

YSI INCORPORATED

# LEVEL SCOUT

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OPERATIONS MANUAL





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## 1 . 0 P R O D U C T D E S C R I P T I O N

The Level Scout submersible datalogging level transducer represents the leading edge of level sensing technology available today. Key features include:

- Embedded datalogger and level sensor in one package
- Pressure accuracy of +/- 0.05% FS TEB (Total Error Band)
- Integrated temperature measurement up to +/- 0.2 °C accuracy
- Field upgradeable firmware
- Quick-disconnect cable assembly
- Level ranges to 692 feet (211 m) of H<sub>2</sub>O
- Networkable RS-485 interface for long cable runs
- Industry standard SDI-12 protocol
- On-board surge protection
- User-selectable measurement units
- Replaceable batteries, 3-year life
- Variety of logging modes
- Small diameter stainless steel or titanium construction
- Optional RS-485 to SDI-12 converter for connectivity to 3<sup>rd</sup> party SDI-12 devices

The Level Scout is a submersible hydrostatic level transducer with embedded datalogging offering the highest level of functionality and accuracy available.

The Level Scout combines a highly accurate pressure sensor assembly with power conservative microcomputer circuitry. Internal batteries power the electronics providing years of datalogging using linear, linear averaging, event triggered, and logarithmic sampling modes. The batteries are easily field-replaceable via a quick-disconnect cable assembly.

The Level Scout firmware can be upgraded in the field as new features and capabilities are released. The Level Scout features a networkable RS-485 communications interface utilizing the SDI-12 protocol. The unit is supplied with sophisticated yet easy to use Windows based applications software, Data Scout Advanced and Data Scout, for use with a laptop or desktop computer and Data Scout Mobile for use with a handheld PC to facilitate the following functionality:

- Logging set-up and initialization
- Tabular and graphical data display
- Extraction of logged data
- Real time data sampling

All versions of Data Scout software and Level Scout firmware upgrades are available for free download at [www.ysi.com](http://www.ysi.com).



## 2.0 INSTALLATION AND SETUP

This chapter will provide a detailed description of how to setup and install the Level Scout using its typical accessories. Note that a Quick Start Guide is provided with each shipment. This card provides an abbreviated set of instructions for operating the Level Scout immediately after receipt.

### 2.1 INITIAL INSPECTION

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Carefully unpack the instrument and accessories from the shipping container and inspect for damage. Compare received parts with materials listed on the packing list. If any parts or materials are missing or damaged, contact YSI Customer Service at 800-897-4151 (+1 937 767-7241) or your local YSI Representative.

### 2.2 CONNECTING YOUR TRANSDUCER

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#### 2.2.1 CABLE ATTACHMENT

Depending on the Level Scout's pressure format (absolute or vented gauge) and communications needs, there are two variations of cables that may be used: the universal cable or the suspension wire. The universal cable includes power and communications conductors as well as a reference pressure vent tube. It should be used with **all** vented Level Scouts. The universal cable may be optionally used with absolute pressure instruments, especially in installations where it is desired to communicate with the absolute Level Scout without extracting it from its measurement location. When using the universal cable with absolute pressure instruments, the cable vent tube must still be protected from moisture migration.

The suspension wire is intended for use **only** with the Absolute Level Scouts. It provides a low cost suspension solution that also removes the need for periodic maintenance of the vent tube and desiccant filter required on the universal cable.

The following procedure explains how to connect the universal cable or suspension wire to the Level Scout:

- Inspect the two o-rings on the open, battery end of the transducer to ensure they are clean and not damaged.
- Remove the battery insulator strip from the Level Scout.
- Look inside the cable end of the connectors to view how the two sections mate together. Note the two keys in the transducer and cable assemblies and the fact that they are different sizes to ensure proper alignment (figure 2.1).



Figure 2.1

- Insert the transducer housing into the cable assembly retaining nut. Hold the transducer assembly in one hand and the cable in the other near the retaining nut (figure 2.2).



Figure 2.2

- While applying slight pressure, push the two parts together and slowly rotate the transducer assembly until the keys align. When the keys align, the housing will slip into the retaining nut assembly an additional one inch and the transducer will no longer rotate while the user is holding the cable.
- Now that the keys are aligned and seated, grasp the transducer in one hand and the retaining nut in the other. While applying slight pressure, push the two parts together and screw the retaining nut onto the transducer housing. Continue threading the parts together until they are fully mated, leaving no visible gap where the retaining nut meets the transducer housing.

### 2.2.2 SERIAL COMMUNICATIONS CONNECTION

When using the universal cable assembly, the RS-485 communications interface to the Level Scout is terminated in a 9-pin male D-shell connector. This connector is intended to work directly with the Level Scout communication adapters.

The communication adapters are intended to provide electrical signal conversion between the Level Scout's native RS-485 interface and other standard electrical interfaces such as RS-232 (model 771 for connecting to PCs) or SDI-12 (model 772 for connection to an SDI-12 compatible device). In addition, the model 773 USB adapter (combined with the model 771 RS-232 adapter) provides additional PC communication options. Users may also connect directly to the D-shell connector of the universal cable to interface to their own equipment without the use of the YSI communication adapters. Refer to Appendix A for wiring information of the universal cable 9-pin D-shell.

Figure 2.3 and the following text explain how to prepare the Level Scout for communications with the PC using the model 771 RS-485 to RS-232 communication adapter:

- Connect the 9-pin female end of the six foot (6 ft) serial cable to a free serial communications port on the PC. If using the 773 USB interface, plug the USB cable into an unused USB port on the PC.
- Connect the RS-485 adapter to the other end of the serial cable (or 773 USB adapter). Note that both ends of the RS-485 adapter can connect to the serial cable. Ensure that the end marked "RS-232" is connected to the serial cable or USB adapter.
- Connect the 9-pin connector of the Level Scout cable to the other end of the RS-485 adapter (marked "RS-485" on the adapter).

You are now prepared to communicate to the Level Scout.

Note: See Appendix A for connection information for model 772 RS-485 to SDI-12 converter.

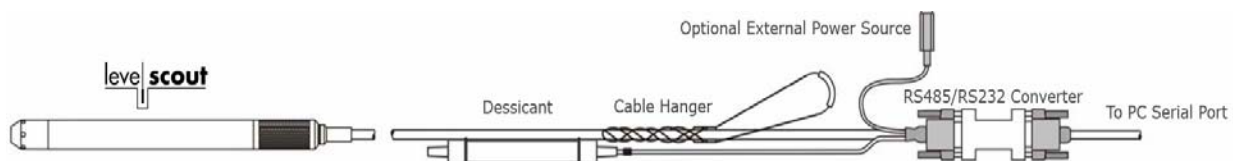


Figure 2.3



### 2.2.3 POWER AND BATTERY CONNECTIONS

The Level Scout is designed to operate for long periods of time via internal battery power or optionally with external power sources. It is shipped with new industrial alkaline batteries installed that will power the transducer for over three years of normal operation.

The universal field cable assembly includes a convenient power connection jack that can be used to provide external power to the Level Scout. It is shipped with a mating connector that has a standard 9V DC battery connection which should be used for data extraction **only**. To use external power to conserve the internal batteries, attach a suitable long life battery to the provided connector or install a power supply in its place. Ensure any external power sources comply with the power supply requirements listed in the specifications section of this manual.

#### *Warning*

The Level Scout is designed to reset its internal microprocessor should it detect a short across the external power leads. To prevent unintended resets of the Level Scout, ensure that the external power leads are not allowed to short to each other or a common conductor (such as a metal surface). Similar resets of the Level Scout can occur if an external power source is used that sources a near 0.0 VDC potential. This can occur if an external battery is used that lacks proper output voltage such as when it has been fully discharged. *If the external battery is fully discharged and attached, it will cause all internal logging to stop.*

## 2.3 LEVEL SCOUT SOFTWARE

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Including with the Level Scout are three (3) separate software programs. All three programs allow the user to communicate and configure the Level Scout.

- **Data Scout Advanced** can be used on a PC or laptop and allows the user to merge data from two separate files. This can be useful when utilizing a BaroScout to compensate absolute transducers for barometric pressure. Data Scout Advanced will also allow the user to display data in graphical format. Data Scout Advanced is described in this manual. A more detailed Data Scout Advanced manual is located on the CD that was shipped with the Level Scout.
- **Data Scout** can be used on a PC or laptop and is a simpler version of Data Scout Advanced. For instructions on how to use Data Scout, please refer to the Data Scout manual located on the CD that was shipped with the Level Scout.
- **Data Scout Mobile** can be used with a handheld PC running Windows® Mobile 2003 SE and has a compact flash slot. For instruction on how to use Data Scout Mobile, please refer to the Data Scout Mobile manual located on the CD that was shipped with the Level Scout.

### 2.3.1 LOADING DATA SCOUT ADVANCED ONTO A PC

A copy of Data Scout Advanced can be found on the CD that was shipped with the Level Scout. The following instructions outline the Data Scout Advanced installation process.

- Insert the information and support CD in the computer.
- Navigate to the CD drive.
- Double click on the DSAdvIns.exe file. This will load the Windows® SETUP program, which guides the user through the remainder of the installation process.
- After installation, Data Scout Advanced can be executed via the Windows® Start menu by selecting Start | Programs | Data Scout Advanced | DSAdv.

## 2.4 INTERNAL CLOCK SYNCHRONIZATION

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When received from the factory, the Level Scout's internal clock will be set to Eastern Standard Time. The internal clock can be quickly and easily synchronized to the local time using the Data Scout Advanced date/time synchronize function as explained in section 3.3 and 4.2 of this manual.

## 2.5 GENERAL FIELD INSTALLATION

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The cable assembly for the Level Scout was shipped with a cable hanging assembly pre-installed. This cable hanger provides a simple method to secure the cable at the top of the installation.

Always carefully lower the transducer into the liquid, penetrating the liquid surface slowly. Avoid dropping the unit into the water as the sudden impact with the water surface can permanently damage the transducer.

The Level Scout is calibrated for operation in a vertical, upright position with the cable extending up. Although it may be operated in any orientation, anything other than this vertical position will result in a slight zero offset in the measured data. If the transducer will be operated in a known, non-vertical orientation this zero offset error may be easily calibrated out as described in section 4.5. Note that the threaded hole on the end of the Level Scout closed-face nose piece offers a convenient method to attach a weight to help ensure vertical orientation.

## 2.6 DESICCANT FILTER INSTALLATION

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The universal field cable assembly is shipped with a desiccant filter installed on the end of the vent tube. When installing the Level Scout for use, *always* ensure a desiccant vent filter is attached to the cable vent tube. Failure to use a vent filter could result in moisture migration down the cable vent tube. This can cause measurement offset errors (from water drops in the vent tube) or premature failure of the transducer, which would not be covered by warranty. **When using the desiccant filter, remember to remove the filter's protective cap prior to collecting data.** This will allow air into the desiccant filter. The vent filter is designed to last for at least one (1) year in humid conditions before needing replacement.

When using the universal cable assembly with an absolute pressure Level Scout, the vent tube must still be protected from moisture migration but it is not critical that air must flow through the vent tube. In this situation the protective cap may be left on the desiccant filter or alternately the vent tube may be capped to minimize maintenance requirements.

When using the desiccant filter, ensure a proper maintenance/replacement schedule is followed as described in section 4.6 of this manual.

## 2.7 CABLE PROTECTION

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When working with the transducer cable, such as when lowering the transducer into a well, make sure the cable does not drag over sharp edges which could nick or cut the cable outer jacket. A cut in the outer jacket will provide a path for water to migrate into the transducer electronics causing permanent damage. Cable damage represents one of the most frequent causes of transducer failure.

The polyurethane-jacketed cables are quite flexible. Care needs to be taken to ensure that when bending the cable to suit the installation, the vent tube does not become crimped inside the cable. To avoid this crimping, **do not bend the cable tighter than a radius of 1 inch.**

Many users require a compression fitting or strain relief to secure the cable as it enters a junction box. Care needs to be taken that the fitting is not over-tightened to the extent that it damages the cable or crushes the internal vent tube.

Crimping the vent tube from tight bends or crushing it within the cable can result in measurement offset errors since the reference pressure port of the Level Scout's internal transducer will now be blocked. This will prevent the reference from 'breathing' as a result of atmospheric or temperature related pressure changes.

## 3.0 OPERATIONS USING DATA SCOUT ADVANCED

Data Scout Advanced provides easy Level Scout operation of both simple and complex tasks without the need for custom software development. Data Scout Advanced is capable of running on most PCs using Windows® 98, ME, NT, 2000 or XP. The host PC requires a serial communications port to interface to the Level Scout.

This chapter will describe the basics of Data Scout Advanced operation so the user can fully utilize the Level Scout. Refer to the separate Data Scout Advanced manual if more detailed information is needed. See section 2.3.1 for software installation instructions.

### 3.1 INITIAL SETUP AND CONFIGURATION

#### 3.1.1 FIRST TIME DATA SCOUT ADVANCED USE

Start the Data Scout Advanced application on the PC. The first time Data Scout Advanced is initiated there will be a warning that states it has an empty site network (referred to as a 'Site Net') as shown in figure 3.1. This is normal and simply indicates that Data Scout Advanced has no prior history of the transducers attached to the PC.

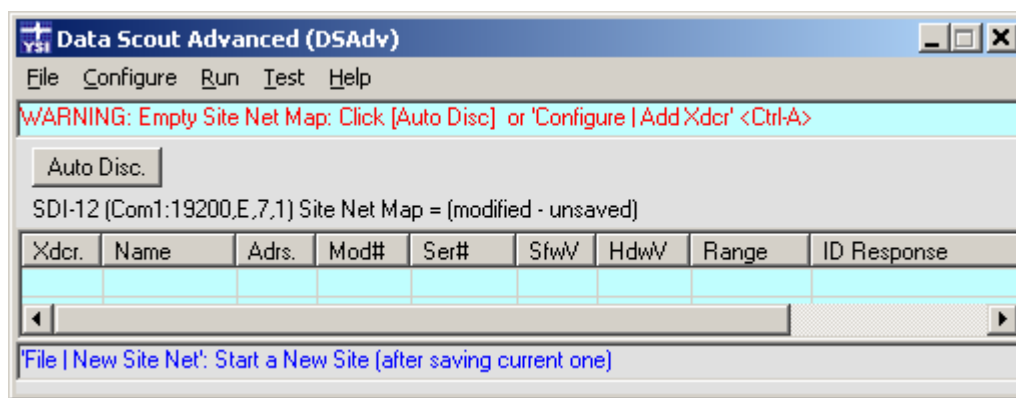


Figure 3.1

To configure Data Scout Advanced to communicate with the Level Scout, perform the following steps:

- Click **Configure**, and then **Xducer Site Network** from the drop-down menu. This will open the **Xducer Site Net Parameters** dialog form (figure 3.2).
- In the Protocol frame, select **SDI-12**. When SDI-12 protocol is selected, the **Baud** rate pull-down list will default to 19200 which matches the factory default of the Level Scout. If the baud rate of the Level Scout has been changed, select the Data Scout Advanced baud rate that matches the configuration in the Level Scout. In the **Port** pull-down list, select the PC COM port that the Level Scout is attached to. Normally, the other check boxes (**Echo Used** and **Modem Used**) will remain unchecked.
- Click **OK** to apply these settings and return to the main Data Scout Advanced menu.

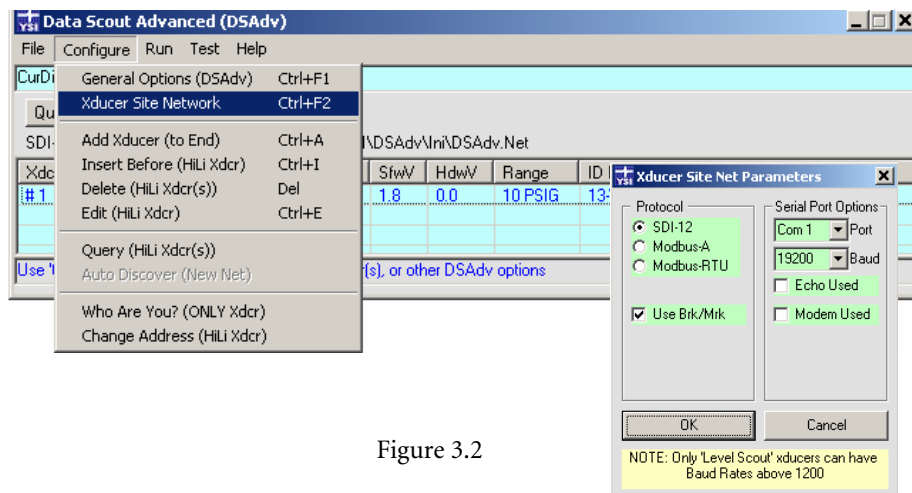


Figure 3.2

Now that the PC communications settings have been made, click the **Auto Disc.** button to initiate a search for attached transducers. Data Scout Advanced will indicate the status as it searches through all SDI-12 addresses (0-9, A-Z, a-z) on the network for attached transducers. Note that the default unit address for each Level Scout is 0 (zero) when it is shipped from the factory.

