ADAS-500 Reporting System
User's Manual

Ver **1.91**

Introduction

The ADAS-500 Reporting System is a complimentary utility that is shipped with the AMAC-500 Crawler System. The reporting system is provided free to owners of ATCO's AMAC-500 Crawler Systems.

This ADAS-500 Reporting System provides reporting capabilities for scan data collected with the ATCO ADAS-500 Data Logger. The system reads the ADAS-500 data files directly. It can combine several data files in to a single report file which contains the scan data and information about the inspection and equipment being inspected. The system provides editing features to review and edit your data. After reviewing data, you can print a series of professional reports.

The system is particularly useful when scanning storage tanks that fall under the American Petroleum Institute (API) Standard 653 *Tank Inspection, Repair, Alteration, and Reconstruction.* Minimum thickness calculations and analysis are performed automatically by the system in accordance with Section 2 of the API-653 Standard. For more information on the exact sections supported, refer to the section titled *Analysis Methodology*.

System Requirements

The AMAC-500 Reporting System runs under Windows 95,98,ME,2000 and NT. The system has the same minimal system requirements as the Windows versions it runs in. The system will print to any Windows supported printers. A color printer is recommended but not required.

What to do Next

If your system meets the requirements listed above, it is suggested that you move to the next section *System Installation* Once you install the software, you should procede to the section *Getting Started*. This section will take you step by step through the process of creating report files and processing ADAS-500 data.

The sections *Reviewing Data* and *Printing Reports* will step you through editing and printing the data collected.

The section *Analysis Methodology* explains the methods formulas used by the system to calculate API 653 t_{min} and Thickness Averaging (Critical Length "L") values. Prior to reading this section, you should be familiar with Section 2 of API-653.

The last section is a *Tutorial*. It includes exercises to step you through the processes required to collect, review and print ADAS-500 data with this reporting system.

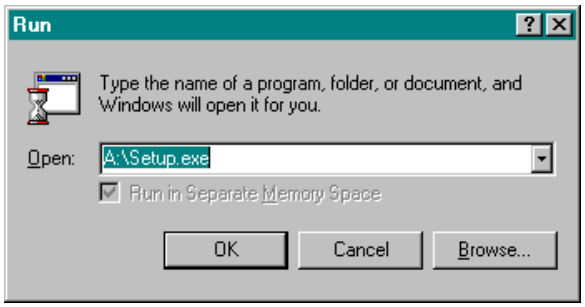
System Installation

If your computer meets the minimum system requirements listed in the previous section, you are ready to install the software. The installation utility on the distribution diskette must be used to install the software.

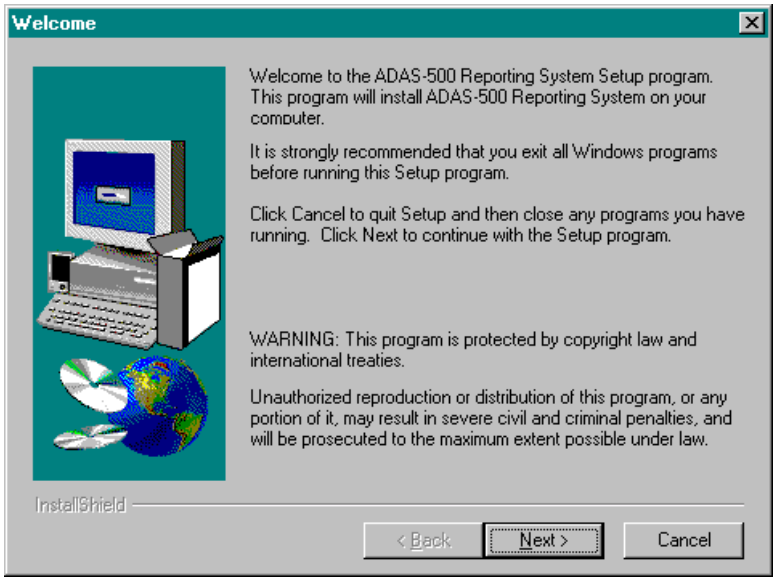
Installation

Close all applications you have running in Windows. Place the distribution diskette or cd in drive **A**: (cd drive)

From the Start menu select **Run...** The dialog box shown below will appear. Type **A:\Setup.exe** (or drive letter of the cd drive) in the edit box and click **OK**.



The installation utility will run and display the dialog box shown below. Click **Next** to continue through the installation. The utility will step you through the process of installation.



When the installation is complete, it will have created the folder below if the default settings were used

C:\Program Files\ATCO\ADAS-500 Reporting System

There should be a menu option under the **Start** menu:

Start | Programs | ADAS-500 Reporting System

Installing the Data Collection Module (DCM)

The DCM requires an ethernet connection between the computer and the MCU-500. This connection utilizes a standard Category 5 (Cat 5) ethernet cable with RJ-45 connectors. If you do not have the cable that shipped with the system, you can use any standard Cat 5 cable. The system does not require a crossover cable, although, one can be used with the system.

The diagram below shows the connections required to use the system. The ethernet connection to the MCU-500 provides both position and UT data to the DCM. Be sure to set which UT device you are using by clicking on *Settings.* You can select either the USN-52 or USN-58. Be sure to set the baud rate for the USN-58 to 115k. Do this by selecting **NEXT** on the main menu of the USN-58 and then **SER COMM**.

Removing or Uninstalling the Software

To remove the *ADAS-500 Reporting System* from a computer, you should not delete the folders and files manually. Remove it by selecting **Start | Settings | Control Panel**.

From the control panel, double click the **Add / Remove Programs** icon. From the list of applications in the window, select *ADAS-500 Reporting System* and click the **Add/Remove** button.

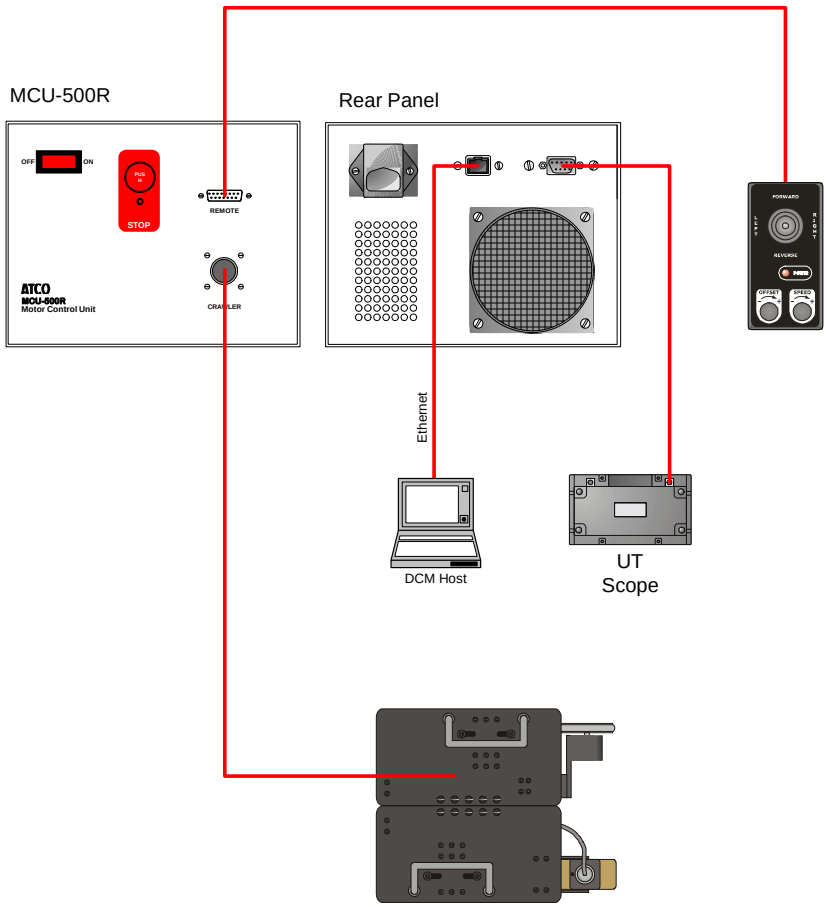


Figure 3 Connecting to the AMAC-500/MCU-500

Getting Started

Running the System

The software must be successfully installed before running the system. If you have not installed the software from the distribution disks at this point, please refer to the previous section and do so now. If the software has been successfully installed, you are ready to run the *ADAS-500 Reporting System*.

From the **Start** menu select **Programs | ADAS-500 Reporting System | ADAS-500 Reporting System**.

If you do not find the **Start** menu entry, proceed to the previous section and run the installation as specified. Otherwise, select the menu option (shown above) and the main screen of the program should appear as shown below.

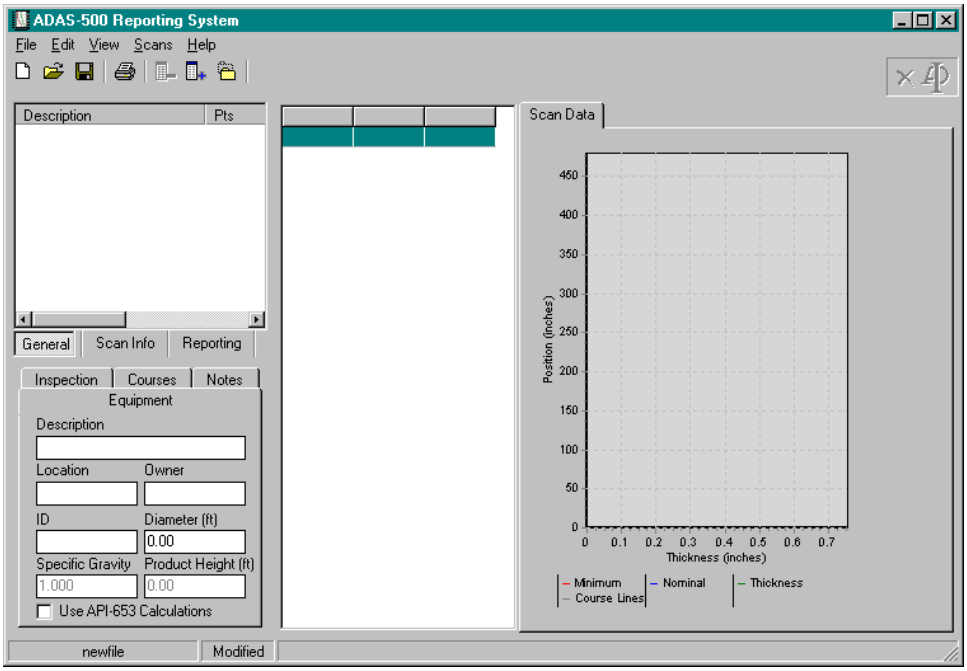
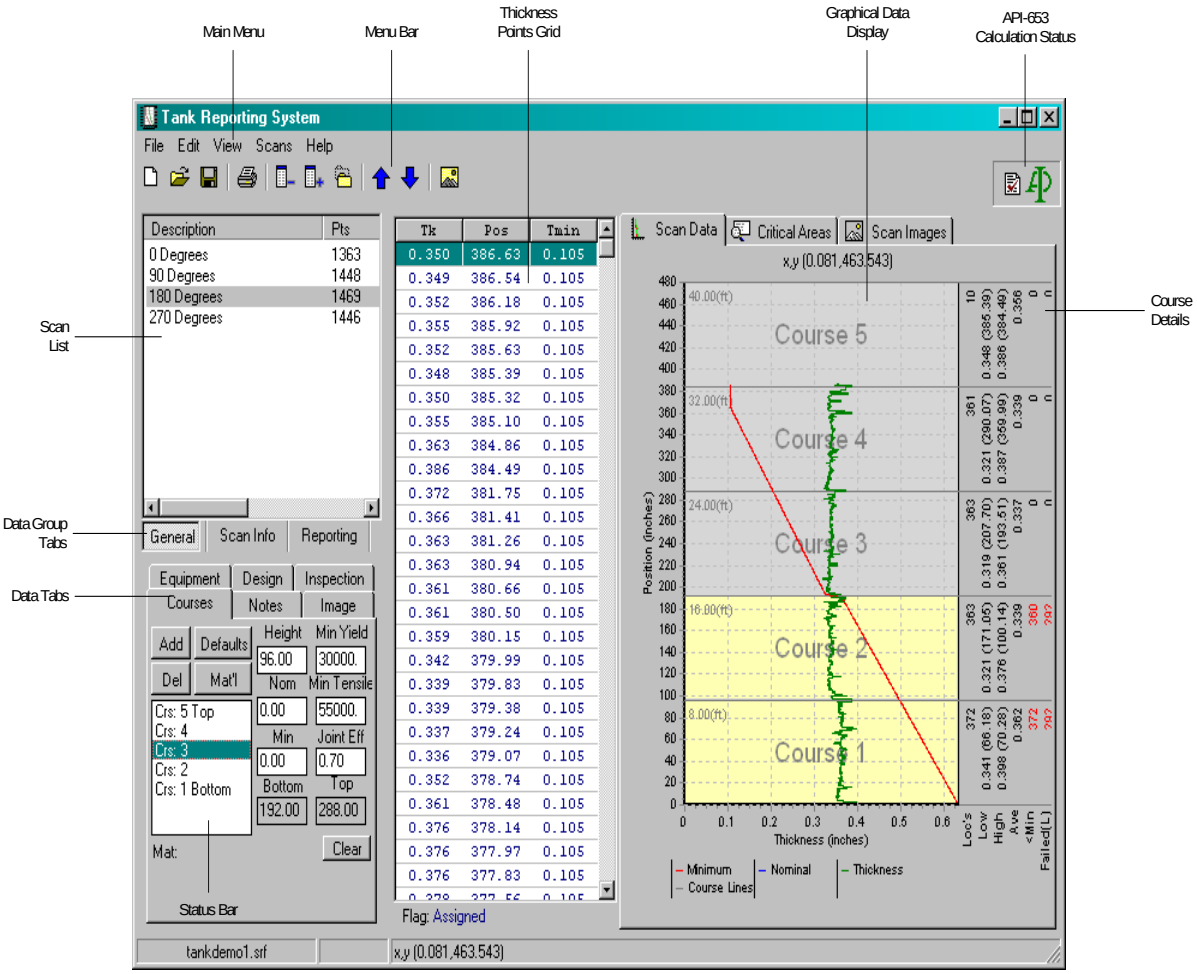


Figure 1 Blank Main Screen

Screen Layout

The figure below shows the main screen of the system and it's major parts.



Main Menu

The main menu structure is shown below with a short description of each item.

File

New	Creates a new blank reporting file
Open	Opens an existing reporting file from disk
Reopen	Provides a list of most recently used files to open
Import	Import a "TK" file as a scan
Save	Saves the current file
Save As	Saves the current file to a new name
Print	Print reports
Print Setup	Allows you to select a printer and set basic report options
Exit	Close the system down

Edit

Cut	Cut the current selection to the clipboard
Copy	Copy the current selection to the clipboard
Paste	Paste clipboard contents
Report Settings	
Minimum	Toggles graphical display of the minimum thickness in the graphs
Course Lines	Toggles graphical display of the course lines in the graphs
Grid Lines	Toggles graphical display of the grid lines in the graphs
Legend	Toggles graphical display of the legend in the graphs
Minimum Color	Sets the color for the minimum thickness in the graphs
Thickness Color	Sets the color for the thickness in the graphs
Course Color	Sets the color for the course lines in the graphs

View

Scan Data	Selects the Scan Data graphical view
Course Details	Selects the Course Details graphical view
General Info	Selects the General data group tab
Scan Info	Selects the Scan Info data group tab
Reporting Info	Selects the Reporting data group tab

Scans

Add Scan	Add a new scan to the scan list
Delete Scan	Delete a scan from the scan list
Insert TK File in to Scan	Insert data from a "TK" file in to an existing scan
Move Scan Up	Move the scan up in the scan list
Move Scan Down	Move the scan down in the scan list

Help

Contents	Displays the contents page of the help system
About	Displays the About dialog which provides version and copyright information

Menu Bar

The menu bar which appears across the top of the main screen below the main menu provides shortcuts to commonly used commands. The figure shown to the right shows each menu bar button.

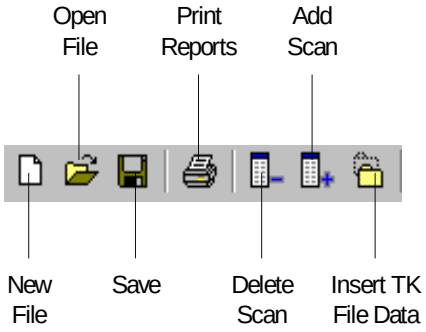


Figure 3 Menu Bar

Scan List

The scan list displays the scans in the current report file. Report files can hold several scans and are usually associated with a single piece of equipment.

As a scan is selected in the scan list, the graphical display and thickness data grid display the selected scan data. When reviewing thickness data, deleting scans or importing data, you must first select the scan in the scan list. The scan list scrolls to the right to display more information about the scan such as the number of thickness points, the number less than minimum, the high and low thickness and the technician name.

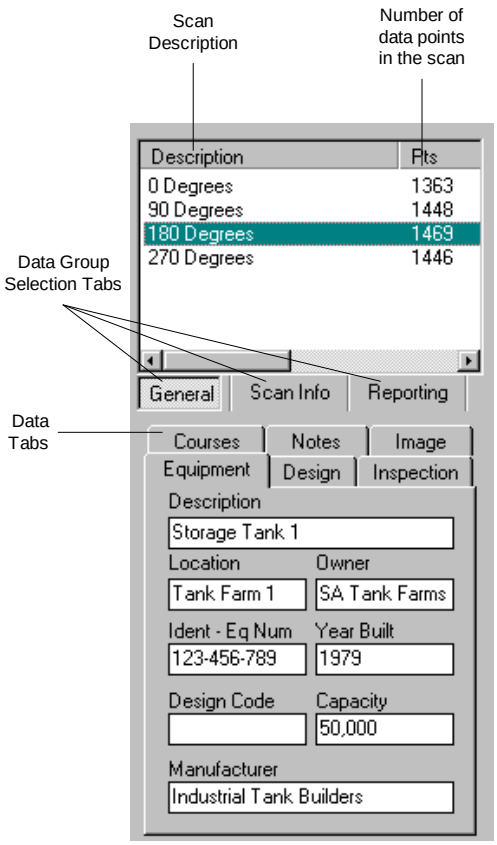


Figure 4 Scan List and Data Tabs

Data Tabs

The data tabs are divided in to three basic groups, General, Scan Info and Reporting. Click the data group tabs at the top to display and edit information in the appropriate data tabs below.

General Group

This group displays general equipment, inspection, course layout and comment information.

Equipment information can be edited by clicking the **Equipment** tab (shown right). An explanation of the fields will be covered later in this section. To enter design information such as diameter and capacity, click the **Design** tab.

Inspection information can be edited by clicking the **Inspection** tab (Figure 5). An explanation of the fields will be covered later in this section.

Course definition information is edited by clicking the **Courses** tab (Figure 8). This is where course height, nominal thickness and other information is entered. An explanation of the fields will be covered later in this section.

General inspection and scan specific notes are entered by clicking the **Notes** tab (Figure 8).

Figure 5

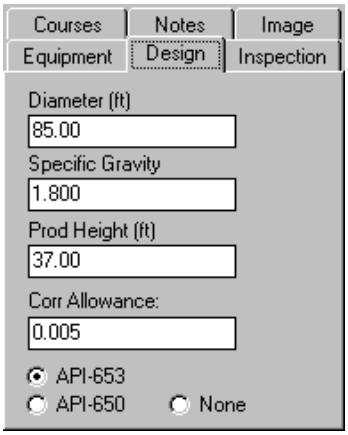


Figure 6

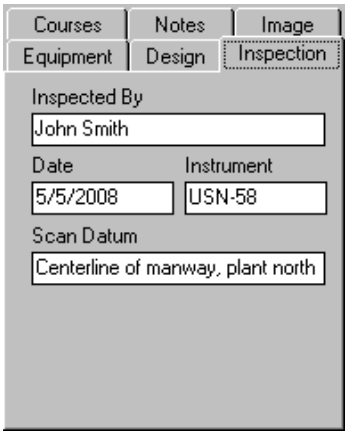


Figure 7

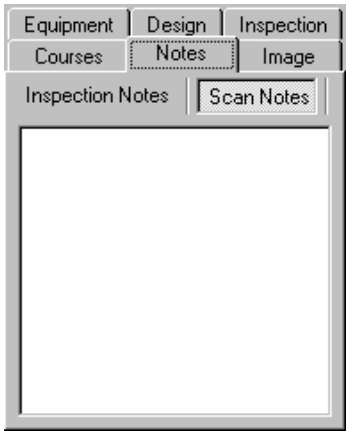


Figure 8

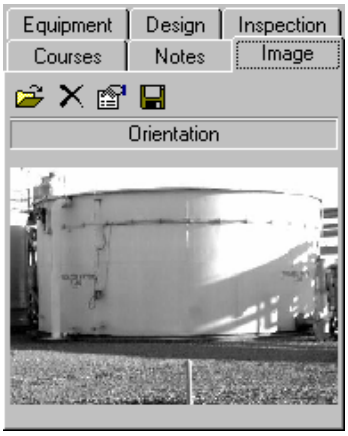


Figure 9

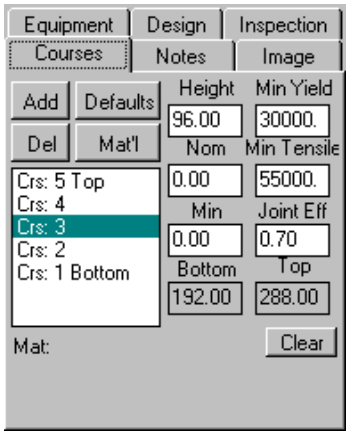


Figure 10

Scan Info Group

This group allows you to review or edit scan information and thickness data. To edit general scan information, click the **Scan Info** tab (Figure 11).

When scans are imported you are given the opportunity to save header information from the Adas-500 data files (TK). If you choose to import scan header information, you can review it by clicking on the Header tab (Figure 13).

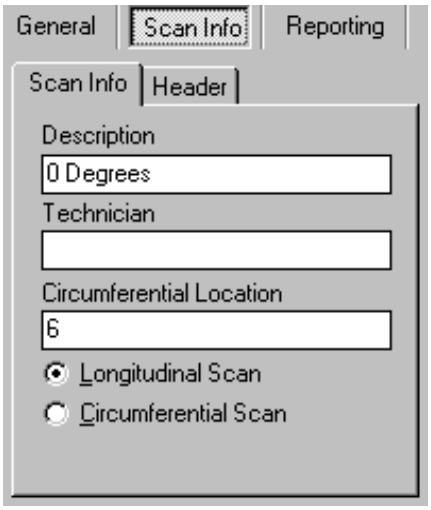


Figure 11 Scan Info Tab

Figure 12 Header Tab

Reporting Group

This group allows you to select various reporting and graph settings. To change the components viewed on the graph such as minimum and nominal thicknesses, course lines, grid lines, legend and course details, select the **Graph View** tab (Figure 13). To change the colors of the graph components, select the **Graph Colors** tab (Figure 13).

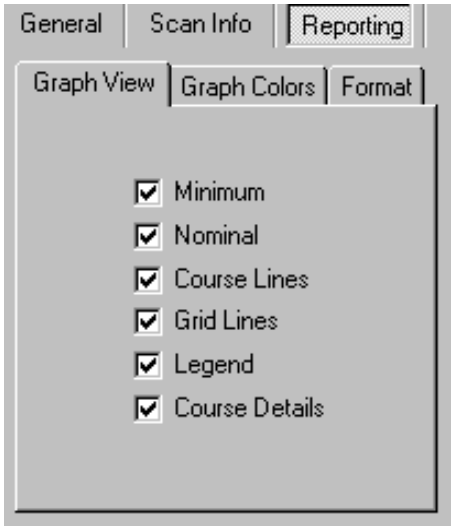


Figure 13 Graph View Tab

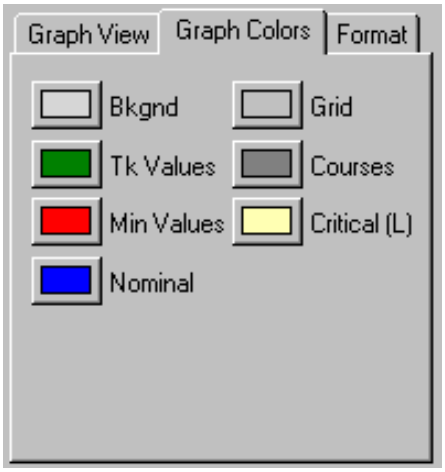
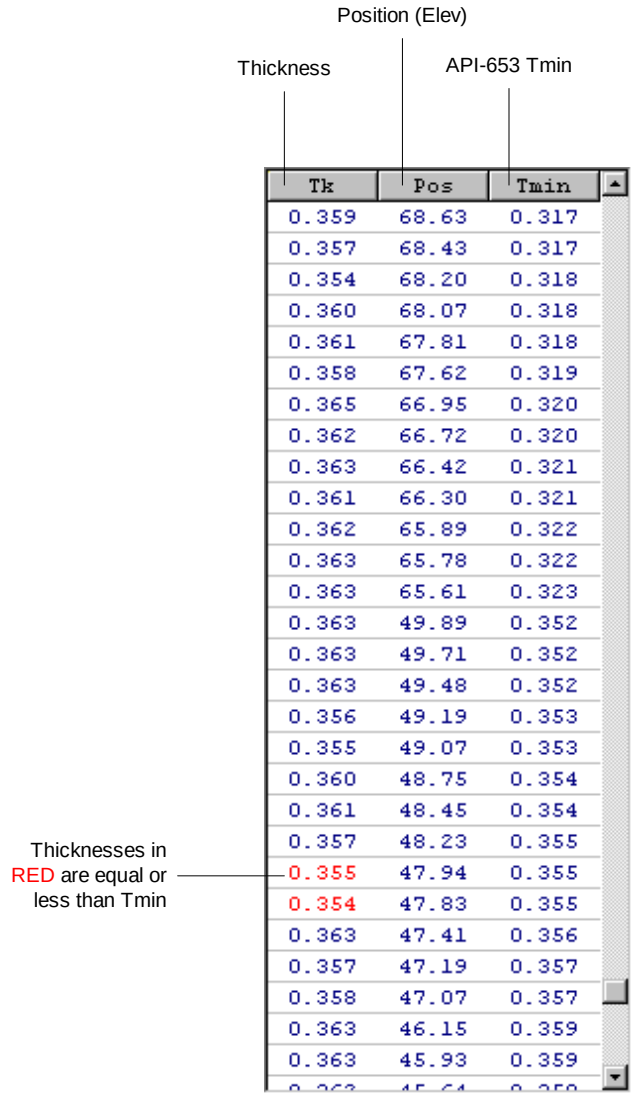


Figure 14 Graph Colors Tab

Thickness Points Grid

The thickness points grid (Figure 15) displays the thickness data of the selected scan. The three columns display the Thickness, Position and Minimum values for each thickness point in the scan. The list of thicknesses is sorted by position with the lowest position at the bottom. The thickness and position values are obtained directly from the ADAS-500 data file. The Tmin / Min column displays the API-653 Tmin value when API-653 calculations are enabled, otherwise the course minimum value is shown. Thickness values in RED indicate that the value is at or below the Tmin value.



Tk	Pos	Tmin
0.359	68.63	0.317
0.357	68.43	0.317
0.354	68.20	0.318
0.360	68.07	0.318
0.361	67.81	0.318
0.358	67.62	0.319
0.365	66.95	0.320
0.362	66.72	0.320
0.363	66.42	0.321
0.361	66.30	0.321
0.362	65.89	0.322
0.363	65.78	0.322
0.363	65.61	0.323
0.363	49.89	0.352
0.363	49.71	0.352
0.363	49.48	0.352
0.356	49.19	0.353
0.355	49.07	0.353
0.360	48.75	0.354
0.361	48.45	0.354
0.357	48.23	0.355
0.355	47.94	0.355
0.354	47.83	0.355
0.363	47.41	0.356
0.357	47.19	0.357
0.358	47.07	0.357
0.363	46.15	0.359
0.363	45.93	0.359

Figure 15 Thickness Point Grid

Graphical Data Display

You can view the scan data graphically by clicking the **Scan Data** tab (Figure 16) on the graphical data display. This shows the entire scan as well as course details. The thickness is plotted against the position (obtained from the ADAS-500 data file). The graph also plots the minimum (either assigned or API-653 Tmin) and nominal values. The graph shown is typical of a vertical storage tank (API-653 type). The data is displayed just as it would be oriented on the tank itself.

