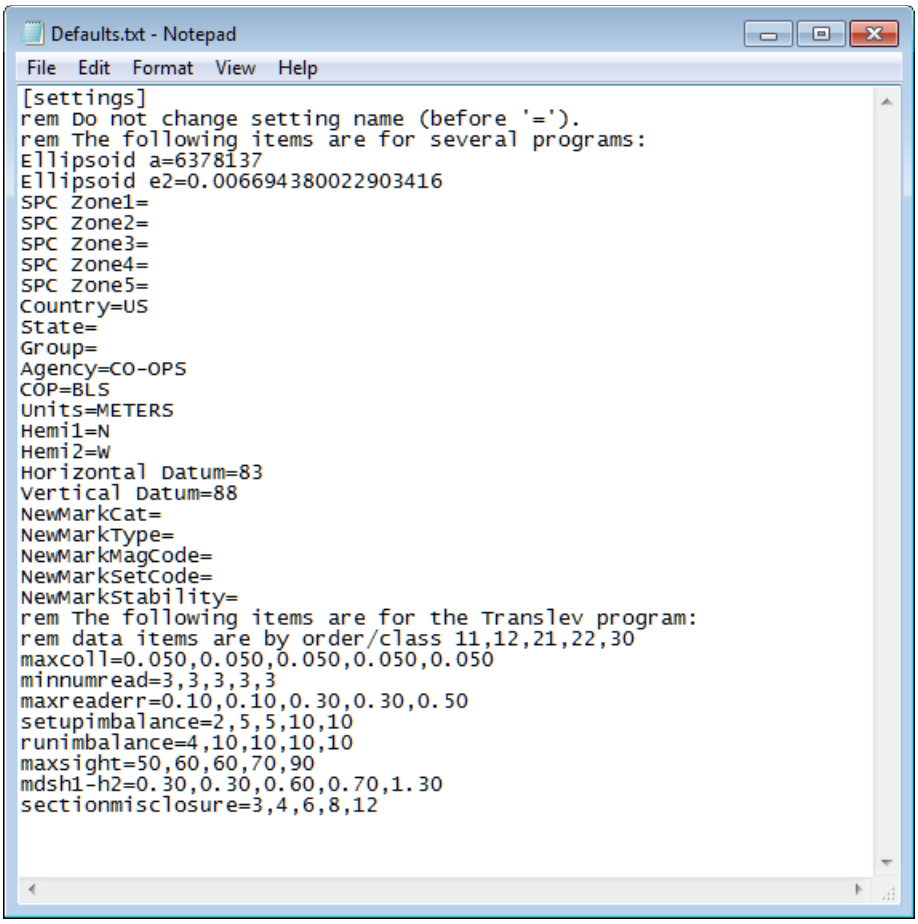
If no changes have been made to the program the following pop-up will appear:



Choose "OK" and the Translev start-up screen appear as shown below. Program updates may also be checked in the WebTools drop-down under "Update".

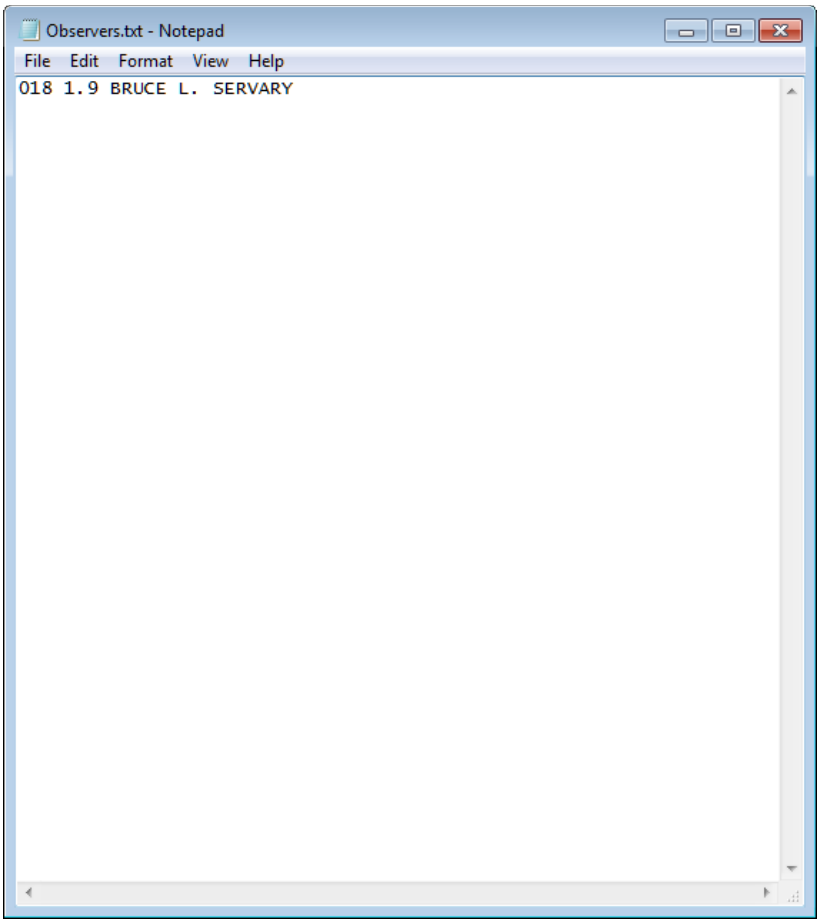
Prior to using the Translev program, the Defaults.txt file should be edited. This will save some data entries in the future by entering information that is redundant each time you use Translev. Navigate to the Translev folder on your PC. Right click on the Defaults.txt file and click Edit.

This will open the Defaults.txt file in Notepad, allowing you to enter data. Navigate to Agency and enter “CO-OPS”, or your agency name. Next, navigate to COP (Chief of Party) and enter your initials. Finally, navigate to Units and enter "METERS". The following screen shows the Defaults.txt with the three lines filled out.



Note: These entries will appear in the Descriptive Data of new Bench Mark descriptions, not current descriptions you are editing. You will still be able to edit this information in the program if you desire.

After checking/modifying Defaults.txt, right click on the Observers.txt in the Translev folder and select Edit. This opens the Observers.txt file in Notepad, allowing you to enter data. This is where the user's three digit observer number (obtained from OET), the height of the level instrument that they normally set it up at (to the center of the eye piece/lens), and their name is entered. Check to see if your information is entered in the file. If not, enter your information in the exact format shown in the file.

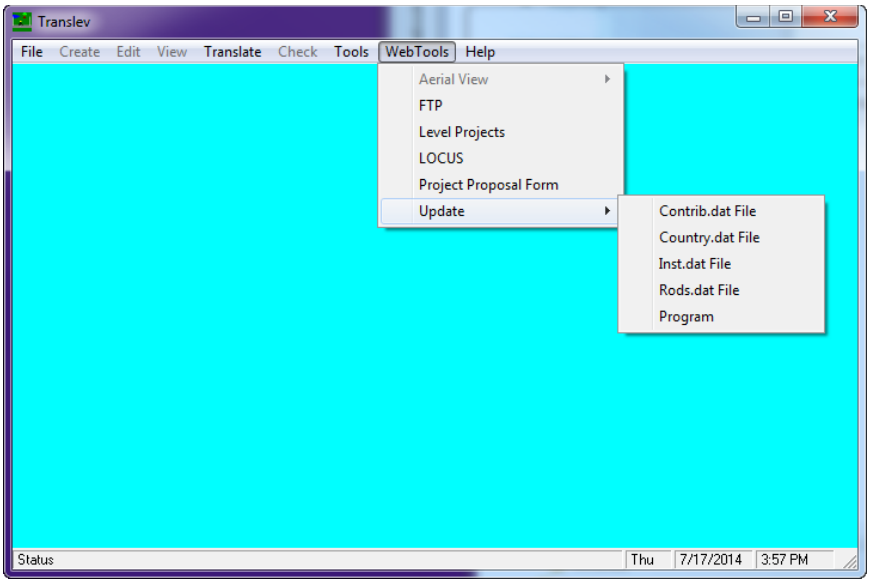


5.2 Update *.DAT Files

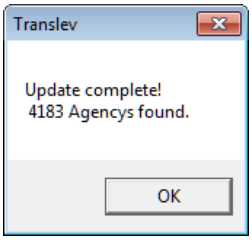
The first time that Translev is used after installation, and periodically thereafter, the *.DAT files should be updated to insure that the most recent information is available to the program. These files are Contrib.dat, Country.dat, Inst.dat, and Rods.dat files. To do this:

1. Start Translev

2. Select the **WebTools** drop down menu and hover over or click Update and the following is displayed:

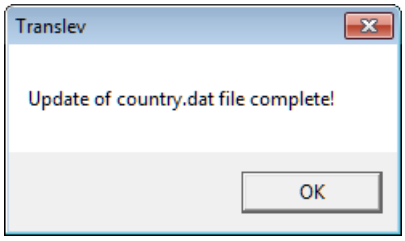


3. Click on Contrib.dat File, wait for the following pop-up window:



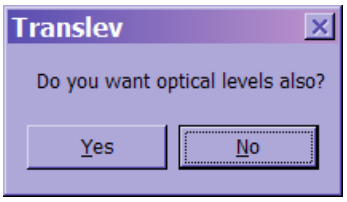
Click **OK**.