*Tip*

Once Data Scout Advanced finds all attached transducers, click the **Stop** button to terminate the search for additional transducers.

### 3.1.2 RESTART OF DATA SCOUT ADVANCED

If Data Scout Advanced had been previously executed, a memory of the last session will be stored on the PC. When Data Scout Advanced is restarted, it will default to the previous session's communications settings (protocol, baud rate, and port). Likewise, Data Scout Advanced will assume that the attached transducers from the previous session are still attached. Note that at this point the **Auto Disc.** button will change to the **Query** button. Use the **Query** button to make sure that the transducers are still connected (figure 3.3). If a previously installed transducer has been replaced by a different transducer, Data Scout Advanced will identify the newly installed transducer and update the main screen to reflect information for this new transducer.

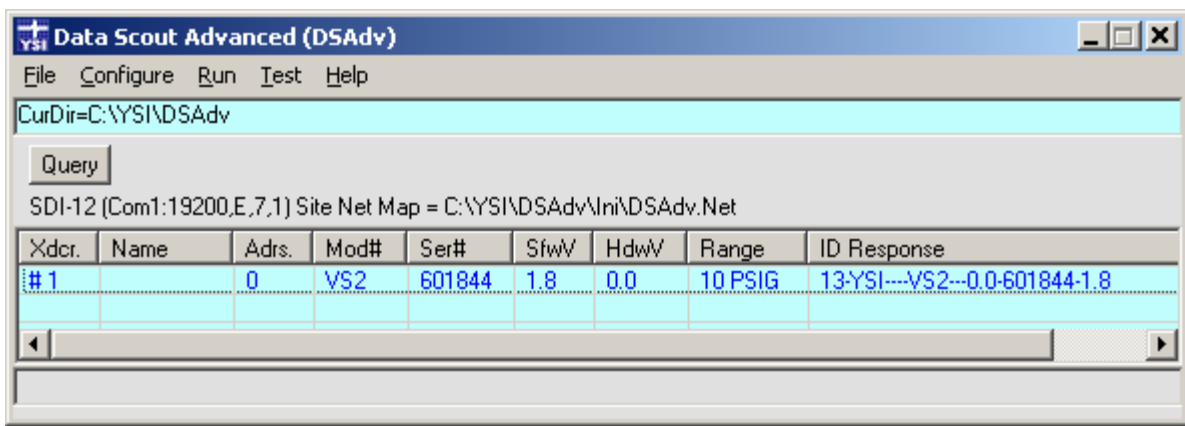


Figure 3.3

To clear the Data Scout Advanced history from the previous session, select **File** and **New Site Net**. This will return the display to the **Auto Disc.** state with no transducers listed. To open an existing named site net, select **File**, then **Open Site Net**.

### 3.1.3 TAKING LIVE DATA

Once Data Scout Advanced has discovered all of the attached Level Scout transducers, it is ready to acquire live data from them. This live data is accessed in what is referred to as the **Run** window. To launch the **Run** window, select the **Run** drop down menu and then select either **All Xducers** or **HiLi Xducer(s)** as shown in figure 3.4. Selecting **All Xducers** launches a **Run** window with data for all identified transducers in the main screen. Selecting **HiLi Xducer(s)** will launch the **Run** window for only the selected (highlighted) transducers. The following sections describe the **Run** window controls related to acquiring, displaying, and optionally recording live data.

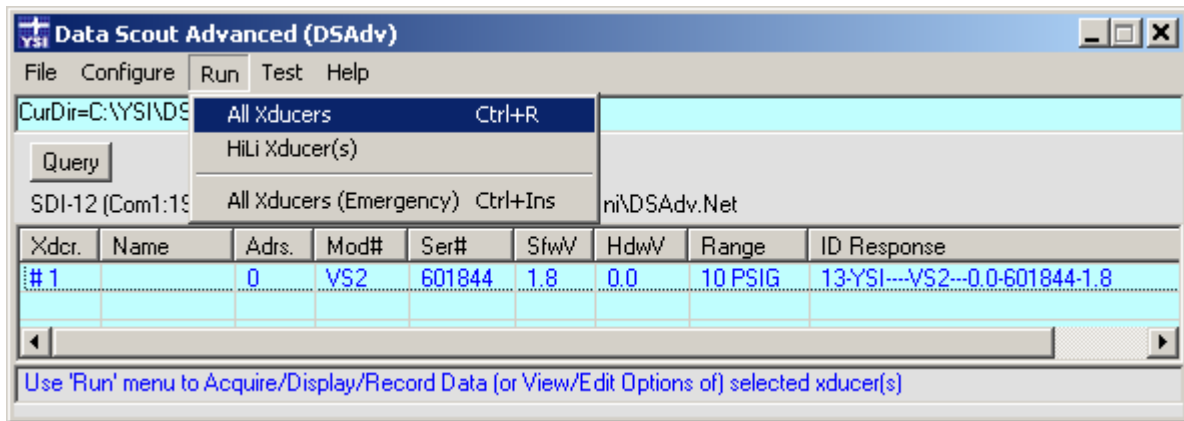


Figure 3.4

*Tip*

The measurement fields acquired and displayed from the attached Level Scout(s) can be changed by selecting the **Acquire** menu item from the **Run** window. Measurement fields listed at the bottom of the drop-down menu may be checked or unchecked as desired.

### 3.1.4 ACQUIRE FRAME CONTROLS

The fields contained within the Acquire frame (figure 3.5), are used to control live data acquisition with the transducers in the current Run screen. These controls operate as follows:

- The leftmost text box in the Acquire frame is an indicator of data acquisition status. The box shows the total number of completed (and partial) live data scans acquired. The fractional part of this number is actually a sub-scan digit representing acquisition of different measurement parameters for each scan. The background color of the box is *white* when Acquire is off, *green* when Acquire is running, and *yellow* when Acquire is waiting during an idle period between scans. This box is normally a display only field, but if clicked when acquisition is off, it clears the accumulated scan count in the box.
- Clicking the **On** button will start continuous data acquisition from the attached transducers at the update rate shown in the **Period** box. The acquired data will be displayed in the Run window data table and/or trend plot, depending on the selected display options. Note that if the value in the Period frame requests a rate faster than is possible for the number of active transducers and the measurement options, Data Scout Advanced will acquire at its fastest possible rate for that configuration. The default Period of '0' will result in Data Scout Advanced acquiring data as fast as possible. To set a specific update period, click the green **Period** text box and enter the desired sample rate in seconds.
- Clicking the **Off** button will stop active data acquisition.
- Clicking the **1** button when acquisition is off will result in only a single data set being acquired from each transducer. The values from this single data set will be displayed in the Run window data table and/or trend plot, depending on the selected display options.

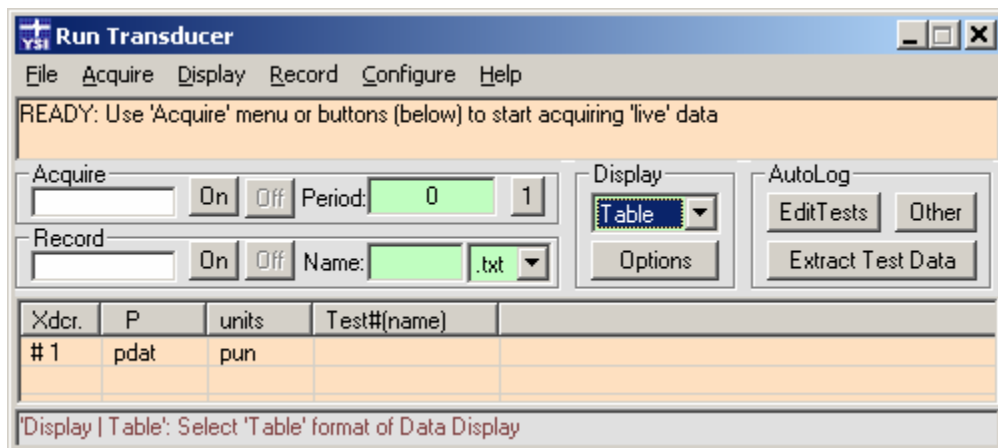


Figure 3.5

### 3.1.5 RECORD FRAME CONTROLS

The controls contained within the **Record** frame are used to configure the recording of live data to the PC's disk drive (figure 3.6). Data recording takes place only as live data acquisition occurs as described in the preceding section. If live data is not running, data is not being recorded. Configuration for data recording can occur at any time whether data is being acquired or not. The controls are as follows:



Figure 3.6

- The frame in the left most position of the Record frame reflects the elapsed data recording time in seconds. The box background color is *white* if Record is off, *yellow* if Record is on but not currently recording any scans, and *green* if Record is writing acquired scans to the current disk file. This timer is reset to 0.0 every time recording is turned on.
- The **On** button starts data recording to disk using the specified file name and file type. The data/time stamp added to the base file name makes the recorded data file name unique.
- The **Off** button disables data recording and closes the current data file.
- The **Name** text box contains the base file name for storage of recorded data. This value can be changed by simply clicking in the text box and typing the desired base file name. Note that the complete file name used by Data Scout Advanced will be:

*base\_file\_name\_yyyy-mm-dd\_hh-mm-ss.txt (or .csv)*

The yyyy-mm-dd\_hh-mm-ss time stamp used as part of the file name reflects the date and time when the recording was started. Assuming the standard installation directories were used, the recorded data files will be stored in folder C:\YSI\DSAdv\Dat

- The File type pull-down list is located adjacent to the file base name text box. The two file type options are formatted text file (.txt) or a comma separated variable format (.csv).

#### *Tip*

The .csv file type should be used if the goal is to import the logged data into a spreadsheet application. The Playback feature of Data Scout Advanced can also be used at any time to convert a file written in one format into the other format.

### 3.1.6 DISPLAY FRAME CONTROLS

The **Display** frame determines the appearance of the Run window with respect to the display of acquired data (figure 3.7). Data Scout Advanced provides the ability to display acquired data in either a simple tabular form and/or in a graphical trend plot form.



Figure 3.7

The **Display** type pull-down list allows the user to select if the data will be displayed as tabular data, graphical trend plot, or both.

The **Options** button in the Display frame opens the **Display Options** window used to control various aspects of the Run window's appearance and behavior during live data acquisition or during the extraction of AutoLog data (figure 3.8). The controls within this window used during live data acquisition are described below. The controls in this window related to AutoLog data are explained later in this chapter (sections 3.2.2, 3.2.3, and 3.2.4).

### 3.1.7 LIVE DISPLAY OPTIONS CONTROLS

When viewing live data, the View/Edit AutoLog and Plot Display Options window can be used to alter the scaling, appearance, and general behavior of the live trend plot (figure 3.8).

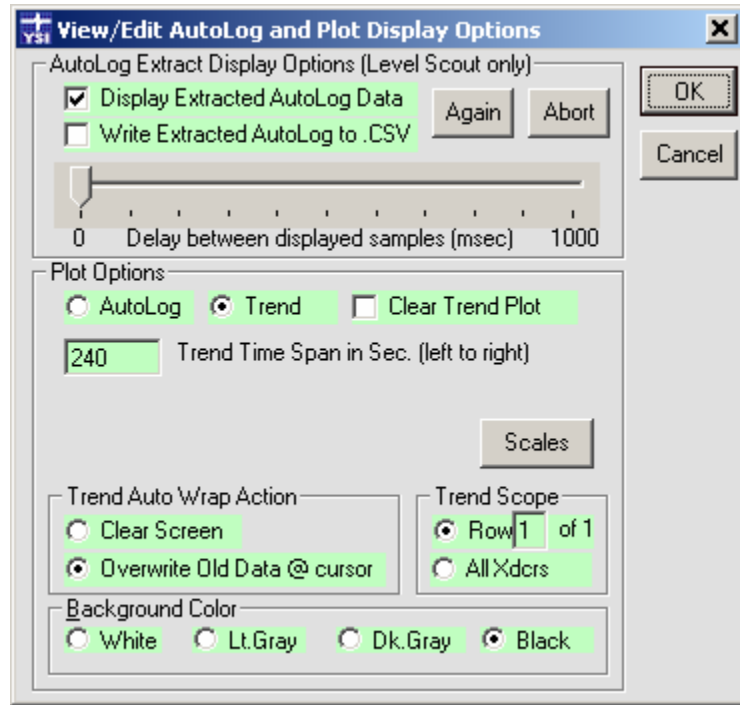


Figure 3.8

#### *Tip*

In order for live data to be displayed in the Run window plot area, the **Trend** button must be selected in the Plot Options frame. If **AutoLog** is selected, live trend data will not be displayed.

The **Plot Options** frame controls are as follows when live Trend data display is selected:

- Clicking the **Clear Trend Plot** check box will result in the clearing of the current trend plot area after the **OK** button is pressed.
- The **Trend Time Span** input field allows the user to specify the time frame covered by the trend plot. This will be the plot X-axis width.
- Selecting the **Scales** button opens a control window with inputs to determine the vertical scaling of all plotted data values. Minimum and maximum values for each vertical axis can be controlled for best viewing of the data of interest. Once these scales are changed, re-selecting the **Plot** display type will restore the original scales.
- The **Trend Auto Wrap Action** frame controls how the Trend graph behaves once the trend has reached the right most limit of the plot area. Selecting **Clear Screen** will result in the contents of the trend plot area being cleared when the Trend Time Span is reached. A new trend plot will then be restarted at the left side of a blank plot area. Selecting **Overwrite Old Data @ cursor** will result in the plot restarting at the left most limit of the screen but it will not clear the existing plot data as it wraps around.
- The **Trend Scope** frame allows for control of which transducers are displayed in the trend plot area. Users may select that the trend plot displays live trend data for a single transducer or all transducers in the current Run window.

### Tip

An alternate way to select Trend Scope, without having to bring up the Display Options form, is to click a particular transducer's row (under Xdcr. column) of the Run window's data table to select only that transducer for display. Click the blank row at the bottom of the column to select all transducers.

- The **Background Color** control allows for customization of the plot background for different viewing preferences.

### 3.1.8 OTHER LIVE DATA OPTIONS

Data Scout Advanced allows for the tabular and graphical display of up to seven live data items from the Level Scout. The user can control which live data items are acquired from the Level Scout and displayed by selecting the **Acquire** menu from the Run window menu bar. This will provide the ability to enable or disable seven different measurements that may be extracted from the unit.

### 3.1.9 CONFIGURING AUTOLOG TESTS

The Level Scout transducer is capable of performing a series of autonomous logging tests which are referred to as AutoLog tests. These tests can be configured to acquire multiple measurement parameters over extended periods of time. Data Scout Advanced contains several configuration forms described below which are used to easily configure the Level Scout for these AutoLog tests.

The AutoLog functions generally focus on only one transducer at a time, therefore, select a particular transducer before selecting one of the AutoLog functions. A single transducer can be selected by clicking its row in the **Xdcr.** column on the left side of the Run window.

### 3.1.10 AUTOLOG EDIT TESTS FRAME CONTROLS

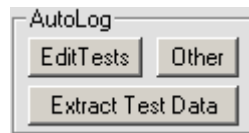







Figure 3.9

Clicking the **Edit Tests** button (figure 3.9) in the AutoLog frame of the Run window opens the **Test Configuration Editor** window (figure 3.10). Before opening this window, Data Scout Advanced queries the attached Level Scout to determine the configuration and status of its sixteen internal test profiles. This configuration information is displayed within the AutoLog configuration windows to reflect the unit's current state. The various components of the AutoLog configuration window are described in detail in the following sections.

The frame labeled **Summary of Existing Tests** contains a page select tab for each of the sixteen internal Level Scout test configurations. The number on the tab reflects the internal test number. A color-coded symbol next to the test number on the page select tab provides a quick visual tool to see the status of each test. The possible test statuses are as follows:

-  **Done** - The red icon indicates that the test profile has completed and that logged data stored in the Level Scout that can be extracted.
-  **Active** - The green icon indicates that the test profile is currently running in the Level Scout. Note that already logged data scans may be extracted while the test profile continues to run.
-  **Pending** - The yellow icon indicates that a test profile has been configured and is scheduled to start. The Level Scout is waiting for the requested start time before changing the test profile status to **Active**.
-  **Idle** - The black icon indicates that a test has been partially defined.
-  **Vacant** - Indicates that the test profile is undefined and available for use.



