

Tackmaster-PC

Manual of Operation

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1.0 General Overview

The Tackmaster-PC is an advanced tester designed to measure the tack properties of printing ink and other materials. This instrument has no external controls, switches, buttons, or displays of any kind. All of the monitoring and control features are provided on a standard PC. All of the functions of this tester are connected to the PC via a standard USB port. Any Windows operating system that supports USB will operate this tester.

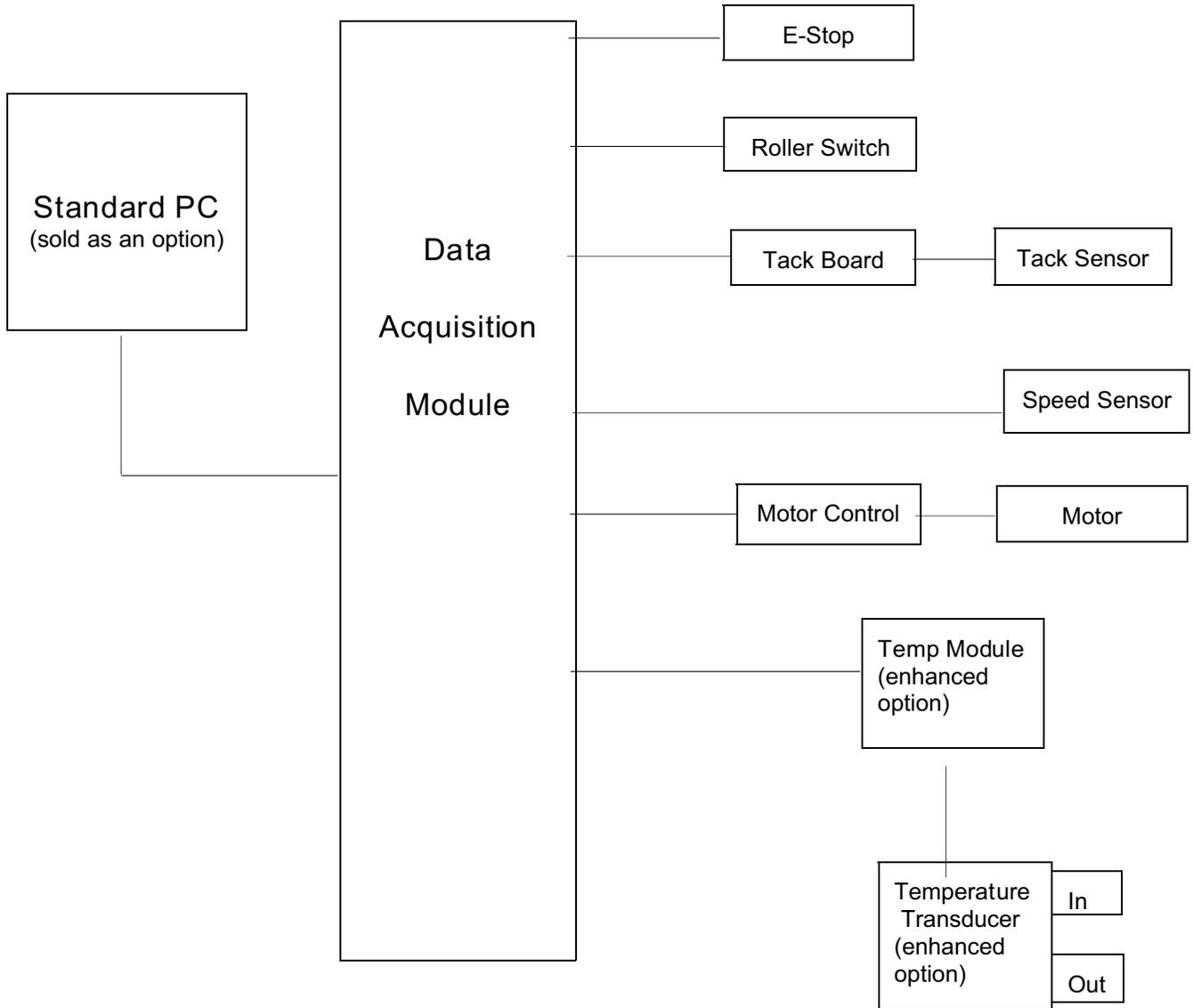


Figure 1: Block Diagram of control system

2.0 Mechanical Design Features

The Tackmaster-PC has been designed with simplicity and durability in mind. The design features include the following:

- Removable Cleaning bar to allow for easy and complete cleaning
- Wider design to allow for easy access to the rollers
- Easy access to all service parts
- Mist shield for performing misting tests
- Clear mist cover which provides complete coverage of the rollers
- Polished metal finish provides easy cleaning

3.0 Initial Startup/Calibration

The Tackmaster-PC will be delivered to the customer tested and ready to operate. The only connect required is from the Tackmaster-PC to the computer via a standard USB connecting cable. If the customer chooses to use their own computer then the software will have to be installed, configured and calibrated as follows:

3.1 Software installation

There are 2 software products required to operate this instrument. Both of these products are supplied on a single CD ROM. The operator must first open the NIDAQ800 folder and click on the "setup, National Instrument Installer" icon and follow the instructions. This process will load all of the data acquisition software that is required onto your computer.

Next the operator will click on the "Setup, INSTALIT Executable" and follow the instructions. This process will load the Tackmaster-PC operating system onto your computer. When the Tackmaster-PC application is started for the first time the operator will be asked to enter a 10 digit license key which is found on the CD's jewel case.

3.2 Interface discovery

Each time the Tackmaster- PC application is started on the computer, an “Interface discovery” will occur automatically. This process will check to make sure that the instrument is connected and all of its functions are communicating properly. A few messages will appear showing the interface discovery process.