4. Select the **WebTools** drop down menu and hover over or click Update, then select Country.dat File and wait for the following pop-up window:



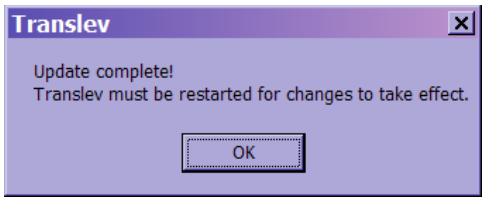
Click **OK**.

5. Select the **WebTools** drop down menu and hover over or click Update, then select Inst.dat File and wait for the following pop-up window:



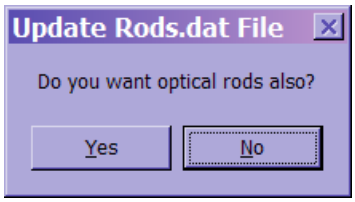
Click **Yes**.

6. The following window is displayed:



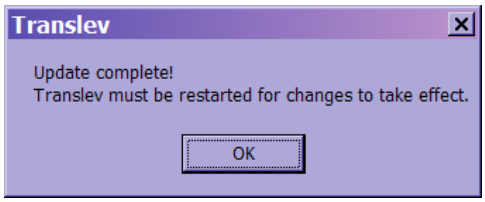
Click **OK**.

7. Select the **WebTools** drop down menu and hover over or click Update, then select Rods.dat:



Click **Yes**.

8. The following window is displayed:



Click **OK**.

9. Exit and restart Translev

5.3 (SUPERSEDED) Processing Level Data from the NA3000 Series Instrument

This section is superseded with this version of the User's Guide. Please refer to the previous version of this User's Guide or the Translev Help File for information previously covered.

5.4 Processing Level Data from the DNA03 Series Instrument

5.4.1 Download the Levelling Data to a PC

5.4.1.1 Using the Data Card

Once levelling is finished and it's time to process the data, the level data file needs to be moved to the data card. This is done using the following steps:

1. Enter the DATA screen as shown in Section 4.2.3.

2. Press "4"; or scroll using to **4 DATA EXPORT** and press .The following screen will be displayed, where XXXXXXX is the name of the job just completed:

```
-----DATA EXPORT------
Target:          Card◆▶
Job :         XXXXXXX◆▶
Data:    Measurements◆▶
Form:           GSI-8◆▶
File:        ------.GSI
Dir :              \GSI

<QUIT>         <EXPORT>
```

3. Insure that the target is set to Card and that the name of the job matches the name of the levelling job to be processed. Use or to select the correct **Target:** and **Job :**.

4. Scroll using to File: and enter the name of the file to be created on the card. This should be the same as the name of the job. Press .
   Scroll to **<EXPORT>** and Press . The following is displayed for a few seconds:

```
Storing Measurements
      to card…
```

5. Power off the DNA03, open the door to the card slot and remove the data card.

6. Insert the card into a laptop and open My Computer of Windows Explorer and navigate to the drive the system assigned to the card.

7. Navigate to the \GSI folder and copy the file named in step 4 above to the folder where the levelling files are to be processed.

The data file is now ready to be processed as described in Section 5.4.2 below.

5.4.1.2 Using the USB Cable

Another option to download the level file is the USB cable. The driver for the cable has to have been installed on the PC previously for this method to work. The driver for the USB cable is included on a disk that came with the cable. The download is done using the following steps:

1. Enter the DATA screen as shown in Section 4.2.3.

2. Press "4"; or scroll using to **4 DATA EXPORT** and press .The following screen will be displayed, where XXXXXXX is the name of the job just completed:

```
-----DATA EXPORT------
Target:          RS232
Job :          XXXXXXX
Data:    Measurements
Form:            GSI-8
File:        ------.---
Dir :             ------

<QUIT>         <EXPORT>
```

3. Insure that the target is set to RS232 and that the name of the job matches the name of the levelling job to be processed. Use or to select the correct Target and Job.

4. Scroll using to **File:** and enter the name of the file with a GSI extension to be created on the PC. This should be the same as the name of the job. Press .

5. Connect the cable from the DNA03 to the PC. Wait for windows to recognize the cable. Scroll to **<EXPORT>** and Press . The following is displayed for a few seconds:

```
Measurem.: DNA --> PC
```

6. Navigate to the \GSI folder and copy the file named in step 4 above to the folder where the levelling files are to be processed.

The data file is now ready to be processed as described in Section 5.4.2 below.

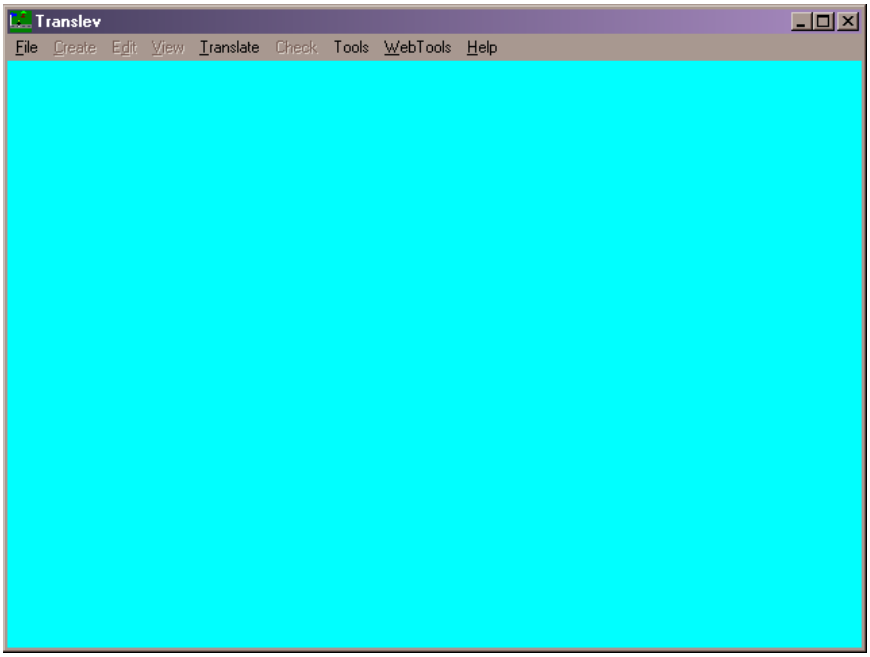
5.4.2 Process the DNA03 Level Data

To process the level data collected using a Leica DNA03 Digital Level, two files must be present in the project folder in order to process levels using Translev:

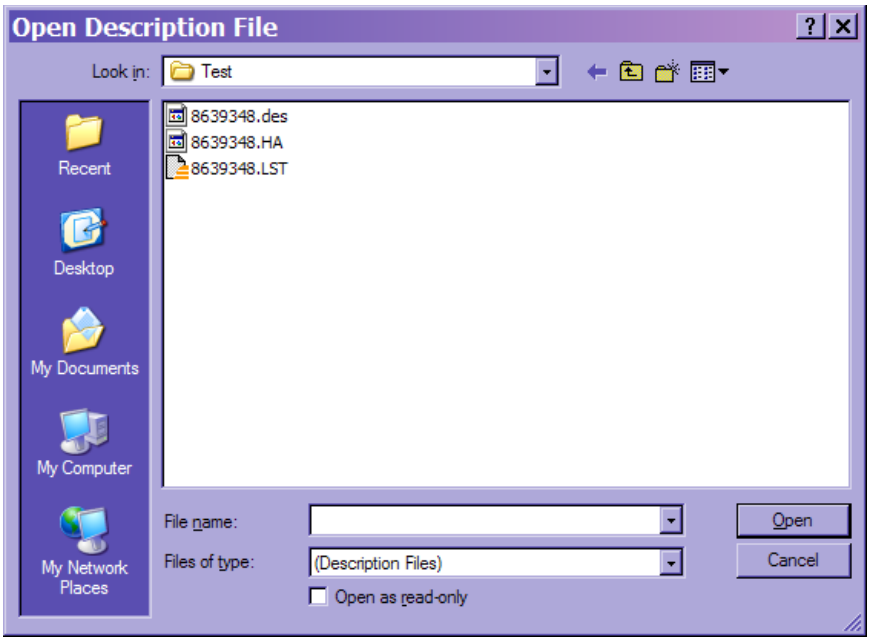
XXXXXXX.DES - BM description file from WinDesc
XXXXXXX.GSI – Raw level data file downloaded from instrument in Section 5.4.1

Matching SSN numbers must be used in the *.des file in order for the levelling data and bench mark descriptions to be properly matched up. The following are the procedures to use to process the level data:

1. Open Translev - Double click on the Translev icon on your PC; or click Start from the Taskbar, hover the cursor over All Programs, then the click the Translev icon in the All Programs list. The following screen is displayed:



2. To Create or Edit An Existing VertObs (*.hgz) File - Select the **File** drop down menu and click **New** to create or **Open** to edit an existing file. Navigate to the project folder in the **Save in:** or **Look in:** field. For a new file, type the station number in the File name box. To open an existing file, choose the appropriate file from the file list window, *.hgz should be visible in the Save as (or Files of) type field. Click **Save** or **Open**. A file list window similar to the following will appear:



Select the *.des file for this project. Click **Open**.