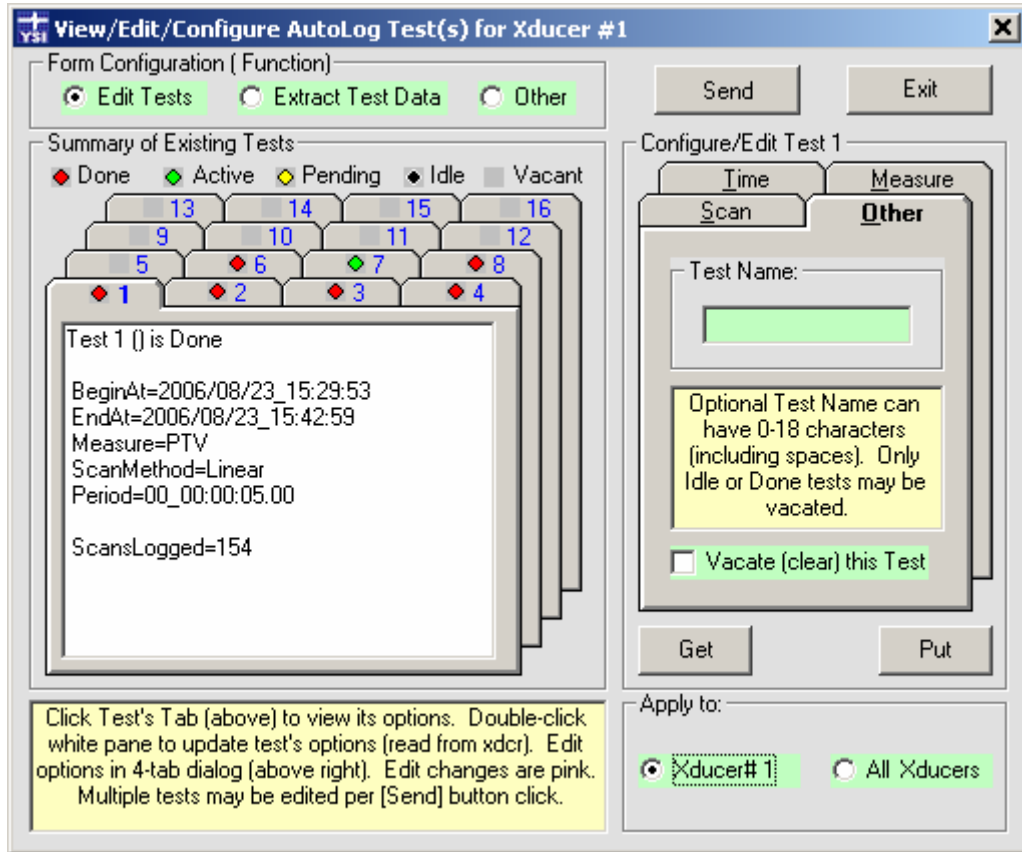


Figure 3.10

Clicking on a test configuration tab will bring it to the foreground of the summary frame. The text box field contained in the test configuration tab contains summary information for that test profile. This summary information is for display purposes only and may not be edited in this field. The majority of this summary information is displayed in a user friendly format in the **Configure/Edit** frame found on the right side of the form.

*Tip*

Double clicking within the current (top) selected tab display area will force Data Scout Advanced to reread that test profile's information from the attached Level Scout. This is useful for getting a quick, real time update of the status of an Active or Pending test profile.

The frame labeled **Configure/Edit Test x** provides an easy to use method for displaying and editing the test profile controls. By clicking on different test configuration tabs in the **Summary of Existing Tests** frame, the contents of the **Configure/Edit** frame will update to reflect the test configuration parameters for that selected test profile. There are four configuration tabs used to configure test profiles; **Time**, **Measure**, **Scan**, and **Other**. These tabs are used to both display the configurations of an existing test profile and to edit the configurations for a new test profile.

*Tip*

You may not edit test profiles for **Done** tests, they must first be vacated. **Active** tests may only have their end time changed.

The **Time** tab is used to display or edit the times a test profile will start and end (figure 3.11). When editing a test profile, Data Scout Advanced will allow the user to specify the start and end times in either absolute time or relative time. If relative times are used, Data Scout Advanced will transparently convert those requested relative start and stop times into absolute times at the time the test profile is sent to the Level Scout. Note that the calculated times are relative to the time the configuration is sent to the Level Scout, not the time the relative settings were entered. If the test end time is specified in relative time, the requested end time will be relative to the

test start time. If the user would like a test to acquire data forever, select an end time of **None** or set an absolute end time with a far off future year.

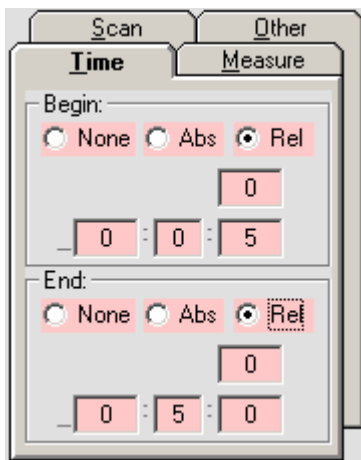


Figure 3.11

When test profile information is displayed, it will always be displayed in absolute time format.

The **Measure** tab is used to display or edit the actual parameters that will be measured during a test (figure 3.12). Possible measurements for each test configuration include pressure, temperature, PCB-temperature (only available on Level Scout with 4MB memory option), and supply voltage. A check next to the measurement type indicates that data will be collected for that parameter.

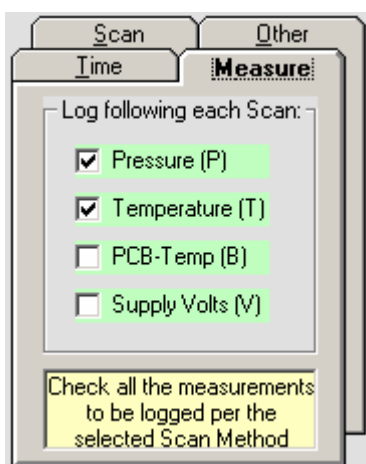


Figure 3.12

**Pressure** is typically the primary measurement of a test profile although it is possible to disable this measurement if temperature is of primary concern.

The **Temperature** measurement is based on the actual temperature of the pressure sensor. This is the actual temperature that is used for the pressure calculation and thermal correction algorithms. This measurement is useful for understanding the actual temperatures the pressure transducer is exposed to. Accuracy of this measurement is  $\pm 1.0^\circ\text{C}$ .

**PCB-Temp** is a high-accuracy temperature measurement that is available on the high memory Level Scout only (model VS4, VT4, AS4 and AT4). The sensor for this measurement is located on the Level Scout's internal printed circuit board, near the pressure sensor. Accuracy of this measurement is  $\pm 0.2^\circ\text{C}$ .

The **Supply Volts** measurement provides an indication of the Level Scout's internal battery voltage level. When using alkaline batteries, the battery voltage will decay linearly with battery use. Note that not all battery technologies behave in this linear decay manner. The Level Scout can operate from battery power as long as the reported battery voltages remain above 1.5 volts. Applying external power to the Level Scout will result in a slight increase in the reported internal battery voltage of approximately 0.2 volts.

The **Scan** tab is used to display or configure the sampling method used for the selected test profile (figure 3.13). The **Method** pull down list selects one of four possible data sampling methods described on the following page.

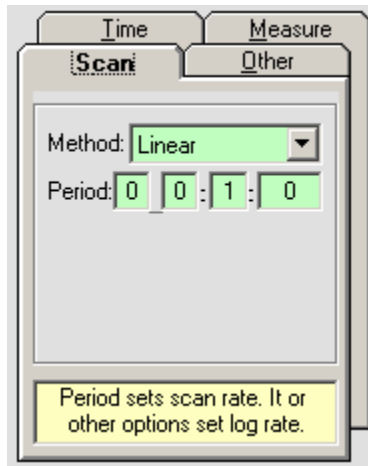


Figure 3.13

- **Linear** - Data is sampled at a constant, linear defined rate. Only the period between scans needs to be specified in Days:Hours:Minutes:Seconds.
- **Linear-Average** - Data is sampled at a specified period but logged to non-volatile memory at a slower rate. Each logged linear data sample is the averaged value of the specified consecutive samples (2-250) that were acquired at the defined sampling rate (figure 3.14).

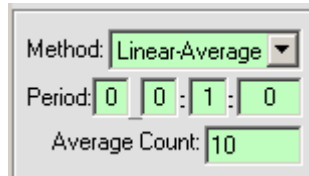


Figure 3.14

- **Logarithmic** - The rate of data sampling and logging initiates at the fastest possible rate of the Level Scout. The sample period then exponentially increases until the final maximum period is reached. The maximum period value is user specified. Data then continues to be sampled and logged at this maximum period for the remainder of the test profile. The initial scanning rate will be between 3 Hz and 10 Hz depending on the measurements and averaging specified for the test profile. This sampling method is useful for situations where data is required at a high sample rate initially but at slower rates as time elapses.

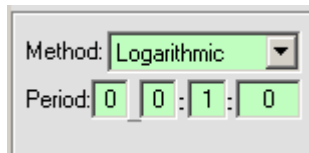


Figure 3.15

- **Event-Based** - Data is sampled internally at a defined constant period. If the acquired data meets an event trigger condition the data set will be logged, otherwise it is discarded. Event trigger conditions may be set up to force datalogging if either the pressure or temperature reading changes by a user defined limit relative to the last reading. Additionally, acquired data can be forced to be periodically logged at some default rate (even if the event condition is not met) by setting a maximum scan count on the Default # Scans box. Note that when specifying the event trigger delta pressure or temperature, it must be specified in units of pounds per square inch or degrees Celsius.

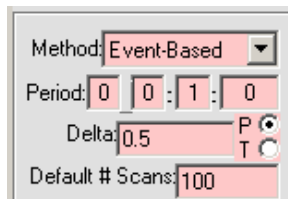


Figure 3.16

The **Other** tab has two functions: providing text names to test profiles and vacating test profiles (figure 3.17). Test profile text names may be optionally added to help identify the purpose of a particular profile. The test name is limited to 18 characters and may be changed on any test other than a test with a Done status.

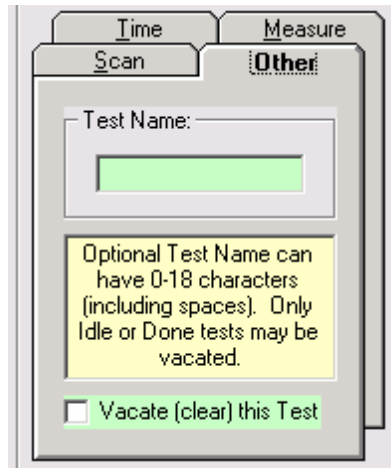


Figure 3.17

The vacate test control is used to clear any definition information for a test profile. Only test profiles with a status of Done or Idle may be vacated. Active tests must be stopped before they can be vacated. **Once a test profile is vacated, its data can not be extracted again.** Care must be taken to ensure that the data has been extracted prior to vacating the test profile definition.

*Tip*

Vacating a test does not free the memory that the test profile may have used to store its AutoLog data. Use the *Erase All Memory* control to free all AutoLog memory for future use (see Section 3.3.1).

By default, the central frame labeled **Apply To** normally applies all current edit changes for any selected tests to the currently selected transducer only (when the **OK** button is clicked). Clicking the **All Xducers** option applies the edit changes to all transducers in the current Run window, as long as each edit change makes sense in each of these other transducers for the same affected test number. In cases where the user is creating the same test in several transducers concurrently, this feature could save time as could the **Get** and **Put** buttons which are described in the Data Scout Advanced Operations Manual.

## 3.2 EXTRACTING AUTOLOG TEST DATA

Once the Level Scout has been configured to autonomously log data, Data Scout Advanced provides utilities to extract data for immediate display or later analysis by other applications. These utilities can be used to extract data from both completed test profiles as well as in-progress test profiles. The applicable forms for extracting and displaying test data are described in the following sections.

### 3.2.1 AUTOLOG EXTRACT TEST DATA FRAME CONTROLS

Clicking the **Extract Test Data** button in the **AutoLog** frame of the **Run** window opens the window shown below in figure 3.19. Before opening this window, Data Scout Advanced queries the attached Level Scout to determine the configuration and status of each of its sixteen internal test profiles. This configuration information is displayed within the AutoLog configuration windows to reflect the unit's current state. Note that this window is very similar to the window used to configure AutoLog tests. The main difference between them is the controls on the right side of the window. The various components of the **Extract AutoLog Data** window are described in detail in the following sections.

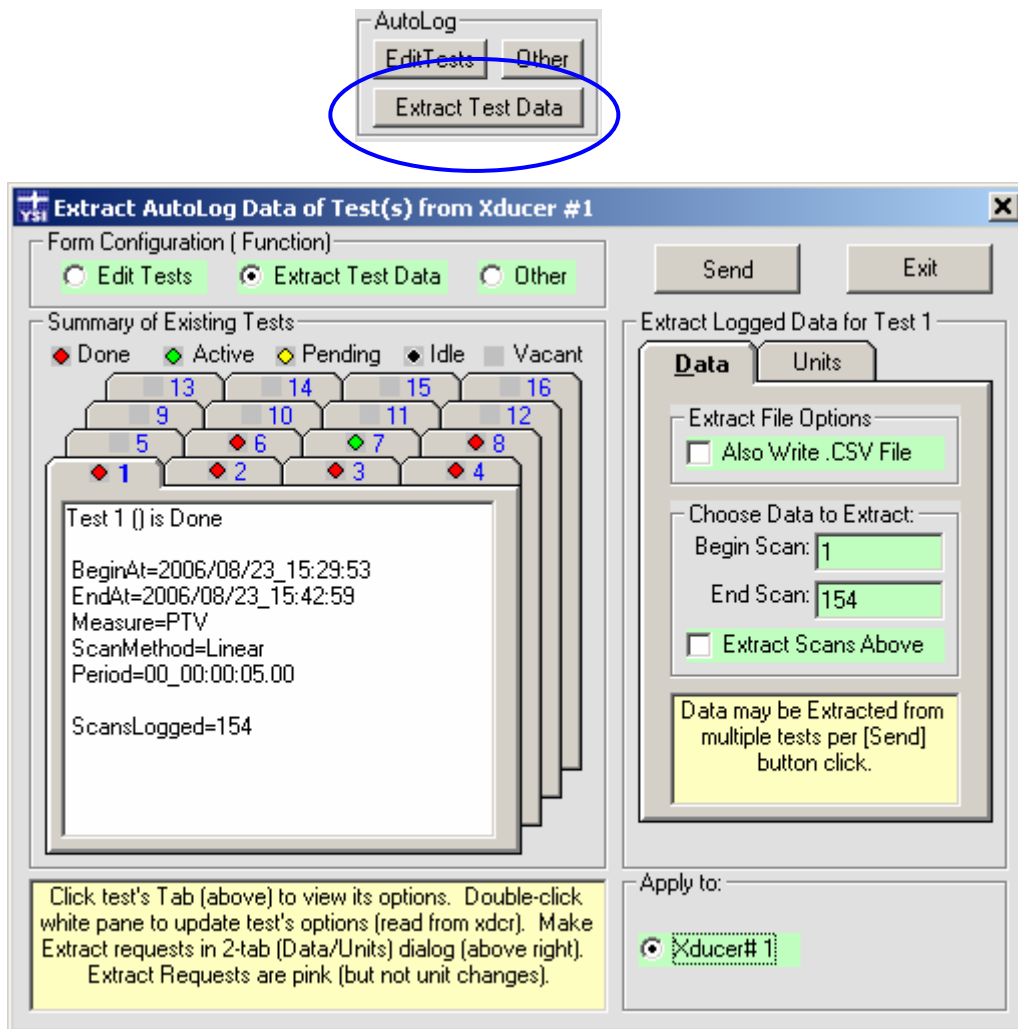


Figure 3.19

The frame labeled **Summary of Existing Tests** contains a page select tab for each of the sixteen internal Level Scout test profile configurations. The number on the tab reflects the internal test profile number. A color-coded symbol next to the test number on the page select tab provides a quick visual tool to see the status of each test. The test status definitions and other aspects of this frame are the same as described in Section 3.1.10.

#### Tip

Only AutoLog Data from test profiles with a status of **Done** or **Active** may be extracted.

*Tip*

Double clicking within the current (top) page select tab display area will force Data Scout Advanced to reread that test profile's information from the attached Level Scout. This is useful for getting a quick, real time update of the status of an **Active** or **Pending** test profile.

The frame labeled **Extract Test Data from Test x** provides easy to configure controls for the extraction of AutoLog test data. The contents of this frame will vary as different test profile tabs are selected in the **Summary of Existing Tests** frame. There are two tabs within this frame to control the data extraction functions.

- The **Data** tab allows control of which AutoLog data points Data Scout Advanced will extract (figure 3.20). By default the fields on this tab will be set to extract all data points (first through last). If a subset of the data is required, the **Begin Scan** and/or **End Scan** data points may be changed to reflect the subset to be extracted. Click the **Extract Scans Above** check box to extract the indicated data sets.
- The **Extract File Options** frame has a checkbox that causes a spreadsheet compatible (.csv) data file to be created in addition to the normal Autolog test data file (.atd).