3.3 Initial Calibration requirements

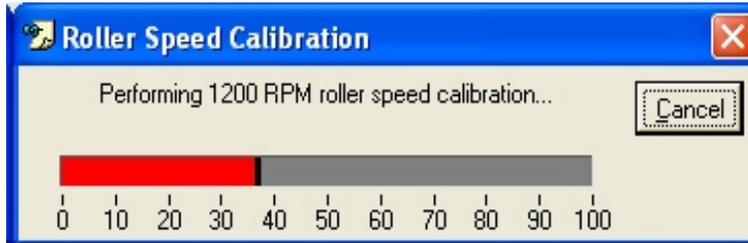
The first time that the software application is run with the instrument, a series of calibration processes will be required to allow the instrument to operate. The computer will prompt the operator of these requirements and online instructions will walk the operator through each of the processes. Here is a summary of these calibration processes.



3.3.1 Roller Speed

The software needs to build a speed verse voltage table in order to be able to predict the approximate voltages required to run the DC motor over the whole speed range of the instrument. Once this voltage table is established, the computer will be able to accurately produce the appropriate voltage to start the test at the specified speed. Please note that closed loop feed back is used to fine tune the actual speed continuously during the test.

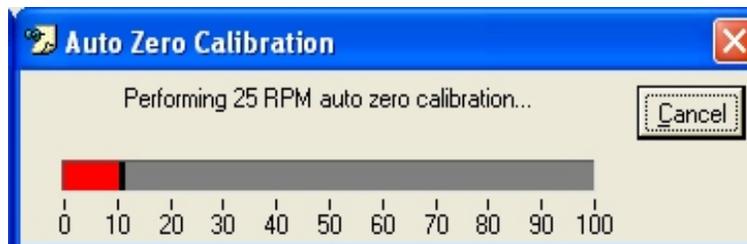
When the speed calibration routine starts, the computer will first run the motor at high speed, then step down the speed in 400 RPM increments recording the voltages over the whole speed range. Upon initial start-up this calibration process might take up to 5 minutes. Subsequent calibration tests will be required on a routine basis to simply fine tune this reference table. These routine calibrations will require much less time to complete. The computer will prompt the operator when this calibration is due.



3.3.2 Auto Tare System

The Tackmaster-PC features a zero offset function. This feature compensates for the zero shift in the Tack measurement present upon speed change. Normally the operator would be required to zero the instrument each time the speed is changed. The software will actually generate a speed verse zero offset table to make this adjustment automatically.

When the tack zero calibration routine starts, the computer will first run the motor at high speed, then step down the speed in 400 RPM increments recording the zero shift over the whole speed range. Upon initial start-up this calibration process might take up to 5 minutes. Subsequent calibration tests will be required on a routine basis to simply fine tune this reference table. These routine calibrations will require much less time to complete. The computer will prompt the operator when this calibration is due.



3.3.3 Tack Sensor Calibration

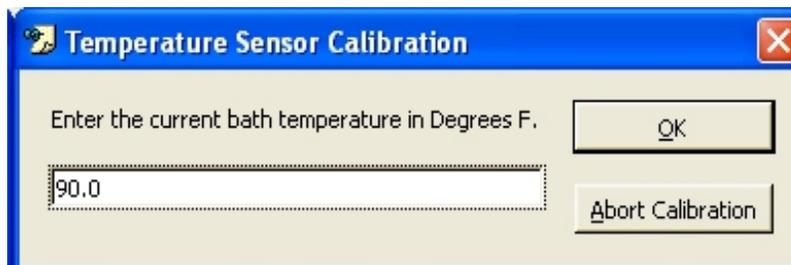
There are actually 3 methods of calibrating the tack data on this instrument. The operator will need to complete the simplest calibration method using the calibration bar initially in order for the Tackmaster-PC to function. The computer will provide on-line instructions for this simple calibration process. Please refer to section 7.3.1 for a description of this process.

All three methods of calibration will be explained in detail in section 7.3.



3.3.4 Temperature Sensors calibration (enhanced temperature option)

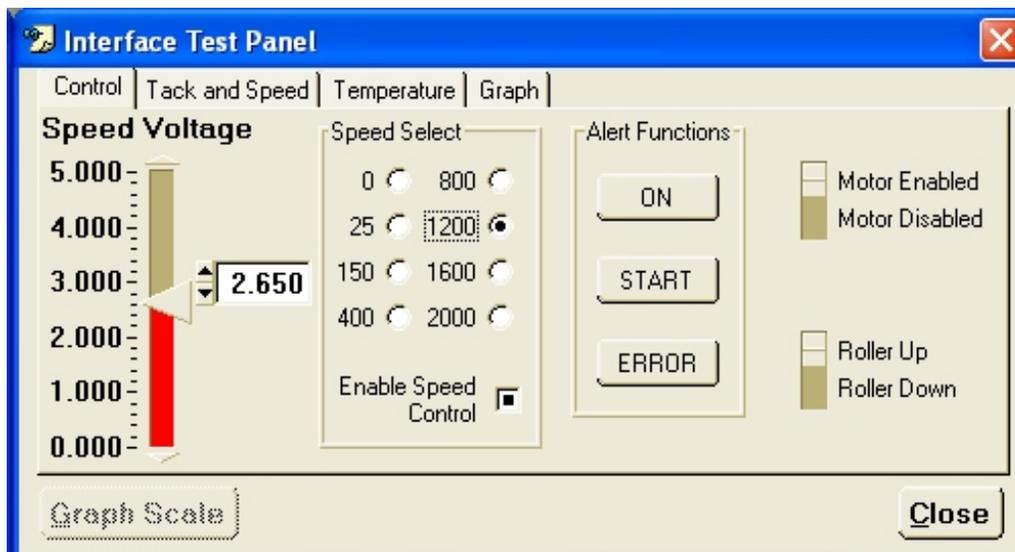
If your Tackmaster-PC is equipped with the enhanced temperature option, you will be required to calibrate the temperature transducer at upon initial start-up. The operator will need to operate the water bath circulator for a short period of time to insure that the water temperature is completely stabilized. Then the operator will measure and enter the exact water temperature. The computer will provide on-line instructions for this process.