3. The Data Set Information screen (see Section 2.2.3) may be displayed. Verify the information and press OK.

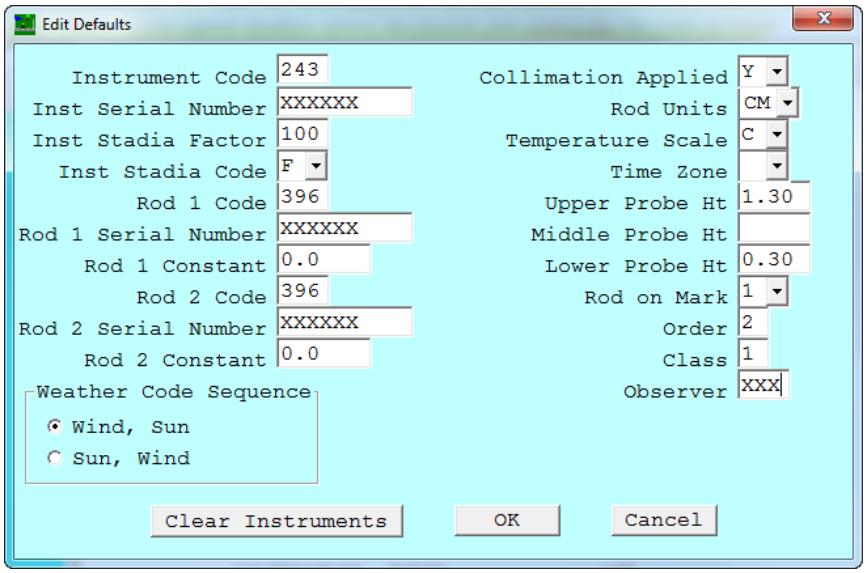
4. The Additional Project Data window (see Section 2.2.3) may be displayed. Verify the information and press Okay.

5. The Translev main screen is now available with the file currently being worked on in the window header. All of the drop down menus are available.

6. Translate the *.gsi File to a *.lvl File - To translate the file previously downloaded in Section 5.4.1, click the Translate drop down menu and select **Wild/Leica .gsi File**.

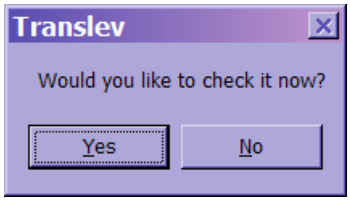
7. The Open Raw Wild Level File window opens. Navigate to the project folder and select the *.gsi file saved earlier. The file name will appear in the File name box. Click **Open**.

8. The Edit Defaults screen similar to the following is now displayed.

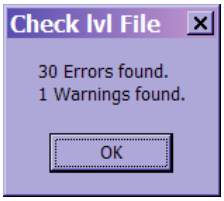


Verify that the window is filled out with the above information. XXXXXX represents the serial numbers of the level instrument and rods being used. Use the drop down list to choose the time meridian of the area the project is being done. Order & Class will be either 2 & 1, or 3 & blank, depending on the order and class of levels being run. XXX is the three digit observer code distributed from CO-OPS headquarters. Be sure to use leading zeroes if Observer code is less than three digits.

9. A following window opens asking to check the *.lvl file.



Click **Yes**. A window similar to the following will open giving the number of errors and warnings in the *.lvl file.

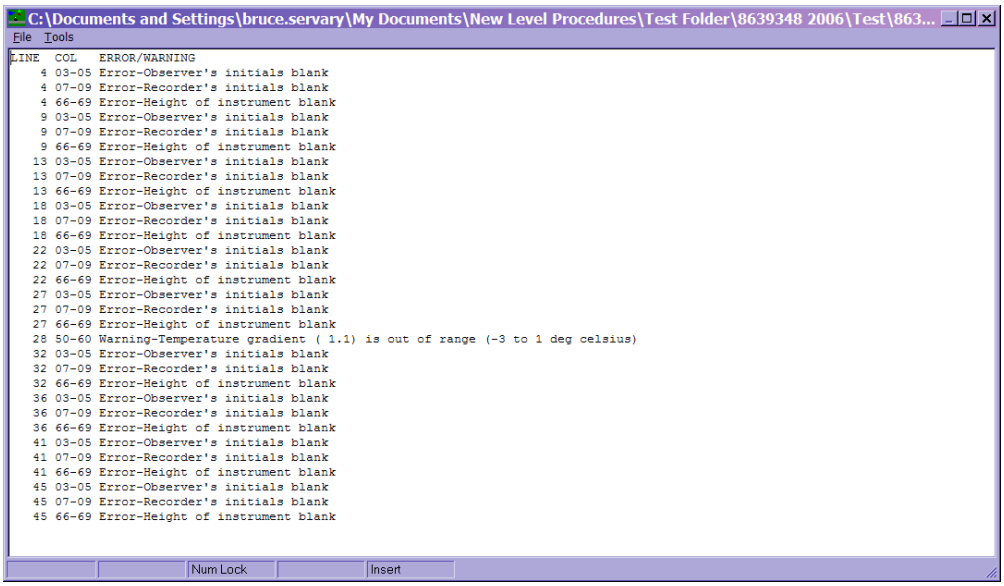


Click **OK**.

If a different window opens stating that the calibration file for one of the rods or the instrument used in the project is missing, click **OK** and select **Update/Inst.dat File** and **Update/Rods.dat File** from the **WebTools** drop down menu. After updating both

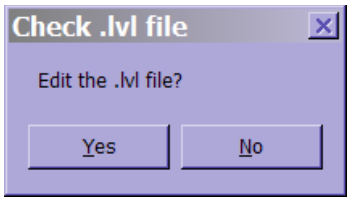
*.dat files, restart Translev, open the appropriate *.hgz file, then select **Lvl file** from the **Chec**k drop down menu.

10. A window similar to the following opens displaying all of the errors that Translev found in the *.lvl file.



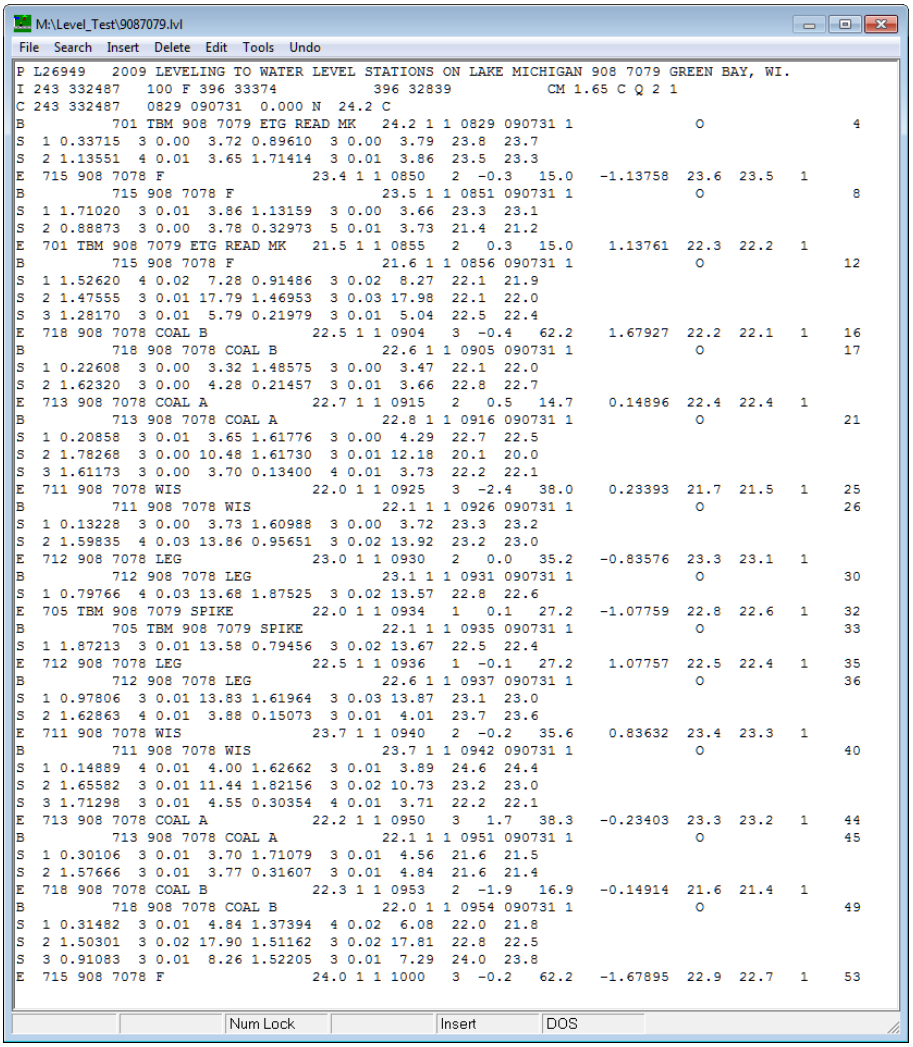
Review the file and make corrections where necessary to clear all the errors. In the example above, the bulk of the errors are caused by the Observer information being absent from the Observers.txt file. When finished reviewing, click **File** in the drop-down menu and select **Close,** or click the **"X"** in the upper right corner of the window.