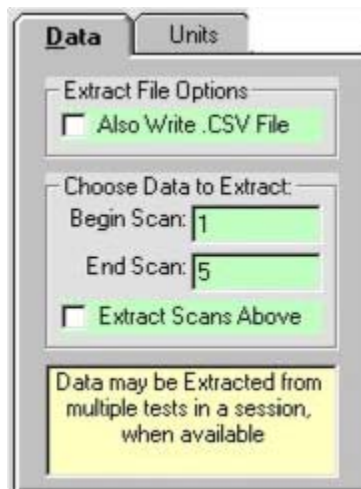


Figure 3.20

- The **Units** tab selects the engineering units into which the extracted pressure and temperature data will be converted when extracted (figure 3.21). The precision of the pressure data may also be selected. The units of measure and precision settings will be used when the extracted data is displayed within Data Scout Advanced as well as when the data stored into electronic files as part of the extraction process. By default, the current pressure units and temperature units of the transducer are selected for the data recorded in the extraction files (.atd and .csv).

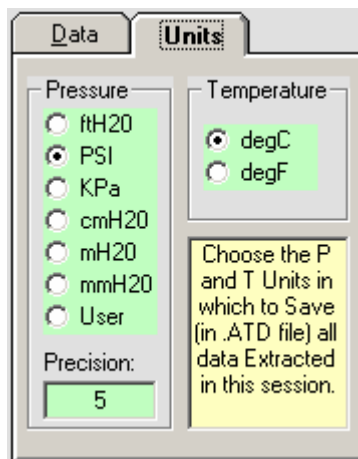


Figure 3.21

### 3.2.2 DISPLAY OF AUTOLOG DATA

Extracted AutoLog data may be easily displayed and analyzed within Data Scout Advanced. This is accomplished 'live' within the transducer Run window or offline later using the Playback application. Like live data acquisition, AutoLog data may be displayed in tabular form, graphical form or both.

*Tip*

Although extracted AutoLog data can be displayed in tabular form, the most useful way of displaying this data is to enable the Plot display type.

To configure the Run window to display AutoLog data instead of live data, change the default settings found under the Display Options window. To enter this window, click the **Options** button in the Display frame located on the main Run window. When the Options button is clicked a screen similar to figure 3.22 will appear. Note that if the **Table** display type is selected, many of the options of figure 3.22 will not be displayed since they only apply to plot displays.

To display the extracted AutoLog data ensure the button labeled **AutoLog** in the **Plot Options** frame is selected. Also ensure the box labeled **Display Extracted AutoLog Data** is selected.

A more detailed description of all of the controls found in the **Display Options** window is provided in the following section.

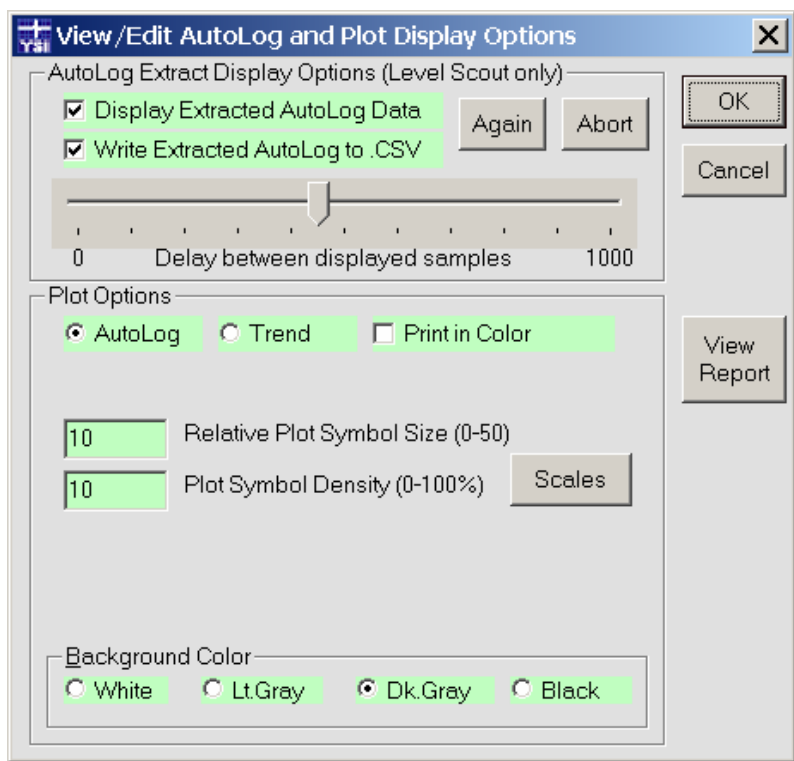


Figure 3.22

### 3.2.3 AUTOLOG EXTRACT DISPLAY OPTIONS

This control window determines how Data Scout Advanced will behave when AutoLog data is extracted from the Level Scout. The top frame of the **Display Options** window shown in figure 3.22 is a typical representation.

The **Display Extracted AutoLog Data** check box determines if the extracted AutoLog data will be displayed on the Run window. If checked, the extracted AutoLog data will be displayed in the current display format: table, trend plots or both.

*Tip*

If you wish to display extracted AutoLog data, make sure the **Display** type is set to either **Plot** or **Both** and the **Plot Options** box has **AutoLog** selected instead of **Trend**. AutoLog data that has already been extracted without this Display type selected, may still plotted by selecting the **AutoLog** button, the **Again** button, and then pressing **OK**.

The **Write Extracted AutoLog to .CSV** check box is used to tell Data Scout Advanced to write both a normal extracted AutoLog data file and another optional file in comma separated variable format. This optional file allows for direct import of the data by most spreadsheet applications.

*Tip*

The .csv format option also appears in the *Data* tab shown in figure 3.20 of the **Extract** window.

Assuming the standard installation directories were used, the recorded data files will be stored in folder C:\YSI\DSAdv\Dat. File names will be of the format:

*Model-sn\_Testx\_yyyy-mm-dd\_hh-mm-ss.atd* (Normal file)

*Model-sn\_Testx\_yyyy-mm-dd\_hh-mm-ss.csv* (Spreadsheet file)

*Model* is the unit's model number. *Sn* is the unit's serial number, *Testx* identifies the Level Scout's internal test profile (Test1-Test16) and the date and time stamp represents the date and time that the data was extracted from the Level Scout.

The **Again** button is used to force Data Scout Advanced to redisplay extracted AutoLog data in the current display mode.

The **Abort** button is used to abort an in-process display of extracted AutoLog data. This function may be required if the display of the selected AutoLog data is requiring an excessive amount of time. This can happen if the file is very large or if the **Delay** slider control is set too high.

The slide control labeled **Delay between displayed samples** controls the amount of time Data Scout Advanced delays between screen updates for each AutoLog data point (figure 3.23). In almost all cases this control should be kept at its default value of 0 msec (slider in the far left position). The only time that a non-zero delay value (or slower display update rate) may be desired is if the user wishes to review AutoLog data in tabular form.

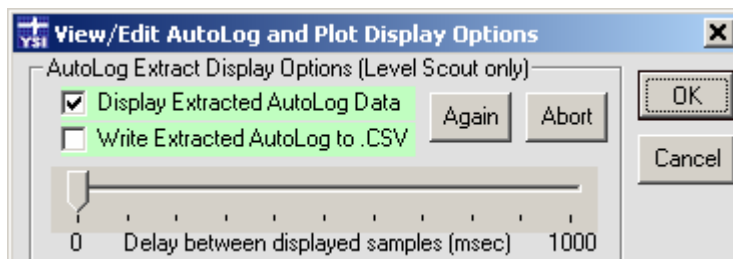


Figure 3.23

*Tip*

The **Delay** slider will only be visible if one of the display options that shows tabular data is selected.



### 3.2.4 PLOT OPTIONS

The **Plot Options** frame provides several controls to customize the Run window plots so they are easily read for the application (figure 3.24). The controls of this frame will vary depending on whether the user has selected to use the plot screen for the display of **AutoLog** or live **Trend** data. Selecting the **AutoLog** plot display will result in all extracted AutoLog data being displayed in the plot window. The AutoLog specific controls are described below.

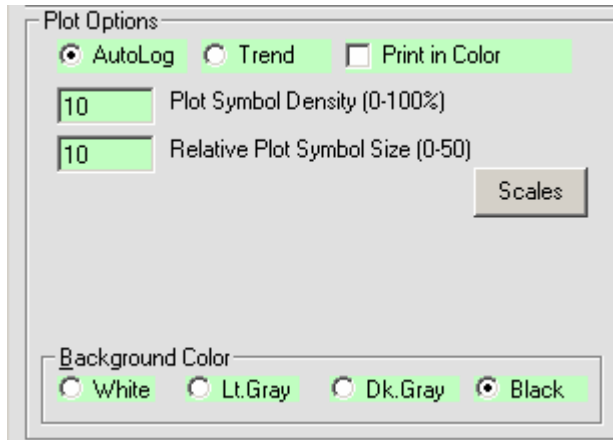


Figure 3.24

- The **Plot Symbol Density** input field allows for control of the frequency of plot symbols used to identify actual extracted data values. A value of 0% results in no plot symbols being used. Only the data points will be displayed with a straight line connecting adjacent data points. A value of 100% will result in every data point being displayed with a plot symbol. A practical rule of thumb is to decrease the Plot Symbol Density as the number of data points displayed increases.
- The **Relative Plot Symbol Size** input field determines the size of the plot symbols. A value of 0 results in an invisible plot symbol while a value of 50 results in a highly oversized symbol.
- Selecting the **Scales** button opens a window form with inputs to determine the vertical scaling of all plotted data values. Minimum and maximum values for each vertical axis can be controlled for best viewing of the data of interest. Control of the horizontal axis minimum and maximum value is provided in order to zoom in on specific periods of data.
- The **Background Color** frame allows for customization of the plot background to best suit viewing preferences.

### 3.2.5 AUTOLOG DATA STORAGE

When AutoLog test profile data is extracted from the Level Scout, Data Scout Advanced will store the resulting data into a folder on the local computer. Data Scout Advanced will always create a formatted ASCII text file containing the extracted data. The format of the filename will be as follows:

*Model-sn-Testx-yyyy-mm-dd\_hh-mm-ss.atd*

*Model* is the unit's model number. *Sn* is the unit's serial number, *Testx* identifies the Level Scout's internal test profile (Test1-Test16) and the date and time stamp represents the date and time that the data was extracted from the Level Scout. If the standard Data Scout Advanced installation directory is used, the AutoLog data files will be located in the folder C:\YSI\DSAdv\dat.

#### *Tip*

Clicking the **View Report** button on the Display Options window will display the ASCII text file for the AutoLog data currently displayed on the Run window.

### 3.3 OTHER USEFUL DATA SCOUT ADVANCED FUNCTIONS

Clicking the **Other** button within the AutoLog frame of the Run window will display the screen shown in figure 3.25. This window contains several useful status and configuration fields that may be frequently referenced during operation. Also, alarm scanning features are configured here. Alarm scanning allows the user to enter Hi and Lo alarm and warning values. If an alarm or warning value is acquired by a transducer, then the transducer can scan at a faster rate and broadcast the alarm data (if configured to do so). Alarm scanning is only available for pressure readings, not temperature.

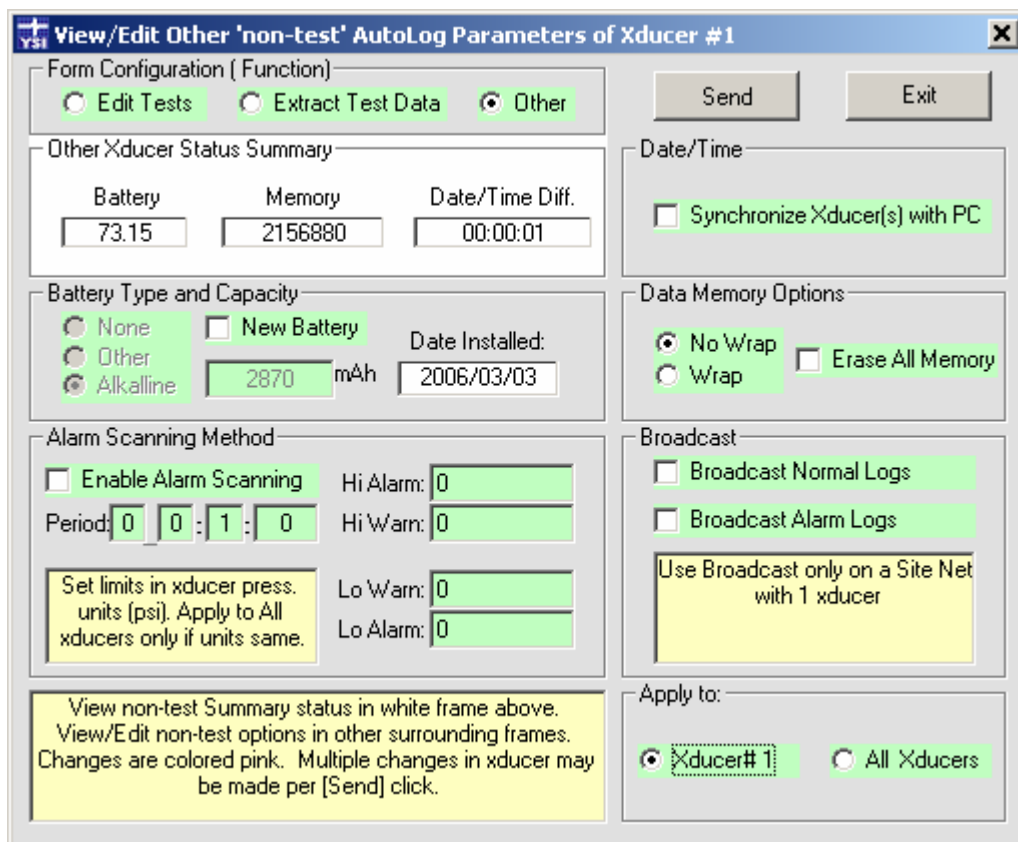
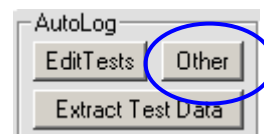


Figure 3.25

#### 3.3.1 BATTERY, MEMORY AND INTERNAL CLOCK

The frame labeled **Other Xducer Status Summary** contains status information reported by the attached Level Scout as is described below (figure 3.26).

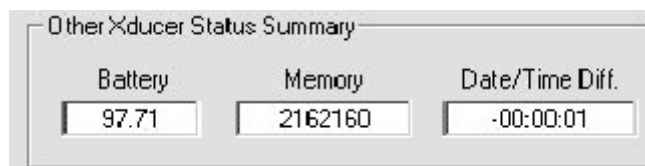


Figure 3.26

- The **Battery** field shows the remaining battery life percentage as calculated by the Level Scout. In order for the Level Scout to accurately calculate remaining battery life, new battery capacity must be properly entered when batteries are replaced (see section 4.1).
- The **Memory** field shows the amount of memory (in bytes) currently available for storing AutoLog test data. The number of samples that this free memory can store will be affected by what data the Level Scout is asked to record for each sample. The time stamp requires 7 bytes. Each additional measurement selected requires 4 bytes each.
- The **Date/Time Diff.** field shows the time difference between the attached Level Scout's internal clock and the clock of the PC it is connected to (hh:mm:ss).

The frame labeled **Date/Time** provides a check box function which will synchronize the attached Level Scout's internal clock to the clock of the PC running Data Scout Advanced (figure 3.27). The synchronization is performed when the **Send** button is selected.

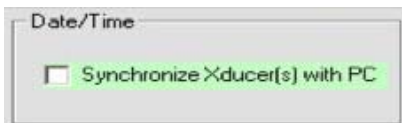


Figure 3.27

The frame labeled **Battery Type and Capacity** (figure 3.28) is used to inform the Level Scout when the internal batteries have been replaced. This provides accurate estimates of remaining battery. Chapter 4 of this manual gives detailed instructions for replacing the Level Scout's internal batteries.



Figure 3.28

The frame labeled **Data Memory Options** (figure 3.29) contains two controls related to the use of the Level Scout's internal non-volatile datalogging memory. The controls are described below.