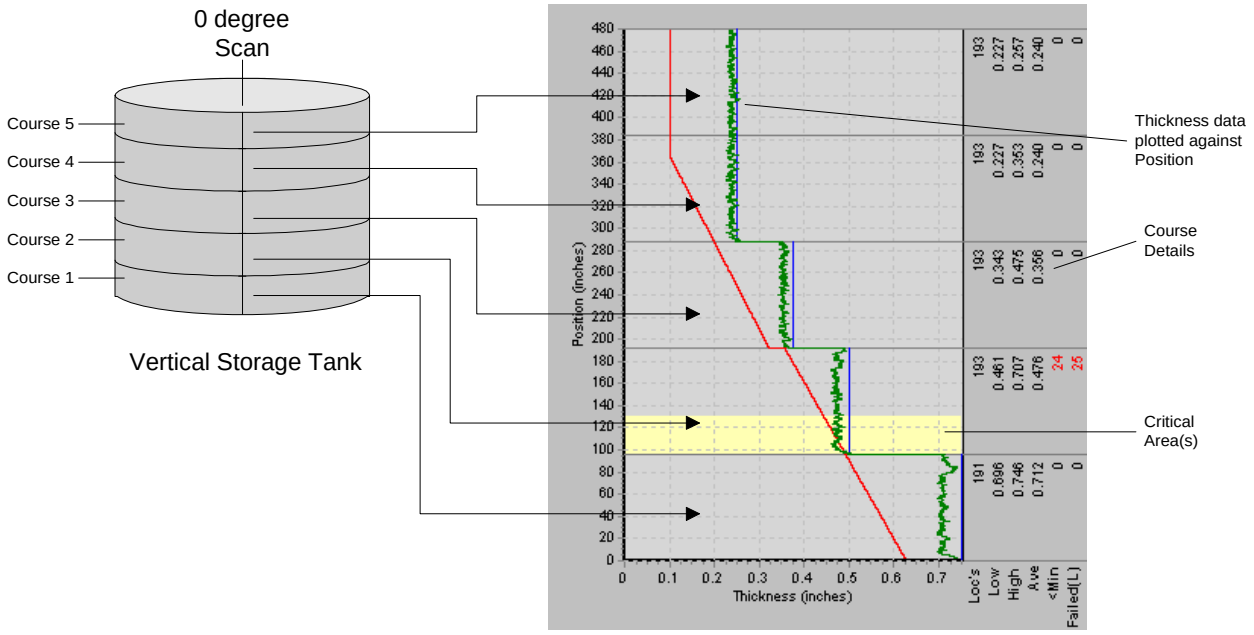


Figure 16 Vertical Storage Graphical Display

The right side of the graph displays summarized scan information for each course. The critical area shown is calculated automatically and shows areas of concern on API-653 enabled inspections. More about the critical areas and other API-653 calculations can be found in the section titled *Analysis Methodology*.

You can view selected course details by clicking the **Critical Areas** tab (Figure 17) on the graphical data display. This shows the scan data by course. The graph plots the thickness, position, minimum and nominal values for each selected course.

Choose a course to view by selecting it from the Course Selection List. The critical areas for each course is listed in the critical area list. The area details button displays a dialog box (Figure 18) which shows the details about the selected critical area. More about the critical areas and other API-653 calculations can be found in the section titled *Analysis Methodology*.

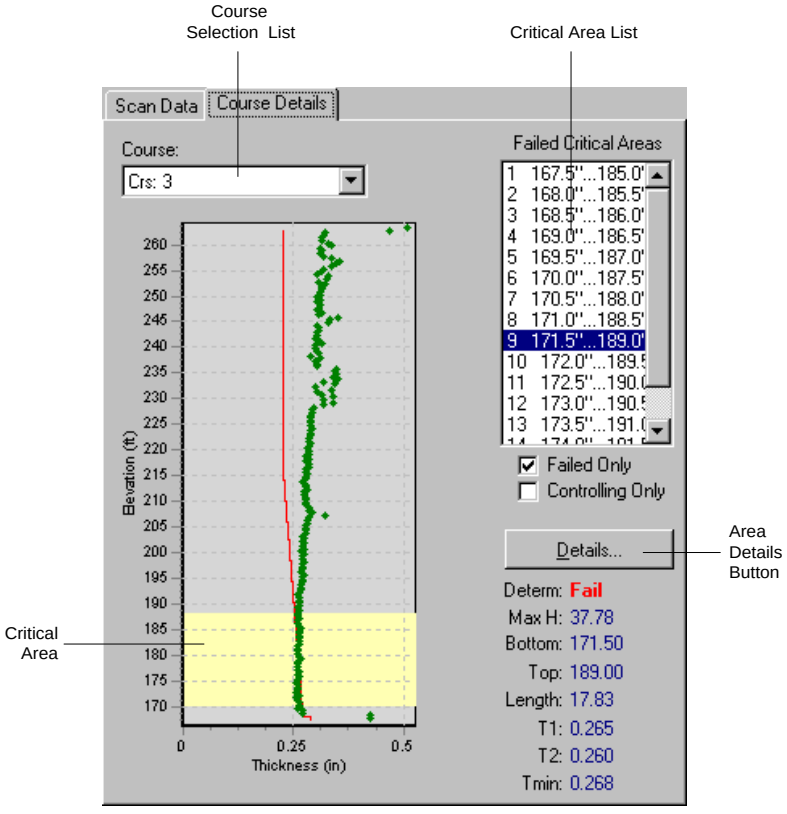


Figure 17 Course Details Graphical Display

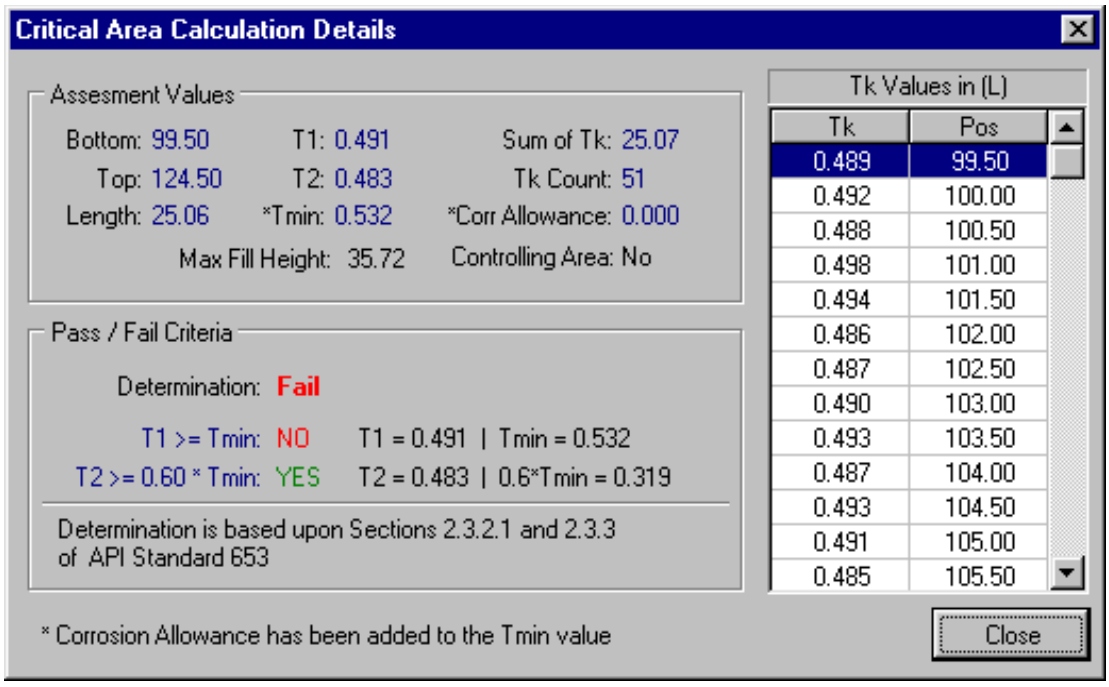


Figure 18 Critical Area / Length Details Dialog

How the System Works

The ADAS-500 Reporting System provides a simple and convenient means to produce high quality, professional reports from data files collected using the ADAS-500 Data Logger or by using the Data Collection Module. If you use the ADAS-500 Data Logger is used to collect data, you can transfer the data to the PC for processing and analysis. If you are using the Data Collection Module, you can interface directly to the AMAC-500 system and collect the data using the PC.

The ADAS-500 generates are text data files containing basic scan, equipment, thickness and position information for scan thickness points. Each file contains a single scan. Typically if you are scanning a vertical above ground storage tank (i.e. an API-653 governed tank) this would be a scan or drop run vertically at the 0,90,180 or 270 degree position[1].

The ADAS-500 Reporting System allows you to read the data files (TK) from the ADAS-500 and work with them as an entire group (such as all four scans of a tank ... 0,90,180 & 270 degrees). Basic information about the equipment and inspection are entered and saved as a report file with the extension " **srf**". This scan report file (srf) contains all the scan data obtained from the TK files as well as equipment information and graph color settings and more. It is a convenient way to group the data in to a single file for a piece of equipment. Once the data is successfully saved in the srf data file, you no longer need the TK files obtained from the ADAS-500. However, it is good practice to save them at least until the work is completed. Generally, it is recommended to make a backup copy of the TK files anyway and save them permanently along with the srf files.

Once you have correctly entered the information required, reviewed the data and set your reporting options, you are ready to print your reports. The API-653 calculations such as Tmin and Critical Areas are automatically done for you provided that you enter the basic information required. Note that you should review the API-653 Standard and become familiar with the formulas used by this reporting system. For more information on how this system performs calculations, refer to the section titled *Analysis Methodology*.

[1] Typical equipment layout techniques are discussed later in this section and can also be found in the AMAC-500 manual.

Typical Scanning Practices and Guidelines

Before using the ADAS-500 Reporting System you should carefully read this section on scanning practices. There are several assumptions made by the system that you should be aware of. The methods shown below are accepted as the standard or typical means of scanning tanks and other equipment.

One of the most important assumptions made by the ADAS-500 Reporting System is the scan location coordinates and layout methods. For demonstration purposes, let us presume that you are scanning above ground storage tanks, like those covered by the API-653 Standard. Typically, vertical scans or drops are done around the shell of the tank. Usually there are either 4 or 8 scans depending on the size of the tank. These are usually at the 0, 90, 180 & 270 degree positions (See Figure 19).

The circumferential coordinates are measured around the circumference of the tank. This specifies the location of the scan on the tank with reference to some datum or zero reference point. This point is typically an easily identifiable object on the tank such as a manway or nozzle.

The longitudinal coordinates are measured from the bottom of the tank. This is very important because the API-653 calculations performed by the system depend on it. When in the field and scanning with the crawler, be sure to always measure your position from the bottom of the tank, and not each course. For example, if the first course is 96 inches in length, a position at 100 inches would fall 4 inches above the top weld line of the bottom course. Refer to the AMAC-500 documentation for more information on scan layout and coordinates.

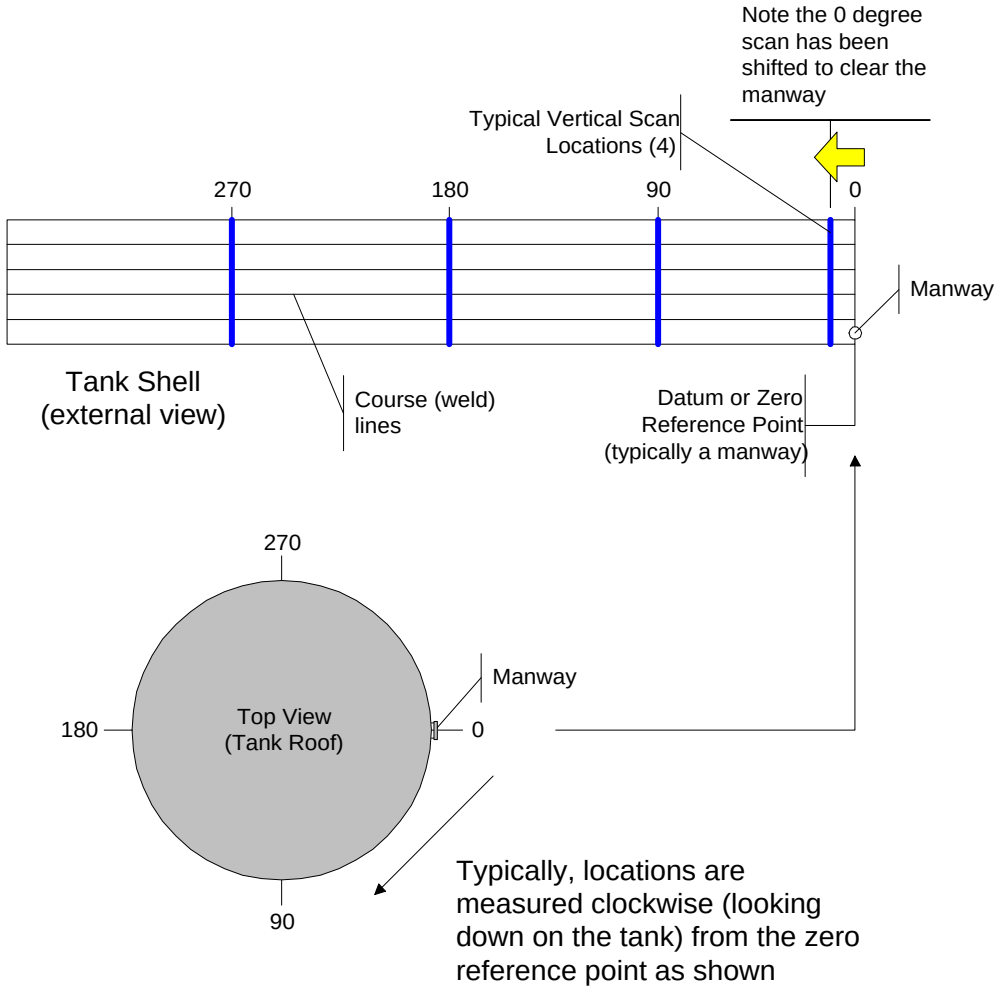


Figure 19 Typical Scan / Drop Layout on Tanks

Creating Report Files

This section will step you through the process of creating report files. It is assumed that you have successfully installed the ADAS-500 Reporting System and read the section titled *Getting Started*.

ADAS-500 Thickness Data Files (tk)

The data files (*.tk) produced by the ADAS-500 are text files containing basic scan and equipment information as well as all thickness and position information for scan thickness points. Each file contains a single scan and are generated automatically when scanning using the ADAS-500.

ADAS-500 Scan Report Files (srf)

Typically, each piece of equipment inspected will have more than one scan associated with it. The ADAS-500 Reporting System allows you to combine several scans from tk files in to a single report file. In addition to thickness and position data, the report file stores equipment design information required to perform automatic calculation of API-653 minimums.

The ADAS-500 Reporting System reads both the Tk and report (srf) data files. The tk files can be read in to the system, but cannot be saved in the TK format. They are saved as a report file (srf). The remainder of this section will step you through the process of creating report files.

Automatic API-653 Calculations

Many of the fields for entering data in to the ADAS-500 Reporting System are required in order to automatically calculate API-653 values. When any of the required variables are not valid or entered, the API-653 Tmin values will not appear in the Thickness Points Grid and the minimum line will not appear on the graph. The system provides an easy way to determine when any of the required values are either missing or invalid. The API-653 Status Indicator (shown below) in the top right corner of the main window provides you with an easy and fast way to determine which required variables are either not entered or invalid.

 Indicates that API-653 Calculations have been disabled

 Indicates that the values of the required fields are entered and valid

 Indicates that at least one of the values of the required fields are invalid

Clicking on the indicator invokes the API-653 Calculation Status dialog (Figure 17). You can quickly identify the fields that require either changing or entry. The fields with the green checkmark next to them are entered and valid. The fields without the checkmark require some attention. An explanation is provided at the bottom of the dialog that indicates the reason. To make changes to the field, highlight it in the list and click the **Go To** button. Once all fields are entered and valid, a green API symbol will appear and the Tmin line should appear in the graph.

The validity criteria for the fields are:

Diameter: The value must be greater than zero.

Specific Gravity: The specific gravity must be greater than zero.

Product Height: The product height must be greater than zero and less than the tank height.

Course Definitions: The courses must be defined in order to determine which course the thickness values were from. This is important since the tmin formula changes depending on course number.

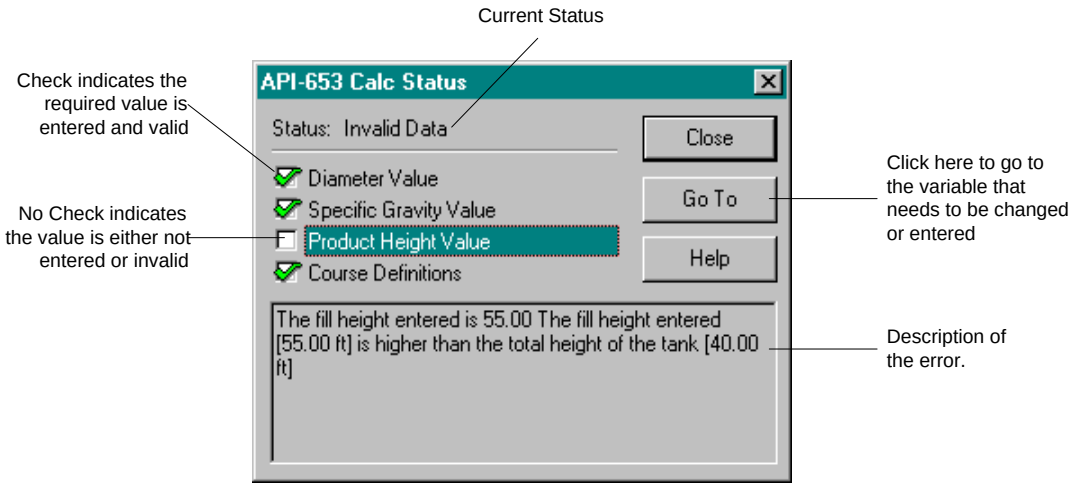


Figure 17 API-653 Calculation Status Dialog

Creating Report Files

When you first run the system, the main screen appears and a blank report file is loaded. At this point, there is no data in the file and you can start entering information immediately. In the event that you have a file loaded, you can create a blank report file by selecting the **File | New** menu option from the Main Menu. If the file you have loaded has been modified, the system will provide you with an opportunity to save it before clearing it.

Entering Equipment Information

You must enter certain information about the equipment being inspected in order to use features like the automatic minimum calculations. To edit equipment information, click the **General** group tab, then the **Equipment** and **Design** data tabs as shown

Description	Description of the equipment being inspected
Location	Location of the equipment being inspected
Owner	The owner of the equipment being inspected
ID	The ID (i.e. Equipment Number) of the equipment being inspected.
Diameter	The diameter of the equipment being inspected in feet. (API-653)
Specific Gravity	The specific gravity of the liquid contents of the tank (API-653)
Product Height	The height of the liquid in the tank in feet. (API-653)
API-653	Use API-653 Tmin Calculations for the equipment being inspected.
API-650	Use API-650 Variable-Design-Point method Tmin Calculations for the equipment being inspected.

Figure 18 Equipment Info

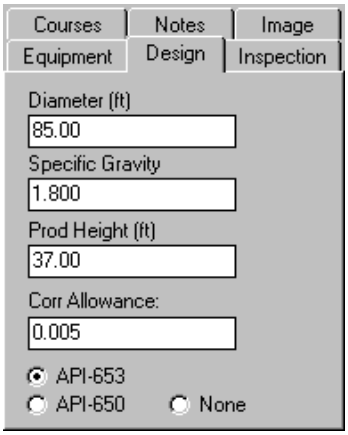


Figure 19 Design Info

Entering Inspection Information

To edit inspection information, click the **General** group tab, then the **Inspection** data tab as shown.

Inspected By	The name of the individual or company performing the inspection
Date	The date the inspection was performed
Instrument	The UT instrument used to scan
Scan Datum	The point of origin for measuring the locations of scans
Corrosion Allowance	The corrosion allowance for the next inspection period. It is added to the API-653 Tmin values in accordance with Section 2.3.

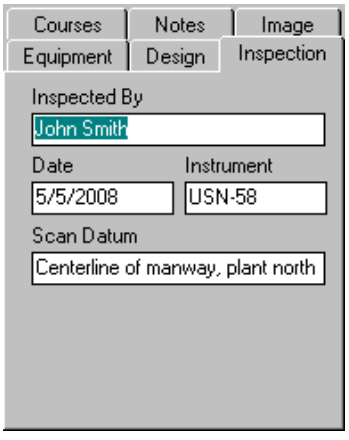


Figure 20 Inspection Info

Defining Course Information

Course information must be defined in order to use the API-653 calculations. Each course is numbered sequentially starting from the bottom. To define course information click the **General** group tab, then the **Courses** data tab as shown in Figure 21.

To add courses to the list, click the **Add** button. To delete a course from the list, select the course to delete and click the **Del** button. To set the course information back to the default values, highlight the courses to change and click the **Defaults** button.

Course Fields

To edit the course fields, click on the course and then the field to be changed. If you need to change several courses to the same value, select all the courses desired and then edit the fields.

Height The height of the course in inches

Nom The nominal thickness value for the course

Min The minimum thickness value for the course. This value is used for the minimum when API-653 calculations are disabled.

Min Yield The minimum yield value for the course per API-653 section 2.3.2. The default is 30,000.

Min Tensile The minimum tensile value for the course per API-653 section 2.3.2. The default is 55,000

Joint Eff The joint efficiency for the bottom weld of the course per API-653 section 2.3.2. The default is 0.7

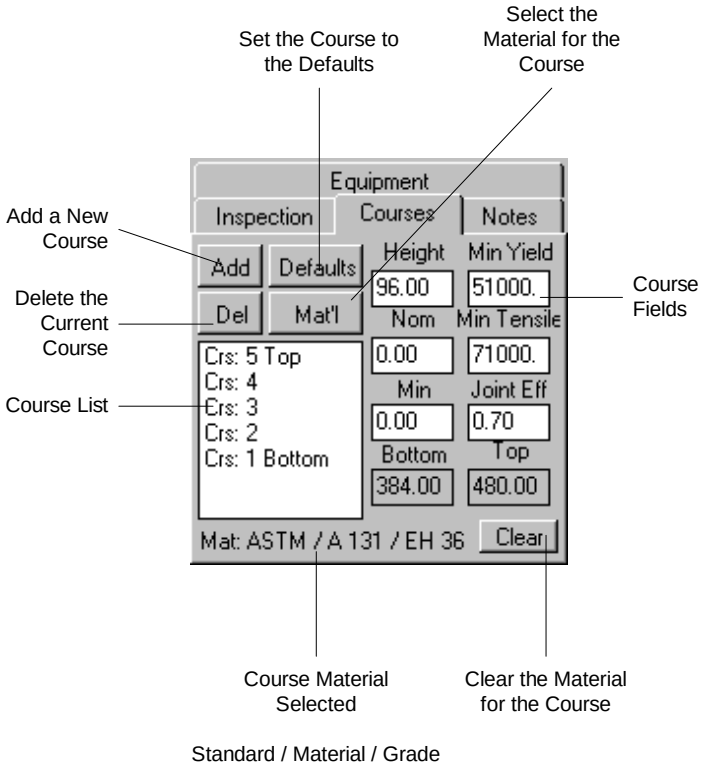


Figure 21 Courses Tab

Bottom The absolute distance from the bottom of the tank to the bottom of the selected course (Read only).

Top The absolute distance from the bottom of the tank to the top of the selected course (Read only).

Course Materials

This system provides defaults for the API-653 Min Tensile and Yield values. These defaults are the same as those provided by API-653 for unknown materials. If you know the material for any of the courses, you can enter them in directly or you can select them from the Materials Table. This table can be modified if the material you need is not found. To manage the materials in the list, select the **Edit** | **Materials Table** option from the main menu. The Materials Table screen will appear (Figure 22). Use this screen to add, remove and edit the materials in the table. The file **materials.dat** contains the material list. If you enter several materials and change from one system to another, you can take them with you by copying this file from the program directory.

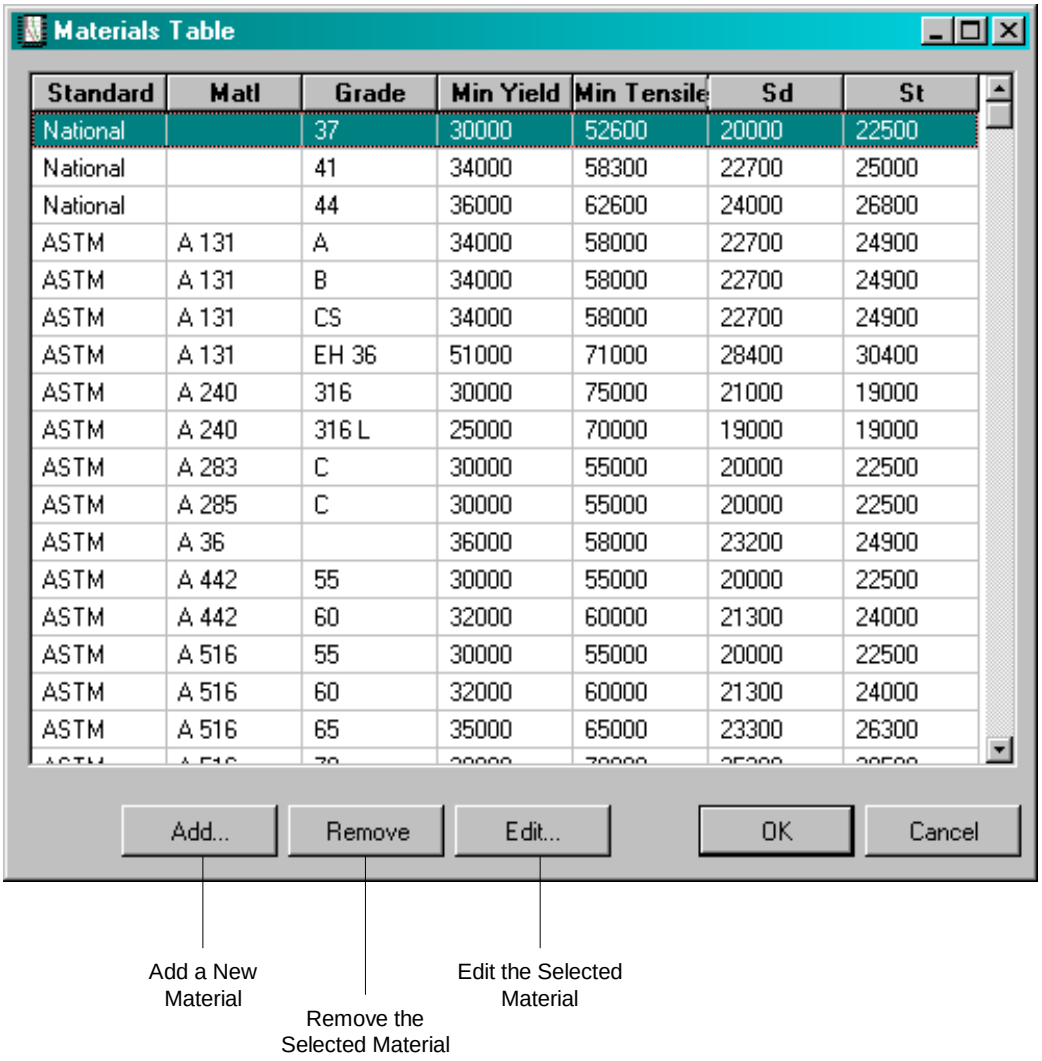


Figure 22 Materials Table Screen

Adding a New Material

Click the Add button in the Materials Table screen (Figure 22). The Material Properties Dialog will appear (Figure 23). Enter the information about the material and click **OK**.

Removing a Material

If you need to remove a material from the Materials Table you can do this from the Materials Table Screen (Figure 22) by selecting the material in the list, and click the **Remove** button.