3.4 Test Panel

Once all 4 of these calibration processes are complete, the operator can monitor these functions to insure that the data acquisition system is calibrated accurately. The operator can access the test panel by clicking on “Configure” then “Interface” then “Test”. The test panel will appear as follows:

Please note that if any functions are “greyed out” on this test panel or are not reading the correct value, then this function will need to be calibrated again.

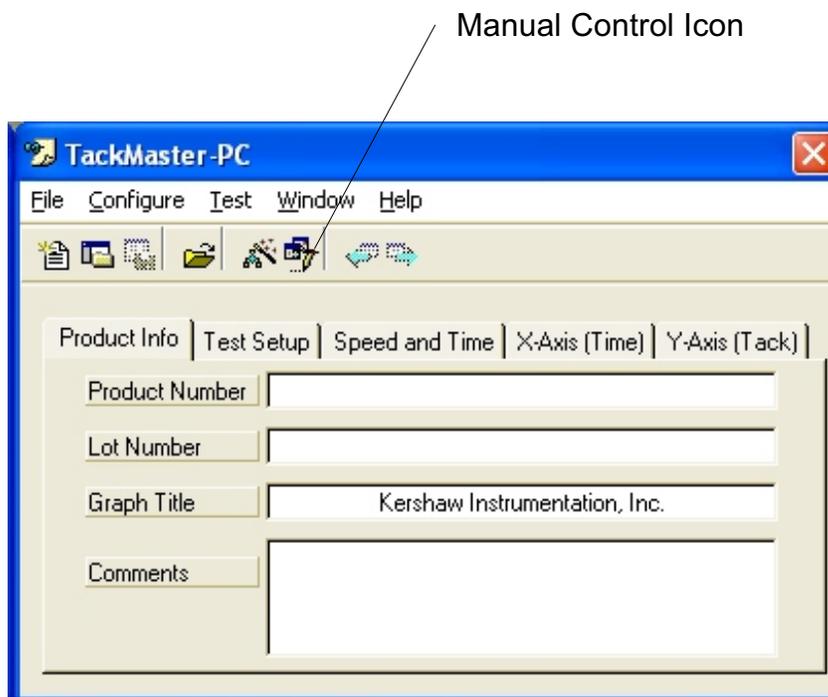


4.0 Manual operation

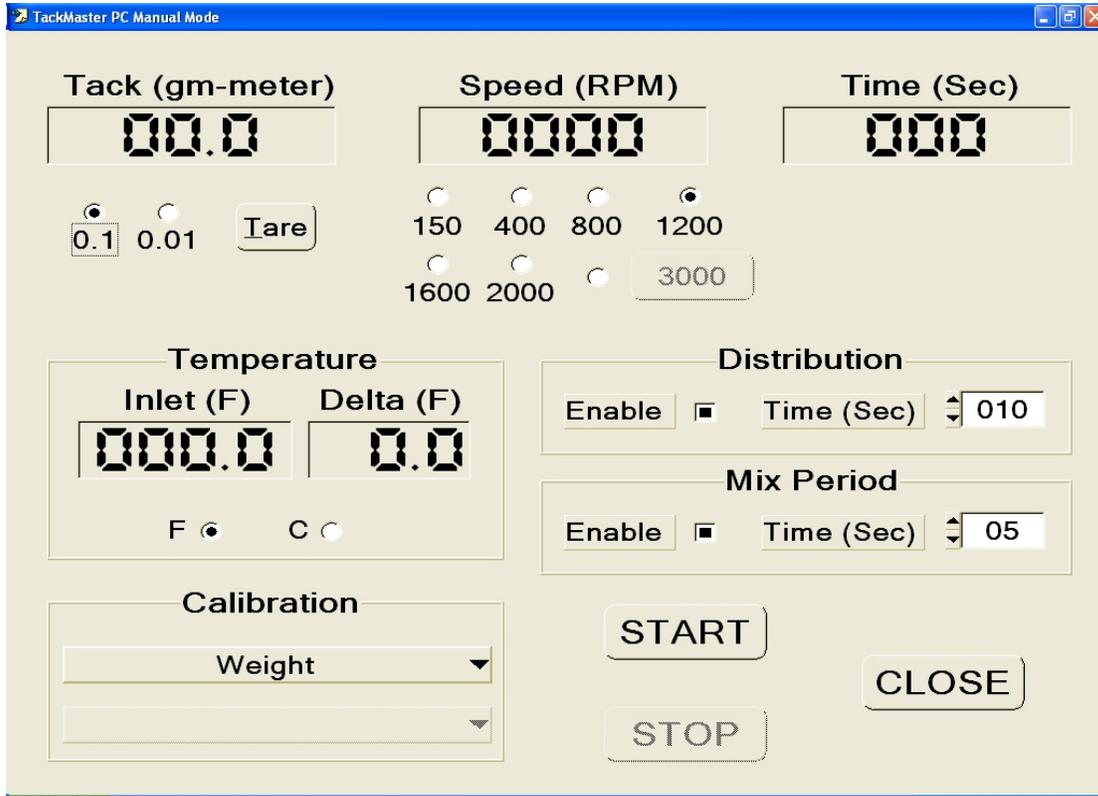
The manual operation of the Tackmaster-PC will allow the user to operate this instrument in the same fashion as conventional tack measuring instruments.

4.1 Initiating the manual operation

To operate this instrument manually from the main menu, click the “Manual” icon as shown below:



The Manual control panel will now appear as shown on the next page:



4.2 Manual Controls

4.2.1 Tack Controls

The digital tack indicator displays the tack value in Gram-meters. The check boxes below the display allow the operator to select either 0.1 or 0.01 resolution.

The “tare” button (zero adjust) allow the operator to zero the tack reading.

