
PBFT VS SPC 98 User Guide

for
GPD Peel Back Force Tester
with SPC Capability

March 20, 2003

Document Version 9.0c
for **Software** Version 3.01

CE Compliant, Part No. PBT-002D

PBFT VS SPC 98 User Guide
Prepared by GPD Global Documentation Dept.
Copyright ©2003 GPD Global
All Rights Reserved

GPD Global
2322 I-70 Frontage Road, Grand Junction, CO 81505
Tel: 970.245.0408 Fax: 970.245.9674
USA & Canada: 1.800.742.5473
E-mail: info@gpd-global.com
Web site: www.gpd-global.com

Safety Instructions



IMPORTANT

For your personal protection, read all instructions before operating this machine.



Strain Gauge - Battery Pack

DO NOT use other types of chargers besides the PBFT's built-in battery charger. The strain gauge is equipped with a rechargeable NiCad (nickel cadmium) battery pack which is not accessible to the operator and should only be replaced by qualified maintenance or technical personnel fully aware of all safety precautions.



Strain Gauge - Speed

DO NOT strike or jar the strain gauge. Apply pressure to the strain gauge clip in a pulling or pushing motion, not by hitting or jarring it. Applying force to this precision instrument at an excessive speed may result in permanent damage to the unit.



Strain Gauge - Force

DO NOT apply more than 1 kilogram of force to the strain gauge clip. Applying excessive weight to this clip, which measures the peel back force of the cover tape, may result in permanent damage to the unit.



Power Source

Operate the PBFT only from the type of power source indicated on the data plate.



Grounding

The PBFT is equipped with a 3-wire grounding type plug (a plug with a third grounding pin). The 3-wire grounding type plug will fit into a grounding type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact your electrician to replace your obsolete outlet. Do not defeat the safety purpose of the grounding plug.



Water & Moisture

DO NOT use the PBFT near water or moisture (damp or wet floor, bench, or table) as corrosion can affect the smooth, consistent operation of the carriage, and thereby the PBFT's readings.



Attachments

DO NOT use attachments not recommended by GPD with the PBFT.



Accessories

DO NOT place the PBFT on an unstable cart, stand, tripod, bracket, or table. The PBFT may fall, causing serious personal injury and/or damage to unit.

TABLE OF CONTENTS

| | page | | page |
|--|------|--|------|
| Getting Started | 1 | Maintenance | 30 |
| Overview | 1 | Preventive Maintenance Schedule | 30 |
| Function | 1 | Replace Lamp | 31 |
| Theory of Operation | 1 | Calibration Accuracy | 31 |
| Mechanical Controls | 2 | Verify Motor Speed | 31 |
| Software Control | 3 | Motor Speed Recalibration | 32 |
| Installation | 4 | Verify Strain Gauge Operations | 33 |
| 1 - Unpack & Assemble | 4 | Installing Calibration Kit | 35 |
| 2 - Verify Mechanical Operations | 4 | Troubleshooting | 36 |
| 3 - Install PC Hardware | 5 | Spare Parts & Accessories | 38 |
| Install Converter Card | 5 | Suggested Spare Parts | 38 |
| Install Adapter | 6 | Suggested Accessory Item | 38 |
| Install Amplifier Cable | 6 | Specifications | 39 |
| 4 - Install & Run Interface Card Software .. | 6A | | |
| Install Instacal | 6A | | |
| Run Instacal | 6B | | |
| 5 - Install SPC Software | 8 | | |
| 6 - Initial Start Up | 7 | | |
| Configure & Calibrate | 9 | | |
| 1 - Configure PBFT with Computer | 9 | | |
| 2 - Calibrate PBFT Speed | 10 | | |
| 3 - Calibrate PBFT Strain Gauge | 12 | | |
| Basic Operations | 14 | | |
| 1 - Start Up | 14 | | |
| 2 - Verify Speed | 15 | | |
| 3 - Configure Printer | 16 | | |
| 4 - Open PBFT Control Center | 17 | | |
| 5 - Modify Test Parameters | 17 | | |
| 6 - Load Carrier Tape | 18 | | |
| Prepare PBFT | 18 | | |
| Load Tape | 18 | | |
| 7 - Run a Test | 20 | | |
| 8 - Additional Operations | 21 | | |
| Save Test Results | 21 | | |
| Print Test Results | 23 | | |
| Change Unit of Force | 24 | | |
| Load Results | 24 | | |
| SPC Analysis | 25 | | |
| Filters | 27 | | |
| Single File Statistics | 28 | | |
| Histogram | 28 | | |
| Horizontal Sections | 29 | | |
| 9 - Shutdown | 29 | | |
| | | Appendices | 41 |
| | | Language Selection | 42 |
| | | Report & Label Samples | 43 |
| | | User Access | 46 |
| | | Window Map | 48 |
| | | Window References | 49 |
| | | Mechanical Assembly Drawings | |
| | | Block Diagram | |
| | | Electrical Schematics | |
| | | Warranty | |

NOTES

Getting Started

GPD suggests reading the document sections listed below to gain a complete understanding of how to set up and operate your GPD Peel Back Force Tester (PBFT):

1. Tour the *Overview* section (beginning on page 1) to gain an understanding of the PBFT's purpose, its theory of operations, and the location and name of its mechanical and software controls.
2. Use the *Installation* instructions (pages 4 through 8) and *Configure & Calibrate* instructions (pages 9 through 13) to properly install and prepare your PBFT for operations.
3. Follow *Basic Operations* (page 14) to put your software-driven PBFT into operation.

Hints: For a visual representation of how the software windows interrelate, refer to *Window Map* (page 49). For a description of the elements within each window, refer to *Window References* (page 50).

Overview

This document describes how to use GPD's PBFT (Peel Back Force Tester) VS and its control software, FORCEWare®. FORCEWare® drives the PBFT VS with SPC and collects data from it, or can demonstrate such operation. The PBFT VS provides reliable and accurate peel back force measurements of cover tape adhesion to surface mount component carrier tapes ranging in width from 8 mm to 56 mm.

FORCEWare® is a software package designed by GPD to be compatible with Windows® 95 and Windows® 98 operating systems. FORCEWare® was constructed for easy use with a variety of hardware and contains many new features requested by our customers. It is, however, not backward compatible with the DOS based software previously used with the PBFT (PBFT software and MASTERFORCE software).

Function

GPD's PBFT accurately measures and records the peel-back force required to remove the cover tape from surface mount component carrier tape. The PBFT is designed to meet EIA-481-1, EIA-481-2, and EIA-481-3. It accommodates tape widths from 8 mm to 56 mm and accepts plastic, metal, and paper tape materials in single and dual sprocket configurations. Test results are recorded for incoming or outgoing taped components.

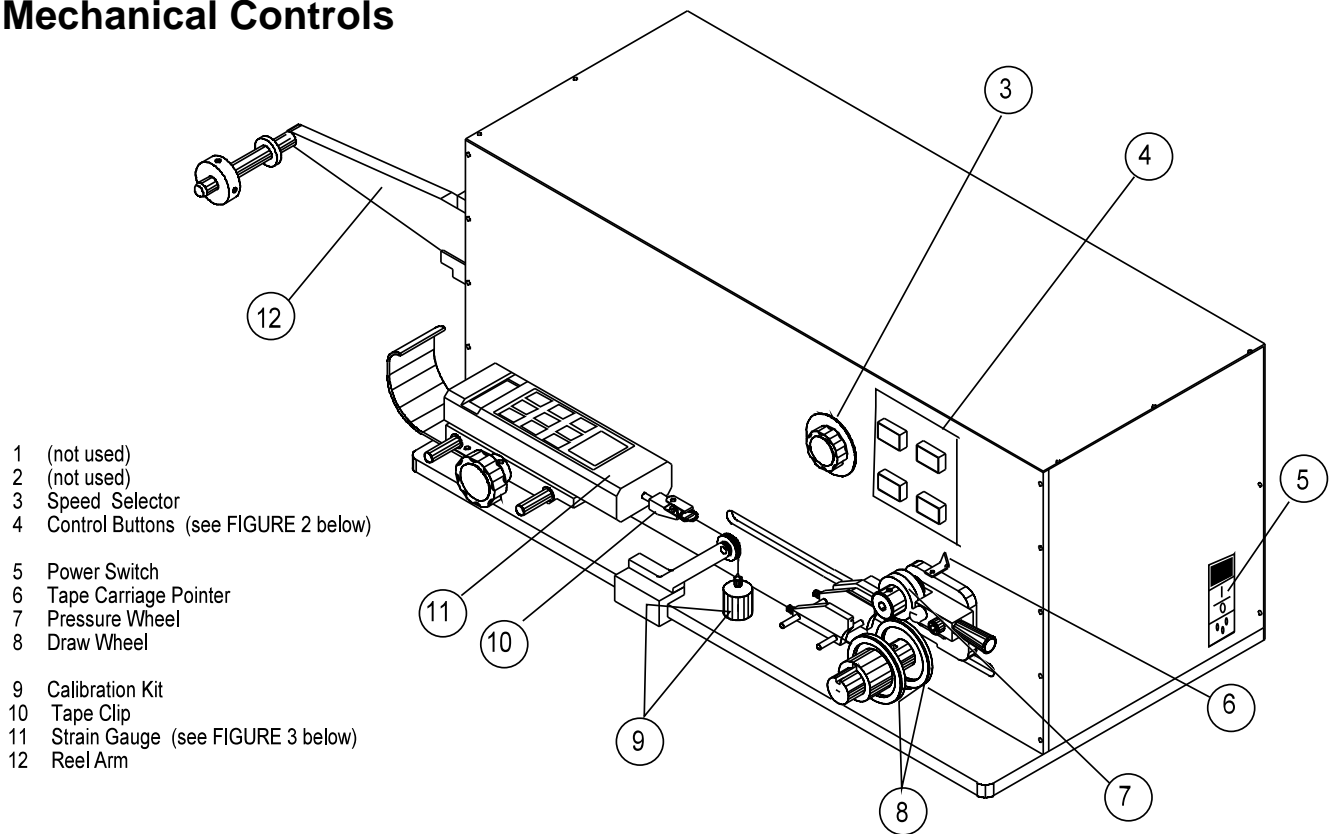
Theory of Operation

Set up involves loading and aligning a reel or strip of component carrier tape, verifying peel speed, configuring the printer, and, as needed, modifying test parameters.

Operations consist of zeroing out the strain gauge, logging onto the SPC software, setting the speed selector to the desired testing speed, and activating a test run.

Test results and speeds are recorded by the SPC software; the peel-back force is also displayed on the strain gauge LCD. Test results may be saved, printed, or reloaded for SPC analysis.

Mechanical Controls



- 1 (not used)
- 2 (not used)
- 3 Speed Selector
- 4 Control Buttons (see FIGURE 2 below)
- 5 Power Switch
- 6 Tape Carriage Pointer
- 7 Pressure Wheel
- 8 Draw Wheel
- 9 Calibration Kit
- 10 Tape Clip
- 11 Strain Gauge (see FIGURE 3 below)
- 12 Reel Arm

Figure 1 PBFT VS - Key elements (shown with Calibration Kit installed)

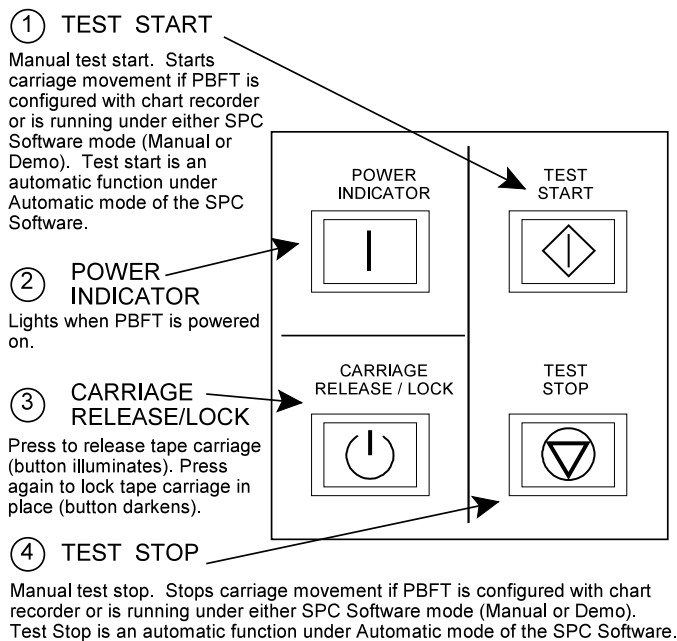


Figure 3 PBFT VS Control Buttons

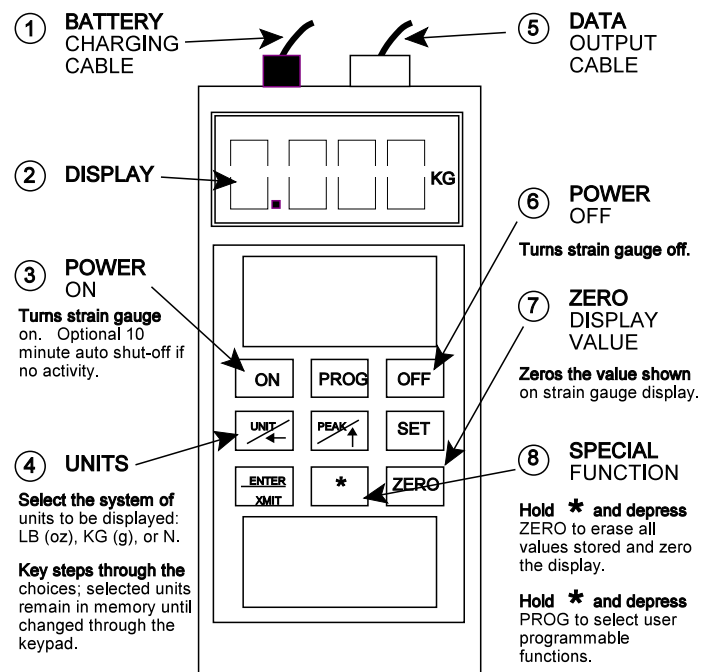


Figure 2 Strain Gauge - key elements

Software Control

All FORCEWare® functions originate with the main window menu bar and its pull-down menus. A description of each function is listed below.


Hint: For a detailed map of all FORCEWare® windows, see *Window Map* (page 49).



| Menu Bar | Pull-down Menu | Description |
|----------|-------------------|--|
| User | Login | Enter a valid user (or vendor) account and password. |
| | Create/Modify | Add or change user/vendor password, security level, and access rights. Also set defaults for save, print, and test parameters options by user/vendor. |
| | Remove | Delete a user account. |
| Setup | Configure PBFT | Configure the PBFT and its interaction with the PC interface card, and calibrate the PBFT speed indicator and strain gauge. |
| | Configure Printer | Define printer options - report dimensions and appended report text. |
| PBFT | Activate PBFT | Use PBFT Control Center to define test parameters and unit of measure, run a test, and view, print, and/or save test results. Also use this window to review prior test results. |
| SPC | SPC Analysis | Display and/or generate reports of SPC data for a user-defined group of test results over a user-defined date and time span. |
| Exit | | Exits from the FORCEWare® control software. |
| About | About FORCEWare® | Title, version number, and release date of the control software. |

Installation

To utilize the FORCEWare® software package, use the following installation procedures to install the provided hardware on your computer and, as applicable, on your PBFT; connect the computer and PBFT with the provided amplifier cable; install the software on your computer; and set up an initial user account.

 **CAUTION:** Installation should only be performed by qualified maintenance or technical personnel fully aware of all safety precautions. Read all safety instructions (page ii) before proceeding with installation.