Assigning a Material to a Course

To assign a material and it's values to a course, select the course on the courses tab (Figure 21) and click the **Mat'l** button. The Select Material dialog will appear. Select the desired material and click **OK**. The values for the material will be assigned to the selected course(s).

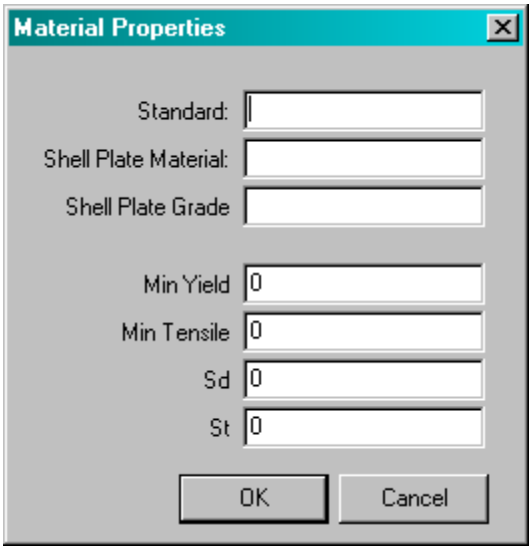


Figure 23 Material Properties Dialog

Entering Inspection and Scan Notes

You can enter inspection and scan notes by clicking the **General** tab, then the **Notes** tab as shown below. To enter inspection notes, click the **Inspection Notes** tab. To enter scan specific notes, click on the desired scan, and then the **Scan Notes** tab as shown below.

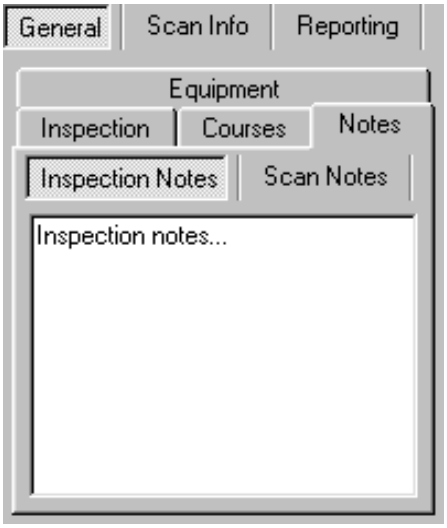


Figure 24 Inspection Notes

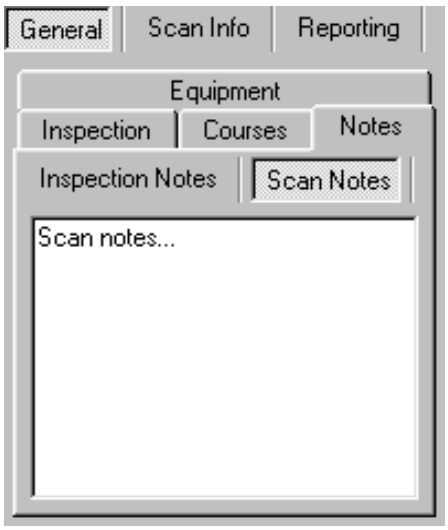


Figure 25 Scan Notes

Creating Scans

Adding scans to your report file is an easy process. The scans are automatically created when you import tk file data using the **File** | **Import** menu option. In most instances, this will be the method used.

Importing TK Files

Use the **File** | **Import** menu option to import TK files directly in to a new scan. When you select this option the Import dialog will appear allowing you to select the TK file to import. You will be asked ***Do you want to add these files to the current file?*** If you answer **Yes**, the selected TK file(s) will be imported to the current report file. A new scan is added for each TK file imported. If you answer **No**, a new report file (srf) will be created and the selected file(s) will be added to the new file. If the current file has been changed, you will be given the opportunity to save it first.

If any header information exists in the TK file, you will be given the opportunity to import as well. The Import Header Information dialog will appear (right). Click the Overwrite checkbox for each header data category you want to import.

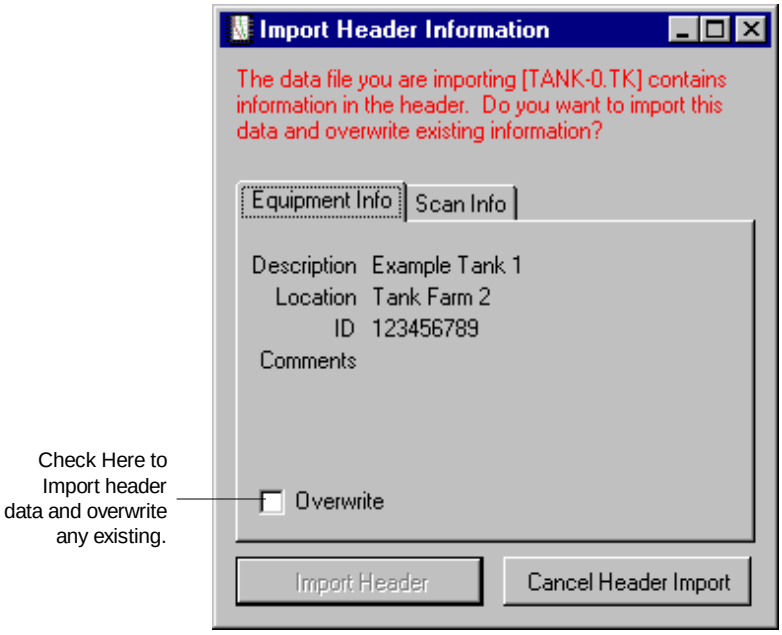


Figure 26 Import Header Information Dialog

Adding TK File Data in to an Existing Scan

Importing TK files directly (as outlined above) is the most convenient way to add your data to the report file. There are some instances where you will use the **Scans | Insert TK Files in to Scan** menu option to insert data from TK files. This usually occurs when a single scan is spanned across more than one TK file.

Example

When you cannot scan the height of a tank due to an obstruction such as a stiffener, you may save the TK file in the ADAS-500. Once it has been saved, you cannot add more data to it. Therefore, you must create a new TK file to scan the remainder of the tank. The scan is now stored in two separate TK files.

To combine these files you can open the first of the TK files using the **File | Import** menu option (as shown above). Once the scan has been created in the report file, click on it, and select **Scans | Insert TK File in to Scan**. The Import Data Dialog will appear (Figure 27). To import the data, select the TK file and click **Import**. When the thickness data from the TK file has been imported, the Import Data Dialog box will close automatically. The data will be imported in to the scan selected in the *Import Into* combo box.

How Data is Imported in to the Report File

As data from the TK file is imported in to a scan, it is sorted automatically by Position. When data is imported in to a scan that already contains thickness points, the new points are sorted with the existing data. Therefore, if you have an existing thickness point at 10.5" and a new point at 10.75" is imported, it will be place just after the existing point at 10.5". Even if you import data points at the same position, the new position will be placed next to the existing one. Therefore, if you have an existing point at 10.5" and you import another at the same position, it will be placed right after the existing one.

Overwriting Data in the Report File

When importing TK file data in the Import Data Dialog, you can overwrite the descriptive (i.e. Equipment Name, Location

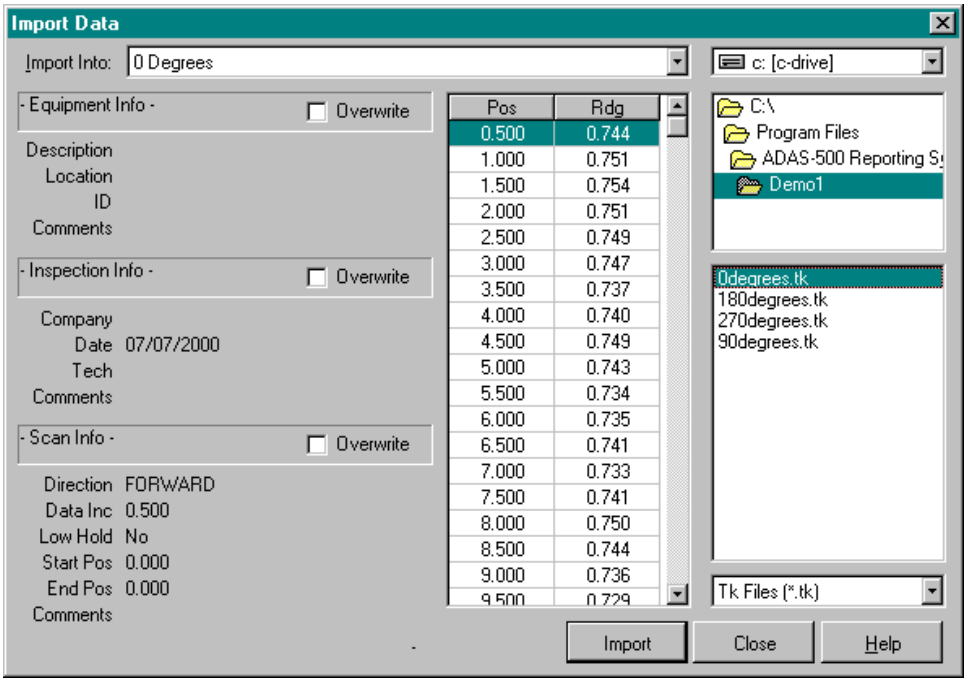


Figure 27 Import Data Dialog

and ID etc...) information in the report file by checking the *Overwrite* check box for each data category. When you import the data (by clicking the Import button), the data in the report file will be overwritten if Overwrite is checked.

Entering Scan Information

You can change scan information by clicking on the scan in the Scan List, and then clicking the **Scan Info** tab, then the **Scan Info** tab as shown in Figure 28.

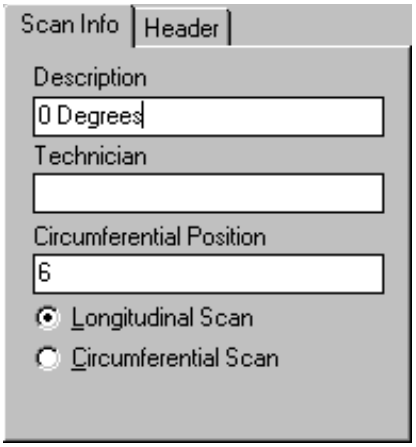


Figure 28 Editing Scan Information

Description The description of the scan for example the position as shown in the figure to the right "0 Degrees".

Technician The technician that created the scan data.

Circumferential Longitudinal Position The position of the scan. The meaning of the value changes depending on the type of scan (below). For longitudinal scans, this field is the circumferential distance from the datum or zero reference. For circumferential scans, it is the longitudinal distance from the datum.

Longitudinal Scan Select this type scan when the scan axis is parallel to the cylindrical axis of the equipment being scanned.

Circumferential Scan Select this type scan when the scan axis runs circumferentially around the cylindrical axis of the equipment.

Data Collection Module

Overview and Setup

The Data Collection Module (DCM) allows you to use your PC to collect data with the AMAC-500. The ADAS-500 Data Logger is not used when data is collected using the DCM. In order to use the DCM, you must first set up the system and cabling. The figure below shows the cabling diagram for the AMAC-500 using the DCM with the ATCO Ethernet Interface.

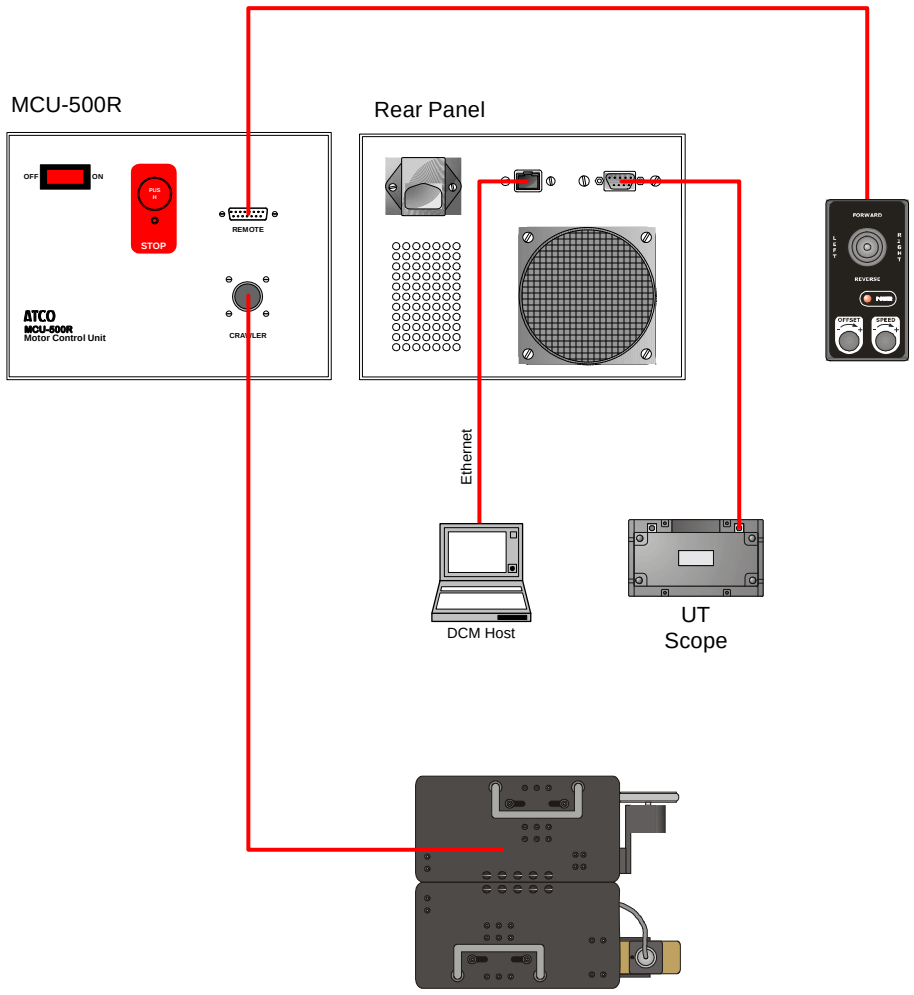


Figure 29 Typical Cabling Configuration

DCM Main Window

The Data Collection Module is invoked from within the ADAS-500 Reporting System. Details on running it will be discussed later in this section. The main window of the DCM is shown below. Prior to using the system, it must be calibrated to work with the crawler's encoders. The encoders are the devices on the crawler that provide the software with the crawler's position. To calibrate the system's positioning, refer to the section in the Appendix *Calibrating Encoders*.

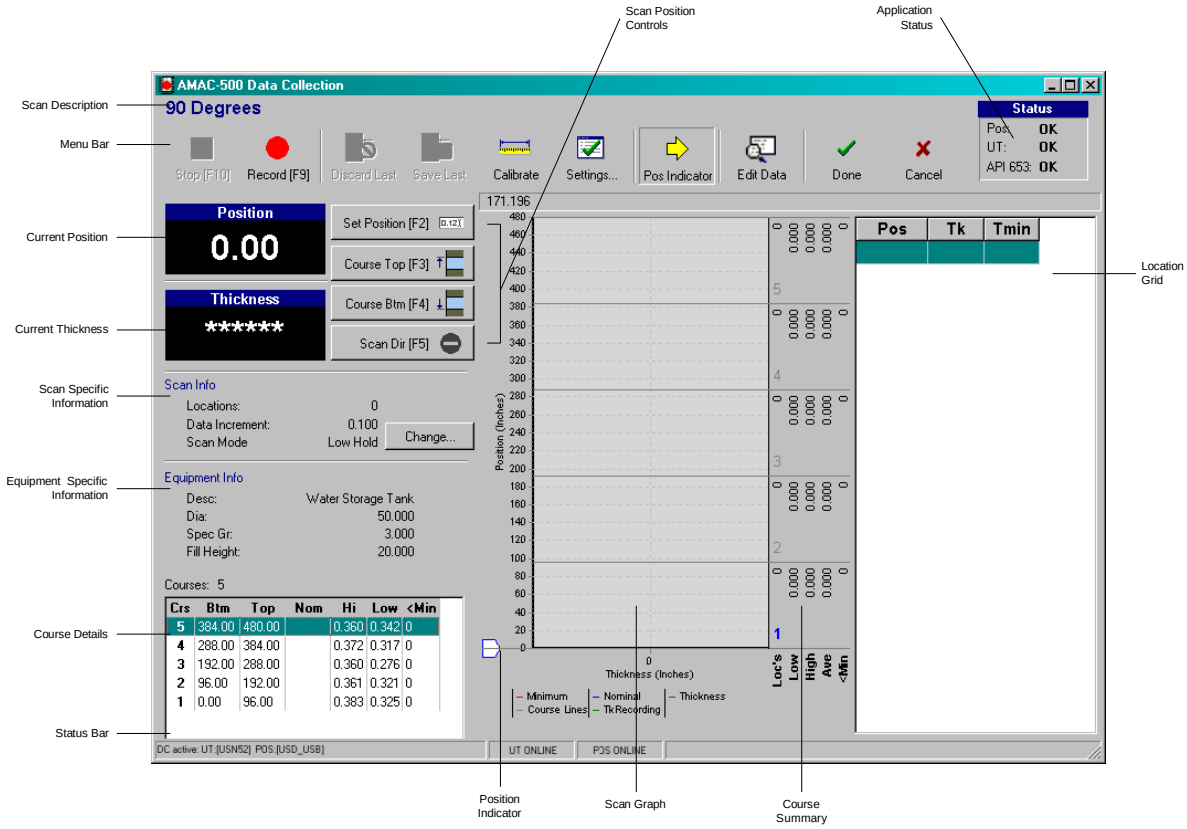


Figure 30 DCM Main Window

Menu Bar

The Menu Bar spans the top of the application window. The buttons contained in it, and their functions, are listed below::

STOP [F10] - Stops recording mode

RECORD [F9] - Starts recording mode

Discard Last - Discards the last set of locations scanned in to the system

Save Last - Saves the last set of locations scanned in to the system.

Calibrate - Allows you to calibrate the travel distance of the crawler and the application.

Settings - Allows you to change the settings of the application.

Edit Data - Allows you to edit / modify the readings in the scan

Done - When you are finished scanning, select this option to save the data and return to the main application.

Cancel - Select this option if you wish to discard any scanned locations and return to the main application.

Application Status

The *Application Status* area shows the status of the key parts of the application. **OK** indicates proper working status. **ERR** indicates that an error has occurred.

POS	Indicates the status of the positioning interface to the AMAC-500 encoders.
UT	Indicates the status of the interface to the UT Instrument.
API653	Indicates whether all of the information needed is available to calculate API-653 minimums.

Current Position

The *Current Position* displays the current position of the AMAC-500 in the scan. This can be changed by using the *Scan Position Controls*. This value changes as the crawler moves. In order to get the correct position, you must be sure to calibrate the position using the *Calibrate* button on the *Menu Bar*. If the position is not being displayed, the POS status shown in the *Application Status* area will likely be **ERR**. When this happens, the error will be indicated at the bottom of the window in the *Status Bar*.

Current Thickness

The *Current Thickness* displays the thickness that is coming from the UT Instrument Interface. If the current thickness is not being displayed, the UT status shown in the *Application Status* area will likely be **ERR**. When this happens, the error will be indicated at the bottom of the window in the *Status Bar*.

Scan Specific Information

The scan information shown here shows the

Data Increment	The interval at which locations are stored in the scan. This value is specified in the ADAS-500 Reporting System prior to loading this module. It can be changed by selecting the **Settings** button on the Menu Bar.
Scan Mode	The method used to scan (explained previously in this document) This value is specified in the ADAS-500 Reporting System prior to loading this module. It can be changed by selecting the **Settings** button on the Menu Bar.
Locations	The number of locations currently in the scan

Equipment Specific Information

The equipment specific information displayed here come directly from the information stored in the ADAS-500 Reporting System. This information cannot be changed in this application. If the information is not correct, it could cause the API-653 Tmin values to be incorrect. If it needs to be changed, exit the application and change it in the Reporting System.

Course Details Grid

Ideally it's easiest to scan the entire length of the scan in one recording. In some cases, the technique may require you to stop and reposition the crawler then resume scanning. When this occurs it can be useful to have dimensional information for the courses. The top and bottom positions of each course, relative to the scan zero reference can help you to set the position of the crawler at the top or bottom of any course.

Double clicking on a particular course in the *Course Details Grid* will set the Current Position value to the bottom of that course. You can also set the position to either the top or bottom of any course by clicking the Course Top or Course Bottom button in the *Scan Position Controls*.

Scan Graph

The Scan Graph displays data relative to the position on the equipment. The data shown on the graph is the thickness, API-653 minimum and course weld line location.

Course Summary

The course summary includes:

Course Number - displayed in the lower left corner of each course summary block (Numbered from the bottom).

Loc's - the number of locations stored in that course

Low - the lowest thickness location found in the course

High - the highest thickness location found in the course

Ave - the average thickness location found in the course

<Min - the number of thickness locations found at or below minimum in the course

Position Indicator

The position indicator represents the location of the Current Position of the crawler. You can click on the arrow and move it anywhere along the scan to change the current position.

Location Grid

The location grid displays the locations stored in the scan.

Pos - the position of the location relative to the zero reference of the scan.

Tk - the thickness value stored at that location

Tmin - the calculated API-653 minimum value for that location

Scan Position Controls

Set Position [F2] - Allows you to enter the current position.

Course Top [F3] - sets the current position to the top of the current course

Course Bottom [F4] - sets the current position to the bottom of the current course

Scan Dir [F5] - allows you to change the direction of the scan relative to the crawler. Positive means that the crawler position increases when moving forward. Negative means that the crawler position decreases when moving forward. The button indicates the current setting (see below).

- Indicates that crawler moving forward increases the position.

- Indicates that crawler moving backwards increases the position.

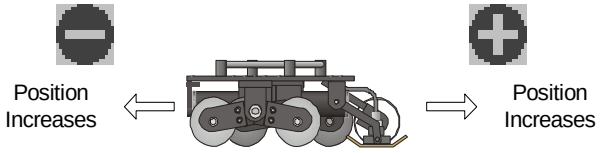


Figure 30 Scan Direction Indicator

Configuration Settings

The Configuration Settings Dialog allows you to select the settings for the PC interface. To change the settings, click the **Settings** button and the dialog will appear (Figure 31).

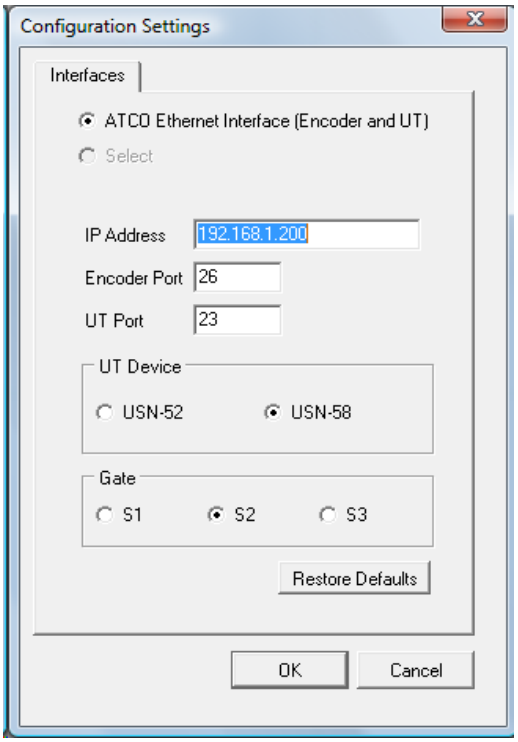


Figure 31 Configuration Settings

ATCO Ethernet Interface

The ATCO Ethernet Interface provides an interface to both the encoder and UT devices through the single ethernet connection. The Krautkramer USN-52 and USN-58 are supported.

IP Address*

This is the IP Address of the MCU-500. This setting should not be changed unless there are more than one of MCU-500s connected to the network. The default setting is *192.168.1.200*.

Encoder Port*

This is the port to use for TCP communication with the Encoder on the MCU-500. The default setting is *26*.

UT Port*

This is the port to use for TCP communication with the UT device on the MCU-500. The default setting is *23*.

** Note: Changing this setting without changing the setting on the MCU-500 to match will cause the communications to fail.*

Gate Settings

When using the USN-58 you can select the gate to read on the device. The values are the three gates S1, S2 and S3. The USN-52 does not support this feature.

Using the Data Collection Module

Prior to using the Data Collection Module (DCM) it must be properly configured (refer to the beginning of this section for more). Once the system is configured and calibrated you are ready to collect data. To collect data using the DCM, you must first create a scan as mentioned in the previous section *Creating Scans*. Before scanning you should become familiar with the scan parameters.

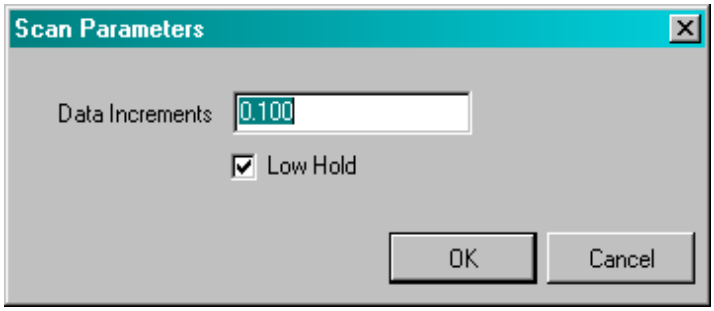


Figure 32 Scan Parameters Dialog

Scan Parameters

The Scan Parameters define how the DCM will collect data while recording. The values are set in the ADAS-500 Reporting System The parameters that control the behavior of the data collection can be changed if needed. The defaults are:

Data Increment: **0.25"**
Scan Mode: **Low Hold**

Data Increment

The Data Increment controls the interval between the locations. For example, a data increment of 0.25" means that locations will be stored every quarter inch. At that increment, if you have a 6 inch scan, you will store 4 location per inch and 24 for the entire scan.

Scan Mode

With the Scan Mode set to **Point**, the system will store the thickness found at each individual point along the increment. For example, if you have 0.25" increments the system will store the thickness it finds at each 0.25" interval. If **Low Hold** is used, the system will store the lowest thickness it finds along the increment and store it. The advantage of using the Low Hold mode is that the entire increment is scanned and it is less likely that a thinning area between the data increments will be missed.

To change the Scan Parameter settings from within the ADAS-500 Reporting System, from the main menu select **Data Collection | Scan Parameters**. The Scan Parameters dialog box will appear (Figure 33). These settings will be the defaults used each time you collect data using the Data Collection Module. Keep in mind, that these values can also be changed from within the Data Collection Module.

Starting the DCM

To scan using the DCM you must first create the new scan or you can add data to an existing one. Select the scan and right click on it. Select **Data Collection | Collect Data** from the menu (Figure 34). The main window of the DCM will appear (Figure 34). If the selected scan has locations in it, they will appear in the DCM. When you scan areas any readings that exist in those positions will be overwritten.