11. A window similar to the following opens asking to edit the *.lvl file.



Click **Yes**.

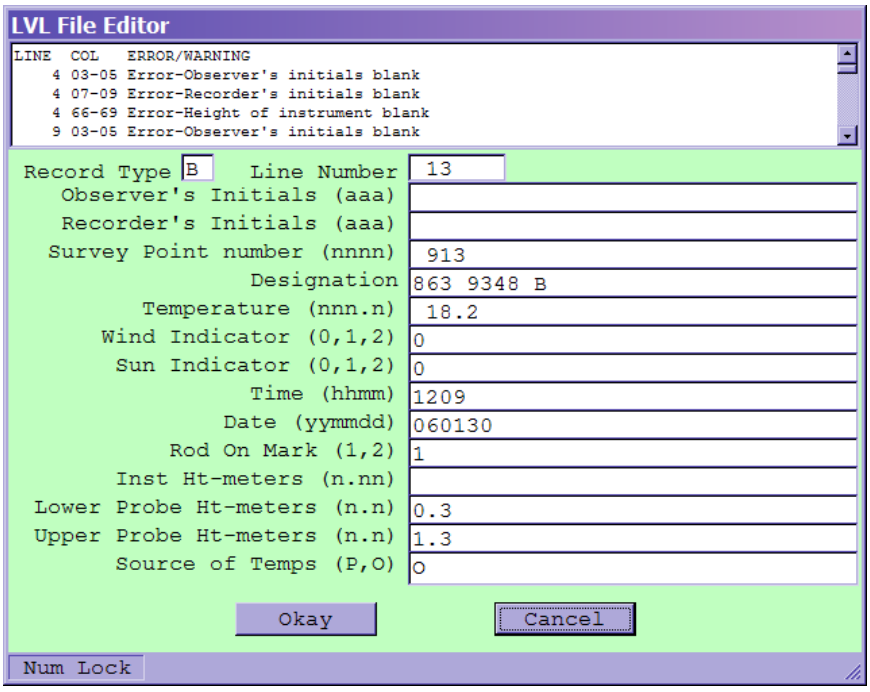
A window similar to the following will open:



Each of the lines in the *.lvl file is a record containing many fields. To edit a record, select a line with the mouse so that the entire line is highlighted, then click **Edit** from the window menu.

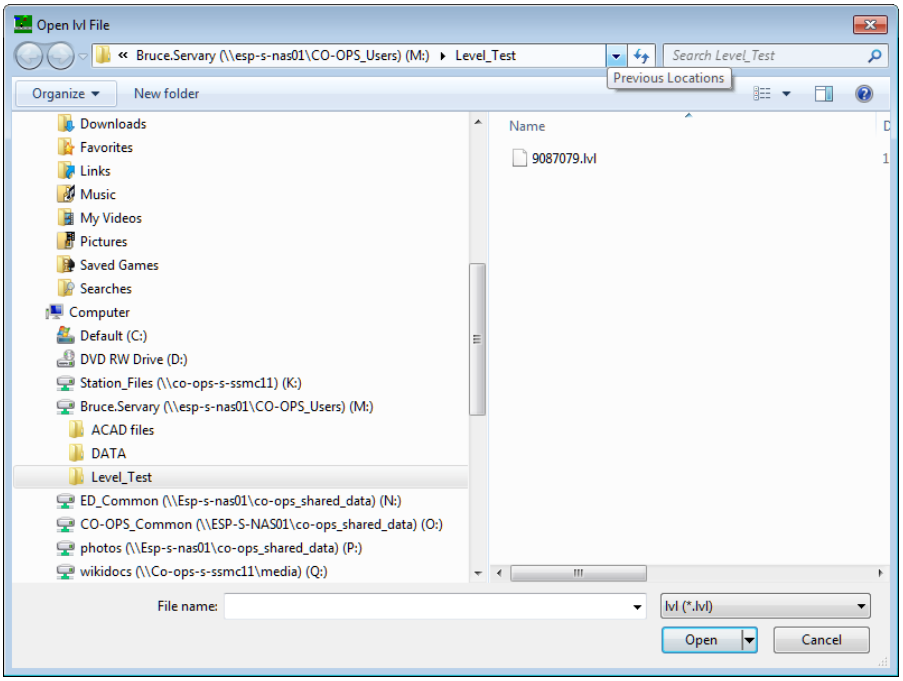
12. The *.lvl error window has been closed, but information in that file is needed to know which lines in the *.lvl need to be edited. Use a text editor, such as Notepad, and open the *.lvl.err file located in the project folder. Use this file as a guide to editing the *.lvl file which is still open from Step 11.

13. Edit the *.lvl file and fix as many errors as possible. The window below is similar to that which opens when a line is selected and **Edit** is clicked on the menu:



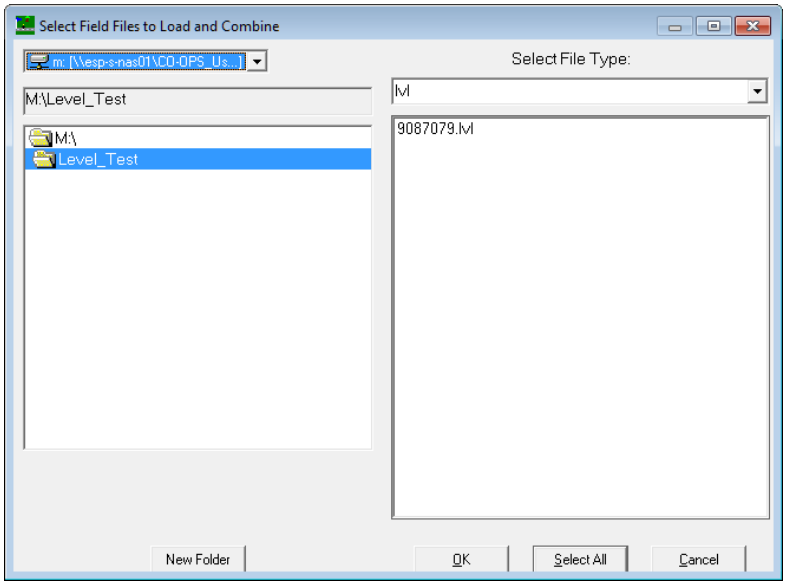
When edits are complete, click **File** in the drop-down menu and select **Save**. Next, click **File** in the drop-down menu and select **Close**.

14. Recheck the recently edited *.lvl file by selecting Check from the main Translev window and picking Lvl file. An Open lvl File window similar to that shown below will open:



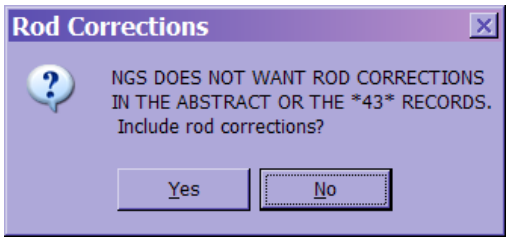
Select the file to check and click **Open**. The next window that opens should show fewer errors than before. Click **OK**, then **File**/**Close** to close the *.lvl.err file. Click **No** to editing the .lvl file if no errors remain, otherwise, click **Yes** and repeat Steps 13 & 14 until all the errors are gone.

15. Import the *.lvl file. This is done by clicking the **File** drop-down menu and selecting **Import .lvl Files**. The Select Field Files to Load and Combine window shown below opens.



Select the *.lvl file recently created by the Translate function performed above and click **OK**.