4.2.2 Speed controls

The digital speed indicator displays the speed in RPM. The check boxes below the display allow the operator to select the standard preset speeds or can enter a custom speed if desired.

4.2.3 Time indicator

The digital time indicator displays the elapse time of the test in seconds. This timer will start upon pressing the on and stop when the test is stopped.

4.2.4 Temperature indication- Standard model

The digital temperature indicator displays the water temperature in degrees F. This indicator reads to an accuracy of ½ degree F.

4.2.5 Temperature indication- Enhanced Temperature option

The inlet water temperature is displayed on the digital temperature indicator in 0.1 degree increments. The difference between the water inlet and outlet temperatures is displayed as ΔT in 0.1 degree increments.

The purpose of this very accurate ΔT measurement is to indicate the energy generated by the ink during the test.

4.2.6 Calibration mode selection

The operator selects the method of calibration desired from the drop down menu provided.

4.2.7 Start and Stop controls

These buttons are used to start and stop the test.

4.2.8 Mix Period

The mix period is the first process of the test. It simply turns the rolls very slowly (25 RPM) to mix the ink on the rollers before distribution. The operator enters the desired mixing time (seconds) in the box provided.

4.2.9 Distribution time

The distribution time occurs after the mixing time and before the actual test begins. The purpose of the distribution period is to distribute the ink on the rolls thoroughly before the test begins.

The operator selects the time and speed requirements for the distribution interval by entering the specified values in the boxes provided.

5.0 Automatic Operation

The Tackmaster-PC features “Projects” which allows the operator to tailor the automatic test procedure and the graphic display to suit their particular needs. Many of these projects can be generated and stored in the project data base and used as desired. The automatic test processes are run directly from the project menu.

5.1 Building a project

The following section describes each of the parameters associated with the project menus.

5.1.1 “Product Info” tab features

Product and Lot Numbers

The “Product number” and “Lot number” boxes allow the operator to enter these numbers into the project area.

Graph Title

The “Graph Title” will appear as a title on the printout. The user may want to use a Company name, Trademark or customer name in this area.

Comments

The “Comments” box allows the operator to enter pertinent information about this project.

Any or all of these areas can be left blank if desired.

“Product Info” Tab



The screenshot displays the TackMaster-PC software window. The title bar reads "TackMaster-PC" and includes a close button. The menu bar contains "File", "Configure", "Test", "Window", and "Help". Below the menu bar is a toolbar with several icons. The main window area has a tabbed interface with five tabs: "Product Info", "Test Setup", "Speed and Time", "X-Axis (Time)", and "Y-Axis (Tack)". The "Product Info" tab is currently selected. It contains four input fields: "Product Number" (empty), "Lot Number" (empty), "Graph Title" (containing "Kershaw Instrumentation, Inc."), and "Comments" (empty). A thin black line points from the caption above to the "Product Info" tab.

5.1.2 “Test setup” tab features

Data Smoothing

The operator can turn the data smoothing option on by checking the Enable box. When this feature is enabled, next the operator enters a smoothing number from 2 to 20 as desired. The larger the number the greater the effect of the smoothing on the graph.

Deviation Display

This feature is only active when the smoothing is turned on. When this feature is enabled, deviation bars will appear on the graph. The greater the deviation in the raw data from the smooth curve, the larger the bars will appear. The operator can also select the desired interval of these bars.

Temperature Control

This feature will only be active when the enhance temperature control option is installed. When this feature is enabled, the software will raise or lower the set point on the heater/chiller to achieve the Target temperature at the outlet to the Tackmaster-PC.

Calibration Type

This area allows the operator to select the type of calibration method desired.

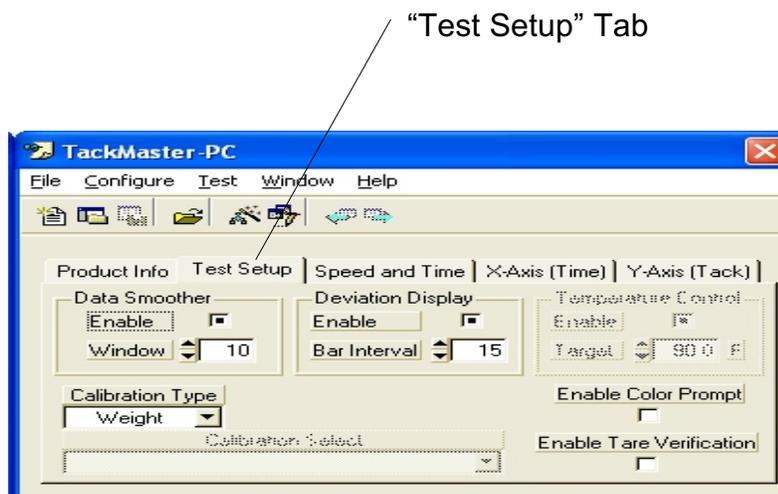
Enable Color Prompt

When this box is checked, the operator will be prompted to select a trace color at the beginning of each test. This feature is useful when running “process color tests” The 4 main process colors being red, blue ,yellow and black have been provided as quick selects at the color prompt.

Enable Tare verification

When this box is checked the instrument will run the rollers dry at the specified test speed to check the tare value of the tack reading. If the tare value is greater then +/- 0.3 gram-meters a failure notice will appear before the test can continue.

If the box is left unchecked, this entire verification process will be skipped, thus the tare value will be left to the discretion of the operator.



5.1.3 “Speed and Time” tab features

Mixing Period

The mixing period is the first process of the test. It simply turns the rolls very slowly (25 RPM) to mix the ink on the rollers before distribution. The operator enters the desired mixing time (seconds) in the box provided.

Distribution Period

The distribution period occurs after the mixing time and before the actual test begins. The purpose of the distribution period is to distribute the ink on the rolls thoroughly before the test begins.