Installation Procedure


Installing your PBFT is a six step process. Perform all of the following steps in the order listed:

- 1 - Unpack & Assemble
- 2 - Verify Mechanical Operations
- 3 - Install PC Hardware
- 4 - Install & Run Interface Card Software
- 5 - Install SPC Software
- 6 - Initial Start Up

1 - Unpack & Assemble

Unpack machine carefully - this is a PRECISION INSTRUMENT:

1. Place the machine on a stable, level surface.
2. Visually inspect the machine for any damage due to shipping. If any obvious damage is observed, contact the GPD Service Dept. at (970) 245-0408 (in USA and Canada, call 1-800-742-5473).

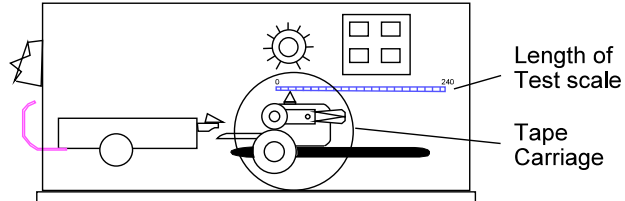
 **CAUTION:** Operation of a damaged machine may cause personal injury and/or invalidate the warranty.

3. Verify that all accessories and documentation have been removed from the crate and packaging.
4. Verify that the draw wheel (see page 2, Figure 1, Item 8) and pressure wheel (Item 7) are in place.
5. Install the reel arm (Item 12) with the provided screws.
6. Plug the PBFT's power cord into the PBFT power outlet (located below the power switch (Item 5)). Plug the other end into a suitable power outlet. See *Specifications* (page 40) for power requirement details.

2 - Verify Mechanical Operations

1. Turn on the PBFT power switch. The power indicator (page 2, Figure 2, Item 2) will light.
2. Verify that the strain gauge (page 2, Figure 1, Item 11) is functional:
 - a. Verify the following cables are attached to the strain gauge:
 - Battery charging cable (page 2, Figure 3, Item 1).
 - Data output cables (Figure 3, Item 5).
 - b. Press and hold the strain gauge ON button (Figure 3, Item 3) until a display (Figure 3, Item 2) appears:
 - If the display fails to appear, let the PBFT recharge the strain gauge battery for *30 minutes*.
 - If the display shows a message of 'BATT', let the PBFT recharge the strain gauge for *one hour*.

3. Verify that the tape carriage is functional:
 - a. Press CARRIAGE RELEASE/LOCK (Figure 2, Item 3) to release the tape carriage.
 - b. Manually position the tape carriage pointer (Figure 1, Item 6) with the zero (0) mark on the Length of Test scale (see below).



Align tape carriage

- c. Press CARRIAGE RELEASE/LOCK to lock the carriage in place.
- d. Select a speed on the speed selector (Figure 1, Item 3).
- e. Press TEST START (Figure 2, Item 1). The following should occur:
 - The tape carriage will automatically travel to the end of its range and stop.
 - The TEST START lamp will darken.



CAUTION: If the TEST START light does not darken, IMMEDIATELY turn off the power switch and contact the GPD Service Dept. at (970) 245-0408 (in USA & Canada, call 1-800-742-5473).

3 - Install PC Hardware

Installation requires placing a converter card in a compatible computer; connecting the computer to the PBFT with an amplifier cable; installing Instacal for the interface card; and installing FORCEWare®, the control software, on the computer. For a retrofit, installation requires installing an adapter between the PBFT and amplifier cable.

For hardware and software requirements for operating a PBFT VS with a personal computer, see *Specifications, PC Requirements* (page 40).

Install Converter Card

1. Verify that the power for both the PBFT and computer are turned off.

IMPORTANT: Address 0x300 and interrupt 5 MUST be available PRIOR to installation.

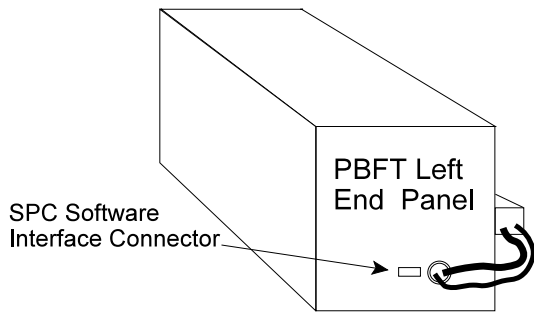


CAUTION: Always power off the PBFT and computer prior to connecting or disconnecting the amplifier cable or damage to the cable and/or computer board could result.

2. If you are installing FORCEWare® as a retrofit, remove the existing converter card from the computer.
3. Install the provided DAS 802/16 card (A/D board) in any of your computer's empty ISA slots.

Install Adapter

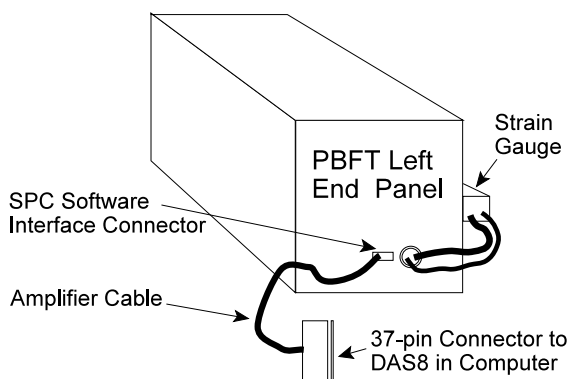
If you are installing the FORCEWare® software package as a retrofit to an existing PBFT, connect the provided adapter to the SPC Software Interface Connector in the left end panel of the PBFT; otherwise, skip this step.



Adapter installation for retrofits

Install Amplifier Cable

1. Connect the provided Amplifier Cable's 37-pin connector to the DAS 802/16 card at rear of the computer.
2. Plug the other cable end into the PBFT's SPC Software Interface Connector (or adapter for those installing the FORCEWare® software package as a retrofit).



Amplifier cable installation

4 - Install & Run Interface Card Software

Instacal, the interface card software, must be installed and run prior to installation of the PBFT control software. Instacal sets up the interface card and enables testing of card functionality.

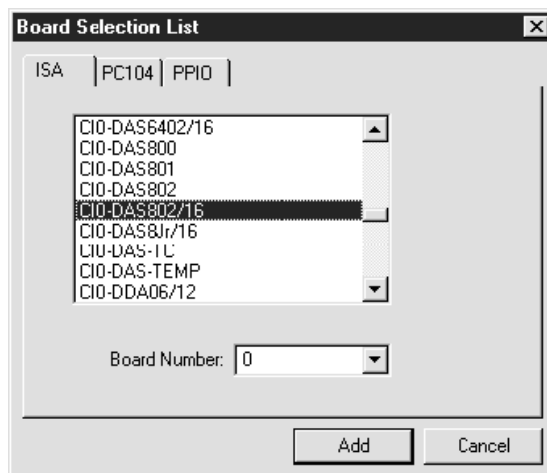
NOTE: All required cards and cables must be installed prior to software installation. Refer to the previous procedure, *Install PC Hardware*.

Install Instacal

1. Turn on the PBFT power switch. The power indicator (page 2, Figure 2, Item 2) will light.
2. Press and hold the strain gauge ON button (page 2, Figure 3, Item 3) until a display (Figure 3, Item 2) appears.
3. Place the first Instacal diskette in the a: floppy drive.
4. Click on the Start button in the lower left hand corner of the screen and choose Run.
5. Type a:\setup and press ENTER.
6. When installation is complete, remove the Instacal diskette and, if prompted to do so, reboot the computer.

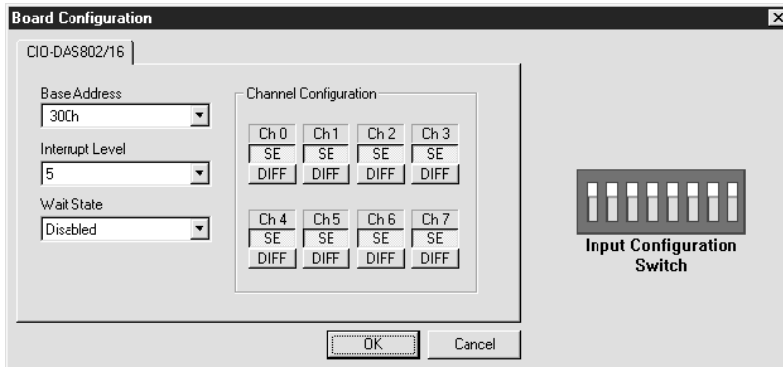
Run Instacal

1. Run Instacal by clicking on Start > Programs > Computer Boards > Instacal.
2. Set up the interface card (board):
 - a. Click on Install > Add Board. A Board Selection List appears.



- b. Scroll down the list and highlight CIO-DAS802/16.
- c. Click ADD.
- d. Click on Install > Configure.

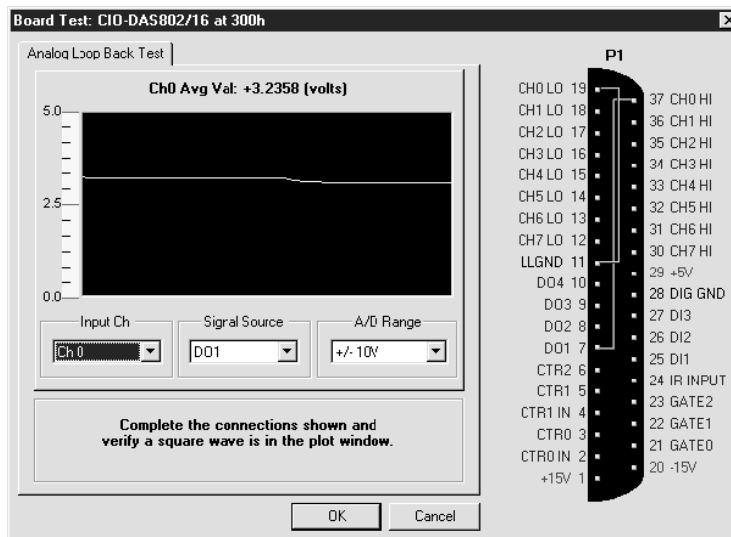
- e. Verify that the Base Address is 300, the Interrupt Level is 5, and the Wait State is Disabled.



- f. Click on each SE button to make sure they are enabled (light gray) and then click OK.

3. Test the interface card/strain gauge/cable setup:
 - a. Click on Test > Analog.
 - b. Select a Signal Source of EXTERNAL and click OK.

NOTE: Spikes in the line, prior to selecting EXTERNAL, are normal due to random environmental noise. Spikes should disappear once EXTERNAL is selected.



- c. Apply force to the strain gauge. The Analog Loop Back Test panel should display strain gauge changes. If changes are not evident, check for power to the PBFT and Strain Gauge and repeat interface card setup to verify correct configuration. If problems persist, call the GPD Service Dept.

4. Exit Instacal by clicking on the 'x' in the upper right hand corner of the Instacal window.

5 - Install SPC Software

1. Place the FORCEware® (SPC software) setup diskette in the a: floppy drive.
2. Click on the Start button in the lower left hand corner of the screen and choose Run.
3. Type a:\setup and press ENTER.
4. Follow the instructions displayed to complete installation.
5. When installation is complete, reboot the computer when prompted.

6 - Initial Start Up

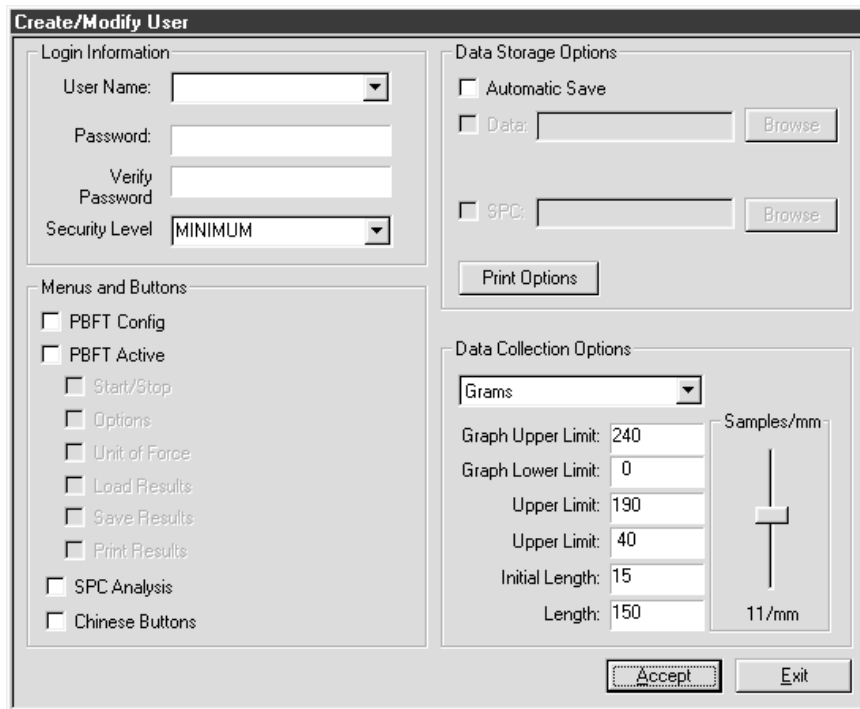
Create an initial user account with access to all aspects of the control software:

1. For initial access to the program:
 - a. Click on the Start button (in lower left hand corner of screen) and select Programs > GPD FORCEWare® > GPD FORCEWare® SPC.
 - b. Answer OK to each of the prompts warning that the software has not been configured.
 - c. User Login will automatically appear.



- d. Type "back" as the User Name.
- e. Type "door" as the Password.
- f. Click on ACCEPT. A "Superuser Access Granted" prompt appears.
- g. Click on OK.

2. Set up initial user account:
 - a. From the main menu bar of the main window, click on User > Create/Modify. Create/Modify User will appear.



- b. Type in a user name, a password, and password verification.
- c. Select a Security Level of MAXIMUM.
- d. Click on all access rights in the Menus and Buttons panel that pertain to current user.
- e. As necessary, set the defaults in the Data Storage Options and Data Collection Options panels.
For details, see *Create/Modify User Window* (page 52).
- f. Click ACCEPT.
- g. Click OK on the "User created/modified" prompt that appears.
- h. Click on EXIT.

You may now log on as the newly created user.



IMPORTANT: Prior to operating the PBFT, the software **MUST** be configured and calibrated. See *Configure & Calibrate* (page 9).

Configure & Calibrate

Generally, the following procedures for configuring the PBFT and calibrating its speed control and strain gauge to the FORCEWare® control software are performed only for initial start up. However, if accuracy performance deteriorates, the following *Calibrate PBFT Speed* and *Calibrate PBFT Strain Gauge* procedures should be repeated. These procedures may be performed on a regular basis to prevent accuracy problems from developing.

Configure & Calibrate Procedure

Configuring and calibrating your PBFT is a three step process. Perform all of the following steps in the order listed:

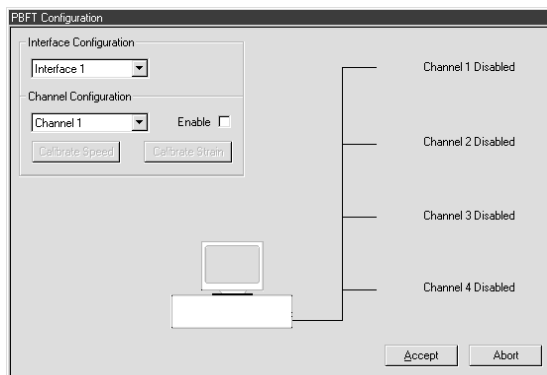
- 1 - Configure PBFT with Computer
- 2 - Calibrate PBFT Speed
- 3 - Calibrate PBFT Strain Gauge

1 - Configure PBFT with Computer

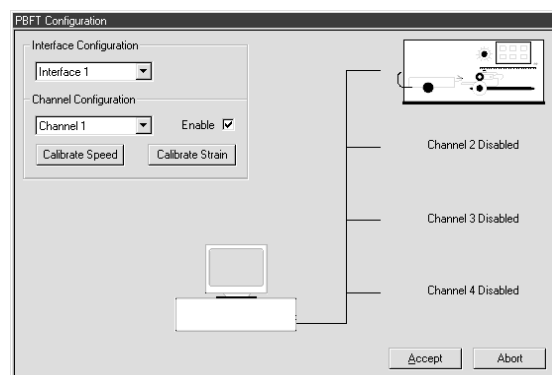
Using FORCEWare®, define and enable the interface card channel to which the PBFT is connected.