16. The window shown below opens stating that NGS does not want rod corrections…etc.

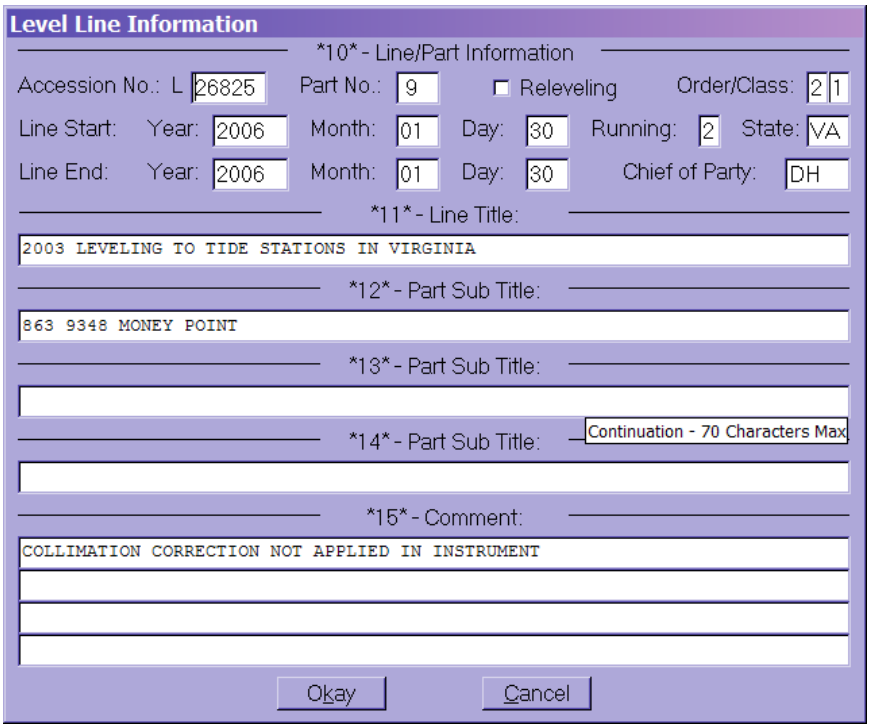


Click **No**.

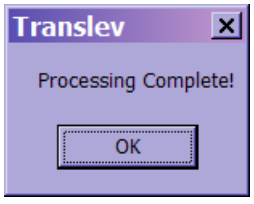
17. A similar window to the following opens asking for the part number.

Enter the part number for this level run and click **OK**.

18. A similar window to that which follows opens and displays the record *10* - Part Information.



Verify the information contained in the boxes and add any additional information required. Click **Okay**. The following window opens stating Processing Complete!

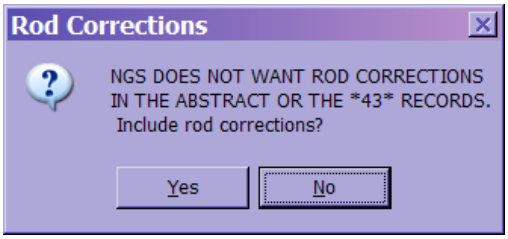


Click **OK**.

19. Create An Abstract - Click the **Create** drop-down menu and select **Abstract (.abs) File**.

20. The Abstract window opens. The part number is displayed and the window is requesting the Starting and Ending bench marks and the starting elevation of the starting mark. The Starting Bench Mark is the station PBM. The Starting Elevation is the PBM elevation above station datum for this station in the current year project instructions. The Ending Bench Mark is the Aquatrak, ETG, or other water level sensor that is generally included in the level run. There is no need to type in the SPSN of the bench marks as there is a drop down menu for the marks. Choose the start and end bench marks and enter the start elevation. If an elevation already exists in this field that is different from the PBM Elevation Above Station Datum for this station in the current year project instructions, change it to the correct value and click **Okay**.

21. The following window opens:

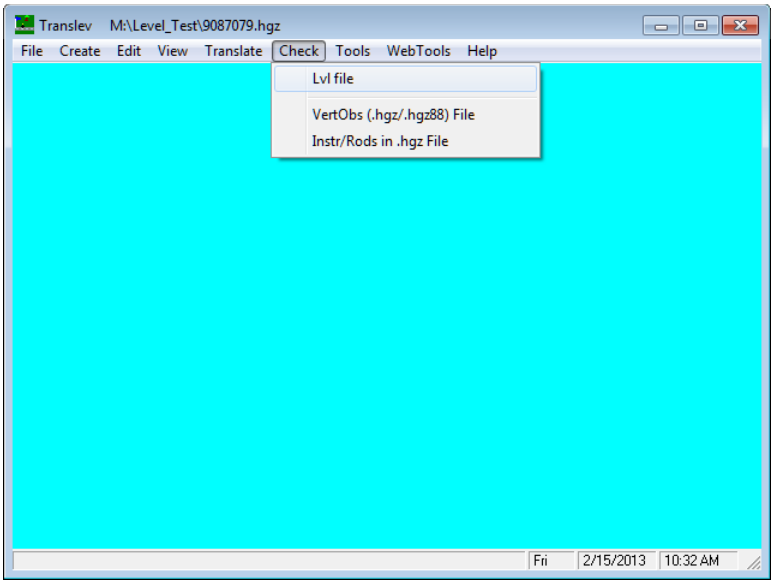


Click **No**.

22. The abstract is created and a window opens displaying the abstract. From this window the abstract may be printed by selecting the **File** drop down menu and clicking **Print**.

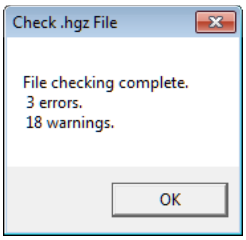
23. Exit the abstract by clicking **File** in the drop-down menu and selecting **Close**.

24. The last step before exiting Translev is to Check the VertObs (.hgz/.hgz88) File. To do this, select 'Check>VertObs (.hgz) File' from the main menu:

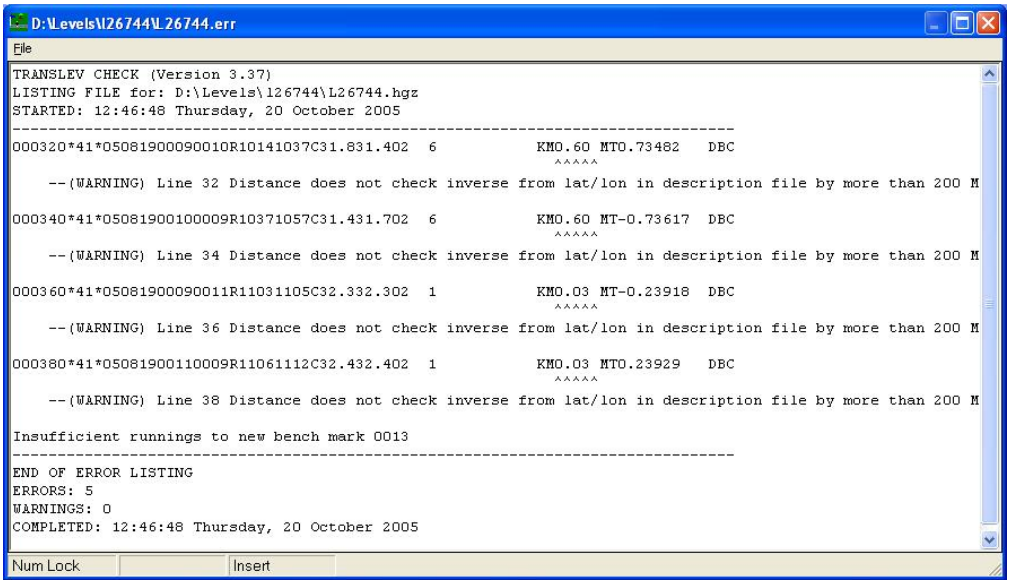


When completed a message box will appear indicating the number of errors and warnings. Click 'Okay' to display the errors and warnings.

If there are errors, a window similar to the following will be displayed:



An error file similar to the following will be displayed after clicking OK:



Each file record that has a problem will be displayed with ^^^^^ under the columns were the warning or error was found along with the appropriate message.
Warnings indicate possible problems. In the case shown, the leveling route was not direct and the leveling distance was substantially more than the geodetic inverse.
Errors indicate problems in the file that MUST be fixed.

25. Repeat step 24 until all the errors are fixed.

26. Exit Translev by clicking **File** in the drop-down menu and selecting **Exit**.

Appendix A - Programs Required on Personal Computer (PC)

The following programs are required installations on the personal computers of those generating description files using the programs required by the National Geodetic Survey (NGS). Descriptions courtesy of the NGS web site. To provide consistency throughout CO-OPS, including CO-OPS IDIQ contractors, install the following software in the folder C:\NGS-Apps. This will facilitate the resolution of any issues that arise regarding the correct operation of the software. Note: Google Earth does not have to be installed in this folder.

WinDesc - NGS supported Description Entry Software. The latest version is located on http://www.ngs.noaa.gov/PC_PROD/pc_prod.shtml

Translev - This program facilitates the process of editing, formatting and checking digital levelling observation data and creates abstracts, bok files, and VertObs datasets for submission to the NGS. The program includes many built-in functions such as predicting temperature differences, refraction corrections, rod corrections and plotting. Also included are routines for editing *.lvl files and VertObs files. The latest version is located on http://www.ngs.noaa.gov/PC_PROD/pc_prod.shtml

DSWORLD - DSWorld plots NGS network points by state, county and type (vertical or horizontal) in Google Earth. Google Earth must be installed prior to running DSWorld. NOTE: Because of changes to NGS web offerings, older versions of DSWorld no longer function. Please upgrade to the latest release. The latest version is located on http://www.ngs.noaa.gov/PC_PROD/PARTNERS/index.shtml

Google Earth - This application is supported by ISD and installed on the personal computers of those using the levelling programs.