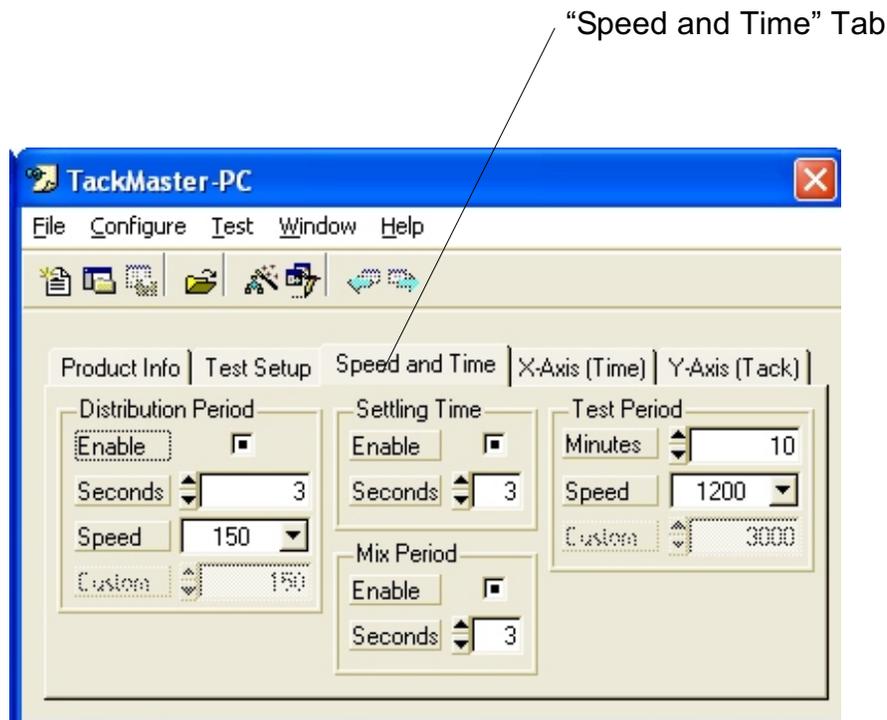
The operator selects the time and speed requirements for the distribution interval by entering the specified values in the boxes provided.

Settling Time

When the instrument begins the test phase the rollers will need time to accelerate to the operating speed and stabilize. During this transition, the data will be unstable. This settling time feature allows the operator to ignore the data during this time. When the enable box is checked, the data will not be recorded or plotted for the selected time period. Keep in mind that the data during this settling time cannot be recovered.

Test Period

In this area the operator enters the length of test and the desired test speed.



5.1.4 “X - Axis (Time) ” tab features

Scaling Mode - Manual

When the operator selects the manual mode, they must also enter the minimum and maximum values desired for scaling the graph. This feature is only for scaling the actual graphic display. The data will be stored accurately even if it exceeds the minimum and maximum values.

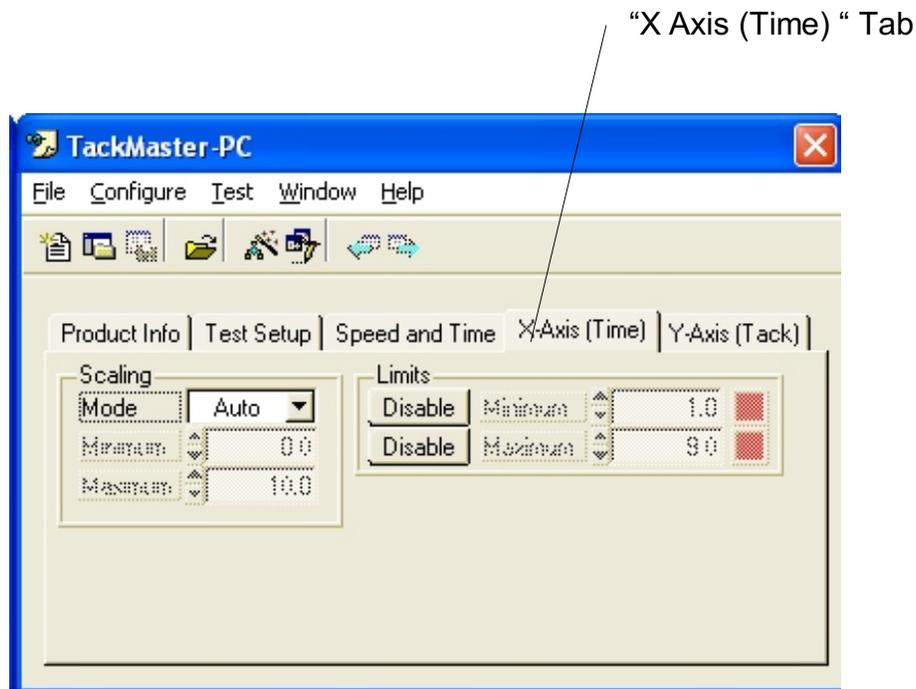
Scaling Mode - Auto

When the operator selects the Auto mode, the software will automatically scale the graph according to the highest and lowest values recorded during the test. The system will be consistently rescaling the graphic display as needed.

Limits

When the limits are enabled, the operator can select the limit values and line colors in this area. These limits will appear on the graphic display.

Please note that all of the features in this area only control the appearance of the graphic display. All of the data is stored in its raw form, thus can be “rescaled ” if desired i.e. the data is not stored as it appears in these project settings.