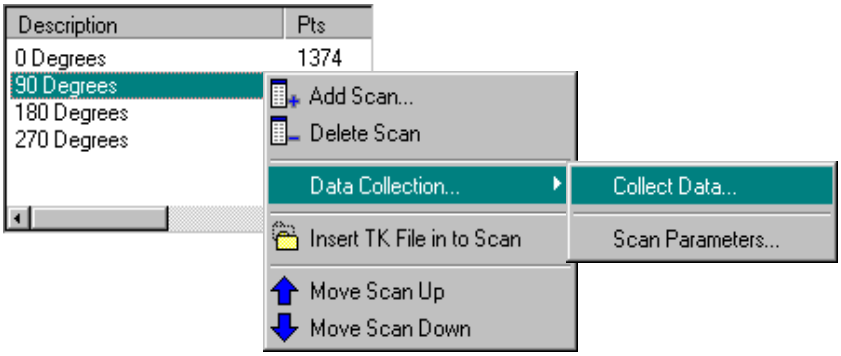


Figure 33 Starting the DCM from the ADAS-500 Reporting System

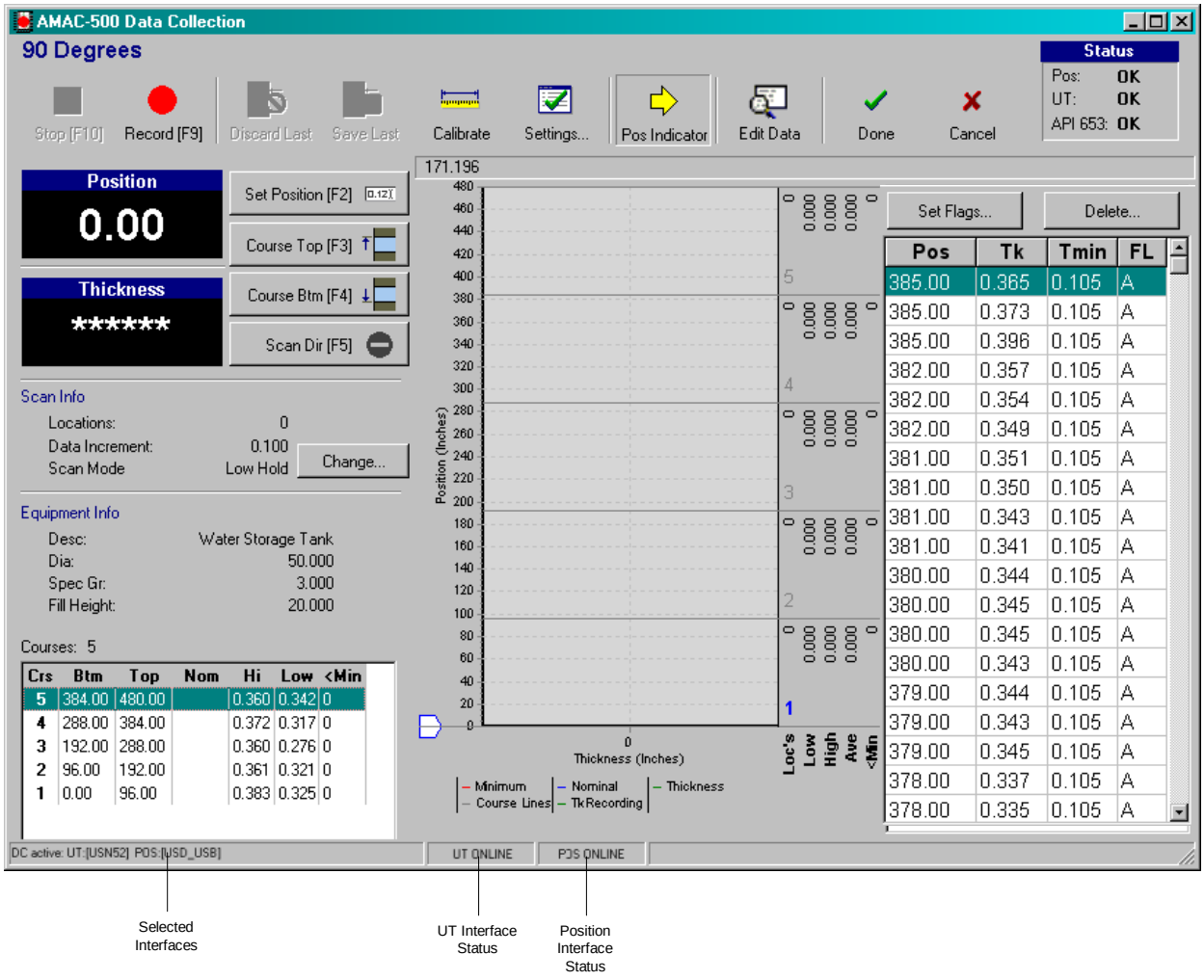


Figure 34 DCM Main Window

DCM Startup

When the DCM starts, it will try to connect to the selected interfaces. The interfaces selected will appear at the bottom of the screen on the Status Bar. The status of each interface is shown in the **Status** window on the top right corner of the screen. The online/offline status is shown on the Status Bar for each device (Figure 34).

If the system has not been calibrated to the encoders, a message will appear allowing you to calibrate. If you are ready to calibrate the system, select Yes and the calibration process will begin. If you are not ready to calibrate, click No and you will be returned to the ADAS-500 Reporting System.

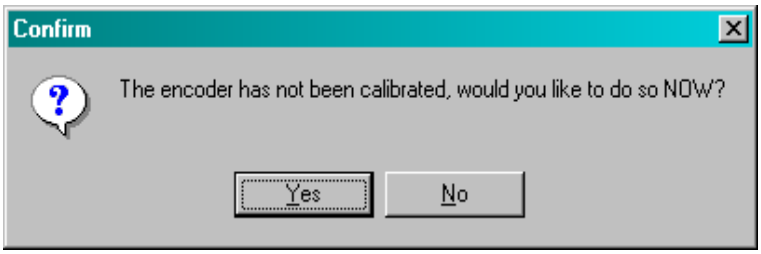


Figure 35 Message displayed when encoder calibration is required.

If all data collection interfaces are working properly, the application status window will show all **OK**. When there are errors, the device will have an ERR in the Status window. If you are scanning equipment that requires API-653 calculations and the API-653 status shows an error, then return to the ADAS-500 Reporting System and correct the problem. Typically this error will occur if the information required to calculate the $\mathbf{t_{min}}$ values is incomplete (i.e. Tank Diameter, Specific Gravity etc...). Once the information is correct in the ADAS-500 Reporting System, invoke the DCM again and the API-653 should display OK in the application status window.

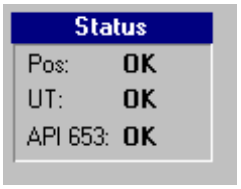


Figure 36 All Interfaces OK

Scanning

Once the interfaces are working properly, you can prepare to collect data with the DCM. For more detailed information on scanning, refer to the section *Scanning Techniques* in the AMAC-500 Manual.

Check the Scan Parameters

Before scanning, be sure that the *data increment* and *scan mode* are correct. They appear under *Scan Info* below the Current Thickness. If the settings are not correct, you can change them by clicking the **Change...** button. For more on *Scan Parameters* refer to that section in this document.

Position the Crawler

Position the crawler at your scan starting point. For more information on positioning and the typical coordinate layout on tanks refer to the section in this document titled *Typical Scanning Practices and Guidelines*. Typically, the crawler will be inverted to scan the first course to reach the area closest to the tank chine (Figure 37). The remaining courses will be scanned with the crawler moving forward in the positive direction of the scan.

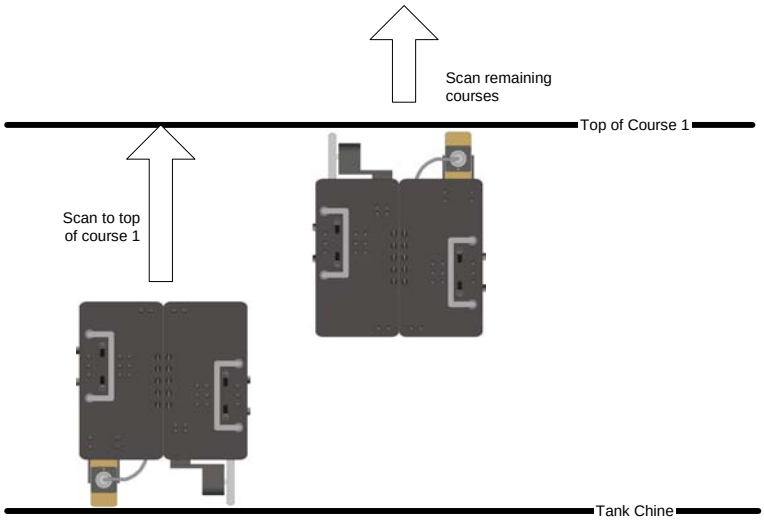


Figure 37 Scanning Course 1 Inverted

Set the Position in the DCM

Once you've positioned the crawler on the equipment, you must set the position in the DCM. To do this, you can click the **Set Position** button or press **F2**. Then, enter the new position and click OK. If the crawler aligned at the bottom of a course, you can set the position by double clicking on the course in the *Course Details* grid.

Set the Scan Direction

You must tell the DCM the direction in which the crawler will be scanning. In some cases the crawler will be moving in a positive direction along a scan while moving in reverse. This typically happens when scanning the bottom course as shown above. In this case set the scan direction to Reverse (-). Otherwise, when you move the crawler backwards the position will decrease. If you are moving the crawler forward and the scan direction is positive, select Forward **(+)** otherwise, select Reverse **(-)**.

Start Recording

When the crawler is positioned and all settings are correct, you are ready to record data. Click the **Record** button (or press **F9**) and then move the crawler to the end point of your scan. The new locations should appear in the *Readings Grid* on the right side of the window as you scan. The *Position Indicator* should move along the graph showing the scanned area with a white background.

Saving / Discarding New Data

When the crawler reaches the end of the scan, click the **Stop** button (or press **F10**). The newly scanned locations should now appear in a white background. At this point you can either save or discard the new data. If you want to keep the data, click the **Save Last** button. If there are any locations in the area you scanned, they will be overwritten. If there were problems such as loss of signal you will likely want to discard the data and scan the area over. In these cases click the **Discard Last** button, you will be prompted to confirm it and the data will be removed leaving any existing data in the scan.

Once you are finished scanning you can either save any changes to the data or discard them. To save them in the ADAS-500 Reporting System close the DCM by clicking on the **Done** button. The changes made to the scan will be saved. If you do not want to save the changes made to the scan, click on the **Cancel** button.

Editing Data

Setting Data Point Flags

To change the Data Point Flag for several points at once, select the data points in the editing grid and click the Flags button. The flag selection dialog will appear (right). Select the Data Point Flag and click OK. This will change the value on all selected points.

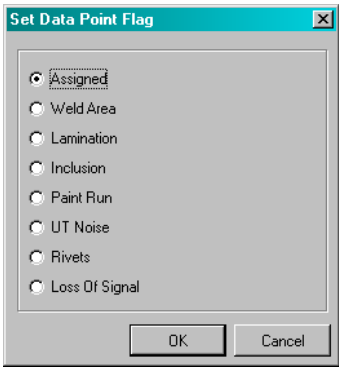


Figure 38 Data Flag Dialog

Deleting Data Points

To delete points, select them in the grid and click the **Delete** button.

After thickness points have been acquired by importing the TK files, you should review the data. There are many conditions where erroneous data can be obtained and you should thoroughly review the data points prior to printing reports. Typically the data points around a weld line or other surface anomaly can cause erroneous data. Pay close attention to these areas when reviewing your data. For quick changes you can review the data from the Main Screen which we will show first below. If you have more involved review you can use the Scan Review Screen which will be shown later in this section.

Deleting Data Points

The fastest way to find erroneous data is to view the graphical presentation. Suspect data is easy to find. The example shown below, though exaggerated, shows a point that is suspect. It is obvious that this point is erroneous and should be removed.

.

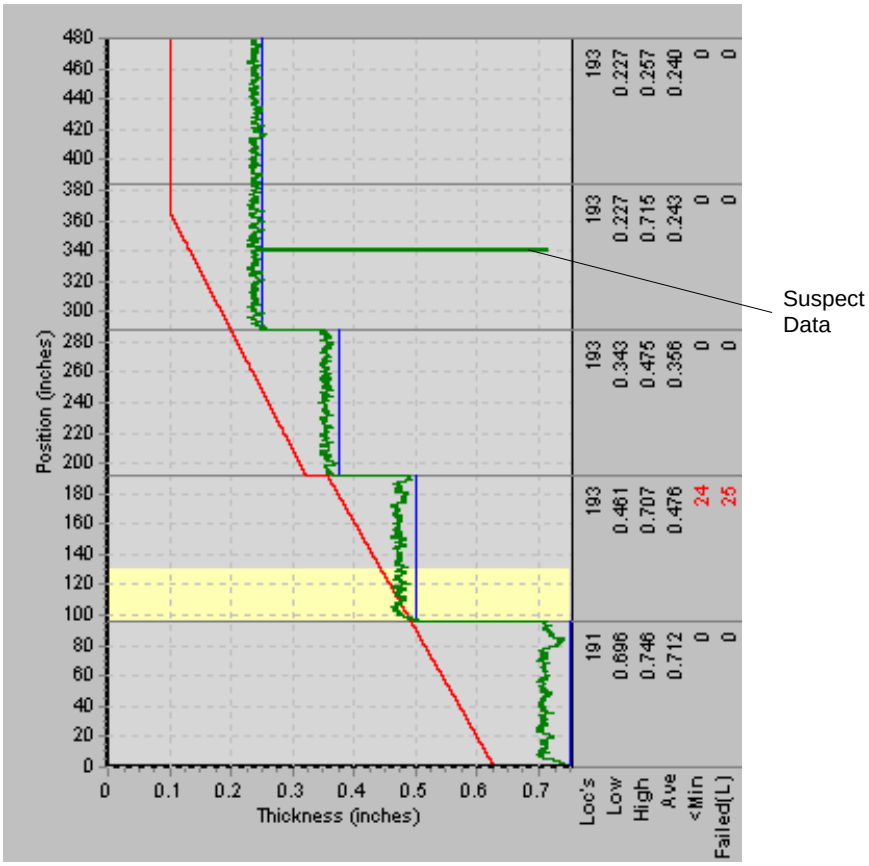
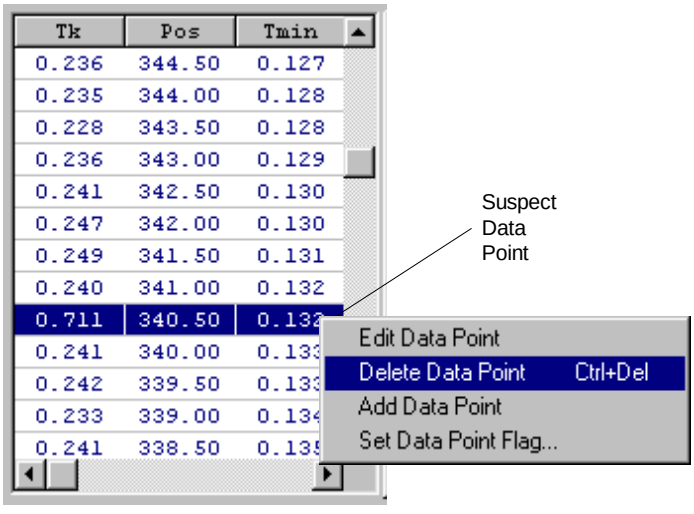


Figure 27 Graphical Presentation

To remove the data point, click on it in the graph and it will be selected in the Thickness Point Grid (Figure 28). Right click on the data point in the grid and select **Delete Data Point**.



Editing Data Points

Existing thickness data points be changed when needed. To change a particular data point, locate it in the Thickness Point Grid and double click on it. The Edit Data Point dialog will be displayed as shown in Figure 29. To edit another point, select the point in the Thickness Point Grid and repeat the process.

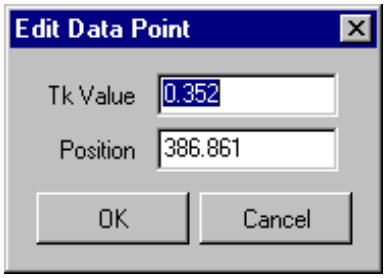


Figure 29 Edit Data Point Dialog

Adding Data Points

You can add thickness data points to an existing scan. This may be needed when portions of a scan may need to be recorded manually. To add data points, first select the scan in the Scan List. Next right click in the the Thickness Point Grid (Figure 30) and select **Add Data Point**.

The Add Data Point dialog will appear as shown below in Figure 31. Enter the new thickness and position values then click OK. The new data point will be added to the selected scan.

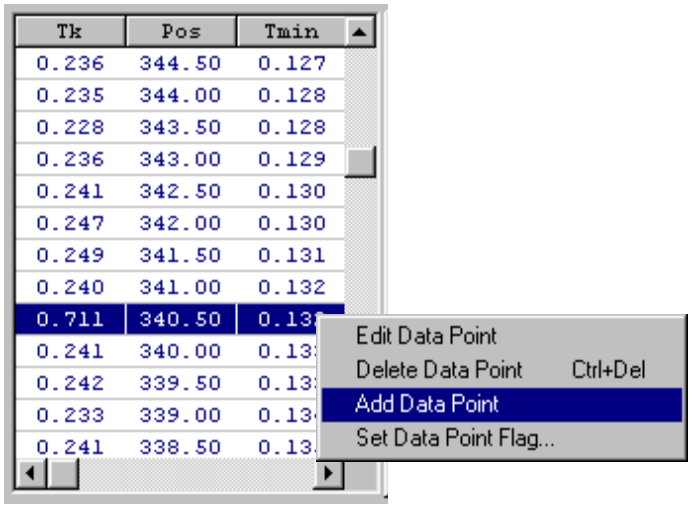


Figure 30 Adding a Data Point

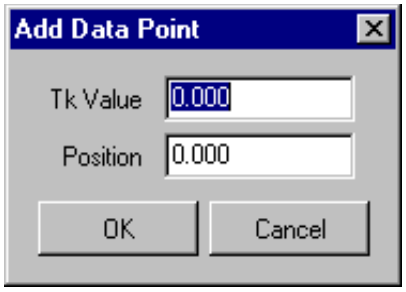


Figure 31 Add Data Point Dialog

Data Point Flags

Each data point has a flag associated with it. This flag indicates whether or not the reading is valid. The flag value is displayed below the scan grid (Figure 32). When the UT system logs a reading as valid, the flag is set to *Assigned*. Data points with this value for the flag are the only ones used in display of graphs and in statistics. When a Loss of Signal occurs, the flag is set to *LOS*. The ADAS-500 Data Logger allows you to assign flags to each data point. You can also set the flags for a data point using the ADAS-500 Reporting System. To set the flag of a particular data point, select the data point in the Scan Grid, right click and select **Set Data Point Flag** (Figure 33). The Set Data Point Dialog will appear (Figure 34). Select the appropriate flag and click OK.

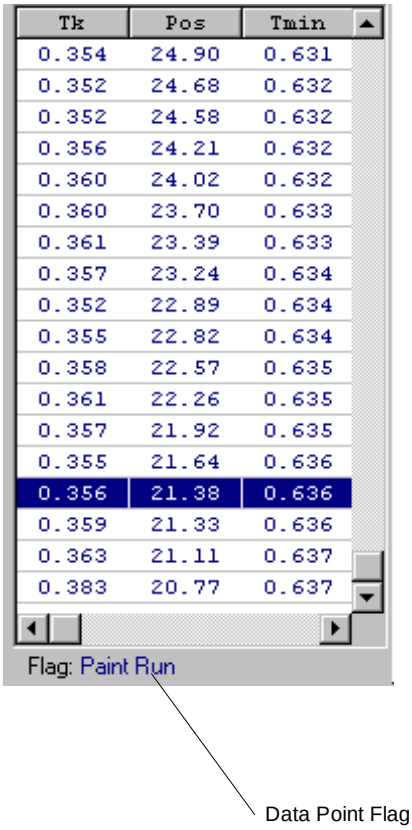


Figure 32 Data Point Flag Display

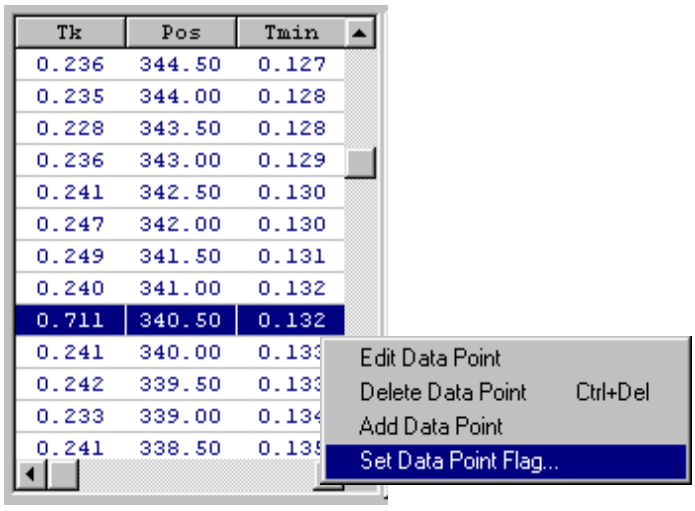


Figure 33 Setting a Data Point Flag

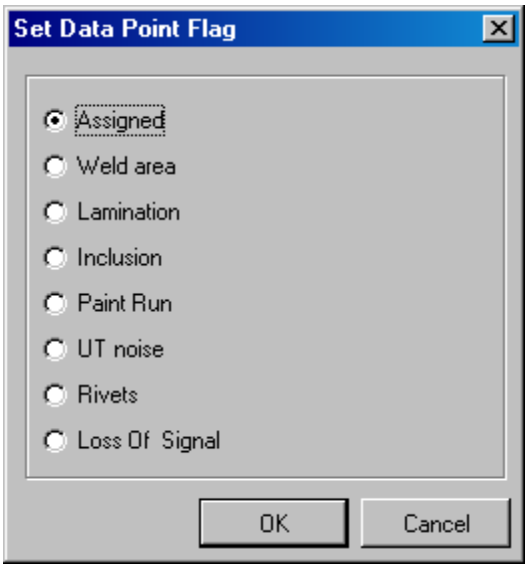
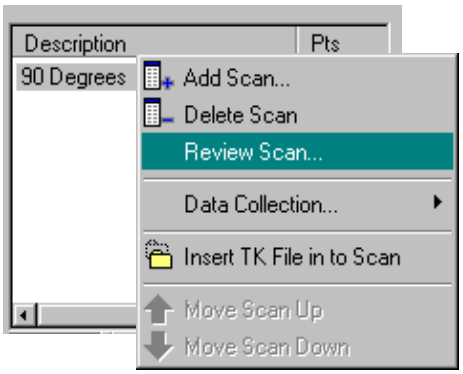


Figure 34 Assigning a Data Point Flag

Scan Review Window

The Scan Review Screen is allows you to delete and assign flags to locations in a scan. To open the Scan Review window select the scan in the Scan List, right click and select the **Review Scan** option. You can also open it by double-clicking on the scan in the Scan List. The Scan Review window will appear as shown below.



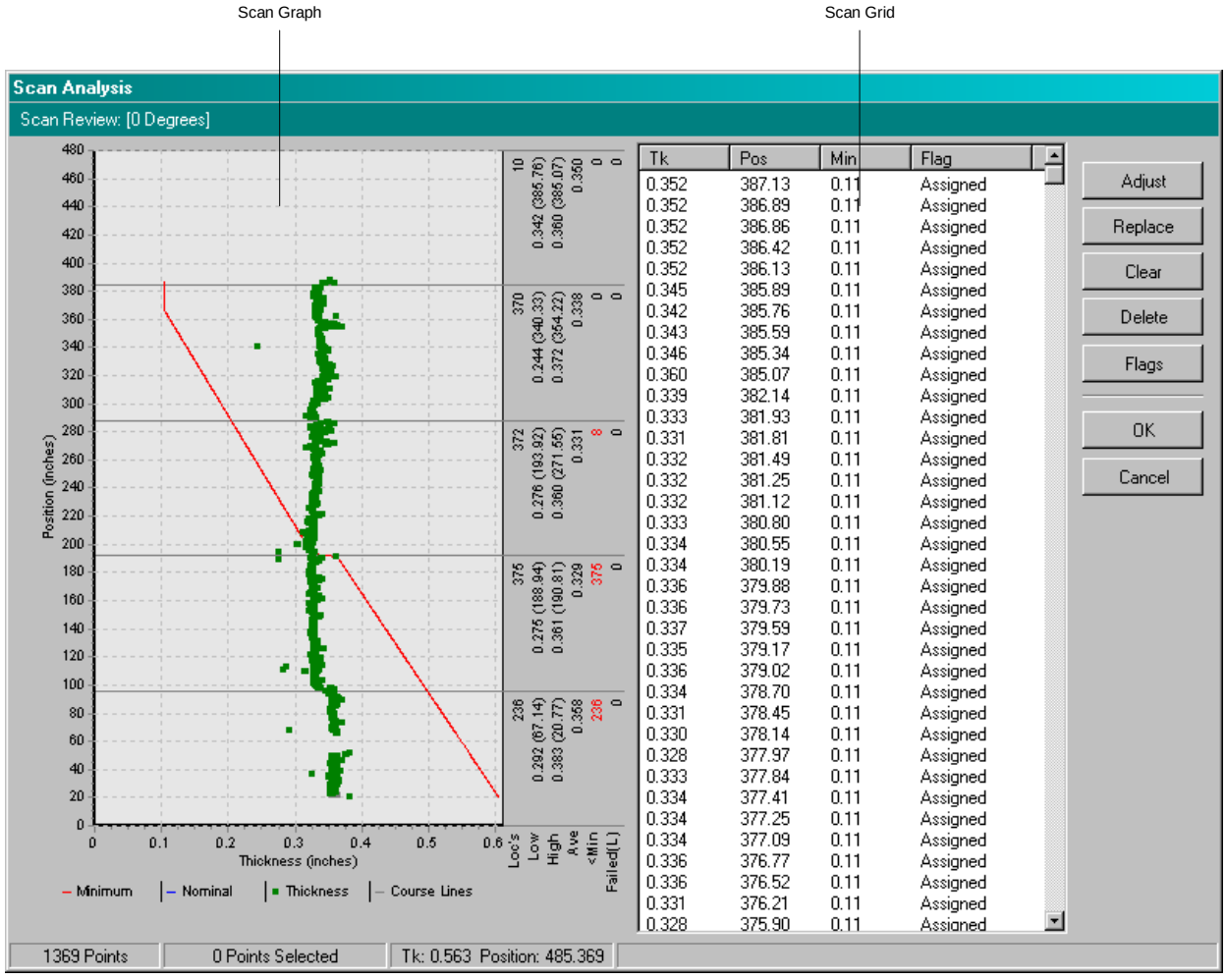


Figure 36 Scan Review Window

You can delete or change the flags on multiple data points at a time using the Scan Review window. You can graphically select data points by clicking on the Scan Graph and drawing a box around the data points you want to select (as shown below). Once you select an area, the scan grid will display only the locations you have selected in the graph. To Clear the selection and display all the locations in the scan, click the **Clear** button (or right click in the scan graph).