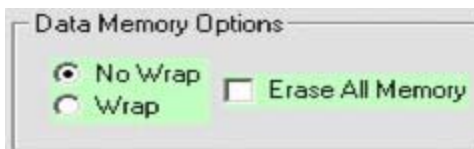


Figure 3.29

- The **No Wrap** and **Wrap** controls determine what action is to be taken if the Level Scout ever uses all available datalogging memory. When set in the default **No Wrap** mode, the Level Scout will stop any AutoLog test in progress once all available memory has been used. This mode ensures that the original data is never overwritten or lost. More recent data, however, will not be stored.
- If the **Wrap** mode is selected the Level Scout will continue executing AutoLog test profiles once all available memory has been used. This will result in older test profile data being overwritten as required to hold newer data. This mode ensures that the most recent data is always recorded but at the expense of older test profile data that will be lost.
- The **Erase All Memory** checkbox is used to reformat the non-volatile memory used for the storage of all AutoLog data. Enabling this check box and clicking the **Send** button will erase all memory, vacate all tests, and return the attached unit to its maximum data storage capacity.

**Warning**

Only use the **Erase All Memory Command** after all test profile data of interest has been extracted from the Level Scout and is stored on a PC. All internal test profile data will be lost after this command is executed.

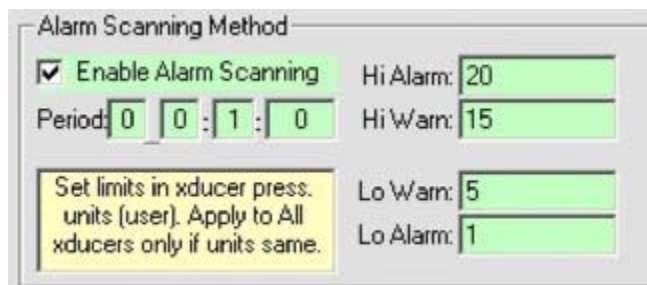
The frame labeled **Apply To** always defaults to the currently selected transducer (figure 3.30). The **All Xducers** button allows the same action to be applied to all transducers in the current Run window.



Figure 3.30

### 3.3.2 ALARM SCANNING METHOD AND BROADCAST

The frame labeled **Alarm Scanning Method** allows the user to establish alarm and warning pressure limits (figure 3.31). When alarm scanning is enabled, if the pressure reading exceeds either of the Hi limits or is below either of the Lo limits the Alarm Scanning Method will be initiated, *overriding the current active scan method*. The Alarm Scanning Method may be optionally configured to use a different logging rate from the previous scanning method that was active. This is useful to obtain faster samplings should an unusual (outside of normal ranges) event occur. Note that both the normal and alarm data are stored within the current logging test profile.



Alarm Scanning Method

Enable Alarm Scanning

Hi Alarm: 20

Period: 0 : 0 : 1 : 0

Hi Warn: 15

Lo Warn: 5

Lo Alarm: 1

Set limits in xducer press. units (user). Apply to All xducers only if units same.

Figure 3.31

#### Warning

When using alarms (with or without broadcasts) make sure the normal logging period of the active test profile is not too long. The transducer only checks the measurement for an alarm condition at the moment the logging event is made. Short transients could be missed or sustained changes could be reported late by up to one normal logging period. For example, if the normal logging period is set to 15-minute intervals, the transducer only checks for an alarm condition once every 15 minutes. Once an alarm condition occurs the transducer can use the optional alarm scanning logging period (normally faster).

To enable the Alarm Scanning Method select the **Enable Alarm Scanning** check box. Next, enter the high and low level alarm and warning values in the provided input boxes. If only a single alarm/warn level is required (not a separate warn limit and alarm limit), the same value should be entered for the warn and alarm input boxes. If an alternate Alarm Scanning Method scan rate is desired, enter the scan period in the **Period** input box. A logging period of 0\_0:0:0 will cause the transducer to use the existing logging period of the test profile that was running prior to the Alarm Scan Method.

#### Tip

The **Alarm Scanning Method** is frequently used with the **Broadcast** option described in the following section.

The frame labeled **Broadcast** (figure 3.32) enables the transmission of autonomous data packets from the Level Scout. Autonomous data is data that automatically transmits, without user requests. The unit can be configured to autonomously broadcast normal logged data packets, alarm logged data packets only, or both normal and alarm logged data packets. In either case, the Level Scout will broadcast the requested data items immediately after logging them to its internal data logging memory.



Broadcast

Broadcast Normal Logs

Broadcast Alarm Logs

Use Broadcast only on a Site Net with 1 xducer

Figure 3.32

The format for the broadcast messages is ASCII characters (7 data, even parity, 1 stop bit) at the current baud rate, with the following formatted data:

*'accctt+yyyy/mm/dd\_hh:mm:ss.ss,[ v u,]<cr><lf>'*

Where 'a' is the transducer address, 'cc' is the broadcast ID code (table 1), and 'tt' is the active test profile number. Next follows a plus sign (+) and time stamp (yyyy/mm/dd\_hh:mm:ss.ss) followed by the formatted decimal datum for each measurement actually scanned per the current test profile. Each datum value (v) is followed by a unit name (u).

A space separates each v and u, and a comma (,) follows each u. A carriage return, line feed combination ends the string.

**Tip**

When the **Broadcast** feature is enabled, only one Level Scout should be attached to the communications (Site) network. Use of multiple transducers may result in data transmission collisions resulting in a failure of correct packets to be transmitted.

Example:

The following example shows a transducer with address 0 broadcasting a Low Warning message from test profile number 3 at one (1) second before midnight, December 24, 2005, for two (2) measurements (pressure and temperature) logged:

*0WLO03+2005/12/24\_23:59:59.00, +0.05 psi, 75.5 degC, <cr><lf>*

**TABLE 1 - BROADCAST ID CODE DESCRIPTION**

NLN	Normal, Linear Logged Scan
NLA	Normal, Linear Average Logged Scan
NLG	Normal, Logarithmic Logged Scan
NEB	Normal, Event Based Logged Scan
AHI	Alarm, Logged Scan Above High Alarm Limit
ALO	Alarm, Logged Scan Below Low Alarm Limit
WHI	Warn, Logged Scan Above High Warn Limit
WLO	Warn, Logged Scan Below Low Warn Limit

### 3.4 DATA SCOUT ADVANCED PLAYBACK FUNCTIONS

To access the Playback functions of Data Scout Advanced select the menu item File and then Playback Any Data Files from the Run window's menu bar (figure 3.33).

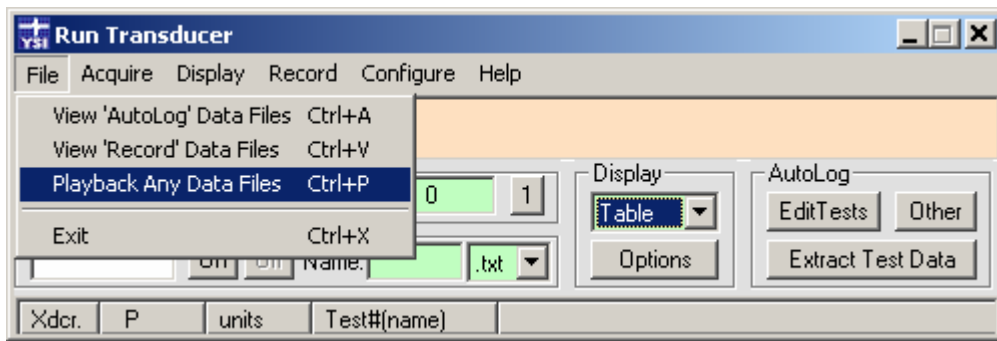


Figure 3.33

Playback is an independent application (DataScoutPlay.exe) which may be started separate from Data Scout Advanced.

#### 3.4.1 BASIC PLAYBACK OF DATA SCOUT DATA FILES

The Playback application has its own menu bar, with functions similar to a typical Windows® PC application (figure 3.34). It also has a Print Plot button.

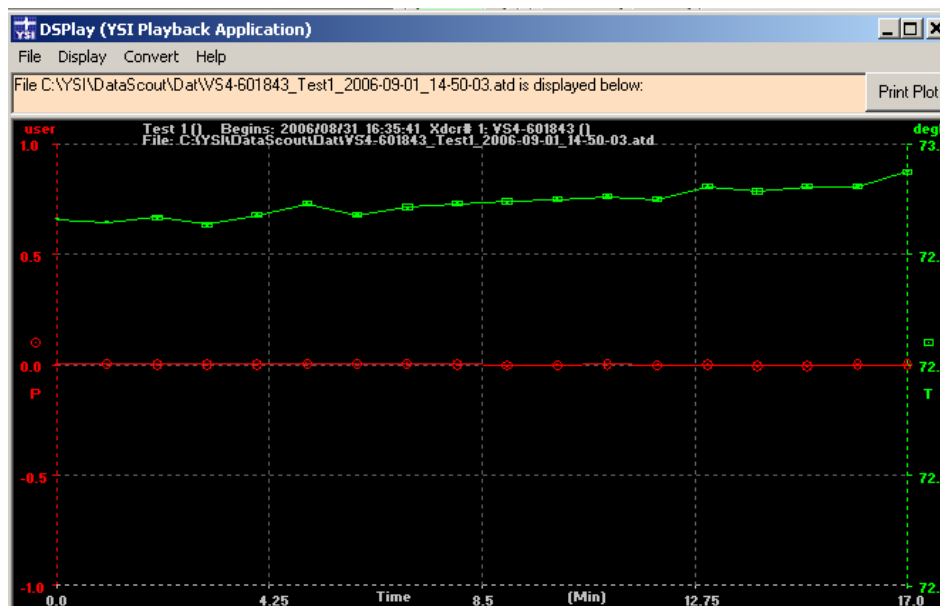


Figure 3.34

To use Playback open any data file generated by Data Scout Advanced. Playback also provides basic Convert functions for transforming the selected data file in various ways. These data files are normally created by Data Scout Advanced's Run window and saved in its Dat subfolder. The user can display "live" recorded data (from .txt or equivalent .csv files) or AutoLog data extracted from the autonomous tests logged inside the Level Scout (from .atd or equivalent .csv files).

- Use the Display | Plot Graph menu item to view the data file as a graph. Other display types allow viewing (or even editing) the file as text. The plot surface may be re-sized by dragging the right-bottom corner of the window (just like the Run window).
- Use the File | Open menu to select the desired file with a standard Windows® Open dialog window. Select the file type by choosing an appropriate "filter" for file extensions .atd, .txt, or .csv.

Playback remembers the last display type, file type, and file name used and restores them on restart. See the Data Scout Advanced Operations Manual for a complete description of all Playback functions. The Convert functions of Playback are described briefly below.

### 3.4.2 COMPENSATE ABSOLUTE PRESSURES WITH BAROMETER

If using a Level Scout with the absolute pressure option, Playback has a very useful function under the **Convert** menu called **Uncompensate Data Per Barometer**. Selecting this function opens a Convert window (figure 3.35).

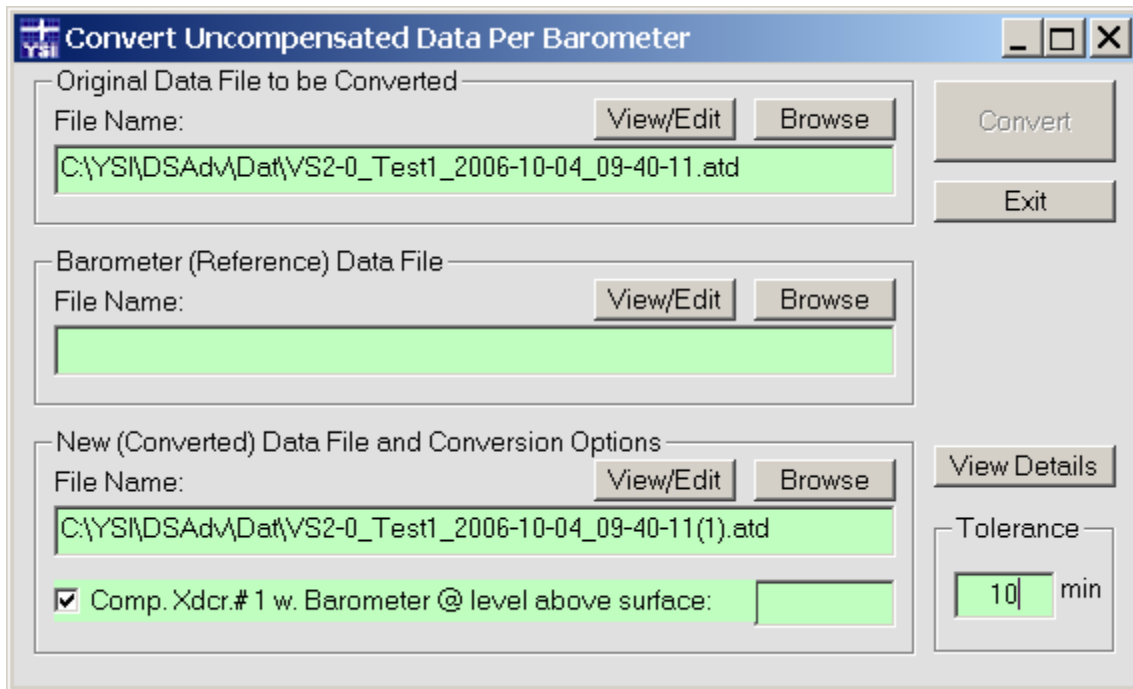


Figure 3.35

The default input file to be converted (compensated) is the previously selected file from the **File** menu of the **Playback** window. Its name appears in the **Original** file frame in the **Convert** window. Use that frame's **Browse** button to choose a different file name. Use the **View/Edit** button to view or edit the contents of the selected file.

The **Barometer (Reference) Data File** frame (Barometer frame) must be assigned the name of a file containing absolute barometric reference data. Use the **Browse** button to select a separate data file extracted from an absolute BaroScout. This file should have a date/time profile close to (but not identical to) the Original file to be compensated. This is a necessary condition when the two input files are separately recorded.

The default output file name in the **New (Converted) Data File and Conversion Options** frame is set automatically using the file name already in the Original frame, but with a version string "(v)" added, where v is a version number. This makes a new file name that is unique. In this example there were no previous versions of that file, so version "(1)" was added to the name.

Since the **Original** example file contains data from only one level transducer, there is a single **Comp** check box (pre-checked) in the **New** frame, plus a single corresponding **Elevation** text box. The elevation box is normally blank (which defaults to 0 inches). However, any integer value may be entered (positive or negative) in inches (in), feet (ft), meters (m), or centimeters (cm). For example, manually edit this box to indicate that the reference BaroScout is located 1 foot above the surface of the water that contains the submerged level transducer to be compensated by entering 1 ft.

Since the date/time profiles of the two input files nearly match, but not quite perfectly, a special age tolerance for barometer readings of 10 minutes has been set (see **Tolerance** frame in bottom right corner of the window). This tolerance is sufficient to allow for the known date/time misalignment of the two files. If the tolerance were set to zero, then some compensated values in the New file might be replaced with the error string **\*\*nobaroo\*\*** instead of numeric converted values because a needed barometer reading was missing at the beginning or end of the file without an exact time correlation. With a tolerance larger than zero, the "closest" barometer reading available will still be used as an estimate.

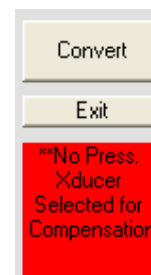
When the **Convert** button is clicked, this program converts every absolute pressure sample in the uncompensated Original file, using the "closest" reference source of absolute pressure data in the Barometer file, and writes the New file. The conversion equations used are simple and straight forward, and are described fully in the Data Scout Advanced Operations Manual. If conversion is successful, a

*bright green* status message appears below the Exit button. Click the View/Edit button in the New frame to view that final “compensated” file as a text report. By selecting the Exit button the Convert window closes, and this New converted file becomes the new “current” file of Playback, and is immediately displayed (i.e. re-plotted). For a complete description of the “diagnostic” Details report obtained by clicking the View Details button, refer to the Data Scout Advanced Operations Manual.

The previous example does not illustrate the case where both “input” files are actually the same file. Consider the new example of a ‘live’ data recording (.txt or .csv file) containing data from multiple pressure transducers where: one or more are to be compensated and one contains the reference barometer pressure. All these pressures have the same basic time stamp. In this case additional controls appear in the **Barometer** and **New** frames of the Convert window in order to select which transducers are which.

The following describes other aspects of Convert that differ from the examples above. Each of these is fully described in the Data Scout Advanced Operations Manual.

- When a separate Barometer file’s data has individual samples which were recorded at a frequency different from those in the original file, the program uses an estimated Barometer value calculated by interpolation. The user may also create a barometer file manually with a text editor that takes advantage of this feature.
- **DataPlay** accepts pressures (recorded in its input files) that are in pressure units other than psia which is required by the internal equations. The final compensated value for water level in psi is then converted back to the original units before being written to the New compensated file. If the compensated files start in psia and end in psi, the user can use another separate Convert function described in section 3.4.1 to convert these compensated psi pressure data to any other level units (ex. ft H<sub>2</sub>O).
- If the Convert window is exited without a successful convert (i.e., the label below the Exit button is *bright red*), Playback’s “current” file does not change from its original name to the New file created. In that case, Playback does not change its display (the original Playback data file remains displayed).