To configure the PBFT with the computer interface card:

1. Verify that both the computer and PBFT are powered on.
2. If not already done, perform *Initial Start Up* (page 7).
3. In FORCEWare®, click on Setup > Configure PBFT from the main window menu bar. The PBFT Configuration window appears.
4. If the PBFT Configuration window looks like the window below at left, with no picture of a PBFT in the upper right hand corner, proceed to step 5. If, like the window below at right, a picture of a PBFT appears in the upper right hand corner, skip to step 8.

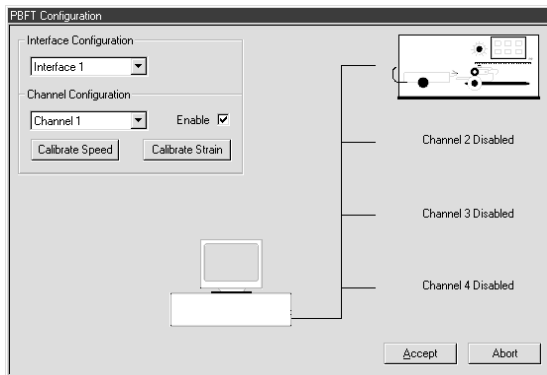


Not previously configured



Previously configured

5. As necessary, change the Interface Configuration selection. (Use Interface 1.)
6. As necessary, select a channel from the Channel Configuration selection box. (Use Channel 1.)
7. Click on the Enable check box. A picture of a PBFT replaces the Channel 1 Disabled label to indicate that the channel is enabled.



PBFT configured with computer interface card

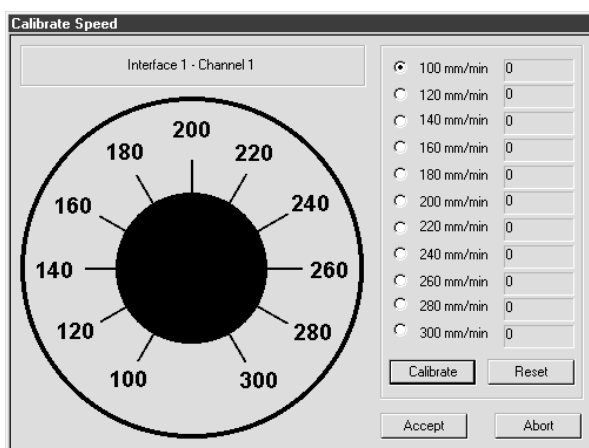
8. Perform the following *Calibrate PBFT Speed* procedure.

2 - Calibrate PBFT Speed

Calibrating the PBFT speed dial requires repeating a simple procedure for each speed setting. First, set the mechanical speed selector to a speed, then select the corresponding software speed value, and finally, click on the software Calibrate button.

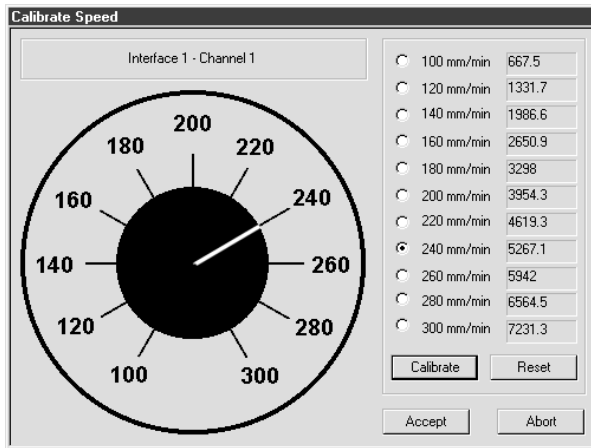
To calibrate FORCEWare® to the PBFT speed indicator:

1. If this is an initial set up, first perform *Configure PBFT with Computer* (page 9).
2. Click on Setup > Configure PBFT from the main window menu bar. PBFT Configuration appears.
3. Click on the CALIBRATE SPEED button. The Calibrate Speed window appears.



Prior to calibration or in reset condition

4. Coordinate the PBFT Speed Selector dial and the simulated dial displayed in the Calibrate Speed window:
 - a. Turn the Speed Selector dial on the PBFT until it points at the 100 mm/min setting.
 - b. Click the CALIBRATE button displayed in the window. You may use either the mouse or press ENTER on the computer keyboard.
 - c. Turn the PBFT dial to the next setting, 120, and again, click CALIBRATE.
 - d. Continue to set the dial and click on CALIBRATE for each speed. When complete, the window should look similar to the one below with values to the right of each speed designation. The values now displayed are in raw data format for the interface card.



Speed values should differ by a consistently similar incremental amount.

- e. The incremental difference between the displayed values should be a consistently similar amount. If they are not, recalibrates the PBFT by clicking on RESET and repeating steps 3 and 4.
5. When you are satisfied with the displayed calibration values, verify that the PBFT Speed Selector dial and the simulated dial are synchronized:

Example: Note that the simulated dial in the illustration above is set to 240 mm/min. This indicates that the Speed Selector dial on the PBFT is set to 240 mm/min.

To coordinate the dials:

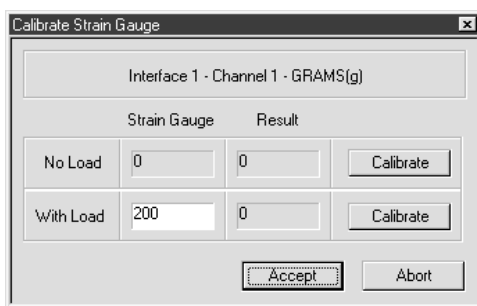
- Turn the Speed Selector dial on the PBFT, in turn, to each speed increment.
 - At the same time, note the response of the simulated dial. It should respond by changing to the same setting.
6. Click ACCEPT to save the changes. The PBFT Configuration window reappears.
 7. Click ACCEPT on the PBFT Configuration window.

3 - Calibrate PBFT Strain Gauge

Calibrating the control software with the PBFT strain gauge is simply a matter of first calibrating the software without a load on the strain gauge and then calibrating the software again with a load (a weight in the upper range) on the strain gauge. Use the GPD Strain Gauge Calibration Kit (PBT-107) to verify strain gauge operations.

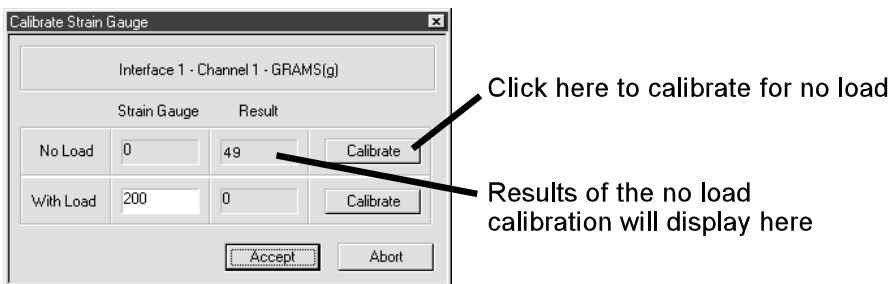
To calibrate FORCEWare® to the PBFT strain gauge:

1. If this is an initial set up, first perform *Calibrate PBFT Speed* (page 10), otherwise, skip to next step.
2. Click on Setup > Configure PBFT from the main window menu bar.
3. Click on the CALIBRATE STRAIN button. The Calibrate Strain Gauge window appears.



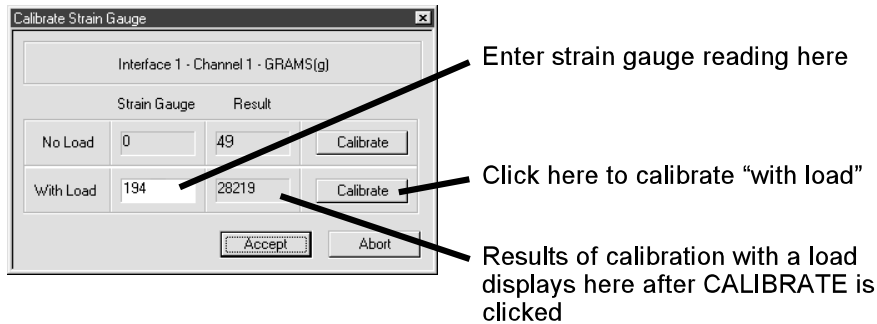
Prior to strain gauge calibration

4. Prepare the PBFT strain gauge:
 - a. Verify that the PBFT strain gauge is powered on.
 - b. With no load on the strain gauge, press the strain gauge's ZERO button.
 - c. Verify that the unit of force (g, kg, N, or lb) displayed by the strain gauge is the same as that displayed in the Calibrate Strain Gauge window. If they do not agree, either change the unit of force in the user's account to agree with the strain gauge or calculate the conversion when asked to enter the strain gauge reading.
5. Click the CALIBRATE button in the No Load row of the Calibrate Strain Gauge window. An acceptable value for the Result column of the No Load row should be within the 0 to <650 range.



Calibrating the strain gauge with NO load on it

- Place a load on the strain gauge and allow the weight to stabilize. A maximum load of 150 grams to 200 grams is recommended.
- Enter the strain gauge reading in the Strain Gauge field of the With Load row. Then click on the CALIBRATE button in the same row. Results similar to those shown below should display. The results for a weight of 200 grams should not exceed a value of 45000.



Calibrating the strain gauge WITH a load on it

- If an "Unacceptable Range" prompt appears, click CANCEL and repeat steps 6 and 7. Check to be sure you are using the same unit of force in the software and on the strain gauge. If the message continues to appear, use a lighter load on the strain gauge.
- Click ACCEPT in the Calibrate Strain Gauge window.
- Click ACCEPT on the PBFT Configuration window. Calibration is now complete.

Basic Operations

The basic process used to run a peel back force test with FORCEWare® and report the results is summarized below. A detailed procedure for each of the summarized steps then follows.

Basic Operations Procedure

There are nine basic steps you need to follow in order to operate your PBFT. Perform all of the following steps in the order listed:

- 1 - Start Up
- 2 - Verify Speed
- 3 - Configure Printer
- 4 - Open PBFT Control Center
- 5 - Modify Test Parameters
- 6 - Load Carrier Tape
- 7 - Run a Test
- 8 - Perform any of the various Additional Operations: Save Results, Print Results, Change Unit of Force, Load Results, or SPC Analysis.
- 9 - Shutdown

1 - Start Up



IMPORTANT: *Configure & Calibrate* (page 9) must be performed prior to initial operation.

Power on equipment and log on to the control software:

1. Power on the PBFT and its strain gauge:
 - a. Verify the PBFT power switch (page 2, Figure 1, Item 5) is turned on.
 - b. Turn the speed selector (Figure 1, Item 3) to desired testing speed.
 - c. Press and hold the strain gauge ON button (page 2, Figure 3, Item 3) until a display (Figure 3, Item 2) appears.
 - d. Verify the strain gauge is set to desired unit of measure. If not, select desired units with the UNIT button (Figure 3, Item 4).
 - e. Press ZERO (Figure 3, Item 7) on the strain gauge. The display should read zero.
2. Power on the computer configured for use with the PBFT.
3. Open FORCEWare® by clicking on the Start button (in screen's lower left hand corner) and select Programs > GPD FORCEWare® > GPD FORCEWare® SPC.
4. Log on using a user account with the appropriate access rights for the operations to be performed.
 - a. If the Login prompt is not automatically available, click on User > Login in the main window menu bar. The Login prompt automatically appears whenever the software is loaded or a user account is added, changed, or deleted.
 - b. Type in a user name and a password.
 - c. Click ACCEPT.

User Login

User Name:

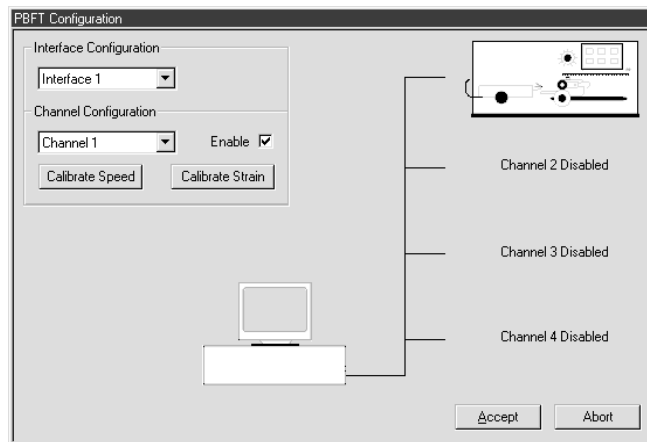
Password:

Accept Exit

2 - Verify Speed

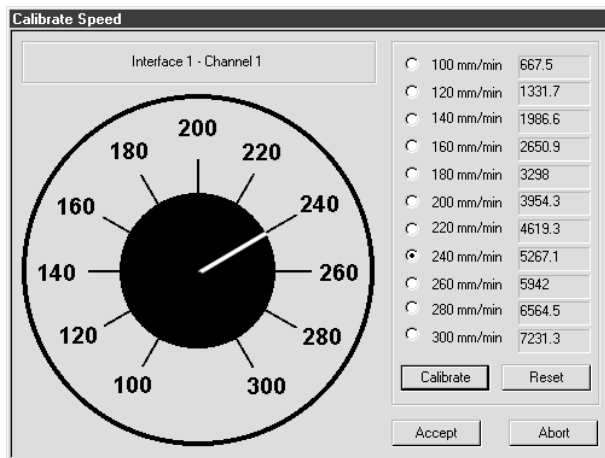
Verify that the PBFT Speed Selector dial and the simulated software dial are synchronized:

1. In the main window menu bar, click on Setup > Configure PBFT. PBFT Configuration appears.



If the window appears differently than shown above, the Configure & Calibrate procedure should be performed before proceeding.

2. Click on the CALIBRATE SPEED button. The Calibrate Speed window appears.
3. Turn the Speed Selector dial on the PBFT, in turn, to each speed increment. At the same time, note the response of the simulated dial; it should respond by changing to the same setting.



The white pointer on the simulated dial should change position to agree with the actual speeds selected on the PBFT.

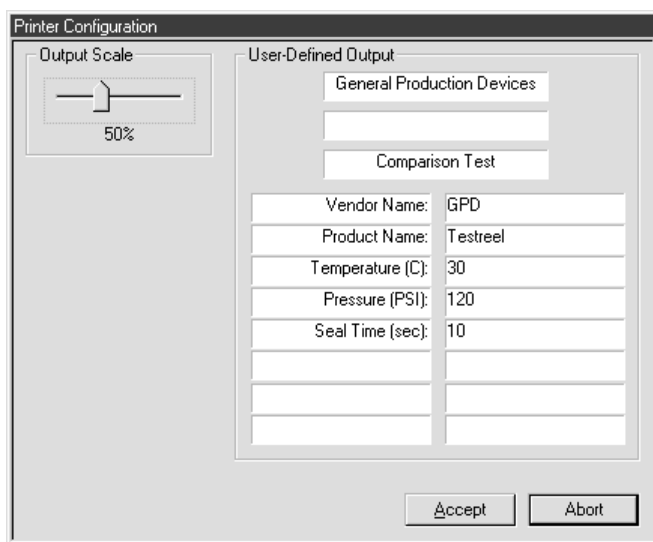
4. Choose one:
 - If dials are synchronized properly, click ABORT. Click ABORT again on PBFT Configuration.
 - If dials are NOT synchronized properly, perform *Calibrate PBFT Speed* (page 10).