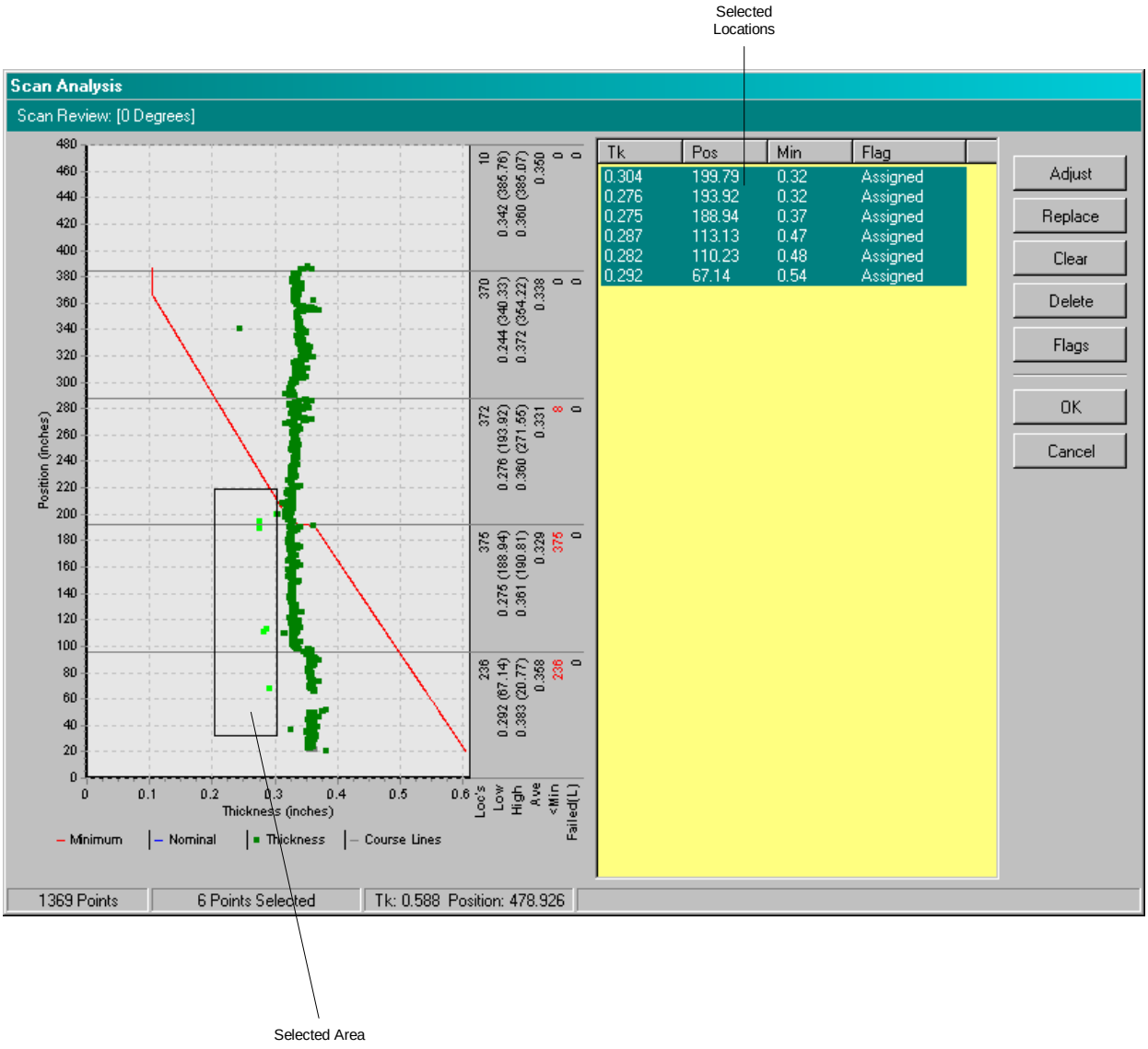
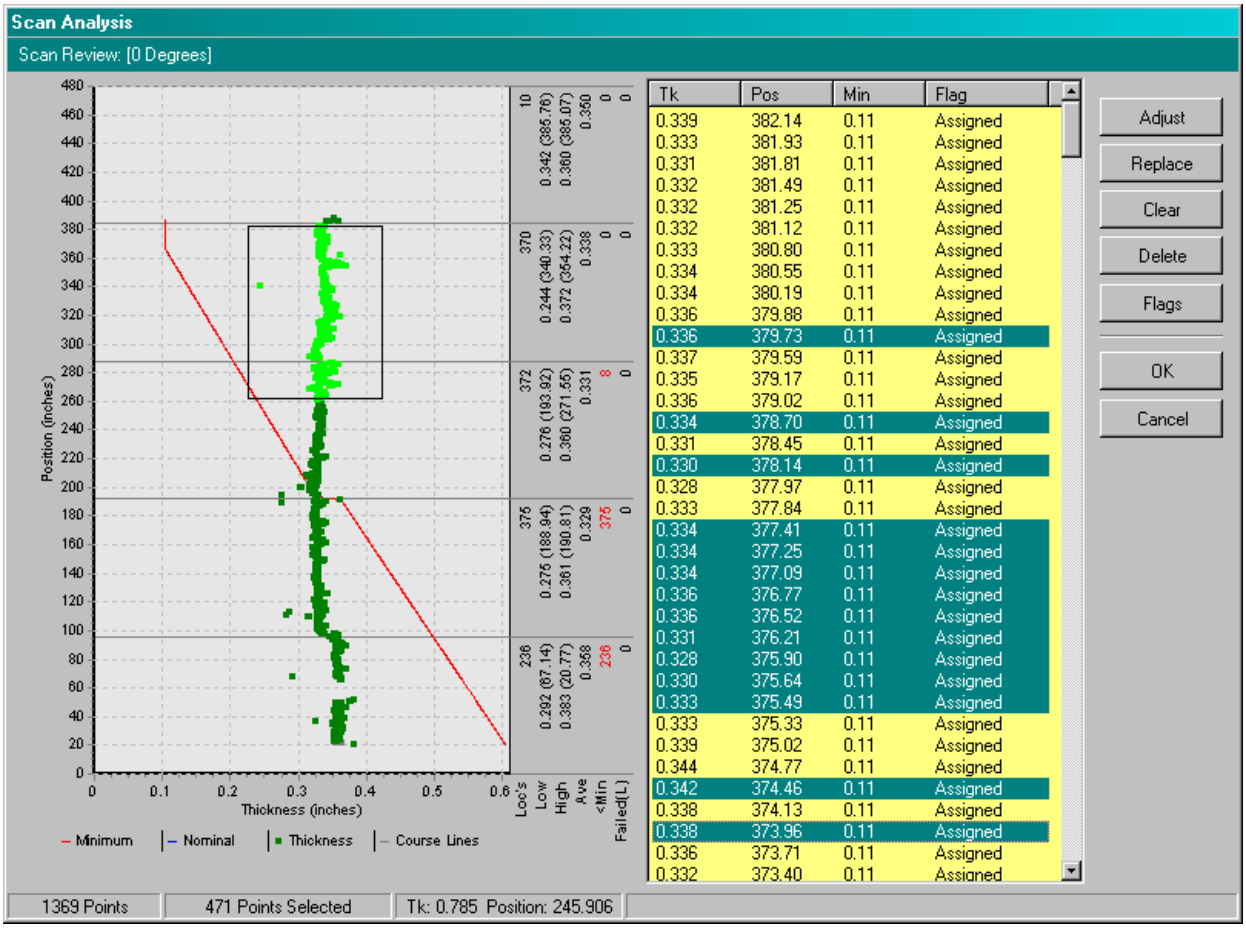


Figure 37

When you select areas in the Scan Graph (as shown above) all of the locations in the scan grid are selected. You can select any of the locations within the grid if required as shown below.



Modifying Data Points

You can modify several data points at a time by selecting them in the grid. This includes changing the flags and deleting data points.

Setting Data Point Flags

To change the Data Point Flag for several points at once, select the data points in the grid and click on the desired Data Point Flag (as shown right). This will change the value on all selected points.

Deleting Data Points

To delete points, select them in the grid (as shown) and click the **Delete** button.

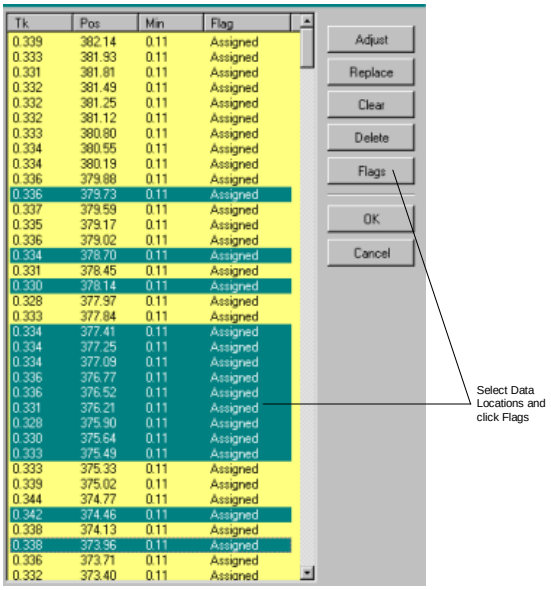


Figure 39 Setting Data Point Flags

Data Point Display

The data points in the Scan Graph are displayed as points rather than connected lines in the Main Window of the application. This allows you to easily differentiate between the points making it easier to select them.

The colors change depending on whether the data point is selected or not. Not the change in color of the data points within the selected area on the graph to the right.

The colors are also different on data points that have a flag assigned other than "Assigned". These data points do not appear in the other graphical displays in the application, only the Review Window.

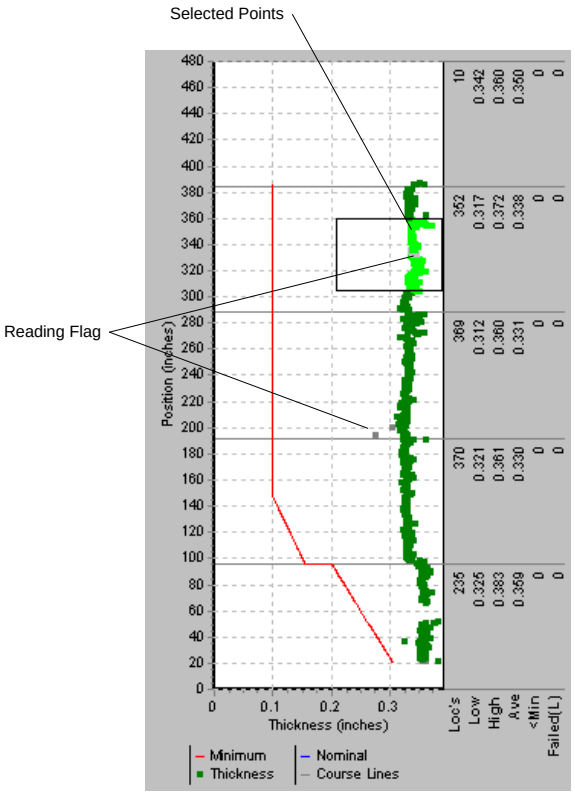
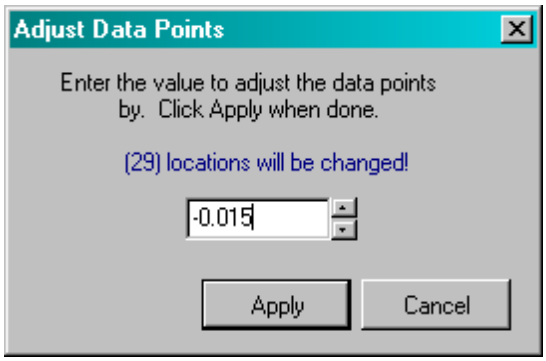


Figure 40 Data Point Display

Adjusting Data Values

You can adjust the values of the data in the scan. This is useful in some circumstances such as removing an average paint thickness amount. To adjust the data values, select the locations in the grid and click the **Adjust** button. The Adjust Data Points dialog will appear (right).



Enter the amount you want to adjust and click the **Apply** button. Entering a negative number will subtract from the values and a positive number will add.

Replacing Data

You can replace values in the scan with either a new value or a flag. Select the data points in the Readings Grid and click the **Replace** button. The Data Replace dialog will appear (below). Set the Find criteria which will determine which data points in the selection will be changed. Select whether you want to replace the value with another numeric value or assign a flag to the points. This is done by choosing the Replace With option. Click **Apply** and all data points that fall within the Find settings will be replaced with the new value or a flag.

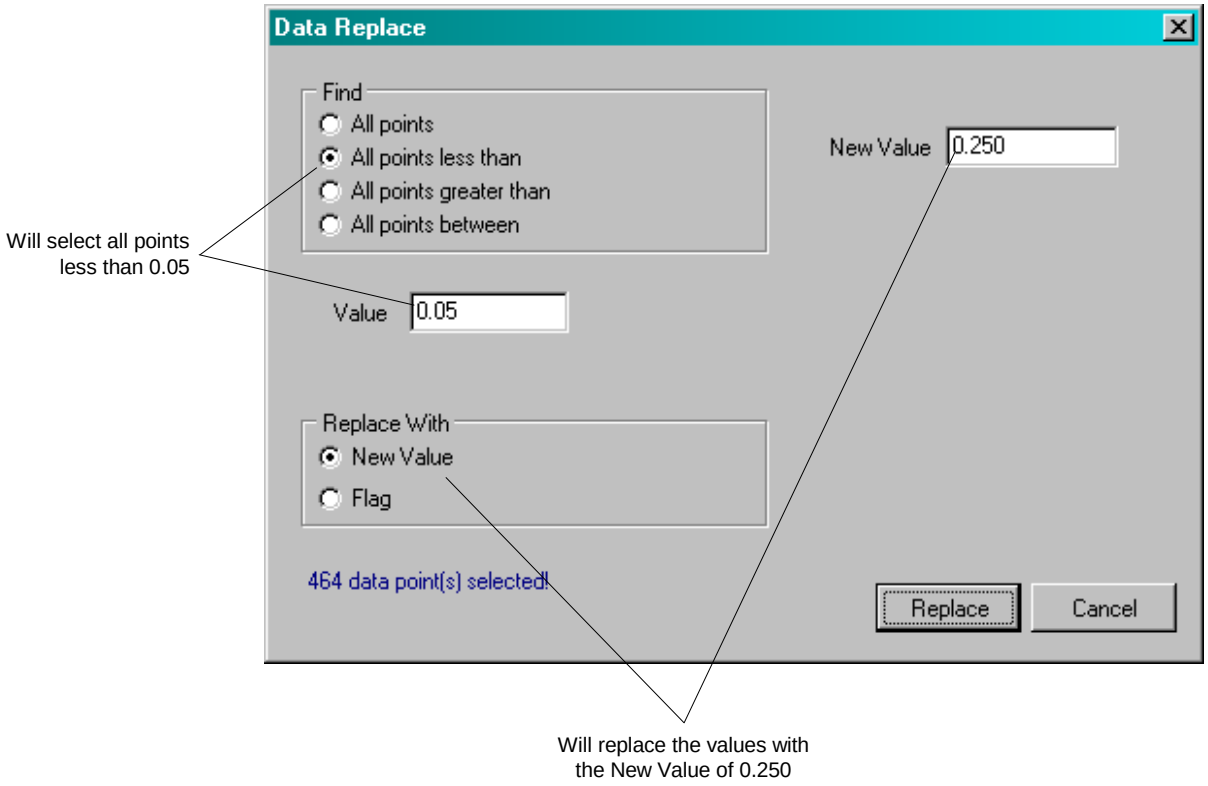


Figure 42 Data Replace Dialog

Printing Reports

When your data has been imported and reviewed, you are ready to print reports. The ADAS-500 Reporting System provides three basic reports *Summary*, *Scan Details* and *Critical Area Analysis*.

Summary Report

The Summary report provides a condensed and global view of the data for all or any selected scans in the report file. The controlling critical area for the entire report file is displayed as well as statistics which are gathered across all scans and courses. For more on critical areas refer to the section *Analysis Methodology*.

Scan Details Report

The Scan Details report provides a detailed view of a single scan. It features a graphical display of the scan and course summary information in a condensed and easy to read format.

Critical Area Analysis Report

The Critical Area Analysis report provides a detailed view of any or all of the critical areas in a scan. It features a graphical display of the course, areas and variables (i.e. Tmin, T1, T2 etc...) that make up the critical area calculation. For more on critical areas refer to the section *Analysis Methodology*.

Report and Scan Selection

You select the scan(s) and report(s) to print from the Print Reports dialog (Figure 43). All reports for the entire report file (all scans) can be printed at one time, or, you can select individual scans and reports as needed.

All scans in the report file are displayed in the list box on the left side of the dialog as shown in Figure 31. You can select or deselect each scan by clicking on the check box on the left side of the scan description. Only the checked scans will be printed. By default, when the dialog appears, all scans are checked (selected).

To select the report(s) to print, check the appropriate check box in the Report List shown in Figure 43. Only the selected reports will be printed. To preview the report(s) before printing, click the **Preview** button. To send the reports straight to the printer, click the **Print** button. To adjust margins and other basic properties of the report, click the **Setup** button.

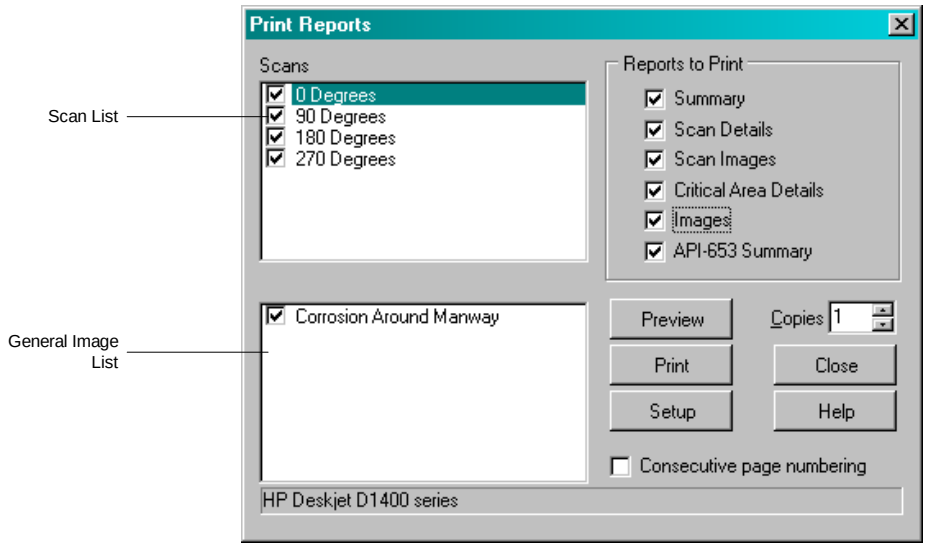


Figure 43 Reporting Form

The order in which the report pages are printed depends on the reports and scans selected. When the Summary report is selected, it is printed first and only the selected scans are used. Then, each scan is printed in the order in which they appear in the scan list.

The Scan Details and Critical Area Analysis are reports are printed together for each scan if selected. The Critical Area Analysis reports can be one or more pages depending on the print mode selected and whether or not the report file contains and Critical Areas. See *Critical Area Report Modes* below for details on the print modes available.

The scans and reports selected as shown in Figure 43 would produce reports in the order shown in Figure 44.

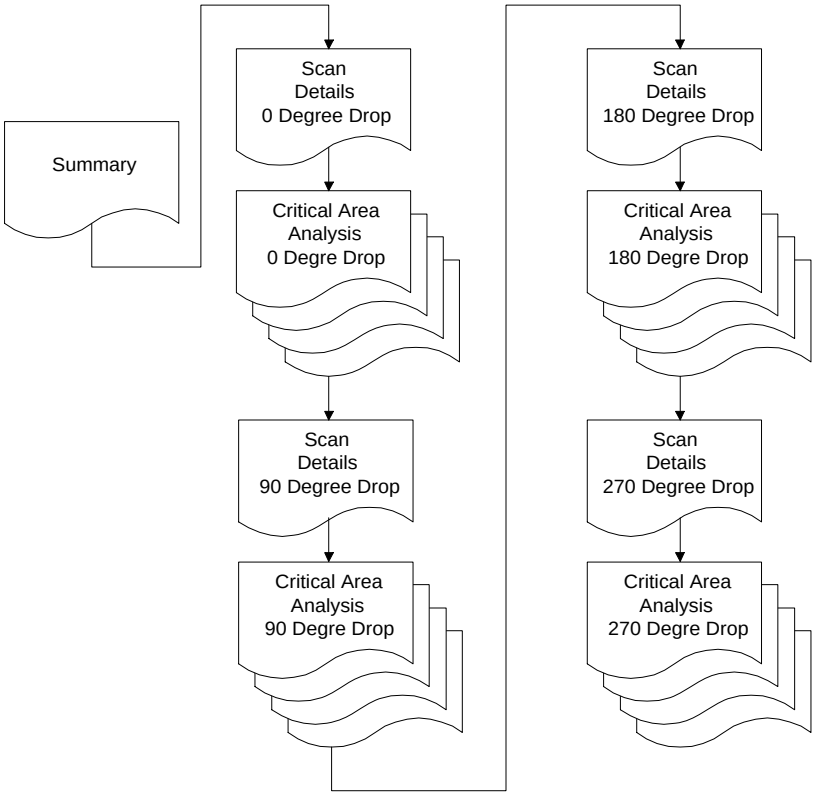


Figure 44 Report Printing Order

The **Consecutive page numbering** check box allows you to print reports with page numbering consecutive throughout all scans and reports. If it is checked, page numbering will start as page 1 for the first page, and continue consecutively throughout all report pages. If it is not checked, each report (i.e. Summary, Scan Details, Critical Area Analysis) page number will begin at page 1.

Print Setup

To select or change the properties of the printer or to change basic report settings, click the **Setup** button. The Print Setup dialog will appear (Figure 45). To change the selected printer or settings, click the **Select** button. Adjust margins of the report with the **Margins** tab shown in Figure 45. To change the Critical Area Analysis print mode, click the **Critical Details Report** tab.

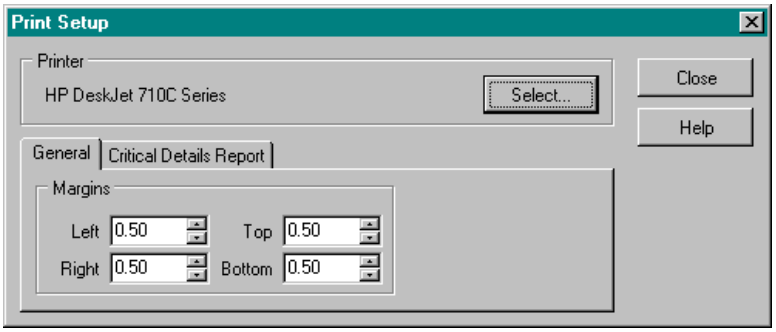


Figure 45 Print Setup Dialog

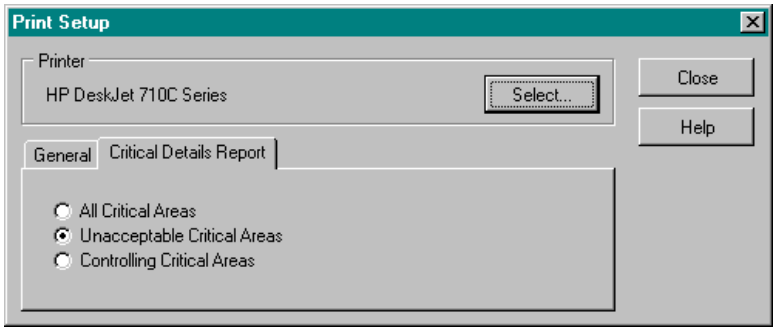


Figure 46 Changing the Critical Area Report Mode

Critical Area Report Modes

Since the ADAS-500 Reporting System can find a large number of Critical Areas in a single scan, there are several modes available for printing. The Critical Details Report tab shown in Figure 46 allows you to set the mode for printing. (See Analysis Methodology for more on Critical Areas). This allows you to select just the Critical Area(s) that you want to print. The three modes are

All Critical Areas

This mode prints all critical areas calculated by the system. This would include all Acceptable, Unacceptable and Controlling critical areas. Depending on the condition of the tank this could produce a large number of pages.

Unacceptable Critical Areas

This mode prints only the unacceptable critical areas calculated by the system.

Controlling Critical Areas

This mode prints on the controlling critical area of the scan.

Exporting Data

Scan data from the ADAS-500 Reporting System can be exported to a text (ASCII) file for use in other applications like Excel. There are several options you can select when exporting to get just the data you want. To export a scan, select the scan in the scan window, right click and select the **Export...** menu option. The **Export Scan** dialog will appear (below). The available exporting options are shown below. The Save To edit is where you enter the name of the destination export file. Click the **Browse** button to select use the Save dialog.

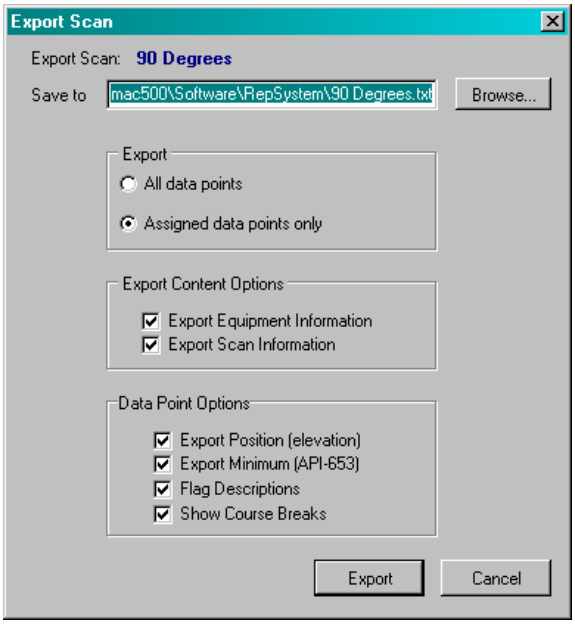


Figure 47 Export Scan Dialog

Export Options

All data points - exports all data points whether assigned, LOS or flagged.
Assigned data points only - exports only data points that are assigned. This excludes LOS or Flagged data points.

Export Equipment Information - When selected, this option will export equipment specific information such as Name, Location, Owner, Diameter and more (shown right).

```
[EquipmentInfo]
Name: Water Storage Tank
Owner: ABC Plant
Location : Tank Farm
ID : Test ID
Diameter: 50.00
Height: 480.00
Courses: 5
API 653: YES
Spec Gravity: 3.000
Prod Height: 20.00
```

Equipment Information Block

Export Scan Information - When selected, this option will export scan specific information such as Name, Location, Number of data points, .and more (shown right)..

```
[ScanInfo]
Name: 90 Degrees
Location: 0.00
Vertical/Long: YES
Data Points: 1261
```

Scan Information Block

Data Point Options

The **Data Point Options** allow you to select what information to export for each data point. The thickness (TK) is always exported. You can select whether to export Position, Minimum and Flag Descriptions for each data point. The format for the Data Points block is shown to the right.

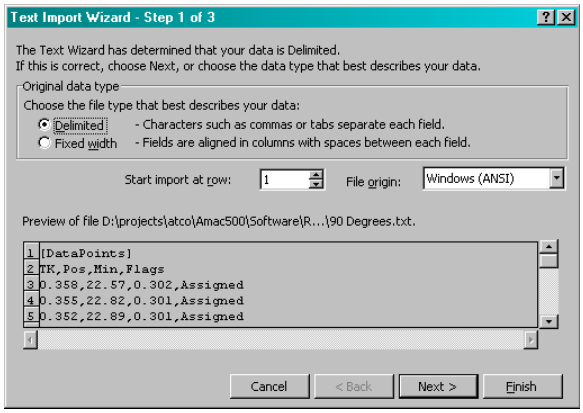
```
[DataPoints]
TK,Pos,Min,Flags
[Course 1]
0.358,22.57,0.302,Assigned
0.355,22.82,0.301,Assigned
0.352,22.89,0.301,Assigned
0.357,23.24,0.301,Assigned
.........
.........
.........
0.332,381.12,0.100,Assigned
0.332,381.25,0.100,Assigned
0.332,381.49,0.100,Assigned
0.331,381.81,0.100,Assigned
0.333,381.93,0.100,Assigned
0.339,382.14,0.100,Assigned
[Course 5]
0.343,385.59,0.100,Assigned
0.342,385.76,0.100,Assigned
0.345,385.89,0.100,Assigned
[DATA END]
```

Data Points Block

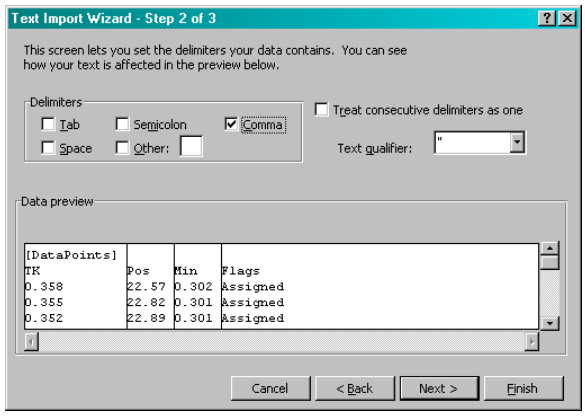
Exporting to Excel

The exported files can be used for further analysis in Excel. If you plan to export each attribute of the data point (i.e. Position, Minimum) in to a column in Excel, the best way to do it is to export the **Data Points** only. Do not include the Equipment or Scan Information. Also, do not include the Course Breaks and the data will appear in individual columns.

In Excel select the **File | Open** menu option and open the exported file. Specify **Delimited,** as shown right, and click **Next**.



Select **Comma** as the delimiter (as shown right) and click **Next**.



Click **Finish**. The data will be placed in the appropriate columns as shown right.

	A	B	C	D
1	[DataPoints]			
2	TK	Pos	Min	Flags
3	0.358	22.57	0.302	Assigned
4	0.355	22.82	0.301	Assigned
5	0.352	22.89	0.301	Assigned
6	0.357	23.24	0.301	Assigned
7	0.361	23.39	0.3	Assigned
8	0.36	23.7	0.3	Assigned
9	0.36	24.02	0.3	Assigned
10	0.356	24.21	0.299	Assigned
11	0.352	24.58	0.299	Assigned
12	0.352	24.68	0.299	Assigned
13	0.1	24.9	0.298	Assigned
14	0.355	25.19	0.298	Assigned
15	0.357	25.71	0.297	Assigned
16	0.358	26.05	0.297	Assigned
17	0.358	26.17	0.297	Assigned

API Standard 653

The ADAS-500 Reporting System features automatic calculations for minimum thickness values and thickness averaging methods defined in the American Petroleum Institute (API) Standard 653, *Tank Inspection, Repair, Alteration, and Reconstruction.* To have a thorough understanding of the calculations performed by this system to calculate the various API-653 minimums and analysis methods, you should be familiar with API Standard 653. This system is written to API Standard 653, Second Edition, December 1999, Addendum 4. You can also use the API Standard 650 Variable-Design-Point method for calculating t_{min} values by selecting it on the Equipment tab.