### 3.4.3 OTHER CONVERT FUNCTIONS

The other two Convert functions on the Convert menu of Playback allow the user to:

- Convert any human-readable text file (.atd or .txt) into its equivalent spreadsheet import version (.csv) and vice versa (figure 3.36).

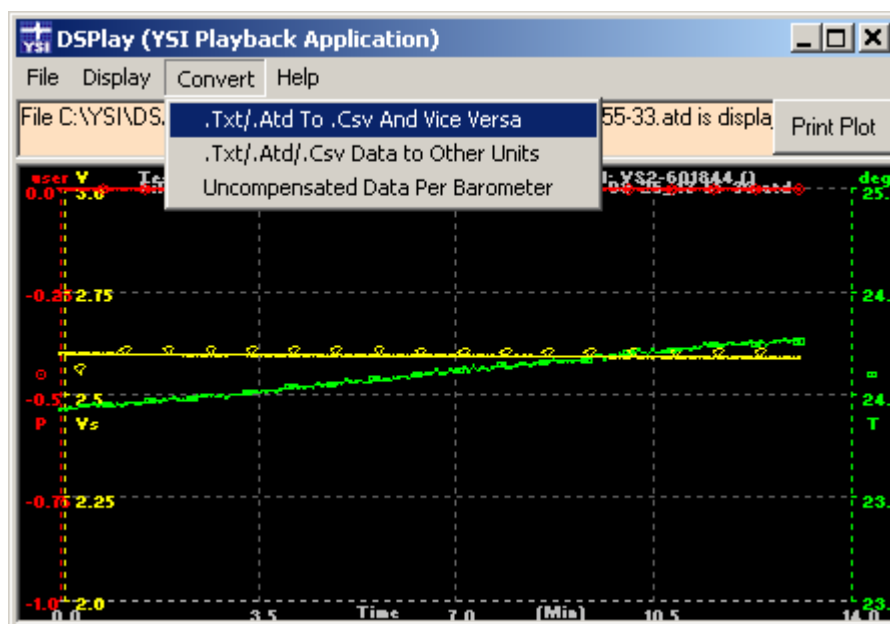


Figure 3.36



- Convert any pressure data or temperature data in any data file (.atd, .txt, or any of the equivalent .csv formats) into selected other pressure/level units or temperature units (figure 3.37).

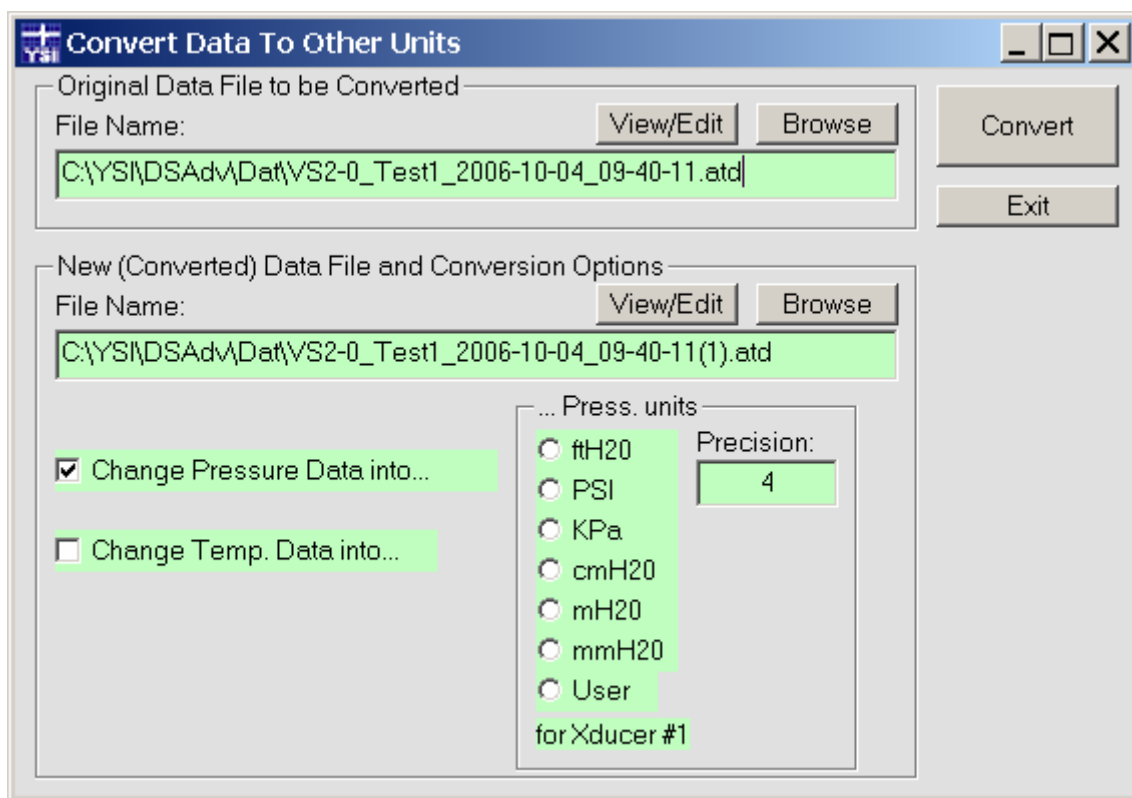


Figure 3.37

Before clicking the **Convert** button, select the new pressure units desired and the data precision. In this example, the precision is 4 digits to the right of each decimal point. The conversion will be almost instantaneous.

After exiting the Convert window, the New converted file becomes the new “current” Playback data file, and is displayed in its new units. This file also becomes the default file available to any other immediate future Convert function. Please note that the headers (first few text lines) of each new converted data file have new header lines added with each new conversion, thus keeping a date/time stamped history of every stage of conversion.

See the Data Scout Advanced Operations Manual for a complete description of these other convert functions and other Playback functions.



## 4.0 MAINTENANCE

This chapter will explain how to perform typical maintenance steps on the Level Scout product. The Level Scout has been designed to provide many years of reliable service while requiring minimal maintenance steps.

### 4.1 BATTERY REPLACEMENT PROCEDURES

---

Periodic replacement of the internal batteries will be required every three to five years. The following simple steps will guide the user through this replacement process.

*Warning*

Due to the inherent explosion risks of lithium batteries when exposed to water, YSI does **not** recommend using lithium batteries in the Level Scout.

First, remove the cable or wire from the transducer by holding the transducer in one hand and the retaining nut with the other hand. Gently unscrew the retaining nut of the cable or wire from the transducer. The nut will rotate while unscrewing from the transducer body, but the cable will remain stationary.

Twist this part to  
unscrew the cable  
from the transducer.

This part remains  
stationary.

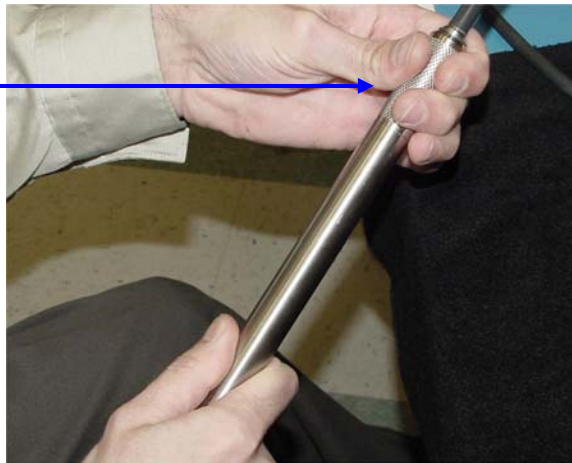


Figure 4.1

Continue to un-thread  
until the nut is completely  
un-threaded. Grasp the  
nut and gently pull it and  
the cable away from the  
transducer body (figure  
4.2).

Lay the cable end aside, on  
a clean, dry surface.



Figure 4.2

With one finger, gently push downward on the internal connector to relieve the tension on the retaining ring. Then, with a pair of tweezers, remove the retaining ring. The ends of the ring fit into two holes on either side of the transducer body (figure 4.3).



Figure 4.3

With the battery retaining ring removed, tilt the transducer and the batteries will slide out. They will push the small circuit board out with them (figure 4.4).



Figure 4.4

**Do not pull** or twist the brown flexible cable attached to the circuit board shown in figure 4.5. Figure 4.5 shows the normal extension of this cable that is required for easy replacement of the batteries.



Figure 4.5

Install two new industrial AA alkaline batteries into the Level Scout. When installing the batteries, pay attention to the polarity of the batteries. The negative battery terminal end of the battery should be installed into the housing first (figure 4.6).



Figure 4.6

Reinsert the battery connector making sure to align the PCB tab into the correct housing slot (figure 4.7).



Figure 4.7

Push the connector down far enough so that the retaining tab is below the retaining clip groove (figure 4.8).



Figure 4.8

While holding the connector down with one hand, insert the retaining clip into one of the holes in the transducer case and work the clip around the case into the hole on the opposite side. Make sure the battery retaining tab is below the retaining clip (figure 4.9).



Figure 4.9

After the retaining clip is secured, screw the unit back together, turning the retaining nut of the cable, NOT the smooth end of the transducer (figure 4.10).



Figure 4.10

*Note*

Once the new batteries are installed, the transducer resets itself. The default baud rate is 19200.

After installing new batteries, the transducer clock must be reset for proper timekeeping as described in section 4.2.

The battery type and rating must be downloaded to the transducer to begin the battery life estimation for the newly installed batteries. This process is explained in section 4.3.

All Autolog test configuration and logged data are retained when the batteries are removed and replaced.

## 4.2 SYNCHRONIZING THE TRANSDUCER INTERNAL CLOCK

Periodically, there may be a need to synchronize the Level Scout's internal clock to the local time. This can occur after shipping the Level Scout to different time zones, replacing the internal batteries, or simply to improve the accuracy of the time keeping.

To reset the Level Scout clock open Data Scout Advanced and click on **Run** to open the Run window. In the Xdcr. column of the Run Transducer window, select the row of the transducer that needs to be synchronized. Click the **Other** button in the Autolog Frame (figure 4.11).

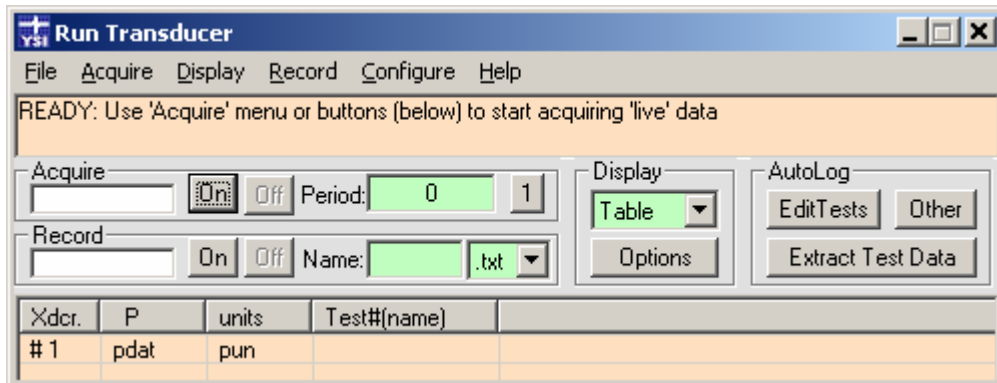


Figure 4.11

Clicking on the **Other** button opens the window shown in figure 4.12.

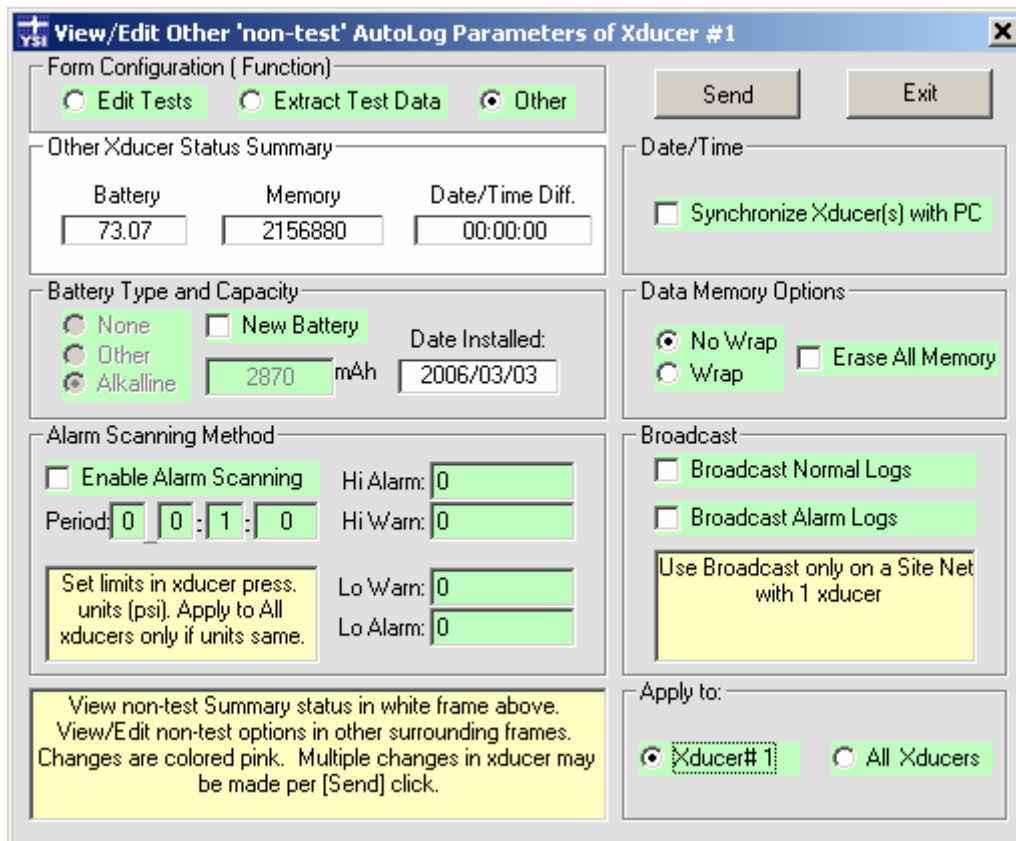


Figure 4.12

To synchronize the transducer clock with the PC's clock, click the box **Synchronize Xducer(s) with PC** in the upper right corner of the **Other** window. When the box is checked, the green will turn to pink, indicating that once **Send** is selected, information will be transmitted to the transducer.

Click **Send** to synchronize the Level Scout's clock.

### 4.3 DOWNLOADING NEW BATTERY INFORMATION

The Level Scout contains logic to estimate the remaining capacity of the internal batteries. In order for this to operate effectively, the transducer must be made aware of a battery replacement and the capacity of the installed batteries. Data Scout Advanced provides an easy method to configure this battery information in the Level Scout.

To configure the transducer's battery information open Data Scout Advanced and click on **Run** to open the Run window. In the Xdcr. column of the Run Transducer window, click the row of the transducer that needs to be updated. Click the **Other** button in the Autolog frame (refer back to figure 4.11).

Check the box next to **New Battery** (figure 4.12), the green will turn to pink and the following notice will appear.

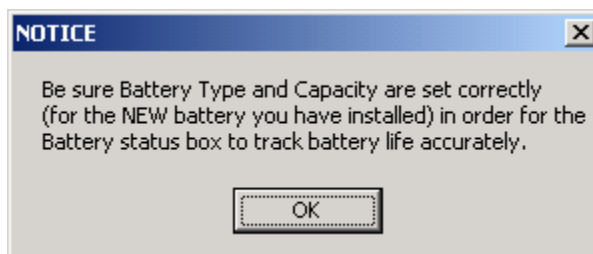


Figure 4.13

Click **OK** on the notice shown in figure 4.13 and enter the battery type and mAh capacity information about the new battery. If the entries are correct, click **Send** on the Other window to transmit the update to the transducer. Click **Cancel** on the Other window to cancel the transmission of the information. The user can also uncheck the **New Battery** checkbox to reverse all battery changes before pressing **Send** if other changes have been made that need to be transmitted to the Level Scout.

This procedure should only be performed at the time a new battery of known capacity is installed.

## 4.4 UPGRADING INTERNAL FIRMWARE

The Level Scout was designed with firmware that is easily upgraded by the user so that they are able to take advantage of added features. When these upgrades are released they are made available, free of charge, for downloading from the YSI web site ([www.ysi.com](http://www.ysi.com)). Data Scout Advanced has built in features to support downloading firmware updates to the Level Scout either one at a time or to several at a time. The following steps should be used to upgrade the firmware.