3 - Configure Printer

As needed, you may change the printer configuration defaults for report dimensions and appended report text. These defaults can be overridden from the Create/Modify User window by users with access to that area. For samples of sized reports and reports with appended text, see *Report & Label Samples* (page 44).

To change printer configuration:

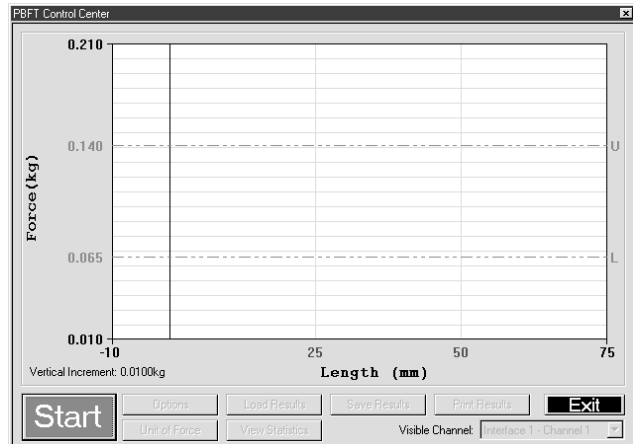
1. Click on Setup > Configure Printer from the main window menu bar. Printer Configuration appears.



2. As needed, change graph, SPC, and label report dimensions by sliding the Output Scale slider to the desired percentage of full size.
3. As needed, add, change, or delete text from any of the fields in the User-Defined Output panel.
4. When all changes are made, click ACCEPT to save changes and exit.

4 - Open PBFT Control Center

Click on PBFT > Activate PBFT from the main window menu bar. PBFT Control Center appears. For user accounts with the appropriate access rights, the OPTIONS, LOAD RESULTS, and UNIT OF FORCE buttons will appear as available for use.



5 - Modify Test Parameters

As needed, change test parameters:

1. Click the OPTIONS button in the PBFT Control Center window. Test Parameter Options appears.

The screenshot shows the 'Test Parameter Options' dialog box. It has a title bar with 'Test Parameter Options' and a close button. The dialog contains several input fields: 'Max Upper Limit' with value 0.21, 'Min Lower Limit' with value 0.01, 'Upper Limit' with value 0.14, 'Lower Limit' with value 0.065, 'Initial Length' with value 10, and 'Length' with value 75. To the right of these fields is a vertical slider labeled 'Samples / mm' with a value of 20/mm. Below the slider is a 'Set as Default' button. At the bottom of the dialog are 'Accept' and 'Abort' buttons.

2. As needed, change parameters and Samples/mm setting. When entering parameters, enter the data in keeping with the current unit of force.

Hint: Slower computers may require a lower sampling setting, i.e., decrease the number of Samples/mm.

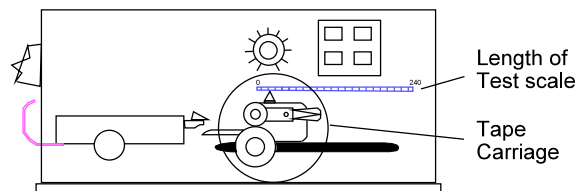
3. Click ACCEPT.

6 - Load Carrier Tape

Load the PBFT with carrier tape according to standard operating procedures:

Prepare PBFT

1. Verify PBFT is turned on.
2. Place a reel of component carrier tape on the reel arm (page 2, Figure 1, Item 12).
3. Align the tape carriage:
 - a. Press CARRIAGE RELEASE/LOCK (page 2, Figure 2, Item 3) until it lights (tape carriage should move freely).
 - b. Manually move the tape carriage left until its pointer (Figure 1, Item 6) aligns with zero (0) on the Length of Test scale (see at right).

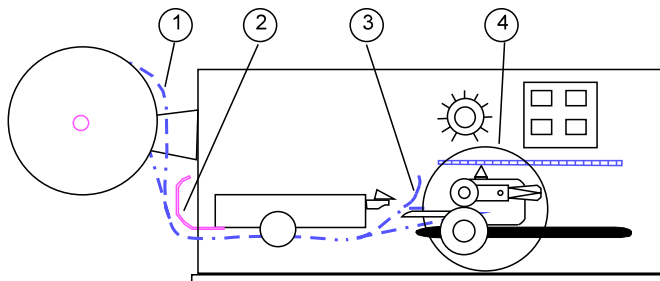


Align draw wheel carriage

- c. Press CARRIAGE RELEASE/LOCK (carriage should lock in place).

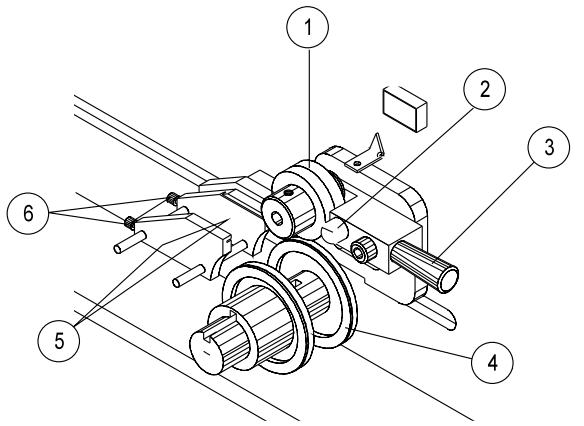
Load Tape

1. Feed carrier tape (see figure below, Item 1) under tape deflector (Item 2) to tape carriage (Item 4).
2. Gently peel back a short length of the carrier tape's cover tape (Item 3).



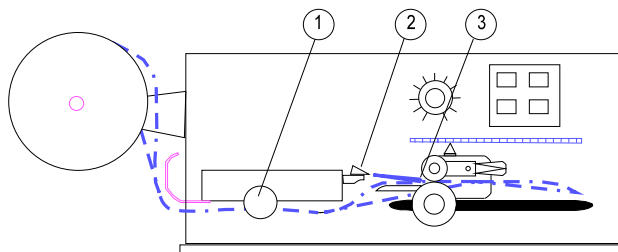
Feed tape to tape carriage

3. Feed carrier tape through the tape carriage:
 - a. Press the draw wheel handle (see figure below, Item 3) down and push the spring-loaded knob (Item 2). This locks the draw wheel rollers (Item 1) open.



Tape carriage

- b. To accommodate carrier tape width, use the adjustment screws (Item 6) to adjust the tape guides (Item 5). The tape must feed through the guides with a minimum of resistance or peel back force values will be affected.
 - c. Lay the tape over the draw wheel (Item 4), aligning tape holes with draw wheel pins.
 - d. Release the draw wheel rollers by pushing down on the draw wheel handle. The spring-loaded knob releases the rollers to hold the tape in place.
4. If necessary, use the adjusting knob (see figure below, Item 1) to align the strain gauge's lateral position so the strain gauge clip (Item 2) is in-line and centered with the tape in the tape carriage.



Feed and align tape

5. Grasp the cover tape and gently peel back a length just long enough to reach from the draw wheel to the strain gauge clip.
6. Secure the end of the cover tape in the clip. Verify that the peel back point (Item 3) is within 40 mm of the draw wheel.

CAUTION: DO NOT strike or jar strain gauge. Apply pressure to strain gauge clip in a pulling or pushing motion, not by hitting or jarring it. Applying force to this precision instrument at an excessive speed may result in permanent damage to the unit.

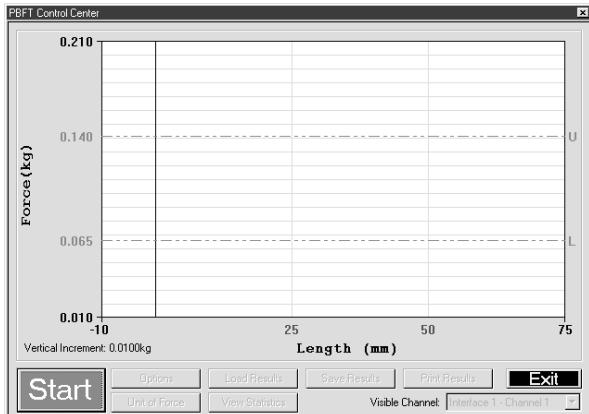
CAUTION: DO NOT apply more than 1 kilogram of force to the strain gauge clip. Applying excessive weight to this clip, which measures the peel back force of the cover tape, may result in permanent damage to the unit.

7 - Run a Test

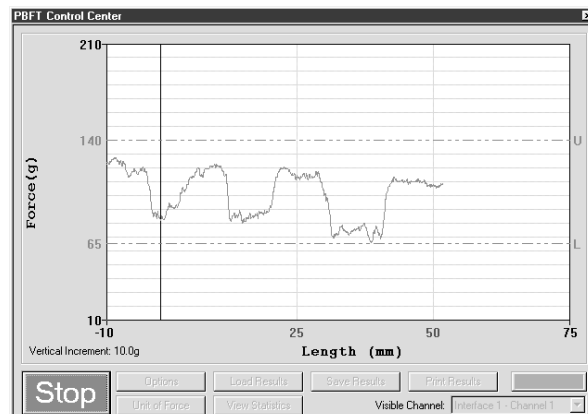
To run a peel back force test:

1. Click START in the PBFT Control Center window.

Hint: When the test starts, the START button will change into a STOP button. You may stop the test at any time by clicking on the STOP button or pressing ENTER on the keyboard.



Ready to run test - click on START



Test in process

2. When the test is complete, Test Results appears. Note the Pass or Fail status and then click CLOSE to exit Test Results. To view these test results again, click VIEW STATISTICS in PBFT Control Center.

Hint: The mean is now displayed on the graph with a solid red line followed by an M.

| | Max | Min | Range |
|------------------------------|----------|----------|----------|
| Limit: | 0.14 | 0.065 | 0.075 |
| Result: | 0.102867 | 0.068968 | 0.033899 |
| Speed: 300 | | PASSED | |
| Mean: 0.084273 | | | |
| Standard Deviation: 0.004410 | | | |

3. Choose one:
 - To save or print results, continue with *Save Test Results* and/or *Print Test Results*.
 - To exit PBFT Control Center and return to the main window, click EXIT.

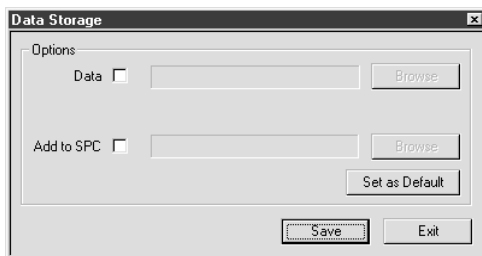
8 - Additional Operations

SAVE TEST RESULTS

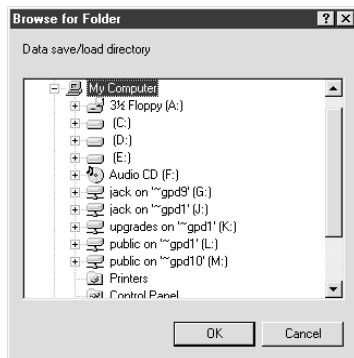
As needed, save test results:

1. Click SAVE RESULTS in the PBFT Control Center window. Data Storage appears.

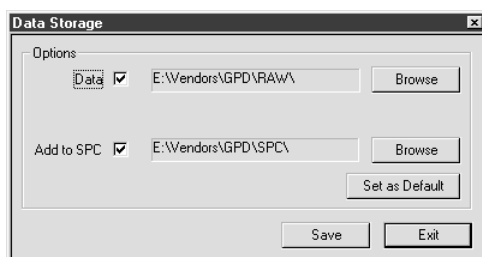
Hint: If a prompt to set a default path appears, click OK or press ENTER to continue.



2. To select a path:
 - a. Enable the appropriate radio button (Data or Add to SPC).
 - b. Click the corresponding BROWSE button. A window similar to the following one appears.



- c. Locate and select the directory into which you wish to save the file, then click OK. The selected path appears.



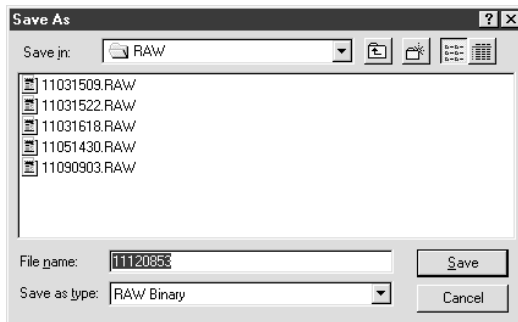
3. If desired, set the newly selected path as the default by clicking on SET AS DEFAULT in Data Storage. The next time the save function is activated, the default path will appear automatically in Data Storage.

Hint: The default save directory for a specific user/vendor may also be specified in the Create/Modify User window. This enables the user to log on as a vendor and have all of that vendor's information stored in a location specifically defined for their data.

4. Repeats steps 2 and 3 if additional data storage options are to be used.
5. To assign a file name:
 - a. Click on SAVE in Data Storage. Save As appears. The default file name will appear in the following format:

MMDDhhmm

where MM is month, DD is day, hh is hour, and mm is minute. You may change the file name if you wish.



- b. Click SAVE in Save As to store the data.

Hint: If multiple data storage options (Data, Add to SPC) are enabled, a Save As window will appear, in sequence, for each option.

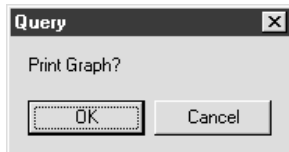
6. To exit Data Storage, click EXIT.

PRINT TEST RESULTS

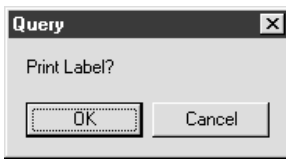
SPC test results can be printed in graph and label formats. See *Report & Label Samples* (page 44) for examples.

As needed, print test results:

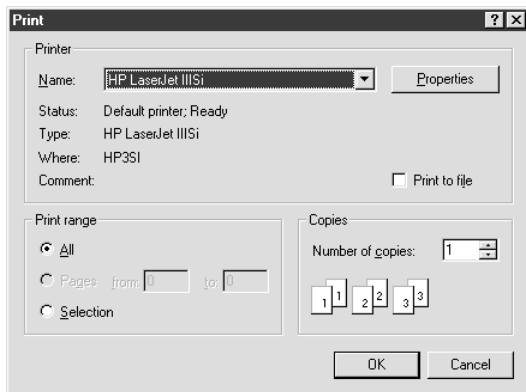
1. Click PRINT RESULTS in the PBFT Control Center window. A Print Graph prompt appears.



2. Choose one:
 - To print graph format, click OK.
 - To print ONLY label format, click CANCEL to skip graph printing and a Print Labels prompt appears.



3. A standard Windows® 95/98 Print window appears. Select a printer, the number of copies, and click OK.



4. If you chose to print a graph in step 3, you will be prompted now to print a label. If you select OK, the same Print window as shown above will appear. Select the label printer, the number of desired labels, and click OK.

CHANGE UNIT OF FORCE

As needed, you may change the unit of force and then save or print again.

1. Click UNIT OF FORCE in the PBFT Control Center window. Unit of Force appears.

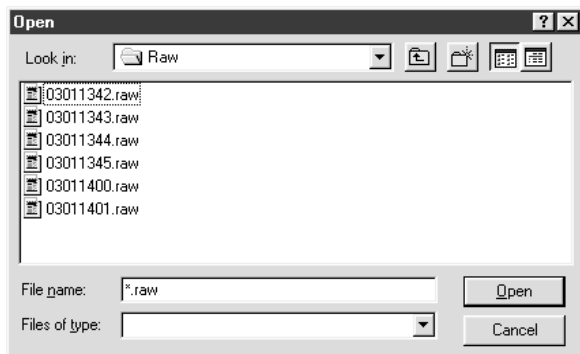


2. Select the desired unit.
3. Click ACCEPT. The Force and Vertical Increment indicators on the PBFT Control Center reflect the current unit of force. The same will be reflected on the printed graph as well.