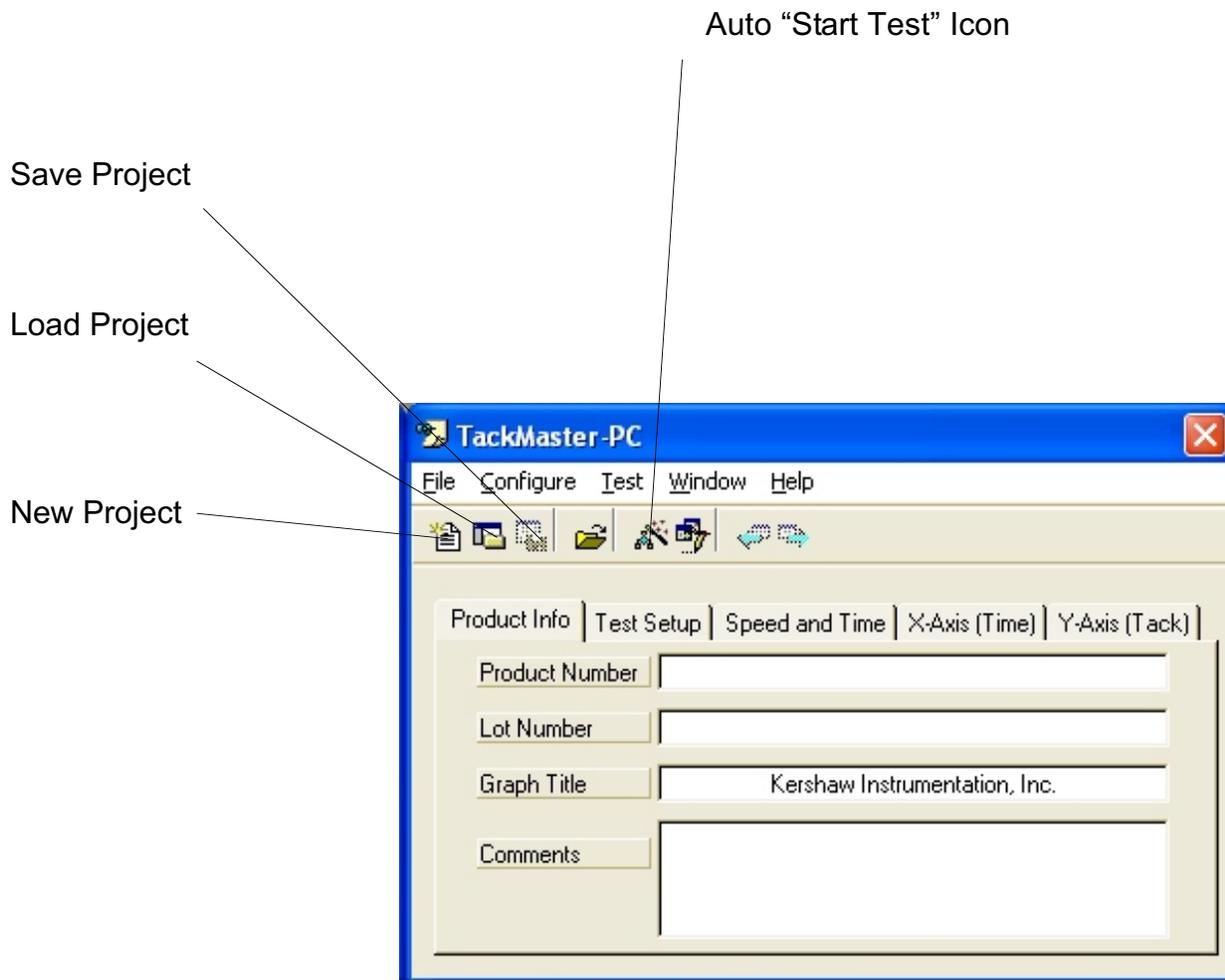


5.1.5 “Y - Axis (Tack) ” tab features

All of the features in this area are identical to the X - Axis (Time) area. See section 5.1.4

5.1.6 Saving and loading projects

The three icons located just above the “Product info” tab are for saving and loading projects. Once the operator has built a project to their specification it can now be stored for future use. When clicking on the “Save Project” icon, the operator will be prompted to enter a project name. This project name will now appear on a drop down menu when they click on the “load project” icon. The operator may only require a few basic tests thus may only have a few projects stored, or they may have hundreds of projects assigned for different products, formulas, customer, operators or suppliers.



5.2 Running an automatic test from a project

This section describes the process when running an automatic test from the project window.

5.2.1 Test start

Once the operator has selected the desired project from the project data base he/she is now ready to begin the test by clicking on the “start test” icon (see the illustration in section 5.1.6 for the location of this icon). The operator will now be prompted to select the trace color if they have checked the “enable color prompt” box and the tare verification routine will be completed if they have selected the “enable tare verification” box.

Now the mixing period will begin, followed by the distribution period and next the instrument will accelerate to the specified test speed to perform the actual test. At this time the graph will appear (as shown in section 6.1) and the trace will appear once the settling time has elapsed. This plot will continue until the test time specified in the project expires. At this time the software will stop recording the Tack data, the instrument will slow to 150 RPM (idle speed), and the results window will appear.

5.2.2 Results Window

The results window will display a summary of the test data including tack, speed and temperature data. When the operator closes this window the instrument will continue to operate at 150 RPM and the software will convert the system back to the manual mode as described in section 4.0.

The screenshot shows a software window titled "Test Results for Yellow10". It contains several data fields and sections:

- Product Number** and **Lot Number**: Input fields.
- Tack Data**:
 - Minimum: 12.5
 - Maximum: 17.9
 - Average: 15.4
 - Standard Dev: 1.6
- Temperature Data**:
 - At Test Start (F): [Empty field]
 - Inlet: 90.3, Delta: 0.0
 - At Test End (F): [Empty field]
 - Inlet: 90.0, Delta: 0.0
- Test Speed**: 1199 RPM
- Slope**: 0.5
- Time Data**:
 - At Max: 10.02 Min
 - Test Time: 10.03 Min
- Close**: Button at the bottom.

5.2.3 Return to manual mode

This manual operation will allow the operator to clean the rollers and prepare to run the next test.