- 1) Download the firmware update from [www.ysi.com](http://www.ysi.com). Make sure to remember the location where the downloaded file was saved. By default Data Scout Advanced will look in the folder C:\YSI\DataScoutAdvanced\Firmware.
- 2) Start Data Scout Advanced and connect to the unit(s) that needs to be upgraded. Open the Run window for the selected units or all units. In the Xdcr. column of the **Run** window, click the row of the transducer(s) that needs to be upgraded.
- 3) Select **Configure** and then **Lock Access** from the menu bar. Data Scout Advanced will query the selected unit and display the current lock state. Select the **Unlocked** button and then select **OK**. This will unlock the firmware memory to allow downloading of new firmware.
- 4) From the menu bar select **Configure** and then **Update Firmware**. The Update Firmware window will open (figure 4.14). Click the **Browse** button to locate the new firmware file to be downloaded to the Level Scout. To update all transducers listed on the Run window, ensure they have been unlocked as described above, then click the **All Xducers** option in the Apply to frame.

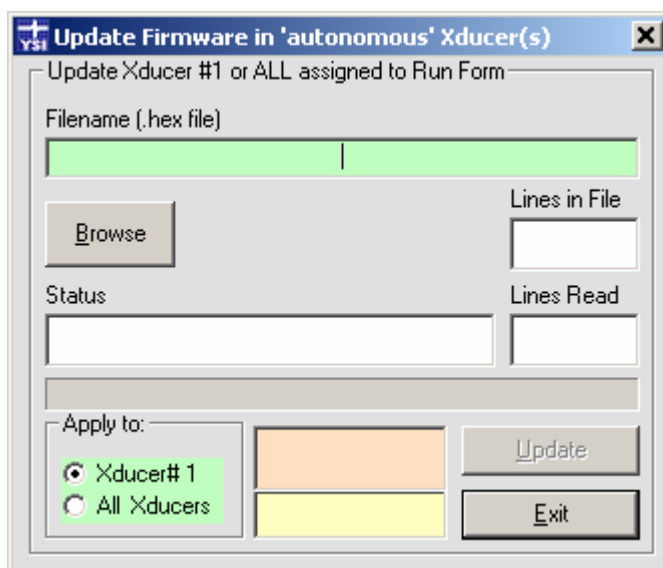


Figure 4.14

- 5) Select the **Update** button to begin the download process. Data Scout Advanced indicates progress in the white status boxes as it updates the transducer's firmware. If multiple transducers have been selected for update, the process is automatically repeated for each transducer.
- 6) When finished, the user will be prompted to redo the synchronization of the transducer with the PC's clock (see Section 4.2).



*Tip*

Do not disconnect the serial cable or terminate Data Scout Advanced in the middle of a firmware download. Interrupting a firmware download before it is complete will result in improper operation of the Level Scout.

#### 4.4.1 RECOVERING FROM FIRMWARE UPGRADE ERRORS

If a firmware upgrade process is interrupted before completion, the transducer will be left in a state where it is unable to operate in a normal manner. If the transducer is left in this mode, use the following steps to enable the transducer's boot loader and download a valid firmware into the unit.

- 1) Remove external power from the Level Scout cable.
- 2) Go to the firmware download function by selecting **Configure** then **Update Firmware**.
- 3) Select the proper firmware download file using the **Browse** button.
- 4) Start the download process by clicking the **Update** button.
- 5) Data Scout Advanced will not be able to start the firmware download since the Level Scout contains previously corrupted firmware. While Data Scout Advanced is trying to start the download process, briefly short together the power input terminals of the cable.
- 6) The firmware download process should begin after the power terminals are shorted. Allow the download to complete.

## 4.5 FIELD CALIBRATIONS

---

The Level Scout is factory calibrated to characterize its pressure and temperature output characteristics. Under normal conditions, factory re-calibrations are not required. The Level Scout firmware does provide the ability to perform simple field calibrations to provide offset or span corrections to the transducer in order to maximize accuracy in each application. Data Scout Advanced provides menus to simplify performing these field calibrations.

#### 4.5.1 FIELD OFFSET ADJUSTMENT

The field offset coefficient is provided to allow for easy offset adjustments of the Level Scout's output without altering its main factory calibration coefficients. When calculating output pressure, the Level Scout firmware will add the field offset coefficient to the factory offset. This offset adjustment is useful to compensate for sensor shifts due to orientation, head pressures or long term sensor drift. The internal field offset coefficient can be configured by the following steps for **Vented Level Scout only**. **If using an Absolute Level Scout, refer to the next paragraph.**

- 1) Place the sensor in its normal operating orientation (normally vertical).
- 2) Make sure the transducer is completely removed from water (or other liquid) to provide a true zero pressure reading (or alternately apply the desired offset pressure/level to the transducer). An Absolute Level Scout should read 14.7xxx PSI when removed from water.
- 3) In the **Xdcr.** column of the Run window click the row of the transducer(s) that require an adjustment. From the Run window menu bar select **Configure** then **Zero**. Data Scout Advanced will read the Level Scout's current field offset coefficient and calculated pressure. It will then calculate the new field offset coefficient required to produce a pressure reading of zero.
- 4) Data Scout Advanced will open window displaying the current measured pressure. If this looks reasonable click the **OK** button. Data Scout Advanced will then adjust the field coefficient.

Alternately, if the new field offset value is known or if using an Absolute Level Scout, the user may enter it directly by selecting **Configure** then **Field Offset** from the Run window menu bar. A window as shown in figure 4.15 below will be displayed. Enter the desired offset value to add the factory offset as well as its engineering units of measure. Click **OK** to transmit the value to the Level Scout.

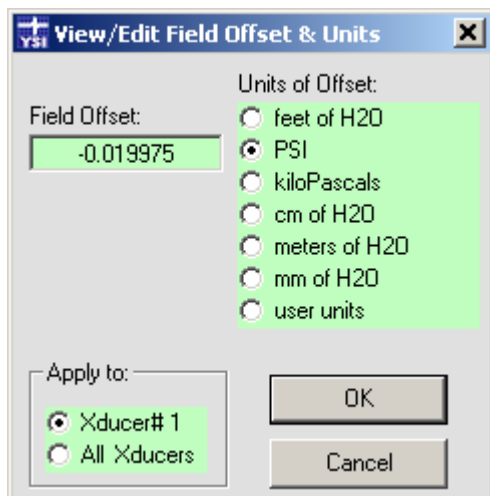


Figure 4.15

## 4.6 DESICCANT MAINTENANCE

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It is recommended that the user establish a regular maintenance schedule for the vent filter. The vent filter should be changed when it is 75% spent. Spent desiccant will have a pink color where unspent desiccant is light blue. The frequency of the vent filter replacement will be a function of the local environment, particularly the humidity. Replacement filters are available from YSI or any Authorized YSI Representative. Even if its color indicates it is spent, **do not remove the old vent filter until a new one is available**. The desiccant vent filter will last at least one (1) year before replacement is necessary.

To replace the desiccant vent filter, use the following procedures:

- 1) Cut the nylon tie wrap securing the old vent filter to the cable assembly.
- 2) Disconnect the soft tubing of the old vent filter from the metal tube exiting the back of the 9-pin D-shell boot.
- 3) Immediately connect the soft tubing of the new vent filter onto the metal tube exiting the back of the 9-pin D-shell boot.
- 4) When the transducer is placed back into service, remove the protective cap from the end of the vent filter.

Remember, the most common failure mode of vented transducers is moisture and corrosion damage due to lack of use or maintenance of the vent filter.

## 4.7 DRYING THE TRANSDUCER CABLE

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If water may have entered the cable vent tube or in the Level Scout, the following procedure can be used to dry either one out.

- 1) Remove the field cable assembly from the Level Scout.
- 2) Remove the desiccant vent filter from the cable.
- 3) Coil the cable then place it along with the transducer in a pan. Place the pan in an oven at 50°C (122°F) for a minimum of two (2) hours. Ensure the oven temperature does not exceed 50°C (122°F). Temperatures above 50°C (122°F) may damage both the transducer and cable.
- 4) Reattach the desiccant to the cable.
- 5) Reattach the cable to the transducer.

## 4.8 CLEANING THE TRANSDUCER

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Either a clogged nose piece or a dirty transducer diaphragm could result in erroneous readings from the transducer. **NEVER** attempt to clean the transducer's nose piece or diaphragm with a sharp or hard object. This could dent the sensor diaphragm and cause permanent damage to the transducer. Use the following procedures to effectively clean the transducer:

### Materials Required:

- Plastic bowls 8-12 inches in diameter and 4-6 inches deep
- Supply of clean, lint-free rags
- 32 ounce bottle of "The Works-Tub and Shower Cleaner" a mild detergent, manufactured by Lime-O-Sol Company and available at local stores.

### Preparation:

Prior to cleaning the pressure transducer, ensure that the cable and the transducer body have been cleaned with a mild detergent to remove any hazardous materials. The vent filter must be properly attached. The cable should be coiled to ensure ease of handling and it must be protected against the possibility of accidental abrasion and/or penetration of the cable jacket by sharp objects. A lead length of 1 to 1½ feet of cable from the transducer should be allowed to facilitate handling during cleaning. The protective covering (or similar protective device) that was shipped with the transducer should be attached to the transducer at all times if the cable is not connected to the transducer.

The work surface needs to be clean, free of clutter, and large enough to accommodate all materials required in addition to the transducer and cable. Fill one of the bowls with fresh water, one with a mild detergent mixed with water, and the last with 16 ounces of "The Works."

### Cleaning:

- Holding the cable 6 inches from the transducer, immerse the unit in the bowl containing the mild detergent and stir for 20-30 seconds. Remove and rinse in the bowl containing the fresh water, using the same stirring motion used in the mild detergent. Wipe dry.
- Place the transducer in a vertical position with the pressure sensing end facing downward in the bowl containing "The Works" solution for approximately 15-20 seconds. Rinse in the bowl containing fresh water and wipe dry.



## 5.0 SUPPORT INFORMATION

### 5.1 WARRANTY

---

The YSI Level Scout Instrument is warranted for two (2) years from date of purchase by the end user against defects in materials and workmanship, exclusive of batteries and any damaged caused by defective batteries. YSI Level Scout cables and suspension wires are warranted for two (2) years from date of purchase by the end user against defects in material and workmanship. YSI Level Scout systems (instrument & cable/wire) are warranted for 1 year from date of purchase by the end user against defects in material and workmanship when purchased by rental agencies for rental purposes. Within the warranty period, YSI will repair or replace, at its sole discretion, free of charge, any product that YSI determines to be covered by this warranty.

To exercise this warranty, write or call your local YSI representative, or contact YSI Customer Service in Yellow Springs, Ohio at +1 937-767-7241 (800-897-4151 US). Send the product and proof of purchase, transportation prepaid, to the Authorized Service Center selected by YSI. Repair or replacement will be made and the product returned, transportation prepaid. Repaired or replaced products are warranted for the balance of the original warranty period, or at least 90 days from date of repair or replacement.

#### LIMITATION OF WARRANTY

This Warranty does not apply to any YSI product damage or failure caused by:

- 1) failure to install, operate or use the product in accordance with YSI's written instructions;
- 2) abuse or misuse of the product;
- 3) failure to maintain the product in accordance with YSI's written instructions or standard industry procedure;
- 4) any improper repairs to the product;
- 5) use by you of defective or improper components or parts in servicing or repairing the product;
- 6) modification of the product in any way not expressly authorized by YSI.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. YSI'S LIABILITY UNDER THIS WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT OF THE PRODUCT, AND THIS SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY. IN NO EVENT SHALL YSI BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY.

## 5.2 SPECIFICATIONS

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<b>Level</b>	<b>Range:</b> 0 - 10 ft, 3.05 m, 4.3352 PSI (Vented) 0 - 50 ft, 15.24 m, 21.676 PSI 0 - 75 ft, 22.86 m, 32.5140 PSI 0 - 250 ft, 76.2 m, 108.38 PSI 0 - 692 ft, 210.6 m, 299.9956 PSI  <b>Range:</b> 0-10 ft. 3.05 m, 19.035 PSI (Absolute) 0-50 ft, 15.24 m, 36.376 PSI 0-70 ft, 21.33 m, 45.046 PSI 0-230 ft, 70.1 m, 114.410 PSI 0-692 ft, 210.9 m, 314.696 PSI  <b>Accuracy:</b> 0.05 % FS TEB* for ranges > 10 ft ± 0.10 % FS TEB* for ranges ≤ 10 ft  <b>Resolution:</b> 0.00001 (Data Scout and Data Scout Mobile) 0.000001 (Data Scout Advanced, user selectable)  <b>Units:</b> psi, ft H <sub>2</sub> O, mm H <sub>2</sub> O, cm H <sub>2</sub> O, m H <sub>2</sub> O, kPA
<b>Temperature</b>	<b>Range:</b> -20 to 50° C (Operating Range) -10 to 40° C (Compensating Range)  <b>Accuracy:</b> ± 1.0° C (for S2, T2, AS2, AT2 models) ± 0.2° C (for S4, T4, AS4, AT4 models)  <b>Resolution:</b> 0.001 (Data Scout and Data Scout Mobile) 0.01 (Data Scout Advanced)
<b>BaroScout</b>	<b>Range:</b> 8-16 psia, 55-110 kPa
<b>Modes of Sampling</b>	Linear, Linear Average, Event, and Logarithmic
<b>Sampling Rate</b>	Programmable, 15 readings per second max
<b>Memory</b>	2 MB (for S2, T2, AS2, AT2 models) 4 MB (for S4, T4, AS4, AT4 models)
<b>Maximum Pressure Scans</b> (Pressure with Time-Stamp)	196,560 (for S2, T2, AS2, AT2 models) 393,120 (for S4, T4, AS4, AT4 models)
<b>Maximum Pressure and Temperature Scans</b> (Pressure and Temp with Time Stamp)	144,144 (for S2, T2, AS2, AT2 models) 288,288 (for S4, T4, AS4, AT4 models)
<b>Time-Stamp Accuracy</b>	±2 min/year (over the compensated temp range)
<b>Proof Pressure</b>	1.5 x FS
<b>Burst Pressure</b>	2.0 x FS
<b>Data Upload Time</b>	100 scans/sec
<b>Storage Temperature</b>	-40 to 80° C without batteries, -20 to 50° C with batteries
<b>Wetted Material</b>	316 SS or Titanium; Viton®
<b>Protection Rating</b>	IP 69, NEMA 6P
<b>Internal Batteries</b>	(2) 1.5 volt AA Alkaline RECOMMENDED
<b>Battery Life</b>	3 years @ 15 minute sample intervals
<b>External Excitation</b>	6 – 16 VDC

<b>External Input Current</b>	8.0 mA (average current during measurement) 25.0 mA (15 mS peak current during page writes) 0.25 mA (sleep current)
<b>Communication Interface</b>	RS-485 (3 volt p-p differential with selectable baud rates from 1200 to 19200)
<b>Protocol</b>	SDI-12 ver 1.3 compliant
<b>Weight</b>	0.70 lbs, (318 grams) with batteries 0.15 lbs, (57 grams) cable assembly without cable 0.05 lbs/ft, (79 grams/m) cable 0.005 lbs/ft, (8 grams/m) suspension wire
<b>Diameter</b>	0.75 inches (12.0 mm)
<b>Length</b>	12.44 inches (316.0 mm) from tip to end cap
<b>Cable</b>	Polyurethane jacketed, molded polyurethane seal 200 lbs, 90 kg pull strength conductors, Conductor size – 22 AWG

\* TEB – Total Error Band includes the combined errors due to nonlinearity, hysteresis, nonrepeatability, and thermal effects over the compensated temperature range per ISA S51.1

### 5.3 ACCESSORIES

770	Communication Cable, non submersible
771	RS-485 to RS-232 converter
772	RS-485 toSDI-12 converter
773	RS-232 to USB converter
780	Desiccant Vent filter
781	Cable Hanger
782	2" vented locking well cap with dock
783	2" vented locking well cap ONLY
784	2" dock ONLY
785	4" vented locking well cap with dock
786	4" vented locking well cap ONLY
787	4" dock ONLY
BS2	BaroScout, stainless steel, 2 MB memory
BS4	BaroScout, stainless steel, 4 MB Memory
710-X	Universal cable, Stainless Steel, X ft in length
730-X	Universal cable, Titanium, X ft in length
750-X	Suspension wire, Stainless Steel, X ft in length
760-X	Suspension wire, Titanium, X ft in length
750-0	Stainless Steel Backshell deployment cap
760-0	Titanium Backshell, deployment cap

## 5.4 ORDERING & TECHNICAL SUPPORT

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For ordering and technical support, please contact one of the following offices:

### YSI Incorporated, World Headquarters

1700/1725 Brannum Lane  
Yellow Springs, Ohio 45387  
USA  
Phone: +1-937-767-7241  
US 800-765-4974  
Fax: +1-937-767-9353  
Email: [environmental@ysi.com](mailto:environmental@ysi.com)

### YSI Gulf Coast

12231 Industriplex Boulevard, Suite A  
Baton Rouge, LA 70809  
USA  
Phone: +1-225-753-2650  
US 866-216-2662  
Fax: +1-225-753-8669  
Email: [environmental@ysi.com](mailto:environmental@ysi.com)

### Endeco/YSI

13 Atlantis Drive  
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## 5.5 SERVICE INFORMATION

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YSI has authorized service centers throughout the United States and Internationally. For the nearest service center information, please visit [www.ysi.com](http://www.ysi.com) or contact YSI Technical Support directly at 800-897-4151 or +1 937 767-7241).