LOAD RESULTS

As needed, you may load the results for a single test run and then view its statistics, change the unit of force, print the results, and save the results.

1. Click LOAD RESULTS in the PBFT Control Center window. Open appears.



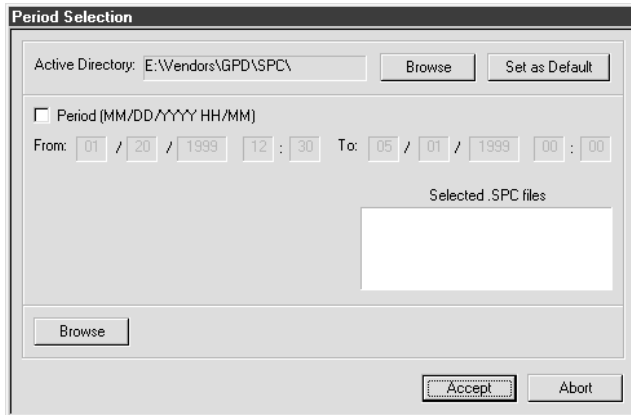
2. Select a single file and click OPEN. The data for the selected file will display as a graph in the PBFT Control Center.
3. You may now act on this data with any of the following PBFT Control Center buttons: VIEW STATISTICS, UNIT OF FORCE, PRINT RESULTS, and SAVE RESULTS.

SPC ANALYSIS

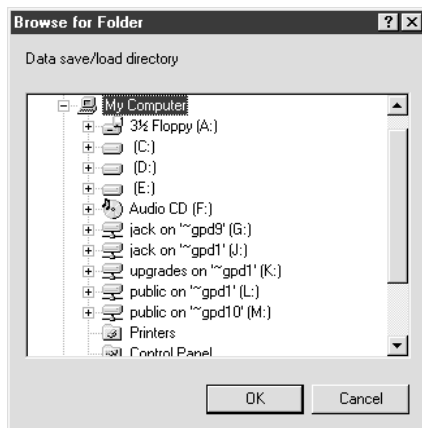
As needed, process results in SPC Analysis. SPC analysis basically consists of selecting the SPC files to be analyzed and then choosing the appropriate analysis tools. Analysis results may also be printed.

To select the appropriate files for analysis:

1. Click SPC > SPC Analysis in the main window menu bar. Period Selection appears.



2. As needed, change the Active Directory:
 - a. Click on the BROWSE button to the right of the Active Directory field. A window similar to the following one appears.



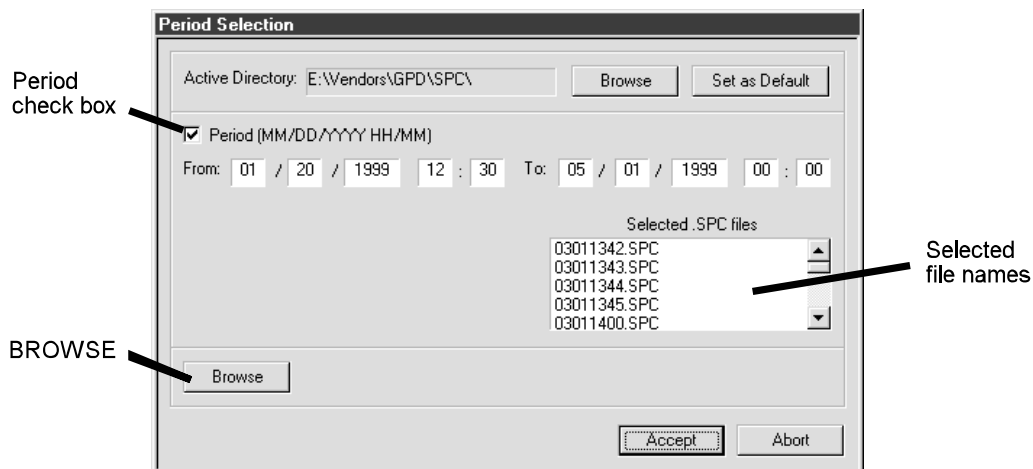
- b. Locate and select the directory from which you wish to select files, then click OK. The selected path displays in Active Directory of the Period Selection window.

3. As needed, set the newly selected path as the default by clicking SET AS DEFAULT in SPC Analysis. The next time the SPC analysis function is activated, the default path will display automatically in SPC Analysis.

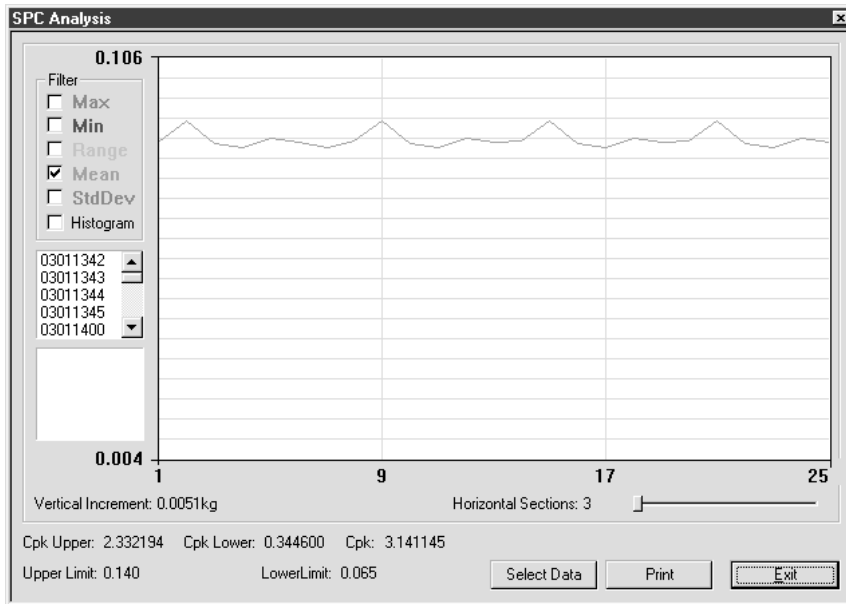
Hint: The default save directory for a specific user/vendor may also be specified in the Create/Modify User window. This enables the user to log on as a vendor and obtain all of that vendor's information stored from a location specifically defined for their data.

4. Choose a method of SPC data selection:

| Period of Time | Active Directory |
|---|--|
| <p>To select test results from a user-defined date and time span:</p> <ol style="list-style-type: none"> a. Enable the Period (MM/DD/YYYY HH/MM) check box. b. Enter dates and times as appropriate for the date and time span you want to include. As you change the values in the period selection fields, the panel containing file names will update. c. Go to step 5. | <p>To select test results from the directory defined in the Active Directory field:</p> <ol style="list-style-type: none"> a. Click the BROWSE button in the lower left hand corner of the SPC Analysis window. Select SPC Files appears. b. Select as many files from this location as needed and click OPEN. The selected files will display in the panel containing file names. <p>Hint: Select a minimum of 5 files.</p> <ol style="list-style-type: none"> c. Go to step 5. |



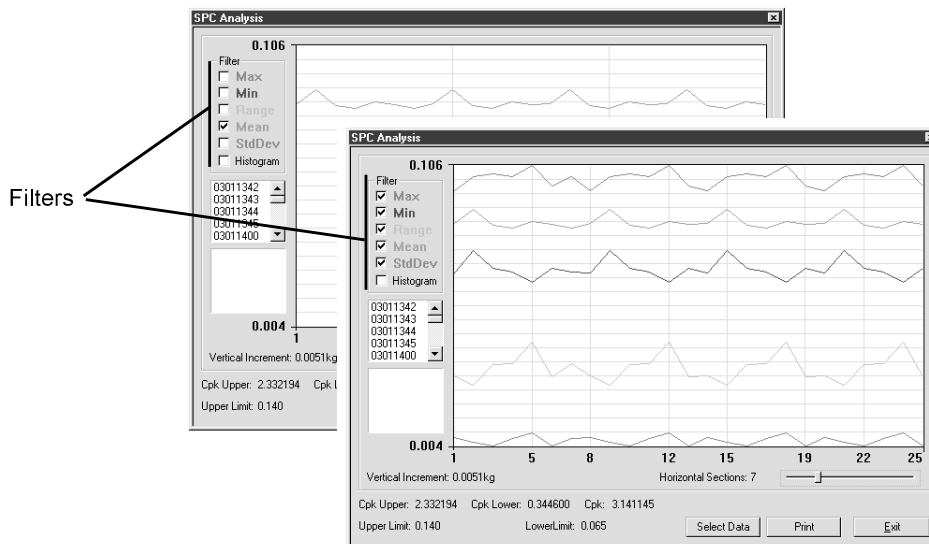
- Click ACCEPT. SPC Analysis appears displaying a graph of the selected file data.



- As needed, analyze the data using the tools available in the SPC Analysis window:
 - For further analysis details, see *SPC Analysis Window* (page 58)
 - For examples of available reports, see *Report & Label Samples* (page 44).

Filters

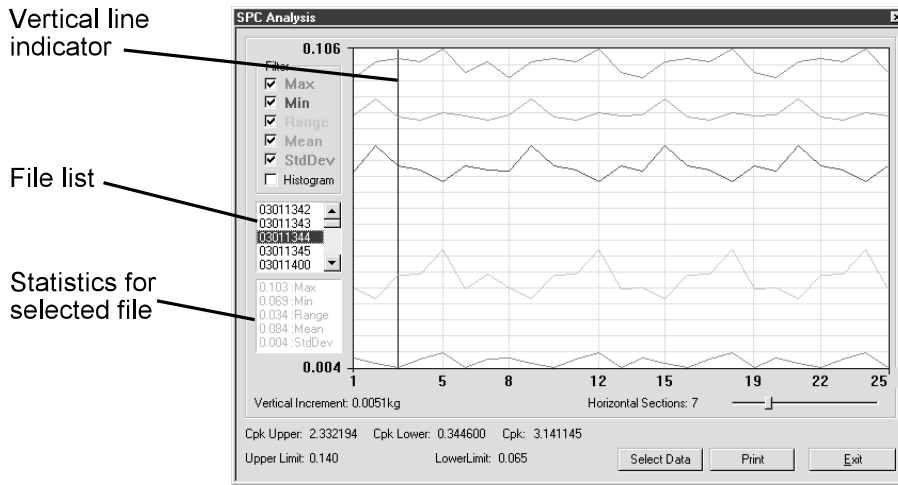
Select from one to five or a combination of filters. Selected filters determine the type of test data results displayed and printed.



A single filter is selected in the rear example; all filters are selected in the front example.

Single File Statistics

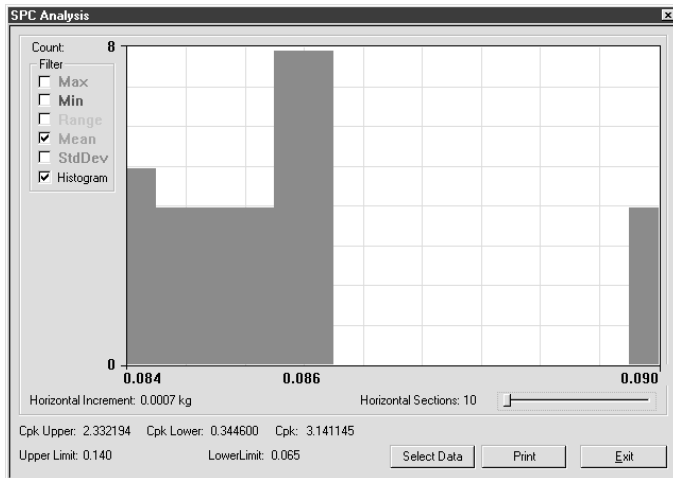
You may view the statistics for any file within the reporting group. Clicking on a single test in the list of files will display the statistics for that test file. Additionally, a heavy black vertical line in the graph moves to the points of the selected test within the graph.



Statistics are displayed for the test file selected in the file list. The points for the selected file are also indicated in the graph by the heavy vertical line.

Histogram

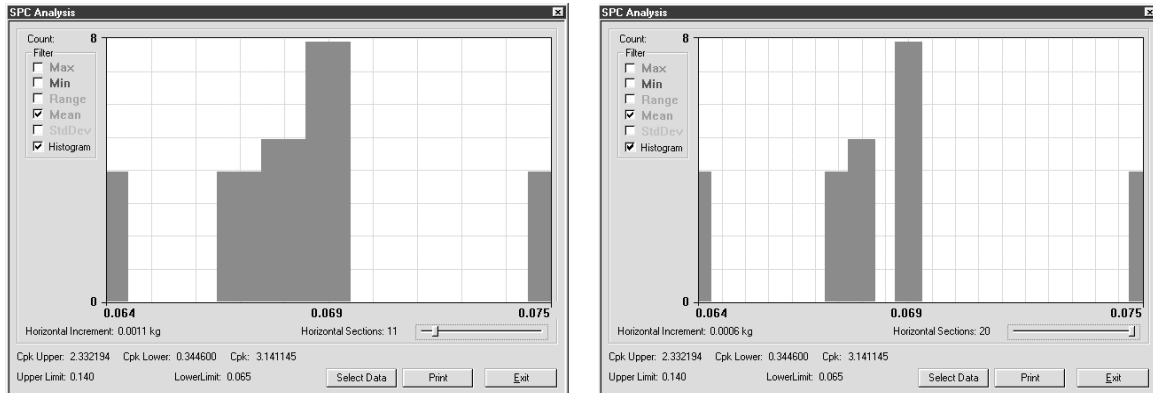
Select the Histogram check box to display a histogram in bar graph format. Any of the filters can be used one at a time with the Histogram.



An example of a Histogram with the Mean filter selected

Horizontal Sections

You may change the number of horizontal sections. Horizontal sections will adjust the range in a histogram or act as simply a visual indicator in line graphs.



The number of horizontal sections selected affects the range displayed in a histogram.

7. If needed, click PRINT to print the displayed data.
8. If needed, click SELECT DATA to select a different set of files or a different date and time span. The Period Selection window will reappear.
9. To exit SPC Analysis, click EXIT.

9 - Shutdown

To exit and shutdown operations:

1. Click on EXIT in the main menu bar of the main window.
2. Power off the strain gauge by pressing the strain gauge OFF button.
3. Power off the PBFT by turning off the power switch.
4. Power off the computer and, as applicable, the printer.

Maintenance



Follow these maintenance rules at all times:

- #1 ONLY QUALIFIED MAINTENANCE OR TECHNICAL PERSONNEL fully aware of all safety precautions should perform preventive maintenance and troubleshooting procedures.
- #2 READ ALL SAFETY INSTRUCTIONS (page ii) before proceeding.
- #3 ALWAYS POWER OFF the PBFT and strain gauge before performing any maintenance.

Preventive Maintenance Schedule

Although the PBFT is a delicate apparatus, it is a low maintenance piece of equipment. Basic maintenance considerations such as wiping dust from the unit's exterior with a soft clean cloth and covering it with a cloth cover during periods of non-use are the only maintenance steps necessary aside from the periodic ones listed.



CAUTION: Power off the PBFT and the strain gauge before performing any maintenance.



IMPORTANT: Due to the main purpose of the PBFT, to take accurate measurements, it is strongly recommended that calibration be verified on a regular (at least monthly) basis.