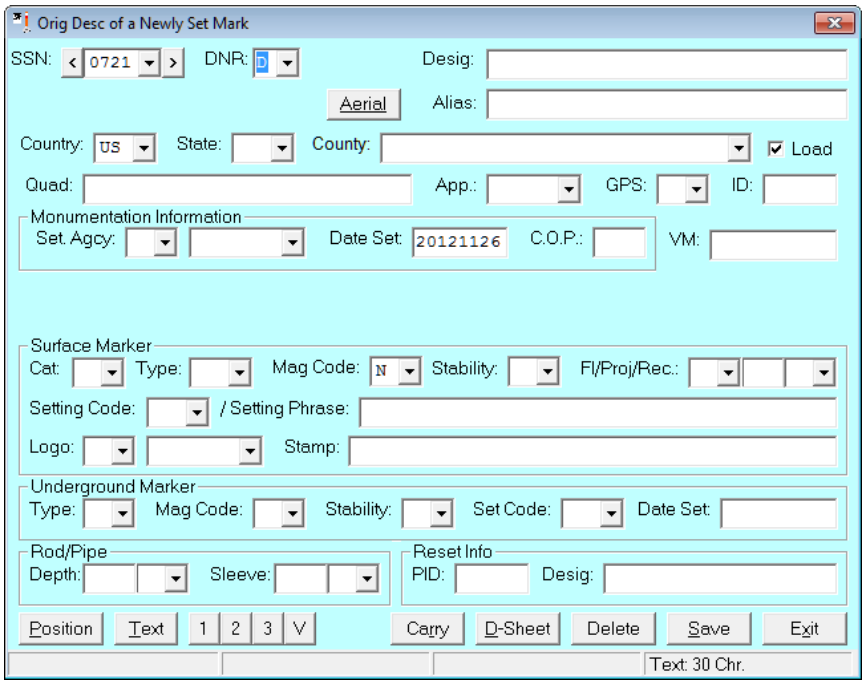
Appendix B - Program Error Message Lists

Refer to the Help functions in References (6) and (7) for the most up to date listing of the program error messages. The Help function will also be the first stop in determining the method of fixing those errors.

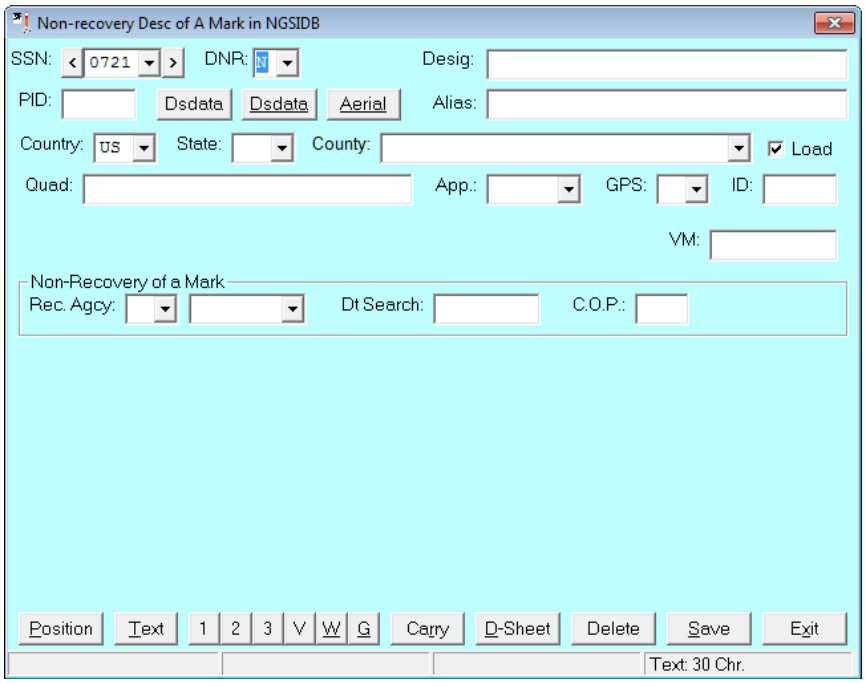
Appendix C - Screen Shots of WinDesc's Data Entry Form

The following are screen shots of the Data Entry Form which change based on the DNR and Rec codes entered. Note the window title changes depending on which code has been entered.

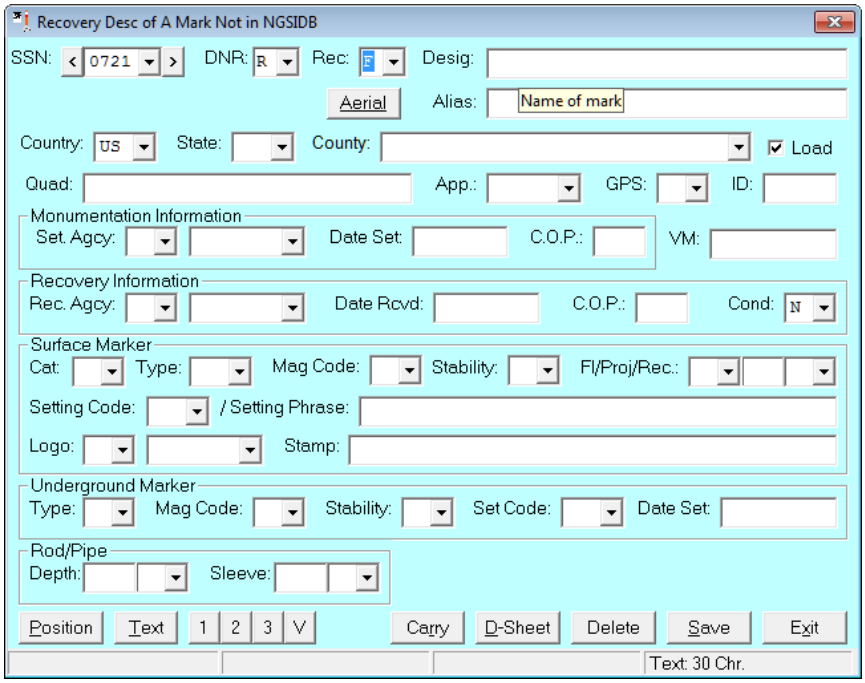
Case 1 – Original description of a new mark. **Code D**



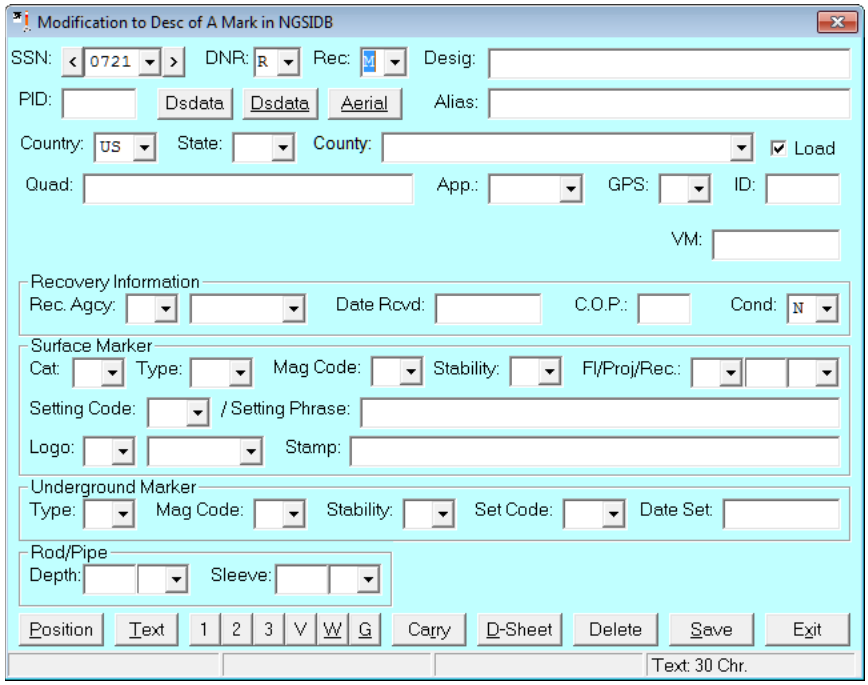
Case 2 – Description of a Bench Mark in the NGS data base that was searched for, but not found; or found destroyed. **Code N**