5.2.4 Saving and/or printing the test

Once the software has switched to the instrument into the manual mode as described above, the most recent test's graphic display and data trace is still active. The operator can click on the test icon and bring this graphic display to the front once again. Now he/she can click on the "Save" icon to store the test and/or print the data in a graphic format or a report format. Keep in mind that all of the data is stored in its raw form. The smoothing does not appear in the data sets.

5.2.5 Running multiple tests for process colors

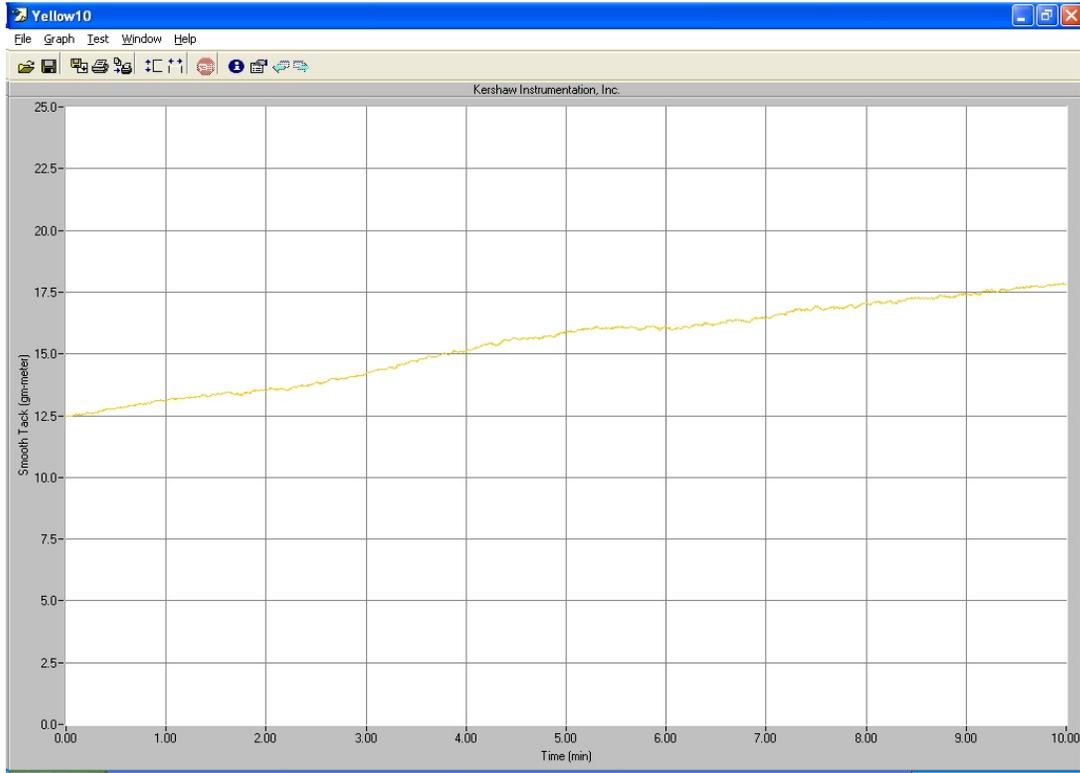
Running multiple inks such as process colors is an easy task. The operator simply runs as many of these automatic tests as needed, selecting the proper trace colors for each plot, then places them all on the same graph.

5.2.6 Adding Multiple data traces on a single graph

After the operator has completed all of the desired tests such as process colors he/she clicks on the "load project" icon and selects to desired project settings.

Now the operator clicks on the "load data" icon and clicks on the first desired trace. Next the operator clicks on the "Add data" icon and selects ALL of the remaining tests desired. When the operator clicks "OK" all of the traces will appear on a single graph.

6.0 Typical test printout



7.0 Calibration

Upon initial start-up of this instrument the software prompted the operator to calibration the speed, temperature and tack systems. These processes were covered in section 3.3. It is recommended that the calibration of these parameters be kept current. These calibration processes are as follows:

7.1 Calibration reminder

A calibration reminder prompt has been provided in this system to alert the operator when calibration is due. This reminder will prompt each 14 days.

7.2 Calibration of Speed and Temperature

Section 3.1 explained in detail the speed profile calibration, tack zero offset calibration and temperature calibration. It is recommended that these parameters be updated as scheduled maintenance on this instrument. To access these calibration processes click "configure", then "Interface" then "Calibrate", select the desired process and follow the on line instructions.

7.3 Tack Calibration

There are three methods of calibration for the Tack system. The operator can select the desired method from either the "Manual Mode" screen or he/she can assign a method of calibration as a project setting on the "test setup" tab in the project area. The following is a description of the 3 methods.