Maintenance Schedule

| Interval | Location | Action to take |
|------------|------------------|---|
| Monthly | Carriage Motor | Verify motor speed with <i>Verify Motor Speed</i> (page 31). |
| | Strain Gauge | Verify operations with <i>Verify Strain Gauge Operations</i> (page 34). |
| Weekly | Machine Exterior | Clean exterior panels with soft dry cloth. Do not use liquid or aerosol cleaners. |
| | Control buttons | Inspect button switches and lamps (see <i>Appendix</i> , Drawing PBFT-3D2, Items 57, 58, 60) for burn out. Replace if necessary. See the <i>Replace Lamp</i> procedure that follows. To replace switch, see "Control button ineffective" symptom in <i>Troubleshooting</i> (page 37). |
| Six Months | Set Screws | Remove PBFT cover (see <i>Appendix</i> , Drawing PBFT-3D2, Item 39) and inspect all set screws and tighten if necessary. |
| | Travel Shafts | Lubricate travel shafts (see <i>Appendix</i> , Drawing PBFT-3D2, Item 73): <ol style="list-style-type: none"> 1. Remove PBFT cover (see <i>Appendix</i>, Drawing PBFT-3D2, Item 39). 2. Clean the two travel shafts. 3. Lubricate both shafts with a small drop of light machine oil so carriage moves smoothly. |
| | Gear Rack | Inspect gear rack (see <i>Appendix</i> , Drawing PBFT-3D2, Item 38) and, if necessary, clean debris from teeth. |

Replace Lamp

To replace control button lamp (Drawing PBFT-3D2, Item 60):

1. Obtain new lamp. See *Suggested Spare Parts* (page 39).
2. Pull off plastic button cover (Drawing PBFT-3D2, Items 53, 54, 55, or 56)
3. Twist and pull out old lamp.
4. Install new lamp and reinstall cover.

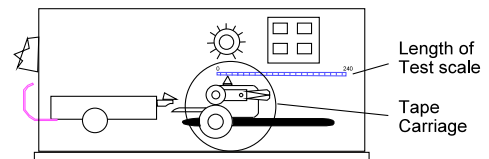
Calibration Accuracy

Motor speed and strain gauge operations are verified at the factory for accuracy of operations; however, if these need to be re-verified, recalibrate per the following instructions.

Verify Motor Speed

Use a stop watch when verifying motor speed.

1. Set speed selector to 100 mm.
2. Align tape carriage:
 - a. Press CARRIAGE RELEASE/LOCK to release the tape carriage.
 - b. Align tape carriage's pointer at zero on Length of Test scale.
 - c. Press CARRIAGE RELEASE/LOCK again to lock the carriage in position.
3. Simultaneously, press TEST START and start your stop watch. When 60 seconds has elapsed, the pointer should be aligned with the 100 mm mark on the Length of Test scale.



Location of Tape Carriage and Length of Test Scale



IMPORTANT: If inaccurate alignment results, perform the *Motor Speed Recalibration* procedure (page 33).

4. Verify the rest of the motor speeds shown in the chart below, recalibrating as necessary.

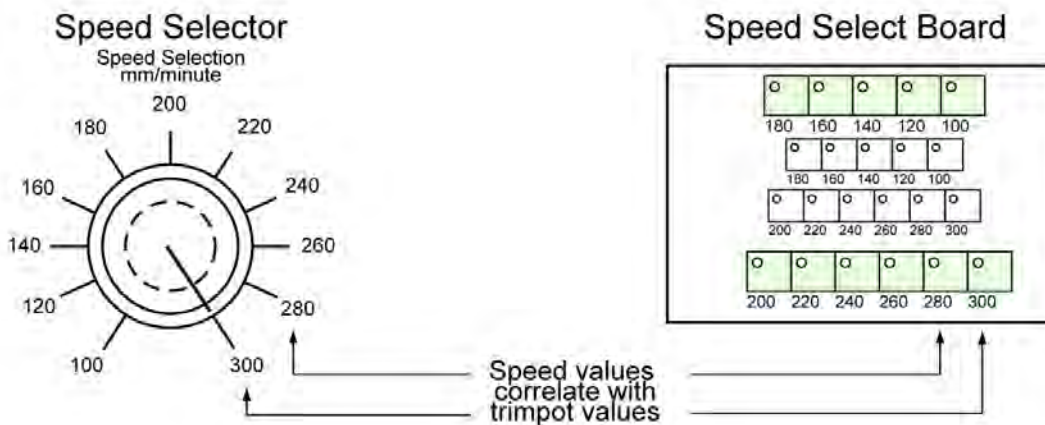
| To test this speed: | the pointer should be aligned at: | when the stop watch has timed: |
|---------------------|-----------------------------------|--------------------------------|
| 100 mm | 100 mm | 60 seconds |
| 120 mm | 120 mm | |
| 140 mm | 140 mm | |
| 160 mm | 160 mm | |
| 180 mm | 180 mm | |
| 220 mm | 110 mm | 30 seconds |
| 240 mm | 120 mm | |
| 260 mm | 130 mm | |
| 280 mm | 140 mm | |
| 300 mm | 150 mm | |

Motor Speed Recalibration

Recalibrating motor speed consists of adjusting the voltage to the motor by varying the related trim pot.

To recalibrate motor speed:

1. Remove the PBFT's top cover and slide it back away from the front cover to expose the speed select board inside. The two outside rows of trim pots control motor speeds.
2. Set the PBFT's speed selector to the speed to be calibrated.
3. Locate the correlating trim pot on the speed select board.
4. Adjust the trim pot by turning it **slightly**:
 - to *increase* speed, turn trim pot *clockwise*
 - to *decrease* speed, turn trim pot *counterclockwise*
5. Verify the new setting by repeating *Verify Motor Speed* instructions (page 31) and repeating the above motor speed recalibration steps as necessary.



Correlation of speed to trimpot

Verify Strain Gauge Operations

Use the following procedure to verify strain gauge operations. To install the GPD Strain Gauge Calibration Kit (PBT-107), see *Installing Calibration Kit* instructions on page 36.



IMPORTANT: Recalibration will be necessary if the strain gauge is replaced or repaired.

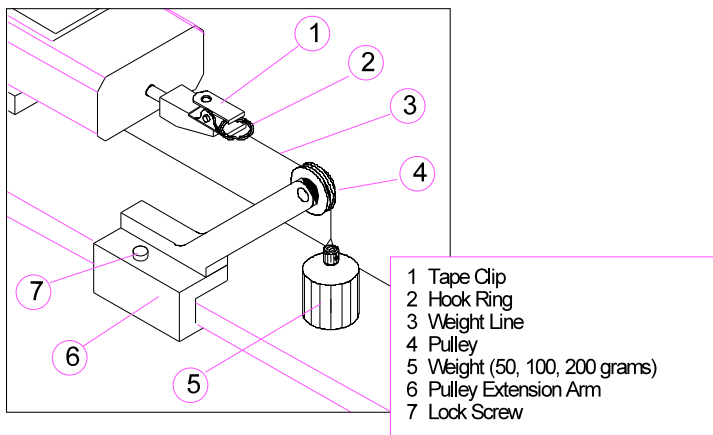
To verify strain gauge operations:

1. Turn the PBFT power switch on.
2. Press and hold the strain gauge ON button until a display appears.



CAUTION: DO NOT strike or jar the strain gauge. Apply pressure to the strain gauge clip in a pulling or pushing motion, not by hitting or jarring it. Applying force to this precision instrument at an excessive speed may result in permanent damage to the unit.

3. Verify the strain gauge is set to 'kg' units. If not, select 'kg' with the UNIT button (page 2, Figure 3, Item 4) and then press the ZERO button (page 2, Figure 3, Item 7) to reset the strain gauge to zero.
4. Slide the calibration kit's pulley extension arm onto the PBFT base plate (see below and page 2, Figure 1, Item 9).



Calibration Kit installed

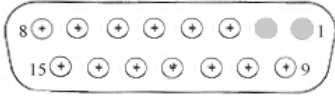
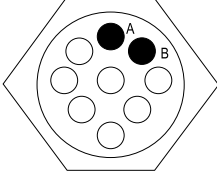
5. Position the arm so that a weight will hang.

6. Verify the strain gauge's display and millivolt outputs:

CAUTION: DO NOT apply more than one (1) kilogram of force to the strain gauge clip. Applying excessive weight to this clip, which measures the peel back force of the cover tape, may result in permanent damage to the unit.

a. Take a voltage reading:

NOTE: The following chart applies to PBFT models without a chart recorder.

| Newer PBFT Models (with SPC 98 Software) | Older PBFT Models (prior to SPC 98 Software) |
|---|---|
|  <p style="text-align: center;">DB15 Pin Locations</p> <p>Take a voltage reading at pins 1 and 2 of the PBFT's DB15 connector into which the software cable plugs.</p> |  <p style="text-align: center;">Connector Pin Locations</p> <p>Take a voltage reading at pins A and B of the PBFT's connector into which the software cable plugs.</p> |

b. With zero (0) grams (no weight), the strain gauge should display 0.000 and measure zero (0) millivolts.

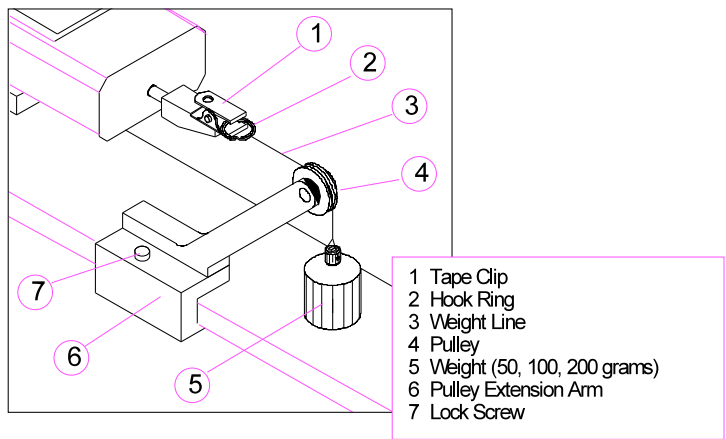
Voltage measured at the connector on the side of the PBFT should be at or near zero (0) volts. The older strain gauges typically have a + or - voltage (with zero weight) which could vary from one unit to the next. This "offset" voltage is neutralized with circuits in the chart recorder and/or the SPC amplifier assembly. Make note of this offset voltage and its polarity.

c. Verify the display and output with a 50 gram weight:

(1) Attach the 50 gram weight. The strain gauge should display 0.050 kilograms \pm .003 kg.

CAUTION: Support the weight while laying its line over the arm's pulley and clipping the hook ring in the tape clip.

CAUTION: GENTLY release the weight's load onto the strain gauge.



Calibration Kit installed on PBFT

- (2) Measure the voltage and polarity.
- (3) Subtract the offset voltage previously measured in step ?. Make note of the resulting new voltage which represents 50 grams.
- (4) Remove the 50 gram weight.

- d. Verify the display and output with a 100 gram weight:
 - (1) Attach 100 gram weight. The strain gauge should display 0.100 ±.005 kg.
 - (2) Measure the voltage and polarity.
 - (3) Subtract the offset voltage previously measured in step ?. Make note of the resulting new voltage which represents 100 grams and is twice the voltage of the 50 gram weight ±.01 volts.
 - (4) Remove the 100 gram weight.

- e. Verify the display and output with a 200 gram weight:
 - (1) Attach the 200 gram weight. The strain gauge should display 0.200 ±.010 kg.
 - (2) Measure the voltage and polarity.
 - (3) Subtract the offset voltage previously measured in step ?. Make note of the resulting new voltage which represents 200 grams and is twice the voltage of the 100 gram weight ±.02 volts.
 - (4) Remove the 200 gram weight.



IMPORTANT: *If verification results are unsatisfactory (if the readings are not within ±1 millivolt and if the strain gauge display values are not within ±1 gram, call GPD's Service Dept. at (970) 245-0408 (in USA & Canada: 1-800-742-5473).*

PBFT Weight Declaration
Issued by:
GPD Global

Equipment: Peel Back Force Tester
 Strain Gauge Calibration Kit
 50, 100, & 200 Gram Weights

Part Nos: PBT-0505 (50 gram weight)
 PBT-0506 (100 gram weight)
 PBT-0507 (200 gram weight)

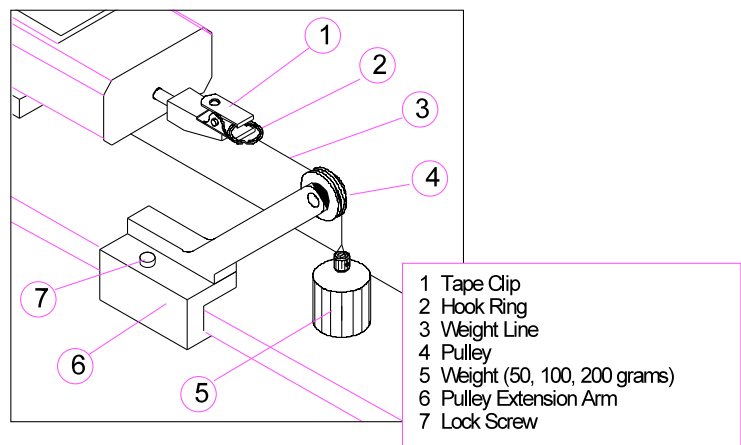
Declaration: All weights are within ±0.2% of nominal and are N.I.S.T. traceable. Manufacturing, inspection, and testing processes conform to applicable specifications.

7. Remove the calibration kit.

Installing Calibration Kit


The calibration kit is a tool used to help verify strain gauge operations. To install the calibration kit on the PBFT:


- 1. Slide the calibration kit's pulley extension arm onto the PBFT base plate.
- 2. Position the arm so that a weight will hang.
- 3. Attach a weight (50, 100, or 200 grams):
 - a. Support the weight while laying its line over the arm's pulley and clipping the hook ring in the tape clip.
 - b. GENTLY release the weight's load onto the strain gauge.
- 4. Verify that the strain gauge displays the weight's actual mass.



Calibration Kit installed

Troubleshooting

 **CAUTION:** ONLY QUALIFIED MAINTENANCE OR TECHNICAL PERSONNEL fully aware of all safety precautions should perform preventive maintenance and troubleshooting procedures.