When returning a product for service to a YSI Facility, include the Product Return form with cleaning certification (see following page). The form must be completely filled out for a YSI Service Center to accept the instrument for service. When returning a product to a YSI authorized service center, please contact the authorized service center directly for information on how to return a product.





Ship to:  
 YSI Service Center  
 1725 Brannum Lane  
 Yellow Springs, OH 45387  
 +1 937 767 7241  
 environmental@ysi.com  
 www.yisi.com

# Product Return Form

If known, please provide your:

YSI Customer # \_\_\_\_\_

Service Request # \_\_\_\_\_

## Step 1: Provide your billing and shipping information

<b>BILL TO</b>	<b>SHIP TO</b>	<b>RETURN SHIPPING</b>
		VIA (CIRCLE ONE)
		DHL    FedEx    UPS
		Account #:
		Please note: Shipping is prepaid and add.
<b>CONTACT:</b>	<b>CONTACT:</b>	<b>METHOD (CIRCLE ONE)</b>
PHONE: (    )	PHONE: (    )	Ground
FAX: (    )	FAX: (    )	Next Day AM
EMAIL:	EMAIL:	2 Day
		Next Day PM
		Other:

## Step 2: Provide information on your equipment

<b>MODEL NUMBER:</b>	<b>SERIAL NUMBER:</b>
PLEASE DESCRIBE THE PROBLEM(S):	

## Step 3: Provide your method of payment

<b>PAYMENT METHOD</b> FOR FASTER SERVICE, SPECIFY 'PRE-APPROVAL' AND PROVIDE THE AMOUNT AND PAYMENT METHOD
<input type="checkbox"/> Pre-approval with PO or Credit Card # included Amount: _____ Signature: _____ X _____
<input type="checkbox"/> Purchase Order (please attach) PO Number: _____
<input type="checkbox"/> Credit Card (circle one) VISA    MasterCard    American Express Name on Card: _____ Number: _____ Expiration Date: _____
<input type="checkbox"/> Prepayment
<input type="checkbox"/> Quote Required
Please note: There is an estimate fee of approximately \$35 to \$80 (product dependent) which is waived if service is approved.

## Step 4: Fill out the Cleaning Certificate

<b>CLEANING CERTIFICATE</b>
Model Number:
Lot/Serial Number:
Contaminants (if known):
Cleaning Agents used:
<input type="checkbox"/> Radioactive Decontamination Certified (check only if product has been exposed to radiation and successfully decontaminated.)
Cleaning Certified by: Signature: _____ X _____
Date: _____

For more information contact us at 800-897-4151 (US) or visit [www.yisi.com](http://www.yisi.com).

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0906 Rev B



**LEVEL SCOUT CONNECTION DIAGRAMS**

Figure A-1 below shows the RS-485 communications signal assignments on the universal field cable 9 pin D-connector that are required for serial communications. Also show are the signal assignments for the power connector that is found on the user (above ground) end of the universal cable assembly. If you need to fabricate your own power connector to mate to this, ensure that the polarities are correct as shown below.

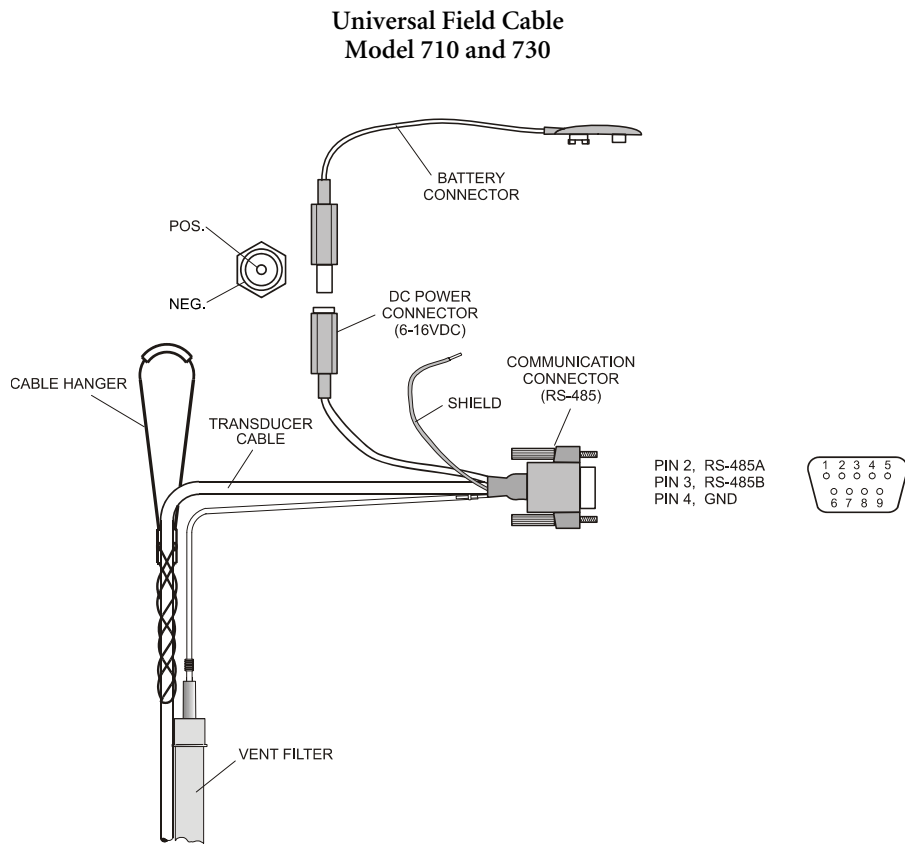


Figure A-1

Figure A-2 contains the signal assignment for the RS-232 side of the Model 771 RS-485 to RS232 converter.

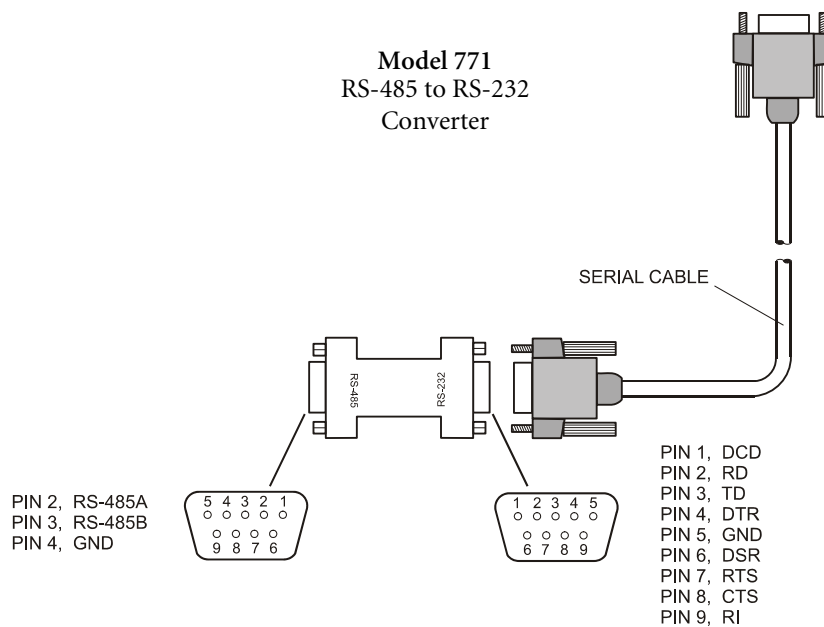


Figure A-2

Figure A-3 contains the signal assignments for the Model 772 RS-485 to SDI-12 converter.

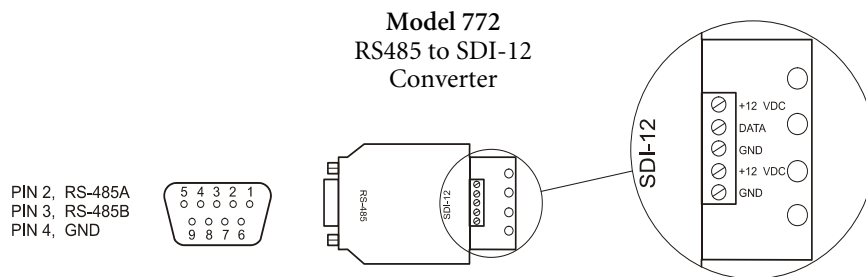


Figure A-3

Figure A-4 contains the 770 Non submersible Quick Disconnect Communication Cable. This communication cable is designed specifically for the technician in the field to extract data from the Level Scout quickly and efficiently. It includes an RS-485 communication connector, DC power connector, and battery connector. The 770 is not intended for field deployment.

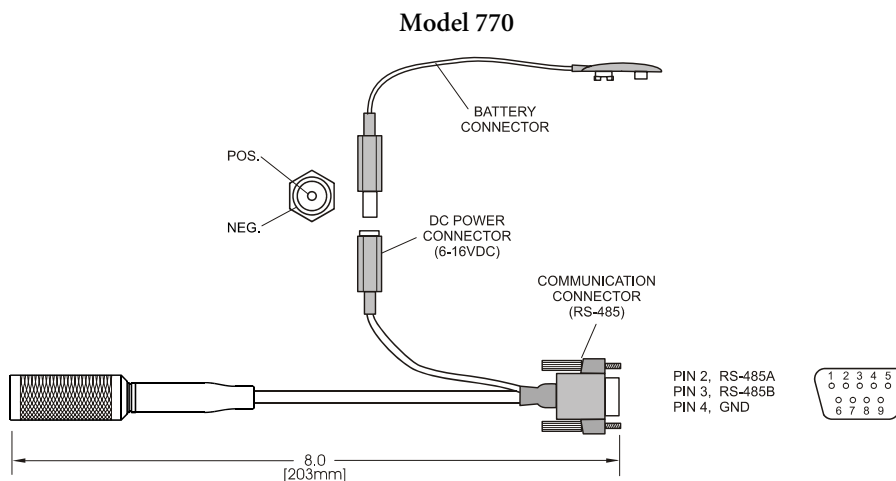


Figure A-4

Figure A-5 contains the Suspension Wire Assembly, Model 750 and 760. The Suspension Wire is intended for use with absolute transducers to suspend the unit during deployment. This assembly includes a stainless steel or titanium backshell, carabiner, and Teflon® coated stainless steel suspension wire.

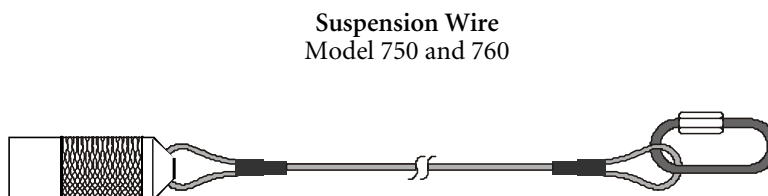


Figure A-5

**SDI-12 COMMUNICATION**

SDI-12 is an industry standard serial digital interface bus. The bus was designed to allow compatibility between data collection devices of various manufacturers. SDI-12 is a single master multi drop bus and command protocol. As many as 10 sensors can be connected to the bus as a time. Each sensor is pre-assigned a unique address (0-9, a-z, or A-Z). Each Level Scout is factory-set to address 0 (zero).

This appendix documents some of the SDI-12 commands supported by the Level Scout transducer. All commands listed alphabetically have the following information:

<b>Command</b>	a 1-3 letter abbreviation (operation code for the command)
<b>Function</b>	a description of the command
<b>Syntax</b>	a complete rendering of the command's structure
<b>Sensor Response</b>	a description of the response(s) returned by the Level Scout

Some commands require another special **Get Data** command (“D0”) to follow them (immediately or after a delay of “t” seconds, as indicated by a parameter in the “main” response). Also, some command responses generate a “main” response, which is followed “t” seconds later by a second response: called the **Service Request** response. In both cases, a standalone colon (:) will indicate this required *following* relationship between two commands and two responses.

To avoid unnecessary repetition of frequently-used parameter descriptions in the table entries, each occurrence of a simple “a” item always represents the address of the sensor. Also, “t” represents a common parameter of a “main” response: **time in seconds** until data will be ready to read with a following “D0” command. All responses end with a non-printable <CR><LF> character pair, which is not shown in the table.

Command	Function	Syntax	Sensor Response
I	Identify Sensor	a!	A13—YSI---AS2---hhh-sssss-vvv  13 Supports SDI Version 1.3 commands  YSI Manufacturer  AS2 Model Number  hhh Hardware revision  sssss Serial Number  vvv Software revision
D0	Get Data	aD0!  <b>Note:</b>  This command is only issued after a <b>Start Measurement</b> (various “M[v]” or “C[v]”) command. It should <b>not</b> be issued until measurement time (returned in response) has expired or extra <b>Service Request</b> response has been received after a <b>Start Non-Concurrent Measurement</b> (various “M[v]”) command is	av or apu  avu or aputu or avv or avvv  p is ± pressure value.  t is ± temperature value.  “v” is other non-specific value  “u” is + units indicator  Example: 0-10.23-0  If previous measurement command was “M” or “C” above example response

		<p>issued.</p> <p>Example: 0D0! (Send Get Data command to sensor "0")</p>	<p>would be "avu" form and would indicate that the water level of sensor "0" is a 10.23 feet.</p> <p>Note: If address is returned alone with no data and unit values, this indicates that there is no data available. Either a Start Measurement command was not issued, the command was aborted by sending a new command before the measurement time expired, or an expected Service Request response was not yet received.</p>
M or M0	Start non concurrent pressure measurement	<p>aM!</p> <p>:</p> <p>aD0!</p>	<p>att2</p> <p>:</p> <p>a (service request response)</p> <p>"2" is number values in "D0" resp:</p> <p>apu or aputu</p> <p>"p" is ± pressure value</p> <p>"u" is + units indicator. Use "XUP" command to set units. If "XUM=1" command is executed then ± temperature value and units code (tu) also appended.</p>
M1	Start non concurrent factory pressure measurement  (factory calibrated value always in psi)	<p>aM1!</p> <p>:</p> <p>aD0!</p>	<p>att1</p> <p>:</p> <p>a (service request response)</p> <p>"1" is number values in "D0" resp:</p> <p>ap</p> <p>"p" is ± pressure value (psi)</p>
M2	Start non concurrent temperature measurement	<p>aM2!</p> <p>:</p> <p>aD0!</p>	<p>att2</p> <p>:</p> <p>a (service request response)</p> <p>"2" is number values in "D0" resp:</p> <p>atu</p> <p>"t" is signed temperature, "u" is = units: 0=Celsius, 1=Fahrenheit. Use "XUT" command to set units.</p>
M3	Start non concurrent scale factor measurement  (user slope, user offset, and field calibration)	<p>aM3!</p> <p>:</p> <p>aD0!</p>	<p>a0013</p> <p>:</p> <p>a (service request response)</p>

	offset)		<p>“3” is number values in “D0” resp: asoc</p> <p>“s” is signed user slope</p> <p>“o” is signed user offset (psi)</p> <p>“c” is signed field cal. Offset</p>
M4	<p>Start non concurrent standards lab scale factor measurement</p> <p>(standards lab calibration slope and calibration offset)</p>	<p>aM4!</p> <p>:</p> <p>aD0!</p>	<p>a0012</p> <p>:</p> <p>a (service request response)</p> <p>“3” is number values in “D0” resp: aso</p> <p>“s” is signed cal. Slope</p> <p>“o” is signed cal. offset</p>
M5	<p>Start non concurrent high accuracy PCB temperature</p>	<p>aM5!</p> <p>:</p> <p>aD0!</p>	<p>attt2</p> <p>:</p> <p>a (Service Request response)</p> <p>“2” is number values in “D0” resp: atu</p> <p>“t” is signed temperature, “u” is = units: 0=Celsius, 1=Fahrenheit. Use “XUT” command to set units is si</p>
M6	<p>Start non concurrent battery voltage measurement</p>	<p>aM6!</p> <p>:</p> <p>aD0!</p>	<p>a0021:</p> <p>:</p> <p>a (Service request response)</p> <p>“01” is number values in “D0” resp: av</p> <p>“v” is the battery voltage</p>
M7	<p>Start non concurrent pressure and temperature measurement</p>	<p>aM7!</p> <p>:</p> <p>aD0!</p>	<p>attt4</p> <p>4 is number values in “D0” resp: aputu</p> <p>p is ± pressure value, first u is = units index. Units set by “XUP” command. t is ± temperature value, second u is +0 = Celsius or +1 = Fahrenheit. Use “XUT” command to set units.</p>

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