7.3.1 Calibration using the bar

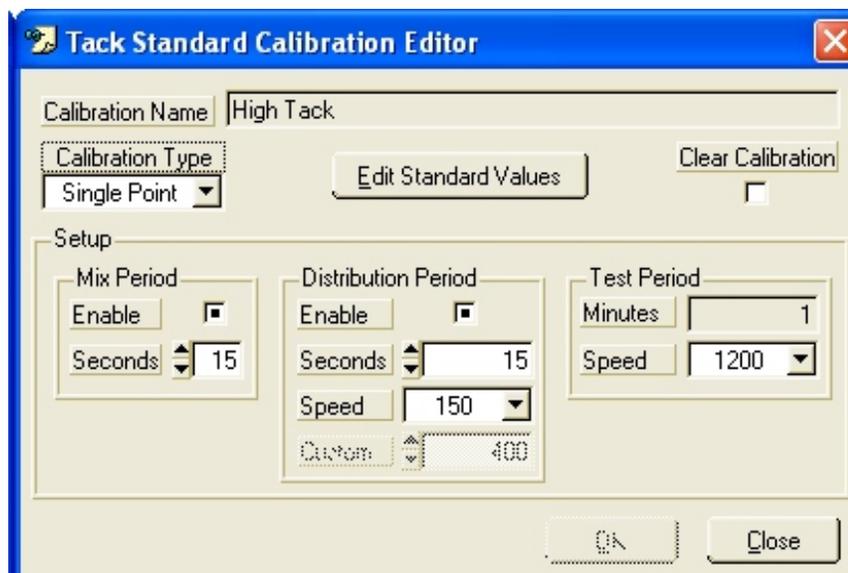
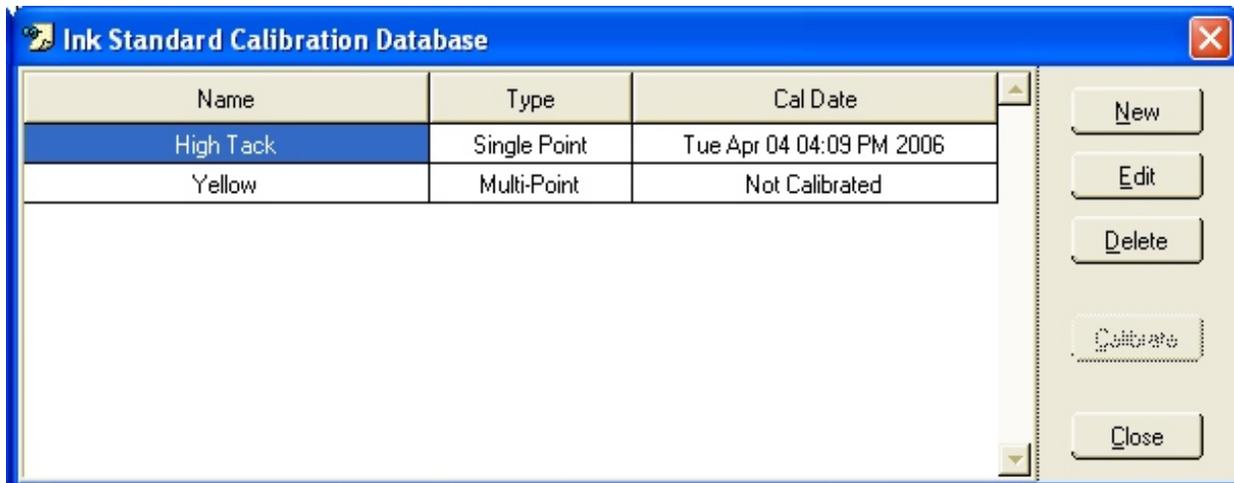
This simple method utilizes the calibration bar as the calibration standard. The brass calibration bar is stored on the left side plate of the machine behind the water seal assembly. This calibration bar attaches to the left side of the top roller by placing it on the calibration saddle. This aluminum calibration saddle is identified by the letters CAL stamped into the side.

To access the tack calibration process using the calibration bar, click “configure”, then “Interface” then “Calibrate”, then select “Tack” and follow the on line instructions.

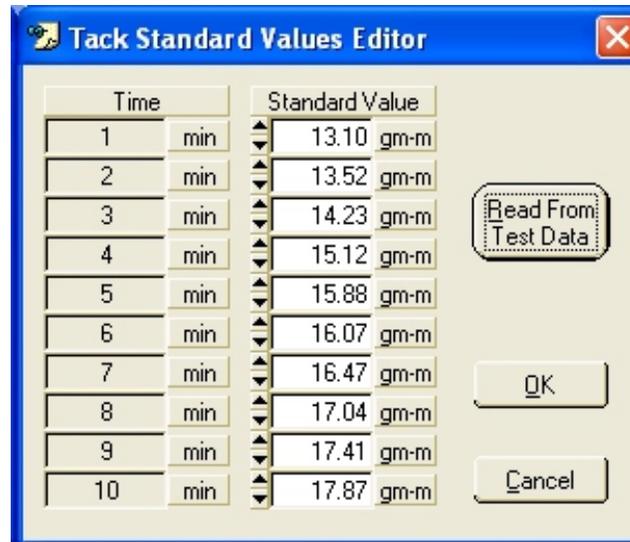
7.3.2 Calibration using a tack standard, single point or multi point

The second and third methods of calibration are single and multi point calibrations using a tack standard ink. To access these calibration methods click “configure” then “Tack Standard Calibrations”. The “Ink Standard Calibration Database” window will now appear. This is the area where the operator will execute the calibration using ink tack standards.

Next the operator will double click on the “Type” button and the “Tack Standard Calibration Editor” window will appear as shown below. The operator will now select the calibration type, and the test parameters required to perform the calibration on a specific tack standard ink.



Now the operator will click on the “Edit Standard Values” button to access the “Tack Standard Value Editor”. The operator will now enter the desired ink tack standard value into the input table provided. If a Single point Calibration type is selected, then the operator will only have access to the 1 minute tack value. If the Multi point calibration type is selected then the operator will have access to 10 data points, one for each of the 10 minutes required for a stability test.



The operator will have the ability to run many different tack standards if required and store all of these scale factors in the data base. This feature is extremely useful when the Tackmaster-PC is required to correlate with other testers at different location or different customers or suppliers using different tack standards. We will use the following example to explain this feature in detail.

An ink manufacturer is obtaining inks and raw materials from several different sources all of which have there own unique calibration standard ink. We know from experience that each of these locations will yield different results when using a single tack standard ink. In this case the operator could run each of the tack standards on the Tackmaster-PC and assign the branch location as the tack standard name.

After this data base of tack standards has been completed, the operator simply selects the branch location from the “calibration selection” drop down menu. The instrument will now correlate with the tack standard used at this particular branch location.

7.3.3 Tack standard calibration using a test file

In some cases you can use a test file to generate the 10 calibration points needed to complete the “Tack Standard Value Editor” table shown above. If the 10 minute stability test has already been run on a Tackmaster-PC or a Tackmaster-92, then the operator can simply click on the “read from test data” button, select the desired test file and the 10 calibration data points will be filled in automatically. This feature allows the user to “best fit” the ink stability curve to match the results obtained on an other tack measuring instrument.