Referenced Sections of API Standard 653

Calculation of t_{min}

The ADAS-500 Reporting System references Section 2 *Suitability for Service*, of the API-653 Standard. The paragraphs in Section 2 used specifically are 2.3.2 and 2.3.3. The primary value calculated by the system is the t_{min} value referenced in paragraph 2.3.3 of the standard. The formula used, is shown below.

$$t_{min} = 2.6\frac{DHG}{SE}$$

Formula (1) 2.3.3 t_{min} Value

The variables of the formula are obtained in several sections of the ADAS-500 Reporting System. The variables **D**, **G** are obtained directly from the values entered in to the Equipment tab shown in Figure 63. The **H** variable is derived using the Product Height field (Figure 63) and the position of the thickness data point (Figure 64).

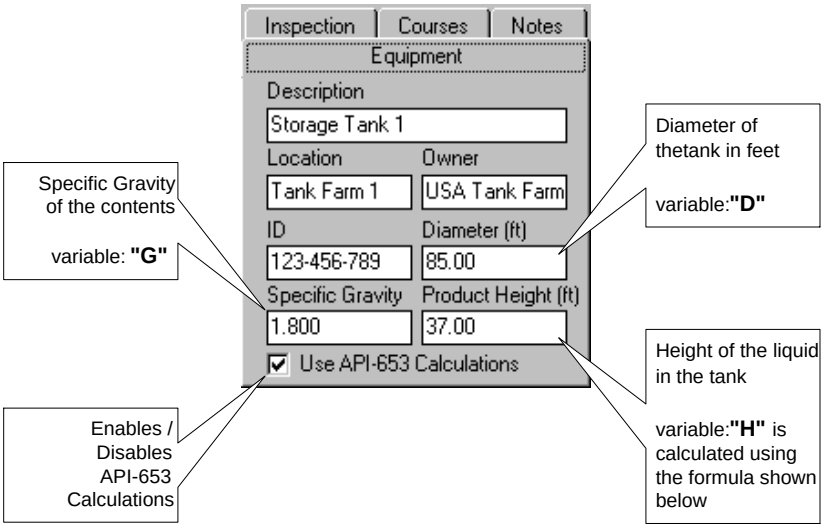


Figure 63 t_{min} formula variables obtained from the Equipment tab

The **H** variable of the t_{min} formula for each thickness data point is calculated by subtracting the Data Point Position (obtained during data acquisition) from the Product Height (Figure 64).

H = Product Height - Data Point Position

The method used to calculate the **H** value in the t_{min} formula requires that all thickness data point positions are measured from the bottom of the tank. Refer to *Section 2 Typical Scanning Practices and Guidelines* for detailed information on measurement coordinates used in the system.

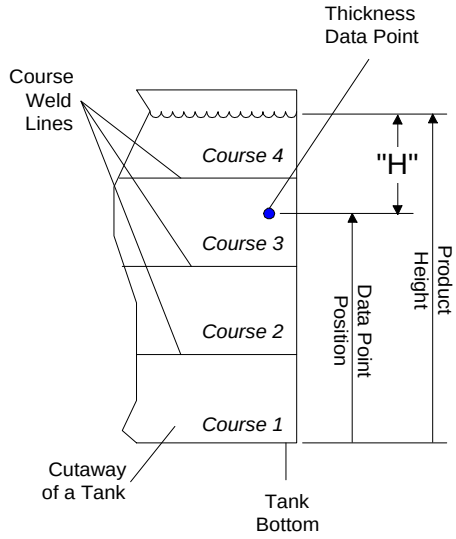


Figure 64 Calculation of **"H"**

The **S** and **E** variables of the t_{min} formula are obtained through the course information entered in the **Courses** tab (Figure65).

The **S** variable is calculated in accordance with Paragraph 2.3.3.1 where the minimum Yield and Tensile (Y and T respectively in Paragraph 2.3.3.1) values for the construction materials are used. Each course has its own defined minimum yield and tensile values. The defaults used by the system are the values specified by API-653 when the material properties are unknown.

The **E** (joint efficiency) variable of the t_{min} formula is obtained through the course information. The joint efficiency is only used close to the weld lines (as specified in paragraph 2.3.3.1). The joint efficiency entered in the course information (Figure 65) is for the weld at the bottom of the specified course.

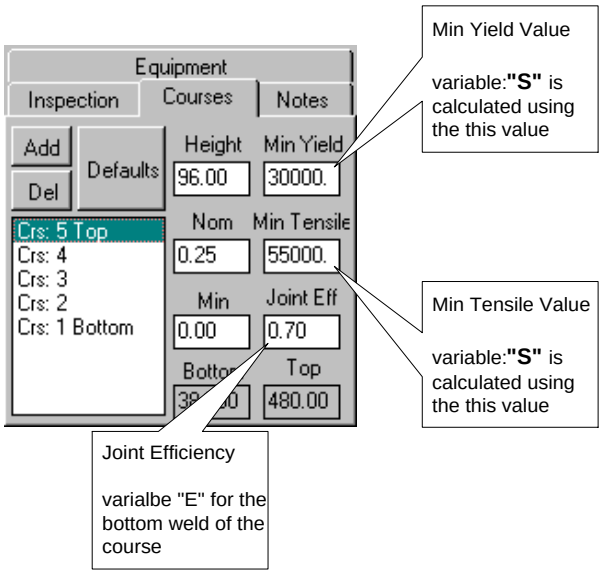


Figure 65 Calculation of **"S"** and **"E"**

Thickness Averaging and Critical Areas

API-653 provides a method to calculate whether a corroded/eroded area is acceptable or unacceptable even when the thickness is less than the t_{min} value. Whenever a thickness value in a scan is below the t_{min} value, the ADAS-500 Reporting System performs automatic thickness averaging to assist you in determining the severity of corrosion/erosion in the area. A thickness averaging over critical length L is calculated for area and referred to in this system as a *Critical Area*. This section will explain how the system calculates these areas.

Critical Length L and Thickness Averaging

As specified in paragraph 2.3.2, you can average the thicknesses in a vertical (longitudinal) plane over an area of maximum length **L**. The critical length **L** is calculated based upon the tank diameter and thickness of the corroded/eroded area. The formula used to calculate **L** is shown below. Since averaging is done only in the vertical plane, Critical Areas are only calculated for longitudinal scans (running vertically up tanks).

$$CriticalLengthL = 3.7\sqrt{Dt_2}$$

Formula (2) 2.3.2 Critical Length **L**

The variable **D** in the formula is the diameter of the tank in feet and is obtained from the data entered in the **Equipment Info** tab (Figure 63). The $\mathbf{t_2}$ variable is the lowest thickness found within the critical area.

When the areas are calculated, each scan and each course is individually reviewed and calculated. Starting at the first thickness point (labeled Pt 1 in Figure 66), the system looks up the scan to determine $\mathbf{t_2}$ (the lowest thickness). The system then calculates critical length **L** using the equation above. The critical area is considered to be all of the thickness data points located starting at *Pt 1* to *Pt N*. The process is repeated, starting at *Pt 2* and looking up the scan. This process is continued until the top of the course is met.

All scans and courses are reviewed automatically and Critical Areas are created. Each area is either acceptable or unacceptable based upon the criteria in paragraph 2.3.2.

$\mathbf{t_1}$ - Average thickness over critical length **L**

$\mathbf{t_2}$ - Lowest thickness found over critical length **L**

t_{min} - Calculated from the t_{min} formula

Acceptance Criteria

The area can be found to be acceptable or unacceptable in accordance with the criteria specified in 2.3.2. The determination is assuming that any pitting that may be present, is considered to be widely scattered as specified in 2.3.3.

The criteria is:

$\mathbf{t_1}$ must be greater than or equal to $\mathbf{t_{min}}$

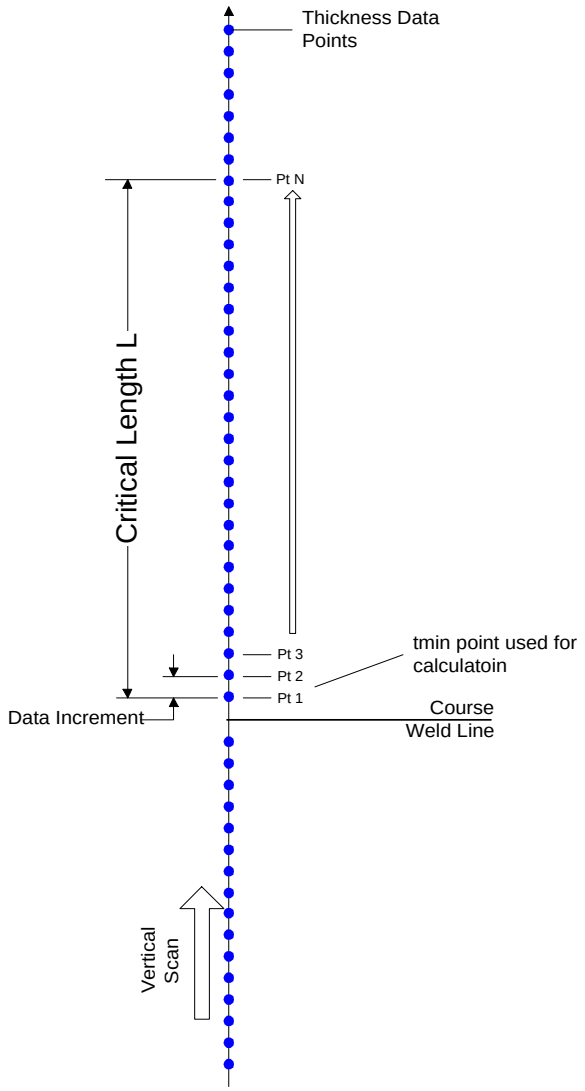


Figure 66 Critical Area Calculation

$\mathbf{t_2}$ must be greater than or equal to (0.6 x $\mathbf{t_{min}}$)

The system will calculate $\mathbf{t_1}$ and $\mathbf{t_2}$ based upon the thickness values in the scan that reside within the length **L**. The system will then compare the values against the $\mathbf{t_{min}}$ as shown in the criteria above. The $\mathbf{t_{min}}$ value calculated for the lowest elevation point (highest $\mathbf{t_{min}}$) will be used for the acceptance criteria. The corrosion allowance (Equipment Info tab) is automatically added to the value of $\mathbf{t_{min}}$.

Determining Maximum Fill Height and Controlling Areas

When shell thicknesses below $\mathbf{t_{min}}$ are found on a tank the area can be averaged (in accordance with API-653 Paragraph 2.3.2) to determine whether or not the corroded/eroded area is acceptable. In cases where the averaging does not meet the criteria, the fluid or product height in the tank can be dropped to a suitable level. API-653 specifies to solve the t_{min} equation for **H** to determine the maximum acceptable fluid or product height for the tank (Formula 3). In order to calculate the maximum recommended fill height of the fluid $\mathbf{H_f}$ we must find the relationship between **H** and the fluid height $\mathbf{H_f}$ and thickness data point position **Pos**. The physical relationship is shown in Figure 64 and shown mathematically in Formula 4 below. The ADAS-500 Reporting System uses formula 5 to calculate the maximum fill height $\mathbf{H_f}$ for each unacceptable critical area.

$$H=\frac{SEt_{min}}{2.6GD}$$

Formula (3) $\mathbf{t_{min}}$ Formula Solved for **H**

$$H=H_f-Pos$$

Formula (4) Relationship of **H** to Product Height and Thickness Point Position

Substituting **H** *in Formula 3 with* $\mathbf{H_f}$ *and* **Pos** *in Formula 4 yields*

$$H_f-Pos=\frac{SEt_{min}}{2.6GD}$$

which results in

$$H_f=\frac{SEt_{min}}{2.6GD}+Pos$$

Formula (5) Maximum Recommended Fill Height ($\mathbf{H_f}$)

Controlling Areas

When all Critical Areas have been calculated, the system reviews each unacceptable critical area to determine which area calculated to the lowest $\mathbf{H_f}$ value. The lowest $\mathbf{H_f}$ value is meaningful because if the fluid level is lowered to this height, all

unacceptable areas would become acceptable. The name given to the Critical Area with the lowest value for $\mathbf{H_f}$ is *Controlling Area*.

Viewing Critical Areas

You can view any critical areas by clicking the **Critical Areas** tab (Figure 67). The critical areas found can be selected in the list box in the upper right corner (Figure 67). As you click on each area, the graphical display highlights the area in the scan (shown in Yellow in Figure 67.

To look at any particular scan and course, simply select the scan in the Scan List, and select the course from the Course list shown in Figure 67. The details showing some of the calculated values of the area are shown in the bottom right of the page. To review all of the details for a particular area, click the **Details...** button. The *Critical Area Calculation Details* dialog box will appear (Figure 69).

When the **Unacceptable** check box is checked, only Critical Areas that are not acceptable will be shown. If **Controlling**

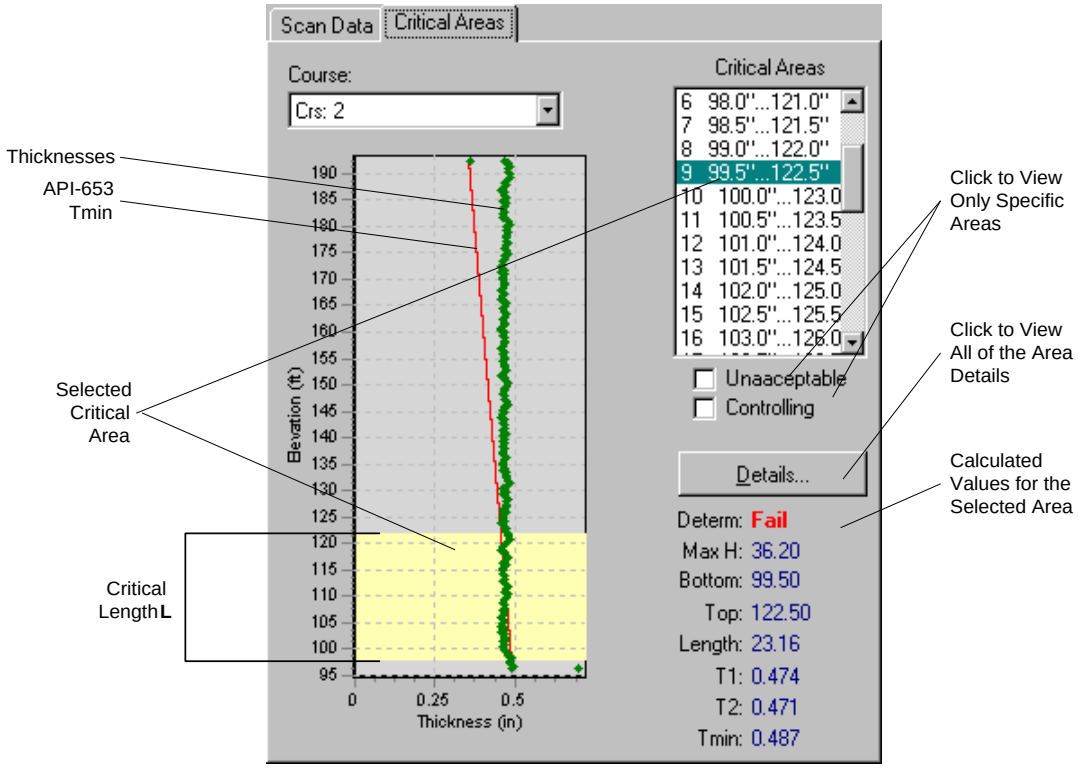


Figure 67 Critical Area Details

check box is checked, only the *Controlling Area* will be displayed.

The Critical Area Calculation Details dialog shows all of the calculated values and thickness data point values used to obtain the determination of *Acceptable* or *Unacceptable*.

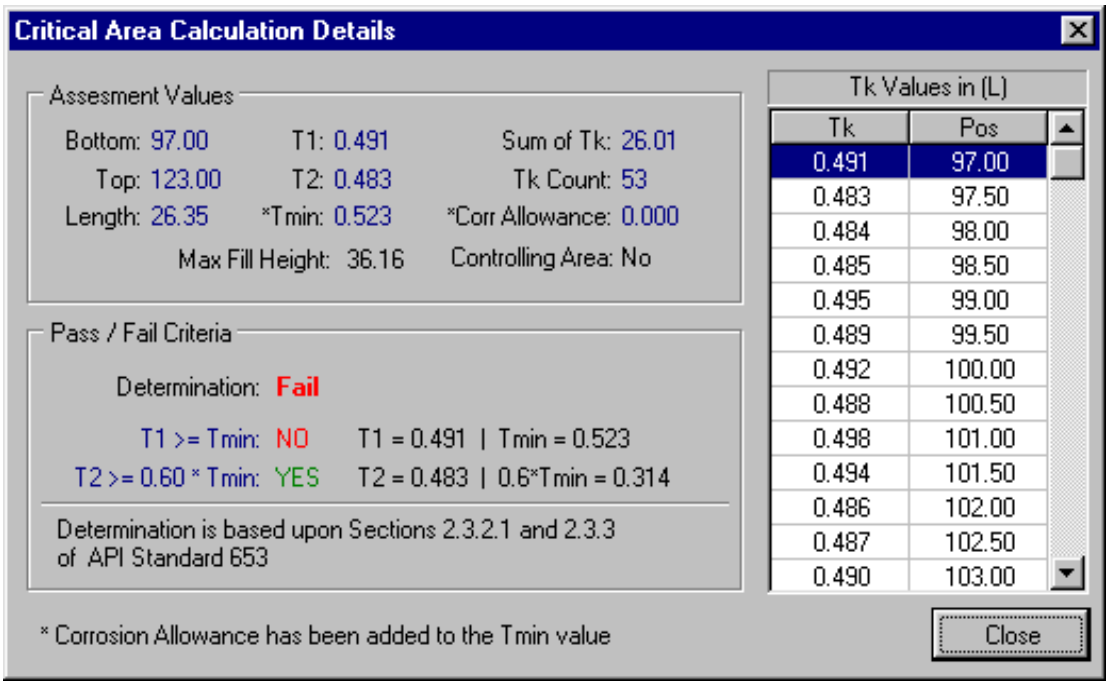


Figure 68 Critical Area Calculation Details

Assessment Values

Bottom	The bottom elevation of the area
Top	The top elevation of the area
Length	The length of the area (critical length **L**)
T_1	The average thickness of the area
T_2	The lowest thickness of the area (used to calculate L in Formula 2)
Tmin	The minimum allowable thickness (obtained from Formula 1)
Max Fill Height	The maximum recommended fill height (obtained from Formula 5)
Sum of Tk	The sum of the thicknesses (used to calculate the average T_1)
Tk Count	The number of thickness points (used to calculate the average T_1)
Corr Allowance	The corrosion allowance until the next inspection (as recommended in API-653)
Controlling Area	Indicates whether the area shown is the controlling area

Pass / Fail Criteria

Determination	Indicates whether the area meets the minimum criteria shown below
T1 > = Tmin	Indicates whether T1 >= Tmin is true / false
*T2 >= 0.60 * Tmin*	Indicates whether T2 >= 0.60*Tmin is true / false

ADAS-500 Reporting System
Tutorial

Tutorial

This section is a Tutorial with exercises to assist you in becoming familiar with some of the fundamental tasks required to use the ADAS-500 Reporting System.

Using the Tutorial

Upon installation, demo data files from the ADAS-500 were installed in a **Demo1** folder under the installed folder. If you selected the defaults when installing the system, the path would be:

*C:\Program Files\ATCO\ADAS-500 Reporting System\Demo*1

Each exercise depends on successful completion of the previous exercise. The best way to work through this tutorial is to start with the first exercise *Building a Report File* and work successively through each.

If the **Demo1** folder cannot be found on your system, you may reinstall the software.

Exercise Summary

The following exercises are covered in this tutorial.

Building a Report File

This exercise steps you through the process of building a report file. This includes importing ADAS-500 data and entering equipment information.

Reviewing Data

This exercise steps you through the process of reviewing data. This includes editing, deleting and adding data points.

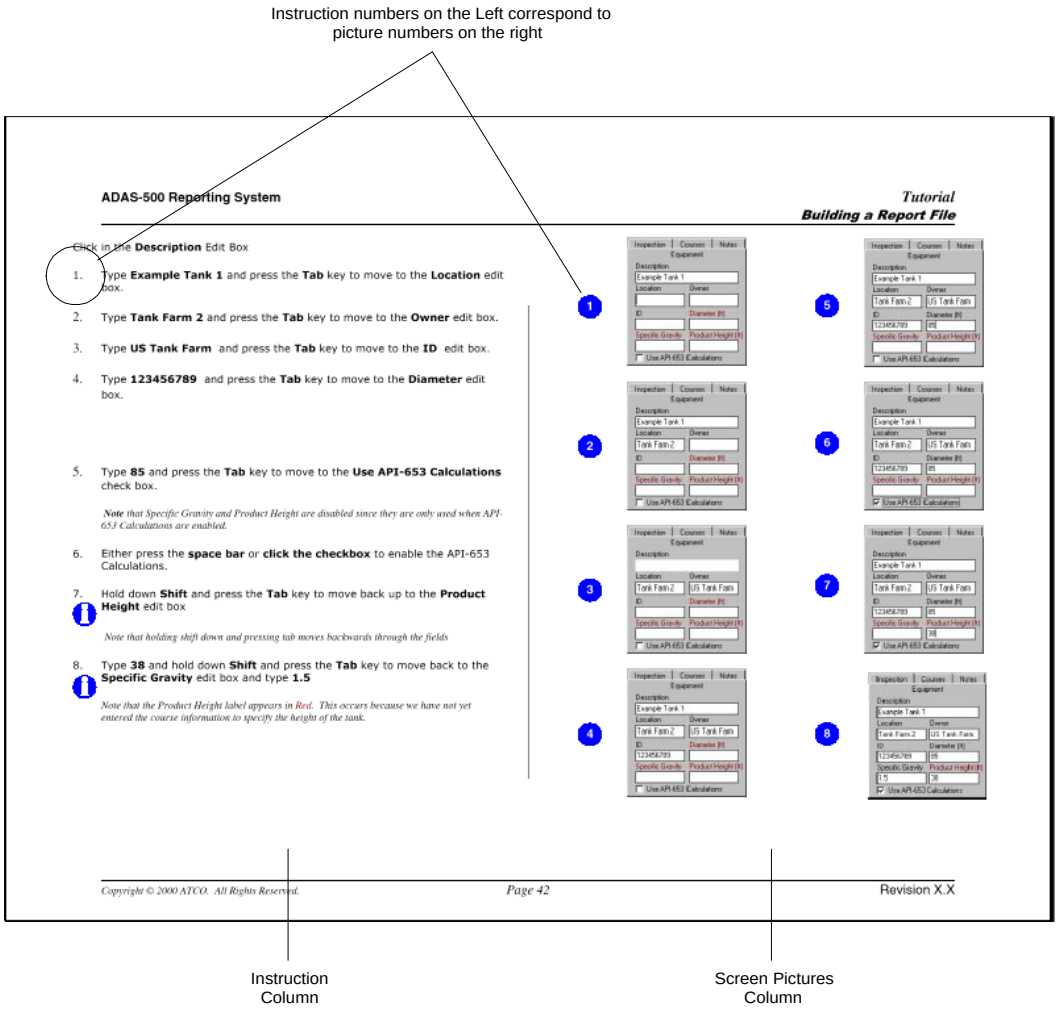
Printing Reports

This exercise steps you through the process of printing reports. This includes printing reports for all scans, or individual reports for selected scans.

Page Layout

The pages are printed in landscape format with instructions in the left column and software screens in the right column.

The number of the instruction in the left column, corresponds to the screen picture in the right column.



Conventions Used in the Tutorial

Text Fonts

Action Text that requires you to perform a task

Explanation text explaining a feature or task

Symbols

Information or an explanation of a feature

Indicates a warning or important item

Signifies the end of a instructional exercise

1 Indicates the instruction number on the left column of the page

Building Report Files

Tutorial

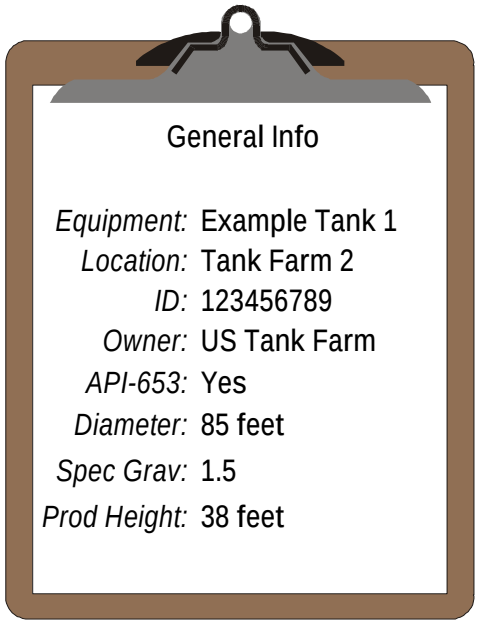
Building a Report File

Let's use a vertical storage tank as an example The general information about the tank is shown on the clipboard to the right.

To get started, run the ADAS-500 Reporting Utility as outlined in *Running the ADAS-500 Report Utility*. If the system is already running, let's start with an empty file. To do this, select **File | New** from the main menu.

The steps required are:

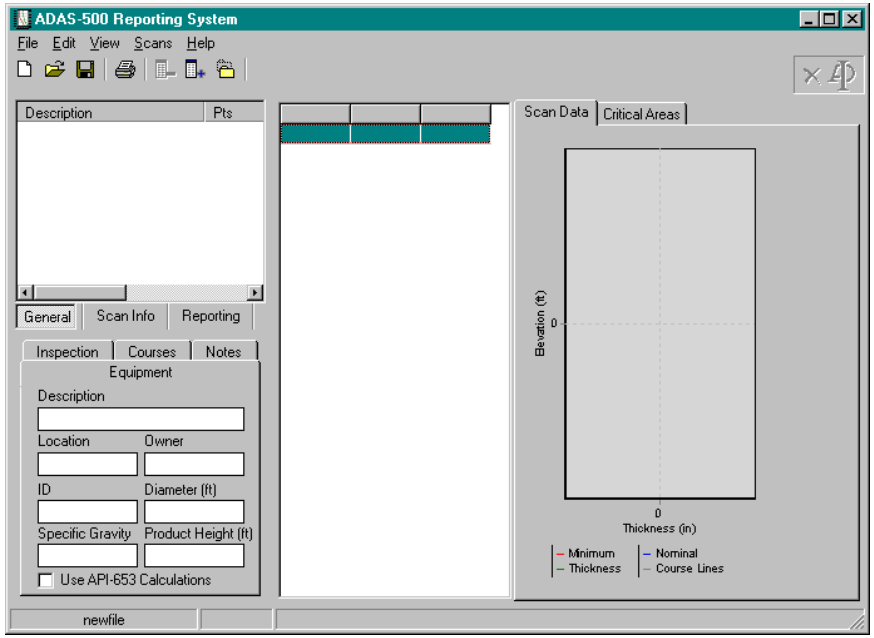
Step 1 - Enter General Equipment Information
Step 2 - Enter Course Information
Step 3 - Open TK Files from the ADAS-500



Step 1 - Enter General Equipment Information

Let's enter information about the storage tank we are inspecting.

Click the **Equipment** tab.