 **CAUTION:** Power off the PBFT and strain gauge before performing any troubleshooting.

| Symptom | Possible Cause | Action to Take |
|-----------------------------------|--|---|
| Control button lamp not lighting. | Lamp is defective. | Replace lamp (Assembly Drawing PBFT-3D2, Item 60): 1. Obtain new lamp. See <i>Suggested Spare Parts</i> (page 39). 2. Pull off plastic button cover (Assembly Drawing PBFT-3D2, Items 53, 54, 55, or 56) 3. Twist and pull out old lamp. 4. Install new lamp and reinstall cover. |
| No power to the machine. | Input power module fuses are defective. | Replace fuses (Assembly Drawing PBFT-3D2, Item 66) - see <i>Specifications</i> (page 40): 1. Obtain new fuse. See <i>Suggested Spare Parts</i> (page 39). 2. Remove fuse holder (Item 65). 3. Replace defective fuses (Item 66) 4. Return fuse holder to machine. |
| | Power supply fuse is defective. | First, inspect the input power module fuses (see prior "Possible Cause" in this table). If they are not faulty, inspect the fuse in the power supply (Assembly Drawing PBFT-3D2, Item 15) - see <i>Specifications</i> . If the power supply fuse is defective, replace the power supply. When installing a new power supply, use the existing nylon screws and spacers in their original positions. |
| Control button ineffective. | Control button switch is defective. | Replace switch (Assembly Drawing PBFT-3D2, Item 57 or 58): 1. Obtain new switch. See <i>Suggested Spare Parts</i> (page 39). 2. Remove defective switch: a. Remove PBFT cover (Assembly Drawing PBFT-3D2, Item 39). b. Squeeze top and bottom clips at the base of the socket and pull socket base off the switch. c. Remove threaded switch retainer and washer. d. Pull switch lamp socket out from the front of the PBFT. e. Desolder and remove the defective switch. 3. Install and solder a new switch base. 4. Install switch lamp socket and replace PBFT cover. |
| Strain gauge display blanks out. | Strain gauge's battery-saving function has automatically shut off the display. | The strain gauge shuts off automatically if no activity occurs for approximately 10 minutes. To reactivate the strain gauge: 1. Press strain gauge ON button to reactivate. 2. Press strain gauge ZERO button to zero the strain gauge or else inaccurate value will result. |

| Symptom | Possible Cause | Action to Take |
|---|--|--|
| Strain gauge display fails to appear or a 'BATT' message appears. | Strain gauge battery pack power is drained. | <ul style="list-style-type: none"> The strain gauge is equipped with a rechargeable NiCad (nickel cadmium) battery pack. The PBFT has a built-in battery charger. DO NOT use any other type of charger. <p>To recharge the strain gauge battery pack:</p> <ol style="list-style-type: none"> Power on the PBFT and strain gauge (Assembly Drawing PBFT-3D2, Item 74). Press strain gauge ZERO button to zero out gauge. Let the PBFT recharge the strain gauge battery for 30 minutes. If the display shows a message of '3 BATT', let PBFT recharge the gauge for one (1) hour. The battery is charged when the 'BATT' message disappears. |
| | Strain gauge battery pack is defective or spent. | <p>Inspect battery charging cable's (page 2, Figure 3, Item 1) DC voltage:</p> <ul style="list-style-type: none"> If 20-24 volts with no load, replace the strain gauge battery. If unequal to 20-24 volts, replace the strain gauge charger. See <i>Strain gauge charger defective</i> (next "Possible Cause" in this table). <p>To replace the strain gauge battery pack:</p> <ul style="list-style-type: none"> The strain gauge battery pack contains rechargeable NiCad batteries. DO NOT replace with any other type of battery. Nickel cadmium (NiCad) batteries must be recycled or disposed of properly. Battery pack is not accessible to the operator - it should only be replaced by qualified maintenance or technical personnel fully aware of all safety precautions. <ol style="list-style-type: none"> Remove the strain gauge from the PBFT: <ol style="list-style-type: none"> Use a 5/32" Allen wrench to remove the two hex screws from the bottom side of the strain gauge holding plate (Assembly Drawing PBFT-3D2, Item 18). Unplug the battery charging and data output cables (page 2, Figure 3, Items 1, 2) and remove the strain gauge. Use a 7/64" Allen wrench to remove the two hex screws from the strain gauge cover. Remove cover. Unscrew and desolder battery pack from the charging socket. Solder a new battery pack in place. Reassemble the strain gauge and reinstall on the PBFT. |
| | Strain gauge charger is defective. | <p>Replace the strain gauge charger (Assembly Drawing PBFT-3D2, Item 63):</p> <ol style="list-style-type: none"> Remove the PBFT cover (Item 39). Remove the battery charger clamp (Item 27), battery charger (Item 63), and its cables. Cut and splice new battery charger cables to length. Secure new battery charger in place with the battery charger clamp and connect the new cables. Secure the PBFT cover in place. |
| Strain gauge display values do not coordinate with SPC software. | Strain gauge is defective. | <ol style="list-style-type: none"> If necessary, obtain new strain gauge. Perform steps 1 and 2 of <i>Verify Mechanical Operations</i> (page 4). |
| | Strain gauge has been replaced or repaired. | <ol style="list-style-type: none"> Perform <i>Verify Strain Gauge Operations</i> (page 34). |

Spare Parts & Accessories

Suggested Spare Parts

| <u>Part Description</u> | <u>GPD Part Number</u> | <u>Qty.</u> |
|-------------------------|------------------------|-------------|
| Fuse (power entry) | 10/1423 | 5 |
| Lamp (control panel) | 2450-0010 | 6 |
| Latching Switch | 5100-0009 | 1 |
| Momentary Switch | 5100-0010 | 1 |

Suggested Accessory Item

| <u>Part Description</u> | <u>GPD Part Number</u> |
|-------------------------|------------------------|
| Calibration Kit | PBT-107 |

Kit includes:

- Hook ring w/ weight line
- Pulley extension arm w/pulley
- Weights (50, 100, & 200 grams)
- Nylon lock screw
- Procedure, *Strain Gauge Calibration Verification Kit Instructions*

Specifications

Physical Specifications

Dimensions 12.5" H x 14.5" W x 29.0" D
 (31.8 cm x 36.8 cm x 73.7 cm)
 Weight (approx.) 65 lbs. (29.5 kg)

Power

AC Input Voltage 100 VAC -240 VAC
 AC Frequency 50/60 Hz
 Consumption 60 watts maximum
 Fuses, Input power module (F1 & F2 on schematic) 1 amp, 250 volts (F1A, 250 V)
 Fuse, Power supply (24 V.C., internal) 2 amps, 250 volts (F2A., 250 V)

Environmental Specifications

Operating Temperature Range 40°F to 104°F (5°C to 40°C)
 Storage Temperature Range -13°F to 158°F (-25°C to 70°C)
 EMI, Radiated, 100-240 VAC Input EN 55022, Class A
 EMI, Conducted, 100-240 VAC Input EN 55022, Class A
 Vibration Per EN 61010-1:1993 and IEC 68-2-6
 Shock Per EN 61010-1:1993

Peel Back

Force Measuring Range (recommended gauge maximum) 0 grams -250 grams
 Speed 100 mm - 300 mm ± 5 mm/minute in 20 mm increments
 Angle 175-180 degrees
 Accuracy After Calibration ± 1%

Tape

Widths Accepted (mm) 8, 12, 16, 24, 32, 44, 56 (Optional 8 mm to 120 mm)
 Materials Accepted Plastic, Paper, Metal
 Configurations Single Sprocket / Dual Sprocket

Strain Gauge

Sampling Rate 5,000 SPS (samples per second)
 Battery Charge Life 8-10 hours with full charge
 Battery Life Span Over 500 charges

PC Requirements - PROVIDED BY CUSTOMER

Operating System Windows® 95 or Windows® 98
 Computer Pentium 133 MHZ or better; 1 available ISA slot required
 Memory 16 MB of RAM minimum (32 MB is recommended)
 Monitor 640 x 480 pixels with 256 colors minimum
 Printer Any printer configured for & supported by Windows® 95/98

SPC Software

Test Range
 SPC Analysis User-defined range
 Data Collection Uses minimum/maximum limits of the first file in the selected data set
 Print Options SPC Data, Label Format, Line Graph Format

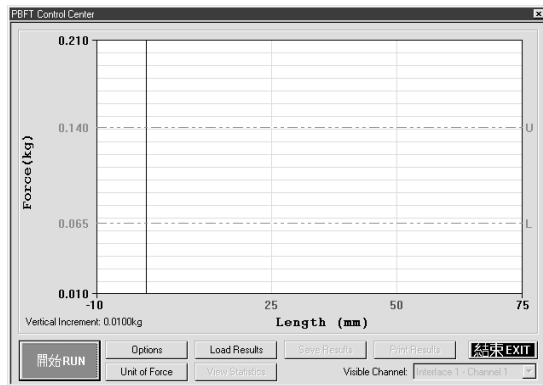
* * * * *

APPENDICES

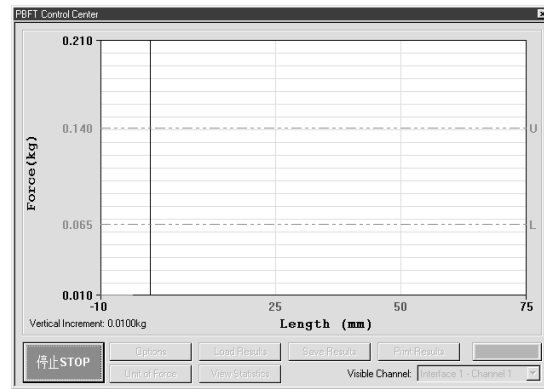
| | page/drawing |
|---|------------------|
| Language Selection | 42 |
| Report & Label Samples | |
| Line Graph Sample | 43 |
| SPC Data Graph Sample | 44 |
| Label Sample | 44 |
| Sizing | 45 |
| Fixed Text | 45 |
| User Access | |
| Add User | 46 |
| Delete User | 47 |
| Change Access Rights | 47 |
| Change Password | 47 |
| Window Map | 48 |
| Window References | |
| Calibrate Speed Window | 49 |
| Calibrate Strain Gauge Window | 50 |
| Create/Modify User Window | 51 |
| Data Storage Window | 52 |
| PBFT Configuration Window | 53 |
| PBFT Control Center Window | 54 |
| Period Selection Window | 55 |
| Printer Configuration Window | 56 |
| SPC Analysis Window | 57 |
| Test Parameter Options Window | 58 |
| Test Results Window | 59 |
| Unit of Force Window | 60 |
| Assembly Drawings | |
| PBFT Mechanical Assembly Drawing | PBFT-3D2 |
| PBFT Assembly Parts Listing | PBFT-3D2 LISTING |
| Electrical Diagrams & Schematics | |
| System Block Diagram | PBT-0414A |
| SPC 98 Components | 8568003A |
| PBFT Electrical Schematic | 8568012B |

Language Selection

The Start and Stop buttons used to initiate and abort test runs in the PBFT Control Center window can be displayed in Chinese and English or English only.



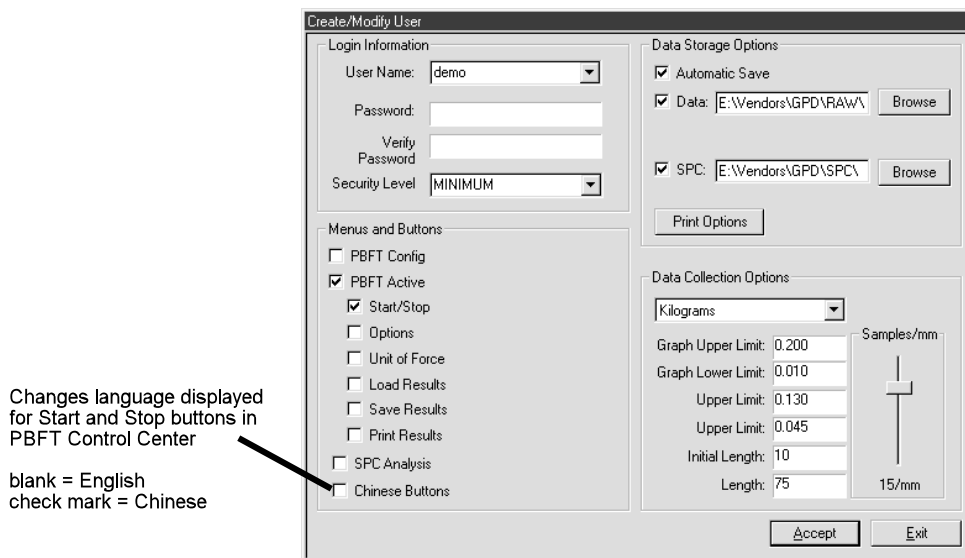
START button displayed in Chinese and English



STOP button displayed in Chinese and English

To change language displayed:

1. Log on using a user account with access to the applicable access right (Chinese Buttons).
2. Click on User > Create/Modify. Create/Modify User appears.
3. Select the user for which the displayed language is to be changed.
4. Click on the Chinese Buttons access right in the Menus and Buttons panel.