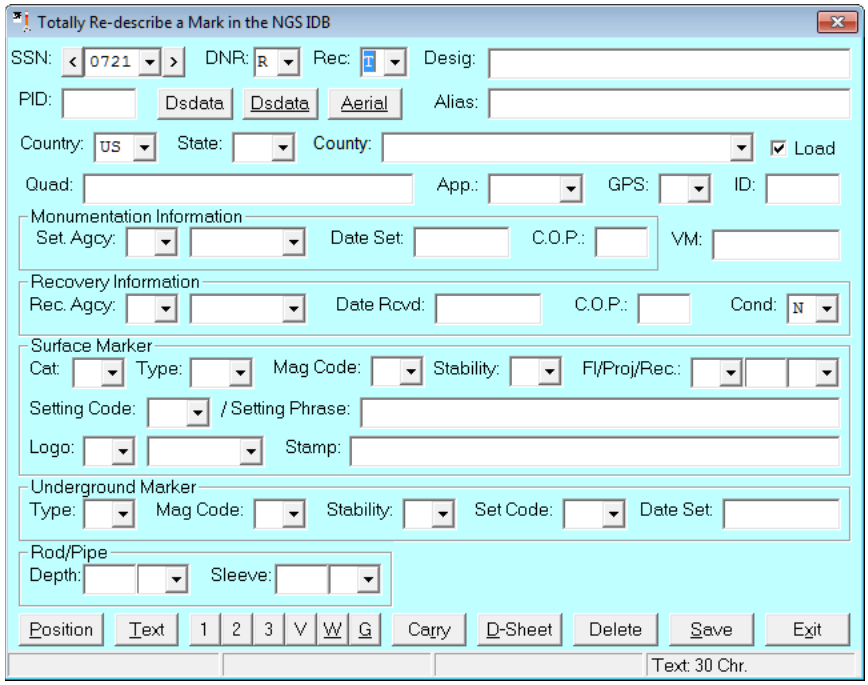
Case 3 – Description of a recovered mark not in the NGS database. **Code R, Rec F**



Case 4 – Changed description of a mark in the NGS data base. **Code R, Rec M**



Case 5 – complete re-description of a mark in the NGS data base. **Code R, Rec T**



Appendix D - Guide For Inserting Photos into WinDesc

Before taking photos set the picture quality in your camera to either 1 mega pixels or 1024 x 768, depending on your camera. Old photos may be used, but they should be resized to fit the above criteria using the Sketch/Skew feature in Paint. The Snagit Editor also has a nice resizing feature.

To resize photos in Paint:

1. Using Windows Explorer, navigate to the photos folder and click View tab > details

2. Choose photo and click the right mouse button. Select 'Open With' > 'Paint'.

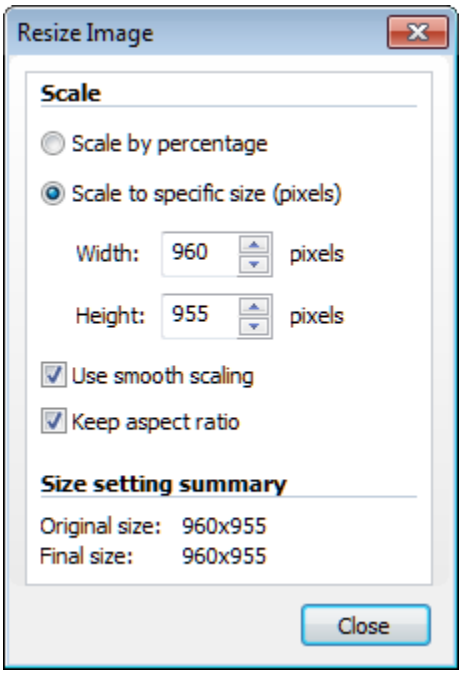
3. In Paint, click 'Image' tab > 'Sketch/Skew'. The change in percentage must be the same for both values (i.e. 45% of current size), or the photo will become distorted.

To resize photos in Snagit Editor:

1. Open the Snagit Editor from the Quick Launch window in Snagit.

2. Open a photo file by entering CTRL-O, navigating to your photo folder, and choosing the photo you wish to resize.

3. Click on the Image tab, then click Resize in the Canvas ribbon box, and select Resize Image… The following window appears:



Select Scale to specific size (pixels), and adjust the width and height to be within 1024x768. Keep the other boxes checked as shown in the picture above and the photo will not become distorted.

4. Save the resized photo.

Naming and Labelling Photos:

1. Update description information before using. This will help to ensure that the data WinDesc uses to rename photos is correct.

2. Choose the appropriate photo for the button (1 = face, 2 = tripod height, 3 = directional photos.

3. Rename the photo when prompted. Ensure Renamed information given by WinDesc is correct before clicking OK. Ensure button 3 photos have the direction entered after the photo number (i.e. PID, BM Designation, 3NNW, date). Hint: clicking on the View tab brings up Google Earth and helps you identify the direction if you don't know it.

4. Labelling photos: for button 1 and 2 photos use: Edit tab > Standard Label and button 3 photos use: Edit tab > Custom Label. The direction (i.e. NNW) should be added after the photo number for button 3 photos (i.e. BM Designation, PID, 3W, date). The direction should be added when the info is highlighted in blue. All labels should be placed at the bottom of the photo, and centered from left to right by moving the numbered box to the above location and pressing Enter.

5. After labelling each photo, go to 'File' > Save & Exit

Appendix E - DNA03 Level Procedure Reference Guide

Print the next two pages on the front and back of a sheet of paper and laminate.

DNA03 Level Procedure Reference Guide

Start of Levelling Day

- Erase Data
  - Press <DATA>
  - Scroll to "2 Delete Jobs" <return>
  - Scroll to "<DEL-ALL>" <return>
  - YES to "Delete all Job and codelists…"

- Perform Collimation Check (Förstner Method)
  - At the "Meas & Rec" screen, press <PROG>
  - From "PROGRAMS", select "4 CHECK & ADJUST"
  - From "CHECK & ADJUST" screen, select "1 Job"
  - From "SELECT JOB" screen, enter
    Job: XXXXXXX (station number)
    Oper: NNN (Observer Number)
    Cmt1: blank
    Cmt2: blank
  - Select "SET"
  - From CHECK & ADJUST" screen, select "2 METH"
  - From "SELECT METHOD" screen, select "AXXB", then scroll to and select Set.
  - Follow prompts and arrow position at top of screen.
  - <SET>

Setup Instrument for Levelling

- SET instrument for line levelling
  - At "Programs" (main), select "2 Line Levelling"
  - Set up new line: (first line of the day)
    Name: 701712 (firstlast SPSN of line)
    Meth: BF
    PtID: 701 (starting SPSN)
    H0: 0.0000 m (zeroed ground height)
    Staf1: blank
    Staf2 blank
  - <SET>

- Check/Set Tolerances
  - Enter Tolerances:
    TDistBal: 5.00 m
    MaxDist: 60.00 m
    StafHigh: 2.90 m
    StafLow: 0.50 m
  - Set Tolerances:
    Precise: On
    DistBal: On
    MaxDist: On
    StafEnds: On
  - <SET>

- From "Line Levelling-Start" screen
  - Select "4 START/CONT", <enter>
  - Verify setting in the "Check List"

- Enter Codes for Start of Levelling
  - Press "USER", ("CODE & ATTR ENTRY")
    Code: 1
    Info1: mmddyy
    Info2: NNN (observer)
    Info3: "DNA03" (instrument Type)
    Info4: "0" (temp. scale in C)
  - <REC>
  - Press "USER", ("CODE & ATTR. ENTRY")
    Code: 2
    Info1: XXXXXX (instrument s/n)
    Info2: +/- collimation Error (no decimal)
    Info3: XXXXXX (rod1 s/n)
    Info4: XXXXXX (rod2 s/n)
  - <REC>

Begin of Measurements:

- Enter Code for start of Section
  - Press "USER"
    Code: 11
    Info1: hhmm (time)
    Info2: rod # on starting mark
    Info3: starting temp - upper probe.
    Info4: weather – wind/sun code
  - <REC>

- Measure Backsight

NOTE: *If Foresight is a bench mark, BEFORE measurement(see next page if not a bench mark):*

- SET Ending SPSN
  - Go to FUNC (shift + user) select, "PtID & INCREMENT"
    Running PtID
    PtID: ending SPSN
    Incr: 1 (always leave "1")
  - <SET>

- Measure Foresight

- Enter Code 33
  - Press USER
    Code: 33
    Info1: lower temp (no decimal)
    Info2: upper temp (no decimal)
    Info3: blank
    Info4: blank
  - <REC>

- Enter Code 99
  - Press USER
    Code: 99
    Info1: hhmm
    Info2: rod # on ending mark
    Info3: ending temp - upper probe (no decimal)
    Info4: XX (wind/sun)

- Record Height difference in field book/backup recording sheet

END OF LEVEL SECTION

*****NOTE***ALWAYS "END" LEVEL SECTION, THEN BEGIN NEW SECTION BEFORE ENTERING CODE 11*******

*****For Level Sections with turns/TBMs between Setups:**

Setup Instrument for Levelling:

- SET instrument for line levelling
  - At "Programs" (main), select "2 Line Levelling"
  - Set up new line:
    - Name 713714 (firstlast SPSN of line)
    - Meth: BF
    - PtID: 713 (starting SPSN)
    - H0: 0.0000 m (zeroed ground height)
    - Staf1: blank
    - Staf2: blank

Begin of Measurements:

- Enter Code for start of Section:
  - Press USER
    - Code: 11
    - Info1: hhmm
    - Info2: rod # on starting mark
    - Info3: starting temp - upper probe (no decimal)
    - Info4: weather – wind/sun code
- Measure Backsight

- Set/Change PtID to "1"
  - Press FUNC (shift + user), select "4 PtID & INCREMENT"
  - Enter "1" for PtID
  - Leave Incr. to "1"
  - <SET>

- Measure Foresight

- Enter Code 33
  - Press USER
    - Code: 33
    - Info1: lower temp (no decimal)
    - Info2: upper temp (no decimal)
    - Info3: blank
    - Info4: blank
  - <REC>

- Move to next setup
  - Continue levelling to turns as necessary
  - Follow every foresight with a "Code 33"
  - Before foresight to a BM, go to "PtID & INCREMENT"
  - Screen and change PtID to Ending BM's SPSN

- Enter Code 99
  - Press USER
    - Code: 99
    - Info1: hhmm
    - Info2: rod # on ending mark
    - Info3: ending temp - upper probe (no decimal)
    - Info4: XX (wind/sun)
  - <REC>

Repeat from "LINE-LEVELLING-START" for each additional section, until end of Level Run

*****NOTE***ALWAYS "END" LEVEL SECTION, THEN BEGIN NEW SECTION BEFORE ENTERING CODE 11*****

End of Level Run:

- Enter Code 9999
  - Press USER
    - Code: 9999
    - Info1: blank
    - Info2: blank
    - Info3: blank
    - Info4: blank
  - <REC>

At the end of the day or project, remember to hit "DATA", and then "EXPORT TO CARD"

****NOTE** IF DISTANCE CHECK IS NEEDED**:

- Press "SHIFT" + "USER" + "1 Test Measurement"
  - PRESS MEASURE BUTTON ("ENTER" to quit back to normal shot mode)

****INSTRUMENT DISPLAYS DISTANCE OF BACKSIGHT, WITH DISTANCE NEEDED TO BALANCE SHOTS ON NEXT LINE****

Appendix F - WinDesc Field Guide

EDITING BENCH MARK DESCRIPTIONS

1. Open WINDESC program
2. In the WINDESC program, Go to FILE, Open.
3. Navigate to project folder and select the *.des file. Click Open
4. Go to Edit, Project Data. Fill in the required data entry for the “DATA SET INFORMATION”. Click OK
5. Click Okay for “Additional Project data”
6. Go to Edit, Descriptive Data.
7. Fill out recovery information for those marks being recovered for this project.
8. Move New Descriptive Text to Historical Descriptive Text. Highlight all text in the New Descriptive Text and delete. Enter RAD <date> <C.O.P>, or any changes from the historical description in the new description tab. Repeat for each mark recovered.
9. Save and Exit the descriptive data window.
10. Create an Index file (*.inx) by going to File, Export, Index (.inx)
11. Exit the *.inx file window.
12. Exit WINDESC

Appendix G - TransLev Field Guide

PROCESSING LEVEL RUN

1. Download “GSI” file to computer.
2. Open TRANSLEV program
3. In the TRANSLEV program, Go to FILE, create new HGZ, the station number or job number will be the HGZ file name, store HGZ file in the appropriate location on your laptop (create a folder to store all data in). Click SAVE.
4. Open Description file, this will be the .DES file with the appropriate station number.
5. Go to “TRANSLATE” and click “Wild/Leica .gsi file
6. Find your GSI file in the appropriate folder on your laptop
7. Edit Defaults… the info should be on your laptop… If necessary, change Instrument and Rod serial #’s, and time zone
8. Check LVL file, click YES
9. Edit LVL file and correct all errors
10. Go to FILE, “IMPORT LVL”
11. Click on the LVL file located on the right, under file types: xxxxxxx.lvl, click OK once selected.
12. ROD CORRECTIONS? Always “NO”
13. Level Part Number? # is located on the PROJ Instructions next to L number
14. Fill in the level line information, *11* Level Title= Title of the Survey, Example: “2011 LEVELS TO TIDAL STATIONS IN VIRGINIA and *12* Line Subtitle = Station Number and Name, for example “863 8610 SEWELLS POINT”. Click OKAY
15. Go to “CREATE” click on Abstract (.abs file)
16. Starting BM is the PBM
17. Starting Elevation is the PBM elevation above Station Datum (SD)
18. Ending BM is the ETG or Aquatrak

Appendix H - Transferring NGS Data Sheets to Create a Water Level Description File

These steps will describe how to create a *.des file for a new station based on the latitude and longitude of the station measured at the site during the reconnaissance or scaled from a chart. It is a good idea to have the PIDs of previously recovered bench marks from the recon, or a list of PIDs of the most likely bench marks to be found in the area based on a previous retrieval of datasheets from NGS. The procedure below does a lat/lon/radius search from the NGS database, and there could be quite a large number of bench marks downloaded during the search. The list of PIDs will help keep the marks desired for the *.des file.

- Start WinDesc
- Open or create a *.des for the station where you need to create bench mark descriptions from NGS data sheets.
- Enter Project Data for the station as described in Section 2.2.2. Exit to the main WinDesc window.
- From the **File** drop down list select **Import/From Internet/By Lat, Lon, Radius**
- Enter the latitude and longitude for the water level station and enter 1 for the radius. Click **OK**
- Check all the boxes and click **Okay**
- Click **Any Vertical** under Type of Control and **Any** under Stability. Click **Okay**
- Enter the starting SSN. The SSNs will be changed when the descriptions are edited, so starting number does not matter except if adding to a *.des file that already has marks. Pick a number that is larger than the largest SSN already in the *.des file. Click **OK**.
- A window opens informing how many marks have been found. To continue to retrieve the datasheet information into WinDesc, click **Yes**.
- After the datasheets have been retrieved, a window opens displaying: Done! Click **OK**.
- From the **Edit** drop down list select **Delete Descriptions**. A window opens showing all the bench mark descriptions that have been imported into the *.des file. Using the list of probable/recovered marks from the recon or earlier NGS search, select all of the marks to delete and press **OK**. Multiple marks are chosen by holding down the Shift key to select a range or by holding down the Ctrl key to select individual marks throughout the list.
- Use the procedures in Section 2.2.3 to edit the bench mark information. Change the SSN: numbers to match the part number and standardized SSN list from the table in that Section.

Appendix I - Converting DESC generated *.HA files to WinDesc *.DES files

*.HA files that have been created with the DESC program can be converted to WinDesc *.DES files. The procedure for doing this is as follows:

1. Copy the *.HA file to the drive and folder where you wish to create the *.DES file.
2. Start a Command Prompt (DOS) window.
3. Navigate to the drive and folder where the *.HA file to convert is located.
4. Type READFILE and press enter.
5. Select Read an *.HA file
6. Enter the file name of the *.HA file to be converted & press enter
7. Enter the file name of the file to be created using *.LST as the extension
8. Press F10.
9. Select Output by SSN
10. Select Exit
11. Close DOS window
12. Start WinDesc
13. Select File drop down and click Open
14. Navigate to the folder the new *.LST file resides in the Look In: field of the Open window
15. Choose Unified Description Files (*.lst) in the Files of type: field
16. Select the file to convert in the files window.
17. Click Open
18. Enter US for Country Code
19. A window should appear announcing the creation of the *.des file
20. Select Edit drop down and click Project Data.
21. Ensure all relevant information is filled out as detailed in Step 2 of Section 2.2.3.
22. Select Edit drop down and click Descriptive Data
23. Ensure all relevant information is filled out as detailed in Step 3 of Section 2.2.4.
24. Select Text and copy the main description to the New Descriptive Text window.
25. Save description
26. Repeat steps 23 to 26 for all bench mark descriptions
27. Exit WinDesc

Appendix J – WinDesc & Translev Output Files to be Submitted to CO-OPS

The following WinDesc and Translev output files are to be submitted to CO-OPS upon the successful completion of a level run at a station.

- XXXXXXX.abs
- XXXXXXX.bok
- XXXXXXX.des
- XXXXXXX.dis
- XXXXXXX.err (if any errors are generated)
- XXXXXXX.GSI
- XXXXXXX.hgz
- XXXXXXX.inx
- XXXXXXX.lvl
- XXXXXXX.nbr

If the original data file from the level instrument: the XXXXXXX.RAW file for the Wild NA3000 series, and the XXXXXXX.GSI file for the Wild/Leica DNA03. If the original data file needs to be edited, place the original data file in a separate folder renamed XXXXXXXo.RAW or XXXXXXXo.GSI and use a copy on which to perform the edits. In addition, all file dates must be chronologically consistent; the *.DES and *.INX files cannot have dates more recent than the *.ABS file.

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