Click in the **Description** Edit Box

1. Type **Example Tank 1** and press the **Tab** key to move to the **Location** edit box.

2. Type **Tank Farm 2** and press the **Tab** key to move to the **Owner** edit box.

3. Type **US Tank Farm** and press the **Tab** key to move to the **ID** edit box.

4. Type **123456789** and press the **Tab** key to move to the **Diameter** edit box.

5. Type **85** and press the **Tab** key to move to the **Use API-653 Calculations** check box.

   Note *that Specific Gravity and Product Height are disabled since they are only used when API-653 Calculations are enabled.*

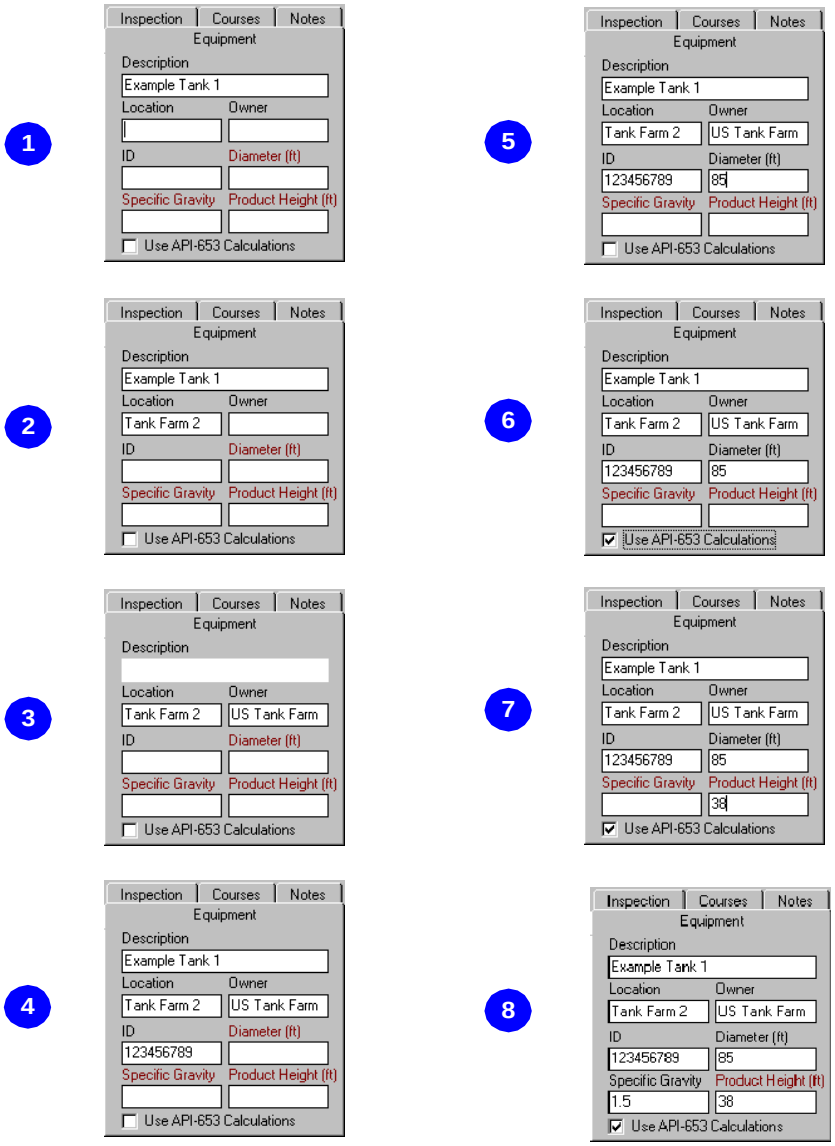
6. Either press the **space bar** or **click the check box** to enable the API-653 Calculations.

7. Hold down **Shift** and press the **Tab** key to move back up to the **Product Height** edit box

Note that holding shift down and pressing tab moves backwards through the fields

8. Type **38** and hold down **Shift** and press the **Tab** key to move back to the **Specific Gravity** edit box and type **1.5**

Note that the Product Height label appears in Red. This occurs because we have not yet entered the course information to specify the height of the tank.



Save the File

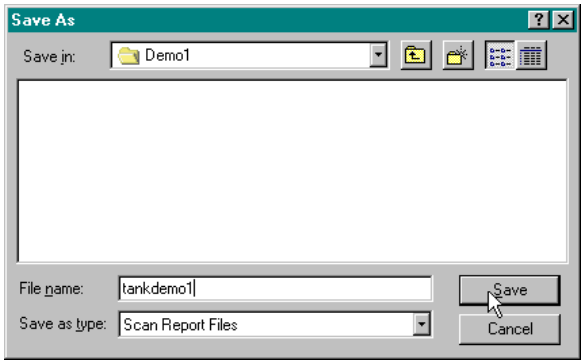
Let's save the information we entered. Select **File | Save** from the main menu. The Save As dialog will appear (right).

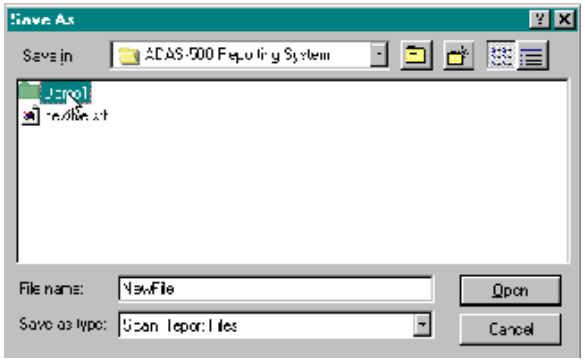
We will save the file to the **Demo1** folder that was created during the installation. You can save it to any location desired. For the purposes of this example, we will save it to **Demo1**.

*Double click the **Demo1** folder.*

Enter **tankdemo1** in the Filename edit box

Click Save

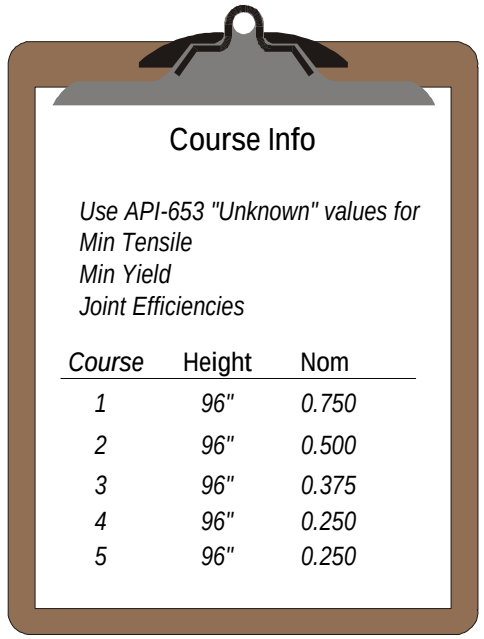




Step 2 - Enter Course Information

The next step is to enter the course information.

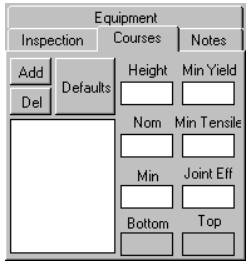
The information we need is shown on the clipboard. There are 5 courses. The height and nominal thicknesses are listed for each. The default values for Min Tensile, Min Yield and Joint Efficiency are to be used. These values correspond to the values specified in API-653 when the material is unknown.



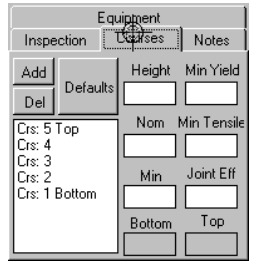
1. Click the **Courses** tab.

2. Click the **Add** Button 5 times to add 5 courses to the list.

1



2



Set the course heights. All courses heights are 96 inches

3. Select the top course *Crs: 5 Top* and hold down the **shift** key.

4. Click on the bottom course *Crs: 1 Bottom*

Note that you can select multiple courses to make changes at one time. In this case, all heights are the same, so you can enter them for all courses.

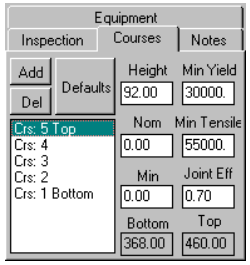
5. Click in the **Height** edit box.

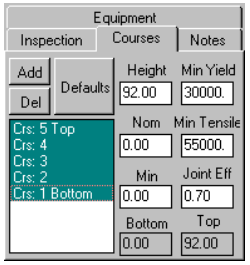
6. Type **96** for the course height

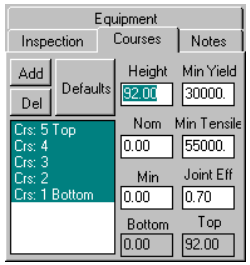
Set the nominal values for each course

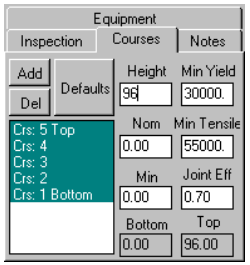
7. Click on the bottom course *Crs: 1 Bottom*

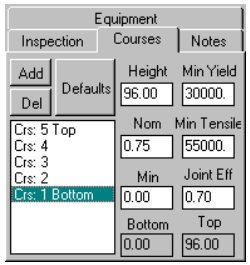
8. Double-Click in the **Nom** edit box and type **0.75**

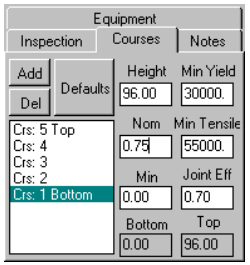












9. Click on the second course *Crs: 2* then Double-Click in the **Nom** edit box and type **0.50**

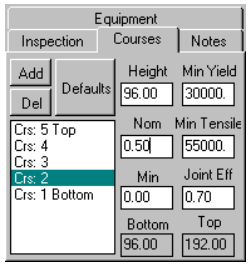
10. Click on the third course *Crs: 3* then Double-Click in the **Nom** edit box and type **0.375**

The last two courses (4 and 5) are the same height, so you can select them both and enter them simultaneously

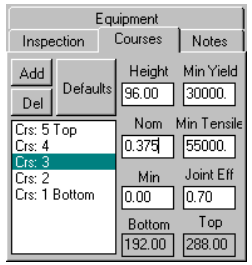
11. Click on the fourth course *Crs: 4*. Hold the **shift** key. Click on the fifth course *Crs: 5 Top* Double-Click in the **Nom** edit box and type **0.25**

Entering the course information is complete. Note that when the courses where created, values for Min Yield, Min Tensile, and Joint Efficiency were given default values. They are the values specified to use in API-653 when the material properties are not known.

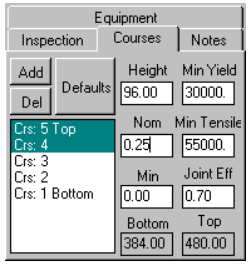
9



10



11



Open TK Files from the ADAS-500

The next step in building your report file is to retrieve your ADAS-500 data. At the time the system was installed, sample data files were installed in the Demo1 folder under the installation folder where the ADAS-500 Reporting System was loaded. The default location is

C:\Program Files\ATCO\ADAS-500 Reporting System

Assuming the files are present on the system, we will import the sample TK files that were installed with the system.

1. Click **File | Import** from the main menu.

2. From the Import Dialog, locate the ADAS-500 Reporting System installation folder

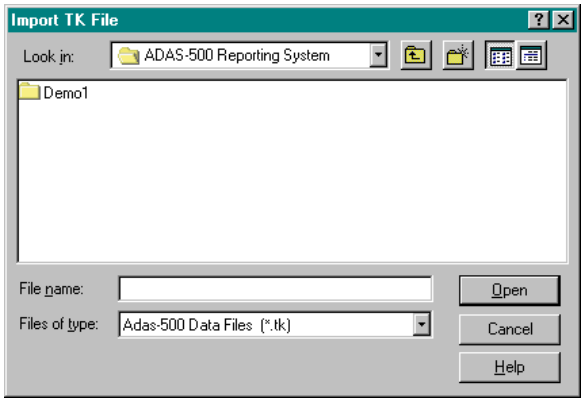
3. Double click the **Demo1** folder from the Open Dialog,

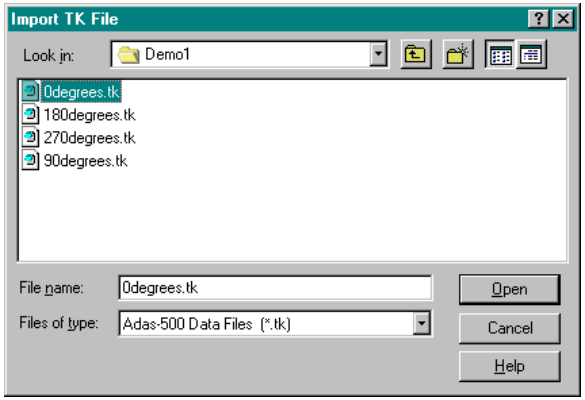
The sample TK files should appear. If the TK files shown do not appear as shown, you will need to re-install the software to continue this session.

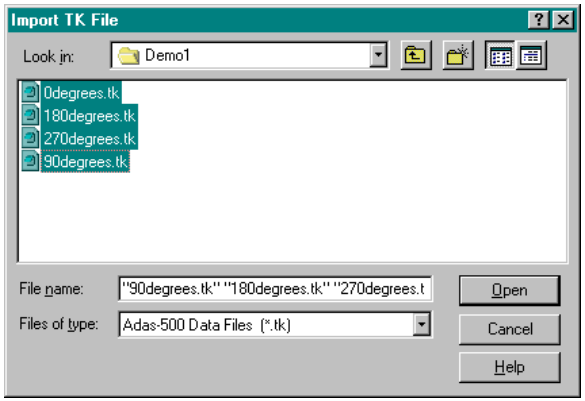
4. Select the four TK files as shown.

Note: To select several files in the Import TK File Dialog, click each file while holding the ctrl key down.

5. Click **Open**

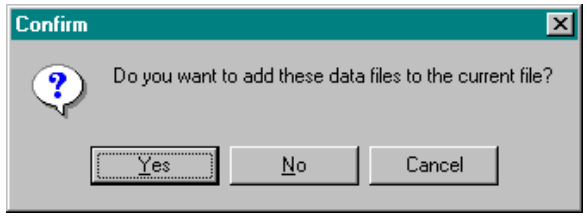






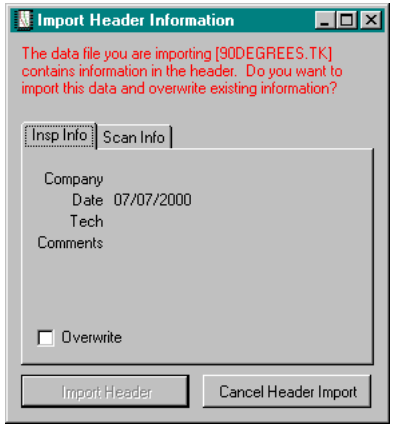
You will be asked if you want to add these data files to the current file.

6. Click **Yes**



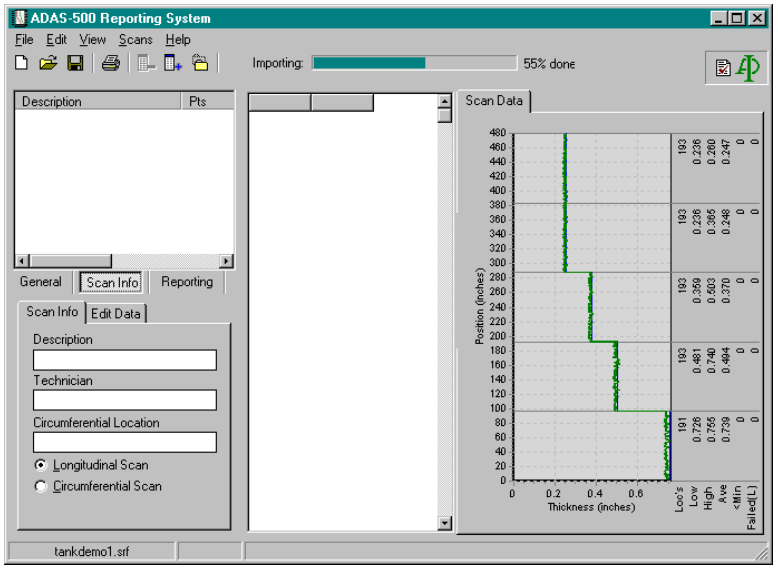
6

7. The Import Header Information dialog will appear for each file imported. Click **Cancel Header Import** button for each.



7

The system will import the files individually.

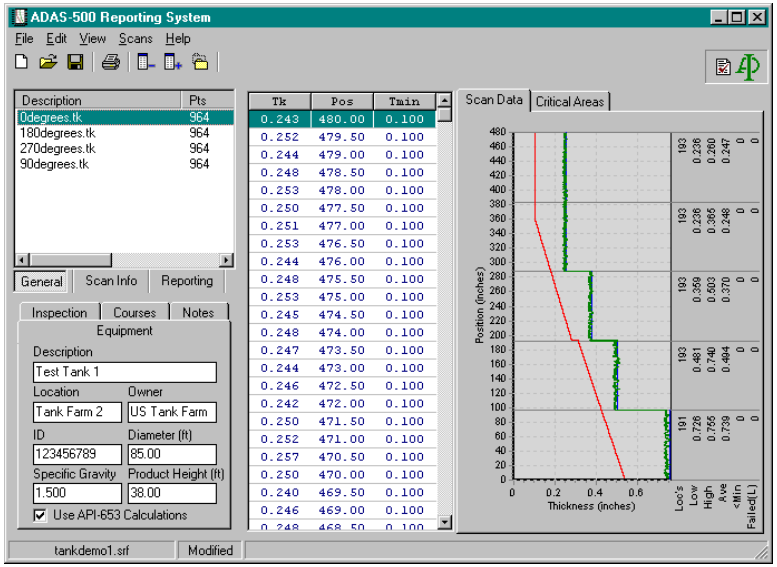


A scan

will be created for each file. The scans should appear as shown to the right. The scan description, will be the name of the TK file that it was created from. As you click on each scan listed in the Scan List, the data points should appear in the grid and the graph should appear with the API-653 minimum as shown to the right.

The sample data files are intended to show 4 scans. Each 90 degrees apart starting at 0 degrees. The samples show a scan at 0, 90, 180 and 270 degrees.

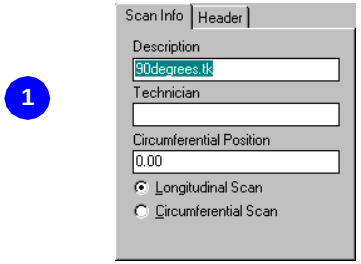
Next, we will edit scan information...

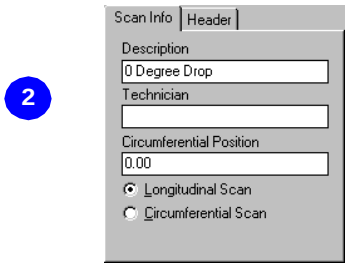


1. Double click on the **0degrees.tk** scan.

   *Note: You can also select the scan in the Scan List and then click the **Scan Info** data group tab, then the **Scan Info** data tab.*

2. Type **0 Degree Drop** for the new scan description and press the **Tab** key to move to the **Technician** edit box





3. Type your name in to the Technician edit box and press the **Tab** key to move to the **Circumferential Position** edit box

   Note: The scans we are editing are vertical drops on a vertical storage tank and considered by the ADAS-500 Reporting System to be Longitudinal scans. For more information on scan types and coordinates, refer to the sections Creating Report Files, Creating Scans.

The circumferential position for the 0 degree scan is 0. Therefore, we have no need to edit the value.

*The order in which the scans were sorted, placed the **90Degrees.tk** at the bottom of the list. We can change the position of the scan the list will appear in order by location or degree position. Keep in mind, scan reports are printed in the order in which the scans appear in the list.*

4. Click on the **90degrees.tk** scan then, **Right Click** and **click move Scan Up** from the popup menu

5. **Repeat** step 4 once again until **90degrees.tk** is in the correct position

With the scan placed in the correct order, let's edit the scan information.

6. Double click on the **90degrees.tk** scan in the scan list. Type **90 Degree Drop** for the new scan description and press the **Tab** key to move to the **Technician** edit box

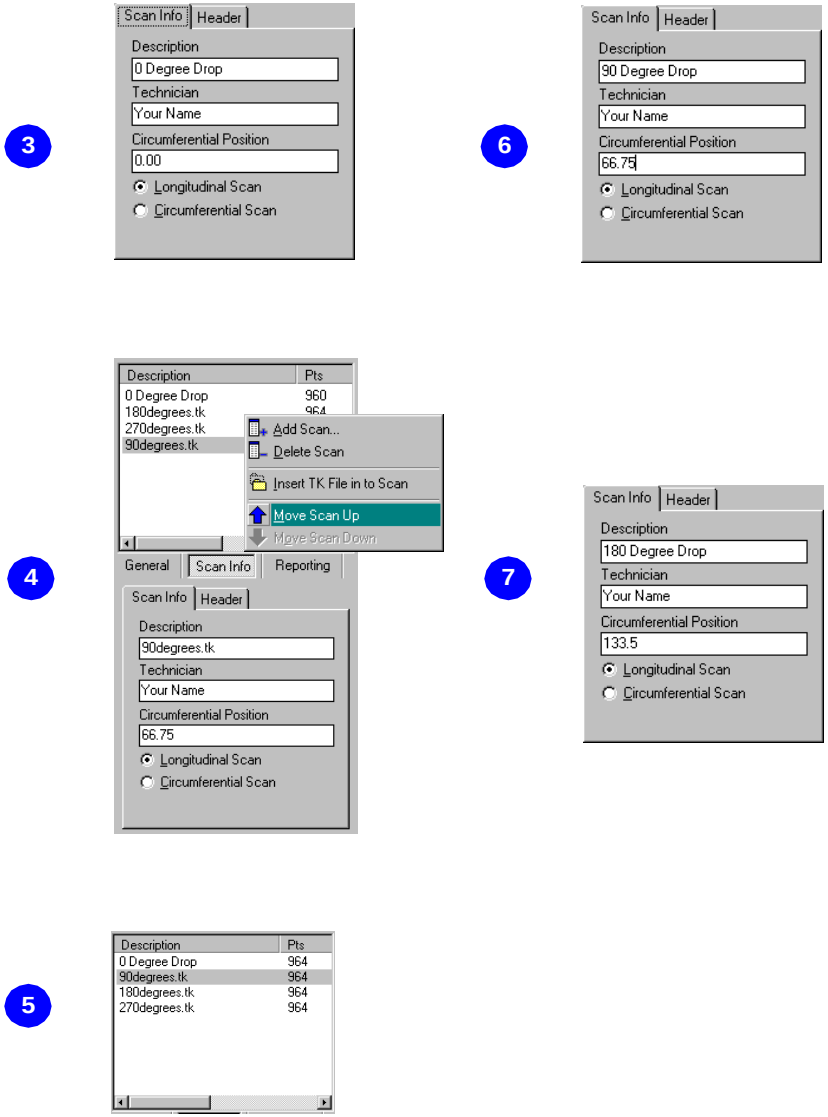
   Type your name in to the Technician edit box and press the **Tab** key to move to the **Circumferential Position** edit box

   Type **66.75** *(The circumferential position of the scan in feet)*

7. Double click on the **180degrees.tk** scan in the scan list. Type **180 Degree Drop** for the new scan description and press the **Tab** key to move to the **Technician** edit box

   Type your name in to the Technician edit box and press the **Tab** key to move to the **Circumferential Position** edit box

   Type **133.5** *(The circumferential position of the scan in feet)*

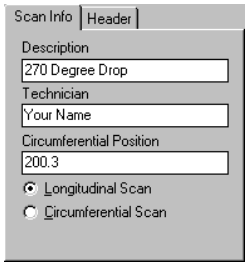


8. Double click on the **270degrees.tk** scan in the scan list. Type **270 Degree Drop** for the new scan description and press the **Tab** key to move to the **Technician** edit box

   Type your name in to the Technician edit box and press the **Tab** key to move to the **Circumferential Position** edit box

   Type **200.3** *(The circumferential position of the scan in feet)*

   Click **File | Save** from the main menu or click the  icon from the menu bar.



Note: The Circumferential Position values are in feet and indicates the position around the circumference of the tank from the datum point. The units can be either inches or feet for vertical (longitudinal) scans. Horizontal scans require that the position be entered in inches only. The API-653 calculations performed by this system for horizontal (circumferential) scans are expecting inches.

Reviewing Data

Tutorial

Reviewing Data

This section assumes that you have completed the previous sections where data was loaded from the samples located in the **Demo1** folder. If you have not completed these sections, the please proceed to the section *Building a Report File.* Once you have completed the section, return here.

Prior to printing reports, the data should be reviewed. There are occasions where erroneous readings can be saved so review your data carefully. This session will step you through the process of reviewing the data and removing any data points that may be suspect.

The data generated for this tutorial is tightly grouped and anomalies are exaggerated for simplicity. The focus of this tutorial is to convey the methods used in the ADAS-500 Reporting System to modify data and not to analyze it.

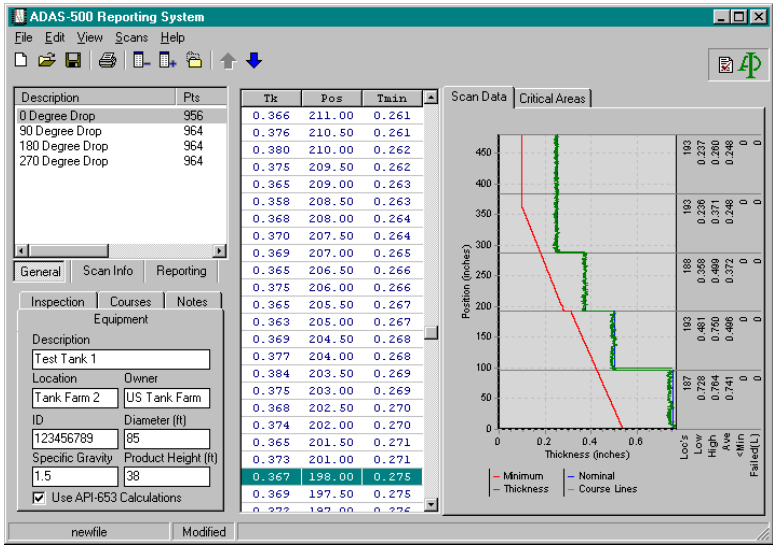
This section covers basic data review and modification, and does not set guidelines for data acquisition and analysis. Experience and knowledge are essential tools in collection and analysis of data.

1. Load the data file "**tankdemo1.srf**" created in the previous section *Building a Report File* Click on **0 Degree Drop**.

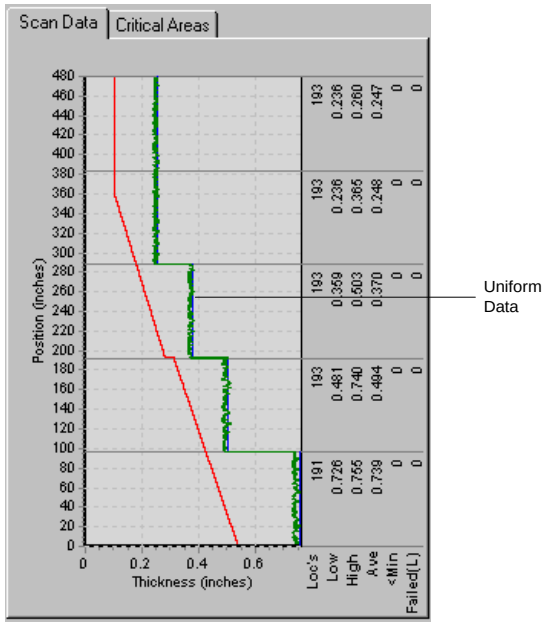
The file should appear with the scans as shown to the right.

2. You can instantly find anomalies in the data visually by reviewing the scan graph. Let's look at the **0 Degree Drop**. The data is tightly grouped in the 0 Degree Drop and does not show any anomalies.

1



2



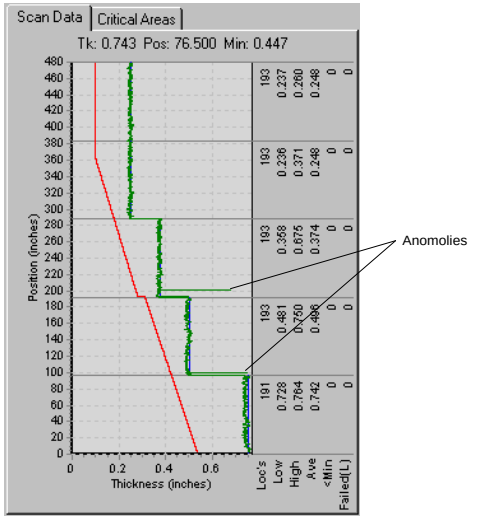
3. Click the scan **90 Degree Drop**.

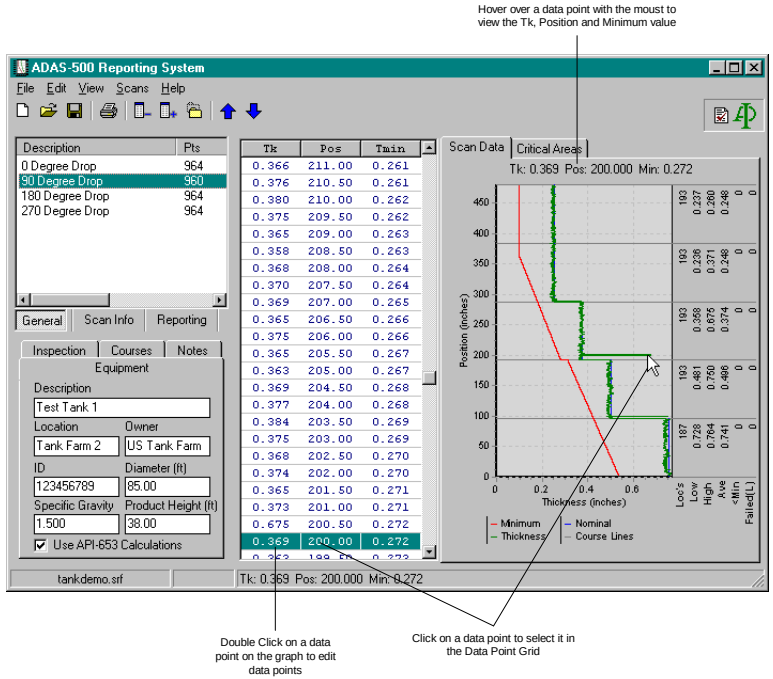
   The graph shows two anomalies which seem to be out of range of the data points surrounding them. You can view the value by hovering over it with your mouse.

4. Position your mouse over the anomaly to view the thickness value.

*When the data point information appears above the graph, **click** with the left mouse button. The data points grid will move to the data point. If you double click a data point on the graph, the editor will be invoked allowing you to change the value if needed..*

Editing will be covered later in this section. The anomalies found in the scan will be removed.





Removing a Data Point

When a data point value is found to be invalid, you can remove it. You must first find it in the data point grid.

1. Hover over the data point with your mouse. When the thickness value appears above the graph, click on the point.

   Click on the data point at *200.5 inches* to select it in the data point grid.

   The data point will be highlighted in the data point grid.

2. Right click on the data point in the grid and select **Delete** from the menu.

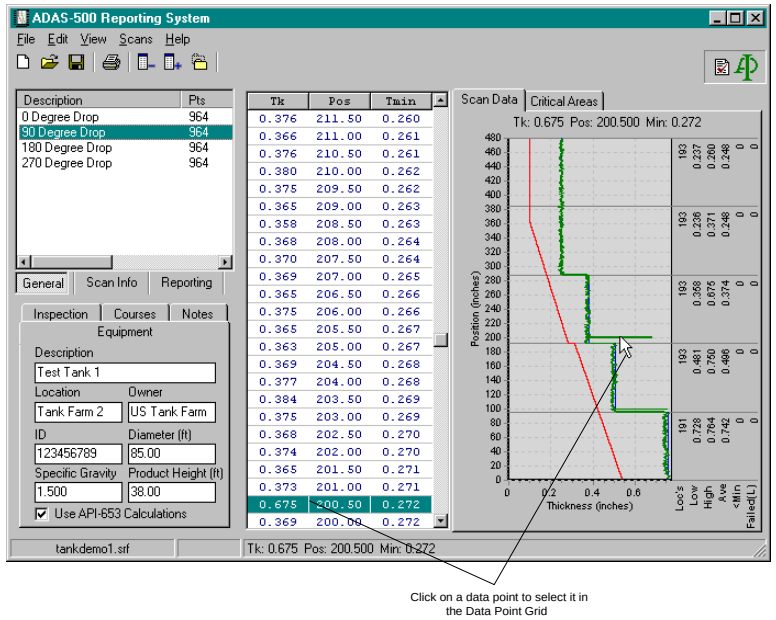
   You will be asked to confirm the deletion.

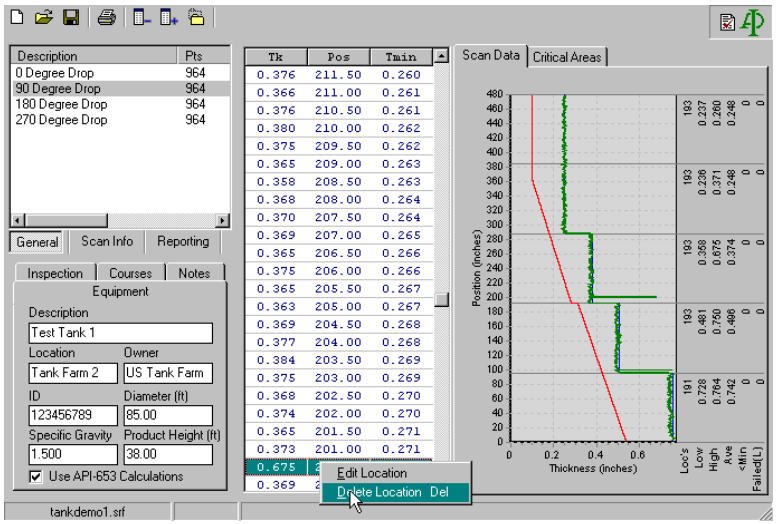
   Click **Yes** to delete the data point.

Repeat this step for the second anomaly in the scan at 100.0 inches.

Save the File

Click **File | Save** from the main menu or click the  icon from the menu bar.





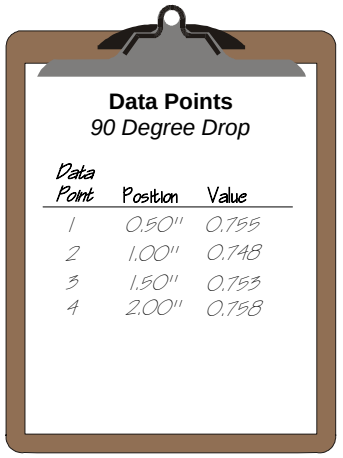
Adding Data Points

There are instances where you may need to enter thickness data manually. For this exercise, we will assume that the bottom 2 inches of the scan were scanned manually. The thickness points are shown on the clipboard to the right.

1. Click the **90 Degree Drop** scan

   Scroll the data grid to the bottom.

Note that the bottom 2 inches of data points have not been entered. The first data point is 0.753 at 2.50" elevation. We will need to enter the bottom 2 inches manually.



1

Tk	Pos	Tmin
0.734	13.50	0.522
0.744	13.00	0.522
0.751	12.50	0.523
0.759	12.00	0.523
0.750	11.50	0.524
0.741	11.00	0.525
0.746	10.50	0.525
0.745	10.00	0.526
0.736	9.50	0.526
0.738	9.00	0.527
0.747	8.50	0.528
0.751	8.00	0.528
0.746	7.50	0.529
0.756	7.00	0.529
0.755	6.50	0.530
0.764	6.00	0.531
0.757	5.50	0.531
0.756	5.00	0.532
0.757	4.50	0.532
0.761	4.00	0.533
0.754	3.50	0.534
0.751	3.00	0.534
0.753	2.50	0.535

First Data Point

2. Right Click the in **Data Grid**

   Select the **Add Data Point** menu option

   The Add Data Point dialog will appear.

3. Type **0.755** and press **<tab>** *Thickness Value*

   Type **0.5** and press **<enter>** *Position*

   Right Click the in **Data Grid** again and
   select the **Add Data Point** menu option (Repeat Step 2)

4. Type **0.748** and press **<tab>** *Thickness Value*

   Type **1.0** and press **<enter>** *Position*

   Right Click the in **Data Grid** again and
   select the **Add Data Point** menu option (Repeat Step 2)

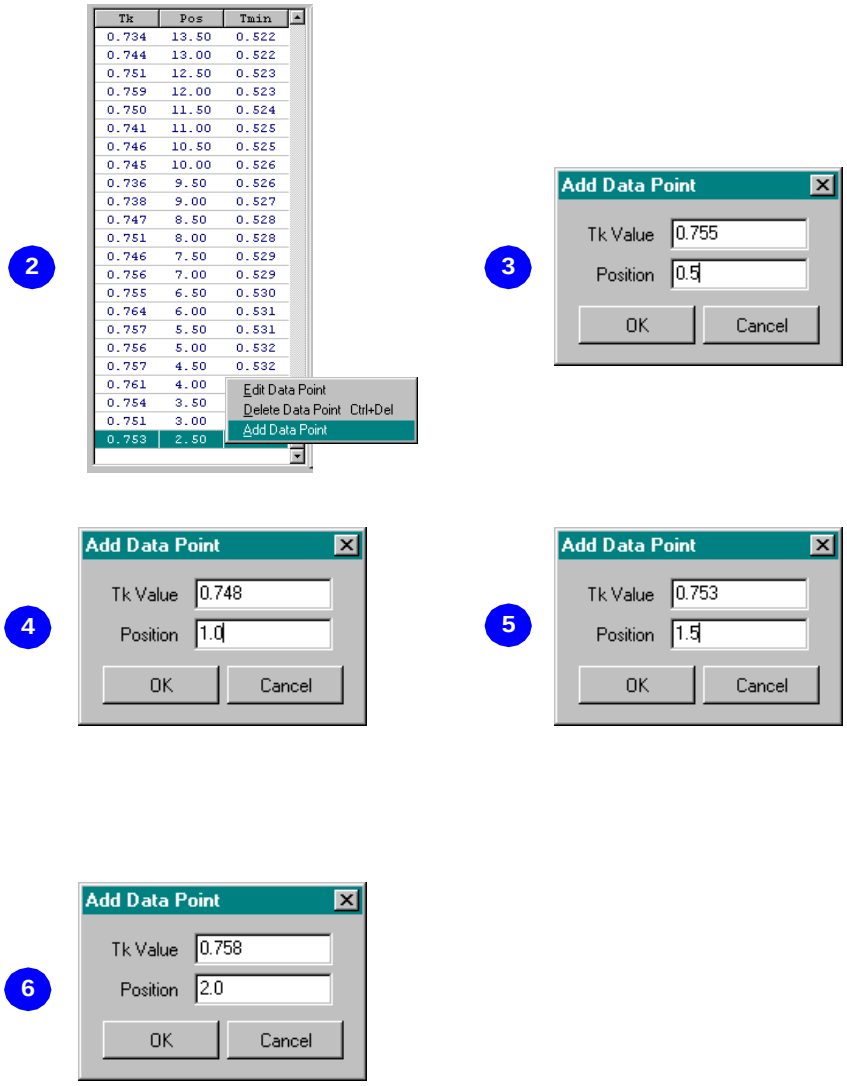
5. Type **0.753** and press **<tab>** *Thickness Value*

   Type **1.5** and press **<enter>** *Position*

   Right Click the in **Data Grid** again and
   select the **Add Data Point** menu option (Repeat Step 2)

6. Type **0.758** and press **<tab>** *Thickness Value*

   Type **2.0** and press **<enter>** *Position*



Save the File

Click **File | Save** from the main menu or click the  icon from the menu bar.

Printing Reports

Tutorial

Printing Reports

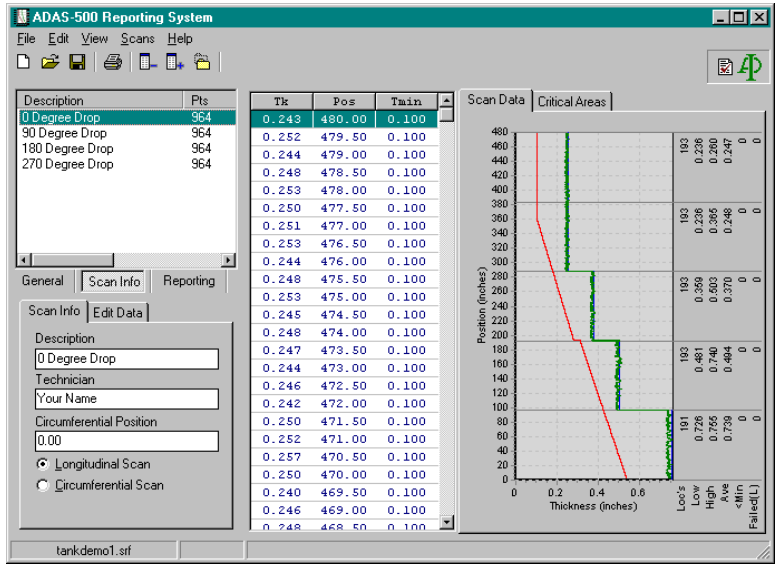
This section of the tutorial will step you through the process of printing reports. Prior to doing the exercises in this section, you should browse through *Section 6* of the manual *Printing Reports*.

This section assumes that you have completed the previous sections where data was loaded from the samples located in the **Demo1** folder. If you have not completed these sections, the please proceed to the sections *Building a Report File* and *Reviewing Data* Once you have completed these sections, return here.

The ADAS-500 Reporting System allows you to print reports either individually, or all at once. When you are printing an entire report for a series of scans, you can do it with a single button click. You can also print individual reports as required. Browse through Section 6 of the manual Printing Reports if you are not familiar with the reports generated by the system.

1. Load the data file "**tankdemo1.srf**" created in the previous section *Building a Report File* Click on **0 Degree Drop**.

The file should appear with the scans as shown to the right.

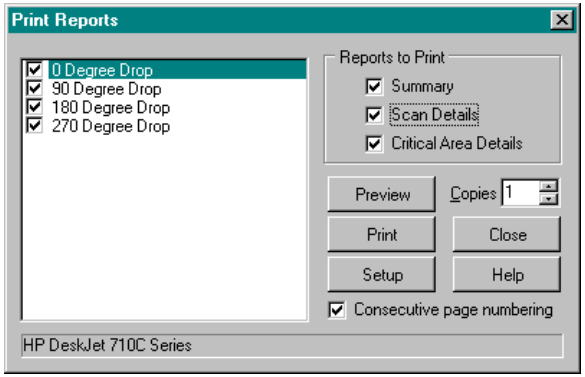


1

Printing All Reports

First we will print all reports at one time.

2. Select **File | Print** from the main menu. The *Print Reports Dialog* will appear.



2

If **Summary, Scan Details** and **Critical Area Details** are **NOT** checked, check them now. Be sure they are all checked as shown in item **#2** in the right column above.

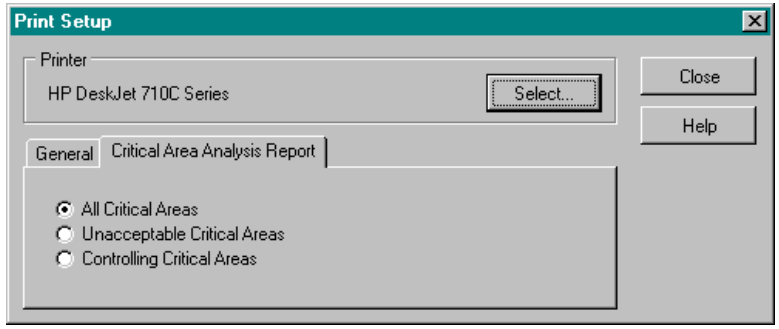
By default, all scans will be selected as shown in item #2 above.

3. Click the Setup button. The *Print Setup Dialog* will appear.

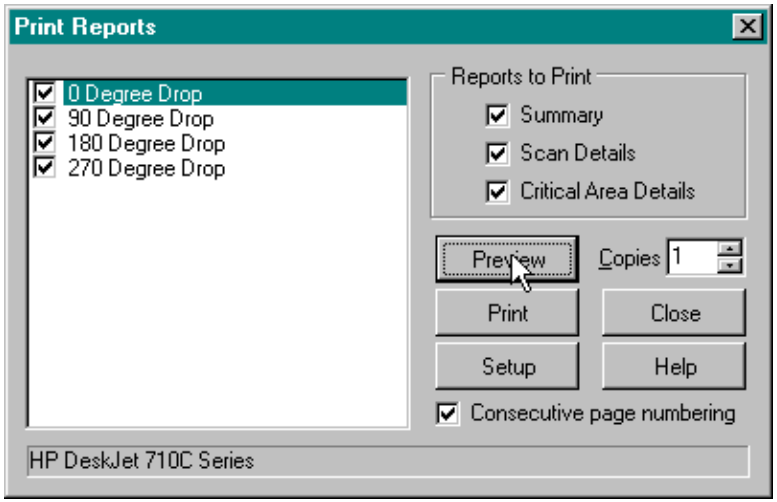
   Click the **Critical Area Analysis Report** tab.

   Select **All Critical Areas** as shown to the right.

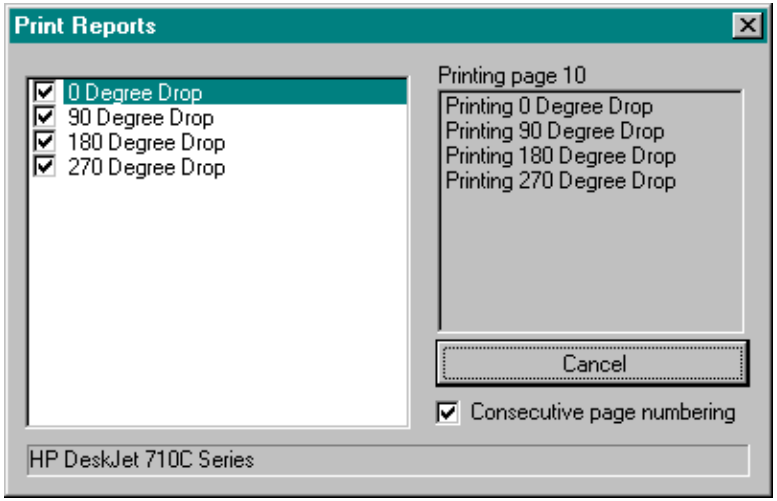
   Click the **Close** button.



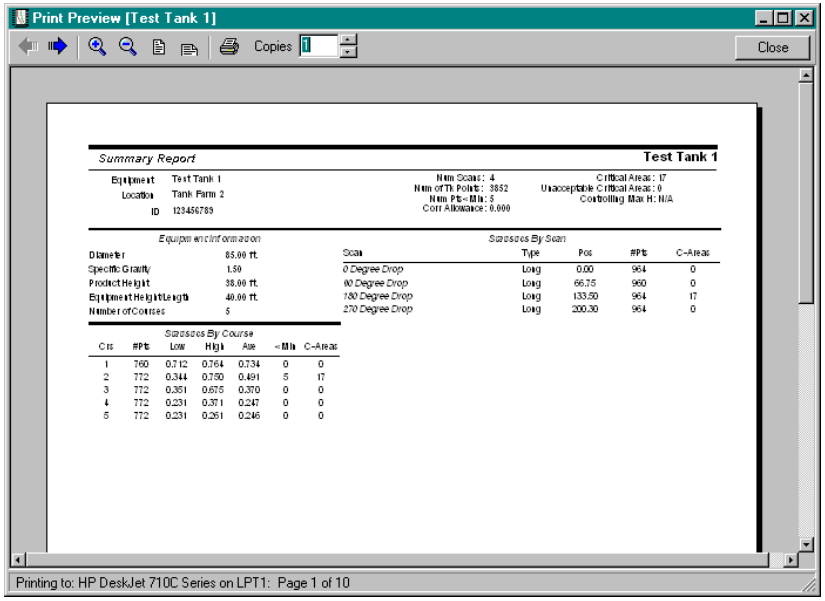
4. With all scans and reports selected, click the **Preview** button.



5. The system should generate 10 pages.

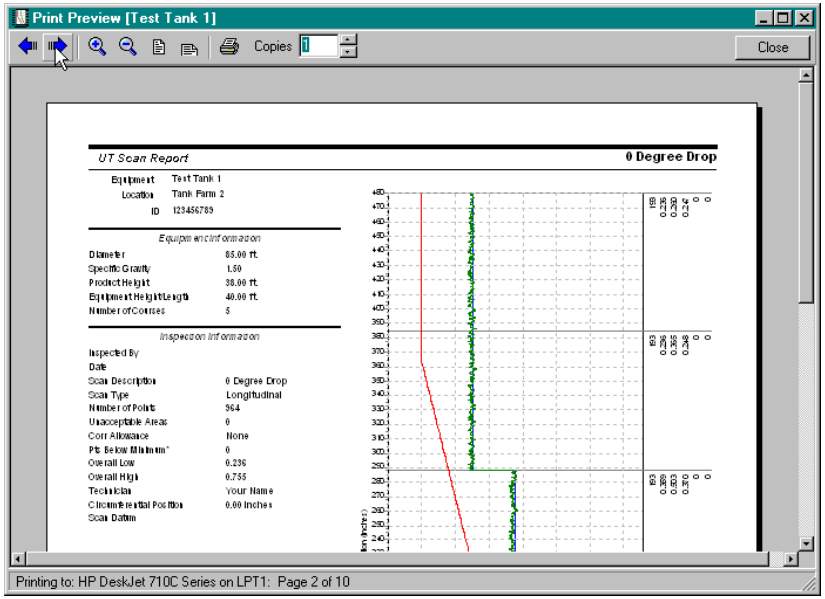


6. The preview screen will appear with the *Summary Report* displayed as the first page.



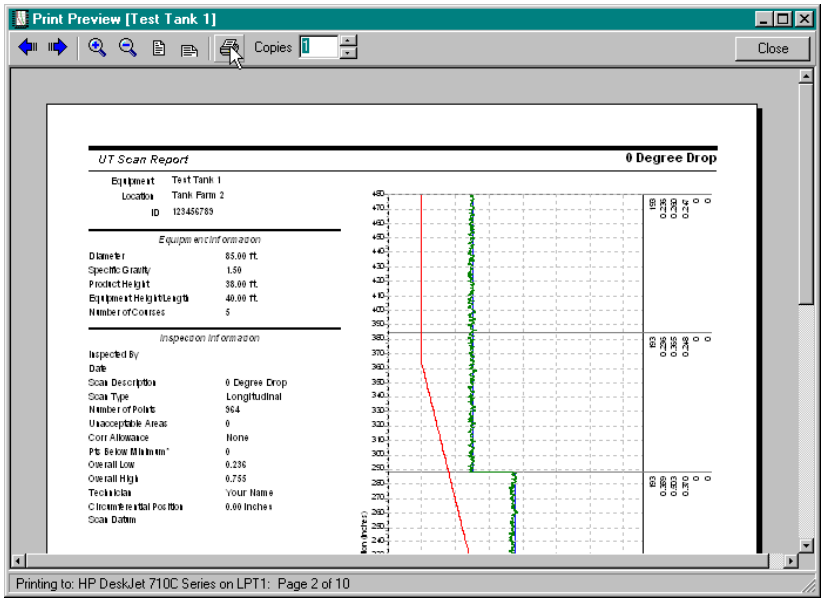
7. Click the **Right Arrow** to view the next page of the report. The *Scan Details Report* for the *0 Degree Drop* will be displayed.

Review the Printing Reports section of the manual for details on the order in which reports are printed.



7

8. If you want to print the 10 pages of the report, click the **Print** button.



8

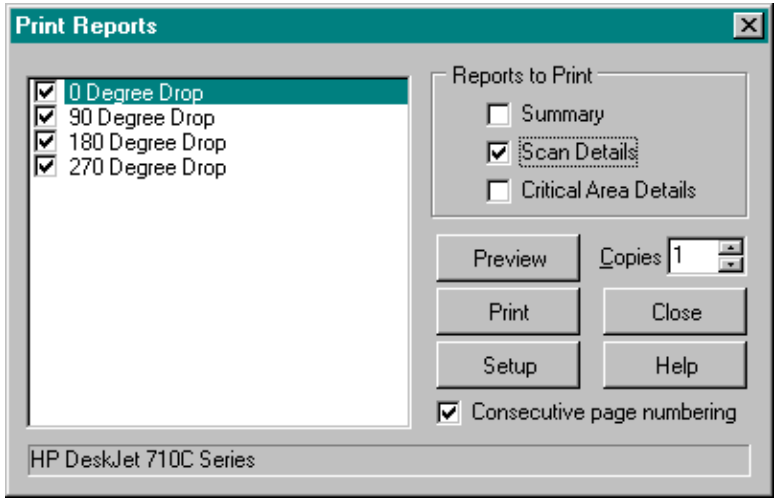
Printing Scan Details Reports

In the event you need to print any reports individually, you can select them from the list. You can print any report, for any of the scans.

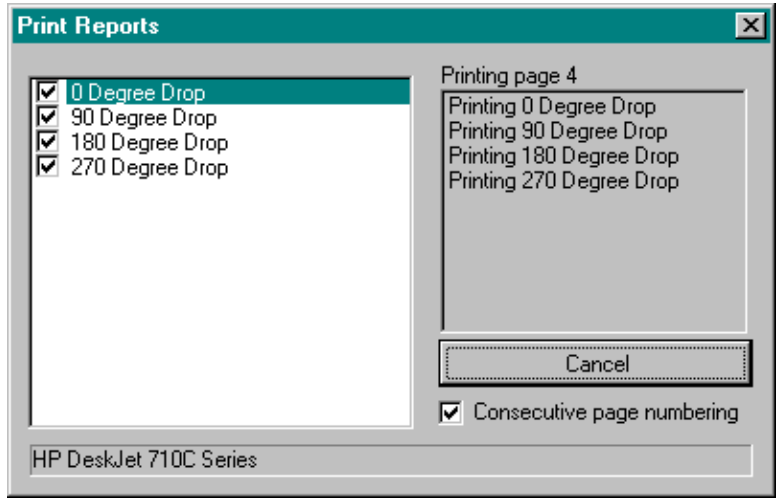
1. Select **File | Print** from the main menu. The *Print Reports Dialog* will appear.

   Select only the **Scan Details** report as shown to the right.

   Click the **Preview** button.



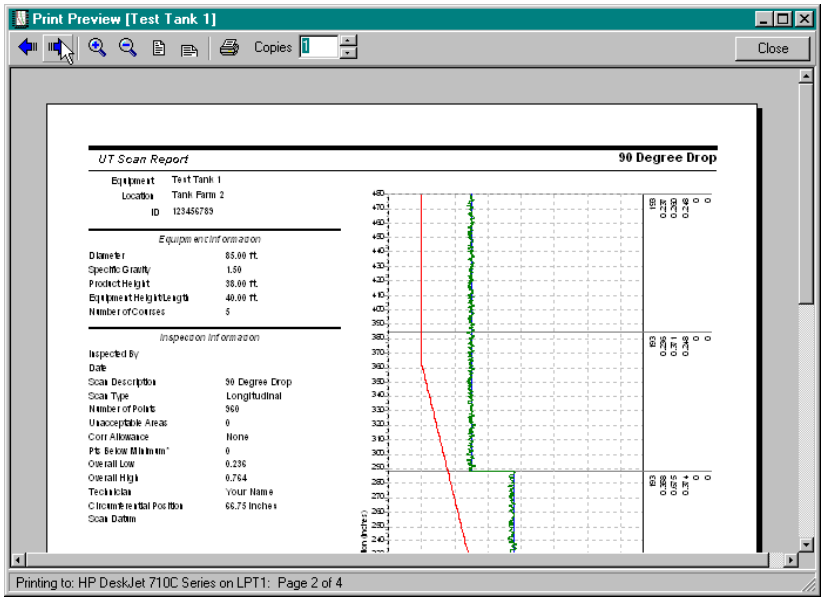
2. The system will generate 4 pages.



A *Scan Details* report will be printed for each scan. The first page displayed, will be the *0 Degree Drop* Details. The reports are printed in the same order in which they appear in the scan list.

Review the Printing Reports section of the manual for details on the order in which reports are printed.

3. Click the **Right Arrow** to view the next page of the report. The *Scan Details Report* for the *0 Degree Drop* will be displayed.



4. If you want to print the 4 pages of the report, click the **Print** button.