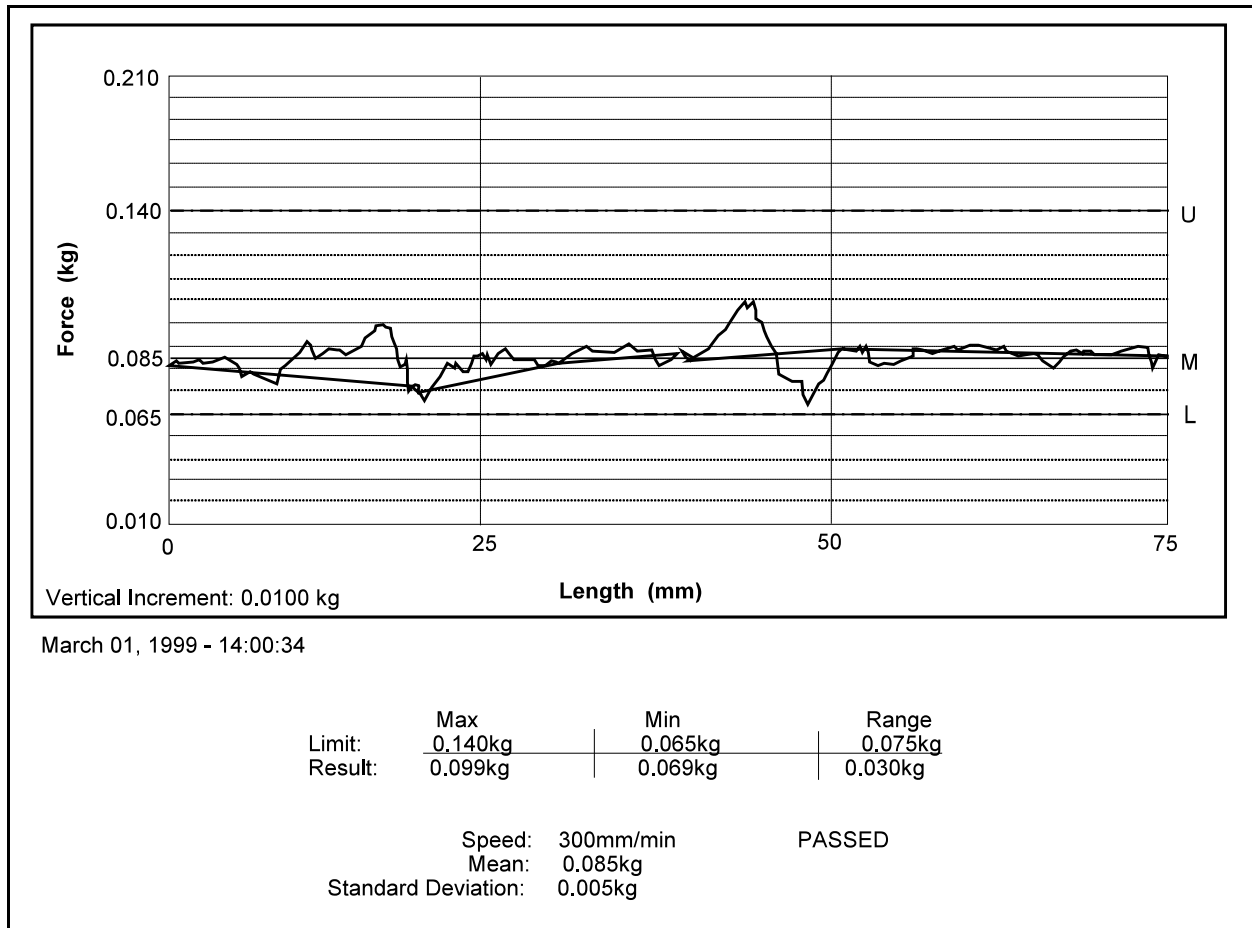


5. Click ACCEPT.
6. As needed, repeat steps 3 through 5 for additional user accounts.
7. Click EXIT.

Report & Label Samples

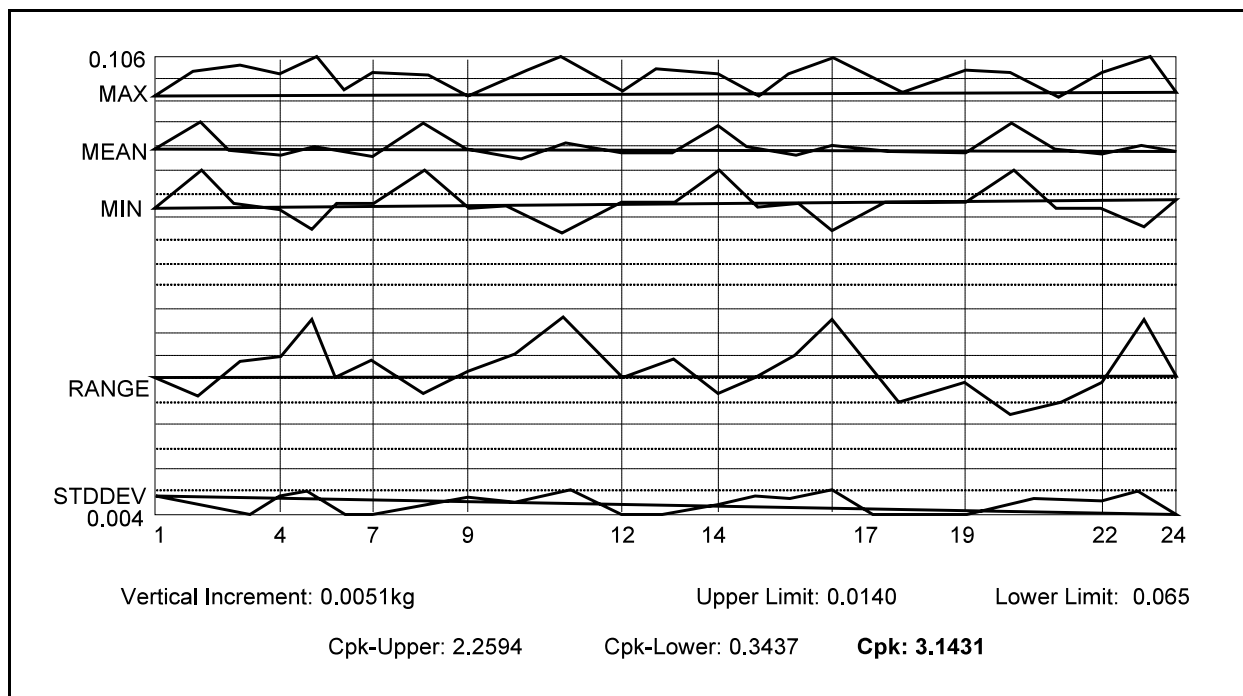
SPC test results can be printed in SPC data, line graph and label formats. You may control the overall dimensions for all of these formats. You may also opt to have user-defined text print at the bottom of SPC data and line graphs reports.

Line Graph Sample



Sample of single test line report generated through the PBFT Control Center

SPC Data Graph Sample



Sample of printed SPC line graph report with all filters selected

Label Sample

March 01, 1999
 Mean:0.085kg Range:0.030kg SD:0.005kg

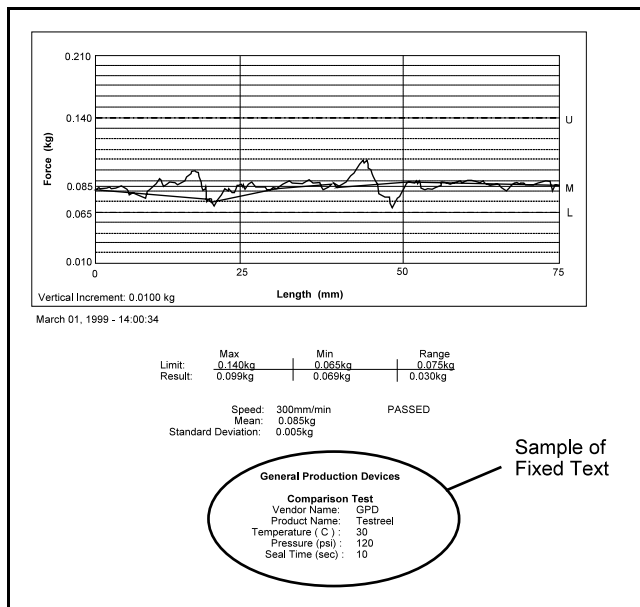
Sample of printed label

Sizing

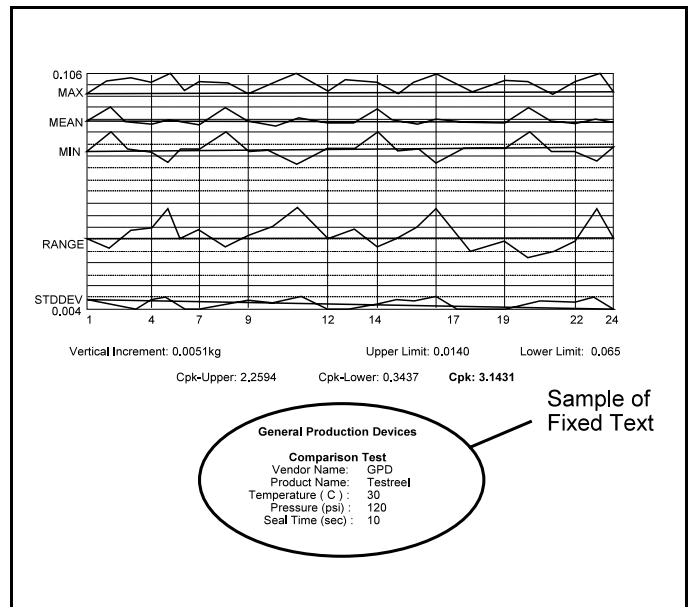
SPC data, graphs, and labels can be generated in a range of sizes, from full size down to 25% of full size. For details about how to change output scale, see *Configure Printer* (page 16).

Fixed Text

User-defined fixed text may be assigned to print at the bottom of SPC data and graphs. For details about how to add and modify fixed text, see *Configure Printer* (page 16).



Fixed text printed on test results report



Fixed text printed on SPC line graph report

User Access

Use this section to create, change, or delete user accounts; and assign or change security levels, access rights, and passwords. You may also establish defaults for certain functions such as data storage, test parameters, and printer configuration options for users without access to those areas.

Add User

To add a user account:

1. Log on with a Maximum security level user name.
2. Click on User > Create/Modify. Create/Modify User appears.

3. Type a new name in User Name.
4. Type in a password in Password and Verify Password.
5. In the Menus and Buttons panel, click on each access right pertinent to the new user name.
6. As needed, set any defaults desired for this user account in the Data Storage Options and Data Collection Options panels.
7. Click ACCEPT and OK.
8. Repeat steps 3 through 6 as necessary to add additional user accounts.

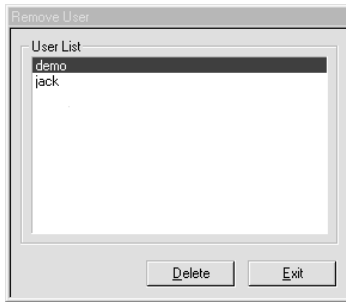
Hint: Multiple entries with the same access and default settings can be made easily as the settings remain until changed or a user account with different settings is selected.

9. Click EXIT.

Delete User

To delete a user account:

1. Log on with a Maximum security level user name.
2. Click on User > Remove. Remove User appears.



3. Select the user name to be deleted.
4. Click on DELETE and then click OK on the prompt that appears.
5. Click EXIT.

Change Access Rights

To change the access rights for a user account:

1. Log on with a Maximum security level user name.
2. Click on User > Create/Modify. Create/Modify User appears.
3. Type a user name in User Name or select a name from the User Name drop down list.
4. Change the access settings by clicking the pertinent buttons in the Menus and Buttons panel.
5. As applicable for this user account, change the defaults in the Data Storage Options and Data panels of the Create/Modify User window.
6. Click ACCEPT and OK.
7. Repeat steps 3 through 6 as necessary to change access rights for other user accounts.
8. Click Exit.

Change Password

To change a password for a user account:

1. Log on with a Maximum security level user name.
2. Click on User > Create/Modify. Create/Modify User appears.
3. Type a new password over the existing entry.
4. Type the new password again as a confirming entry in Verify Password.
5. Click ACCEPT and OK.
6. Click EXIT.

Window Map

A map of the FORCEWare® control software windows are provided below as a visual representation of how the windows interrelate.

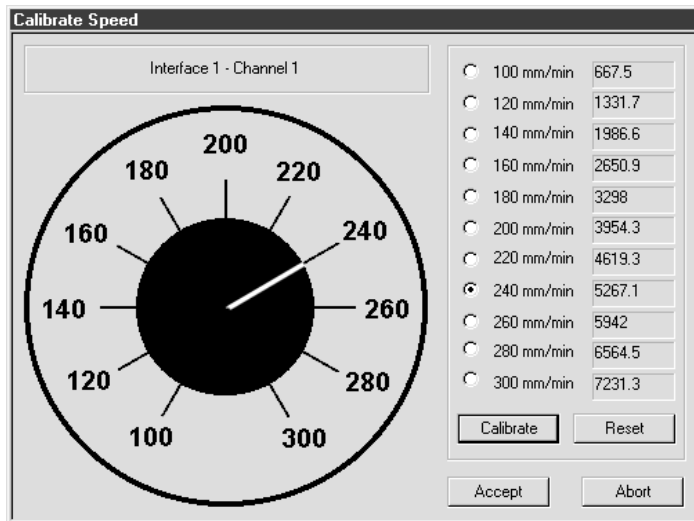
| Main Menu | Pull down menu | Subsequent window... | | |
|-----------|---|---|--|--|
| User --> | Login Create/Modify Remove | User Login Create/Modify User Remove User | Printer Configuration | |
| Setup --> | Configure PBFT Configure Printer | PBFT Configuration Printer Configuration | Calibrate Speed Calibrate Strain Gauge | |
| PBFT --> | Activate PBFT | PBFT Control Center | Options Load Results Save Results Print Results Unit of Force View Statistics | Test Parameter Options Open Data Storage Print Unit of Force Test Results |
| SPC --> | SPC Analysis | Period Selection | SPC Analysis | Period Selection Print |
| Exit | | | | |
| About --> | About FORCEWare® | | | |

Window References

A sample of each FORCEWare® window is shown here with a detailed description of each element used in the window.

Calibrate Speed Window

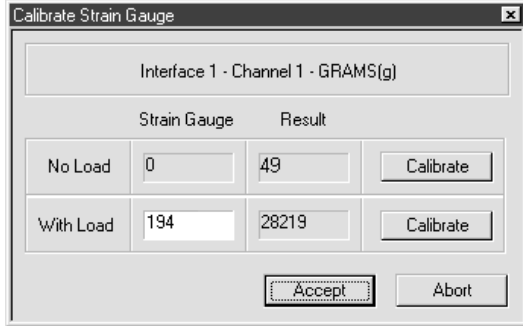
Use Calibrate Speed to configure the PBFT speed indicator and verify that the simulated speed selector is synchronized with the PBFT's mechanical speed dial.



| Element | Description |
|----------------|---|
| Speed Dial | Simulated speed selector used to calibrate the PBFT's mechanical speed selector dial. |
| mm/min | Rate of peel speed in millimeters per minute. Values are in a raw data format for the PC interface card. A successful calibration will display values differing by a consistently similar number. |
| CALIBRATE | Executes calibration of the control software to the PBFT speed indicator. |
| RESET | Clears all mm/min fields. |

Calibrate Strain Gauge Window

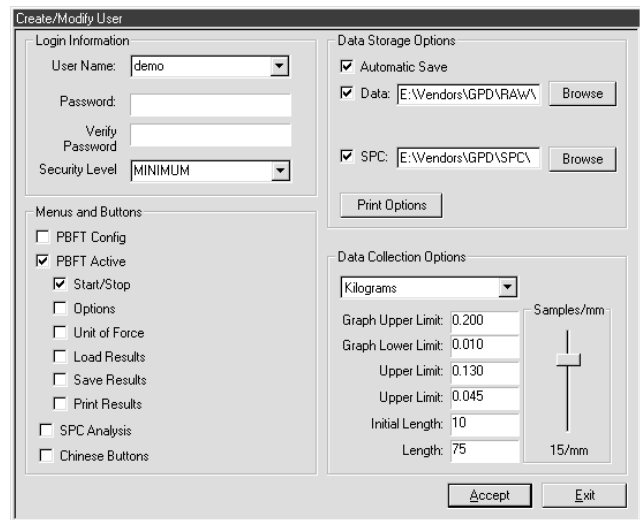
Use the Calibrate Strain Gauge window to calibrate the PBFT strain gauge.



| Element | Description |
|---------------------|---|
| Interface - Channel | Indicates which PBFT strain gauge interface card and channel configuration is being calibrated. The unit of force currently in use also displays here. |
| Strain Gauge | |
| No Load | Display zero (0). With no load on the strain gauge, this integer value results from conversion of the strain gauge reading by the PC interface converter card. |
| With Load | Enter the value displayed on the strain gauge here. This value is converted into the "Result" column value when the Calibrate button is pressed. |
| Result | |
| No Load | Should display the calibrated zero load value for the strain gauge. Acceptable values are within the 0 to <650 range. |
| With Load | Should display a maximum of 65535 or less. A 200 gram load on the strain gauge should not exceed a displayed value of 45000 in this field. With a load on the strain gauge, this integer value results from conversion of the strain gauge load reading by the PC interface converter card. |

Create/Modify User Window

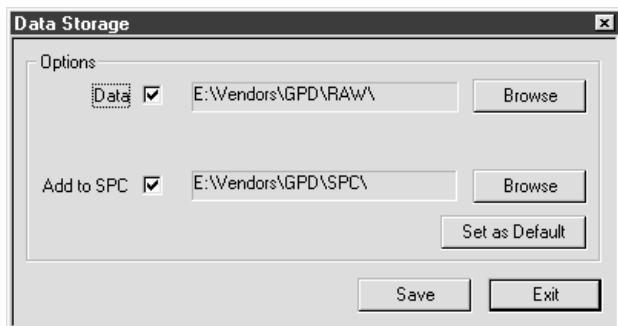
Use the Create/Modify User window to add or change user/vendor password, security level, and access rights. Also set defaults for save, print, and test parameters options by user/vendor.



| Element | Description | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---|----------------|--|-------------|--|------------|--|---------|--|---------------|---|--------------|--|--------------|--|---------------|---|--------------|---|-----------------|---|
| User Name | Can represent a user or a vendor. Case sensitive and may consist of 12 alphanumeric characters. | | | | | | | | | | | | | | | | | | | | |
| Password | Not revealed when typed; a "*" displays for each character typed. Requires a confirming entry in Verify Password. Case sensitive and may consist of 12 alphanumeric characters. | | | | | | | | | | | | | | | | | | | | |
| Security Level | MAXIMUM allows creation of new users and assigning of access permissions. MINIMUM is limited to the access permissions assigned to it. | | | | | | | | | | | | | | | | | | | | |
| Menus and Buttons | Toggle buttons for all available access rights. Any combination of access rights can be assigned to any user name. | | | | | | | | | | | | | | | | | | | | |
| | <table border="0"> <tr> <td>PBFT Config</td> <td>Grants access to calibrating the PBFT speed dial and strain gauge.</td> </tr> <tr> <td>PBFT Active</td> <td>Controls access to all PBFT Active access rights on the Create/Modify User window. At a minimum, also activate at least the Start/Stop access right.</td> </tr> <tr> <td>Start/Stop</td> <td>Grants access to operating the Start and Stop button in PBFT Control Center.</td> </tr> <tr> <td>Options</td> <td>Grants access to test parameter options via the Options button in PBFT Control Center.</td> </tr> <tr> <td>Unit of Force</td> <td>Grants access to the Unit of Force button in PBFT Control Center.</td> </tr> <tr> <td>Load Results</td> <td>Grants access to the Load Results button in PBFT Control Center.</td> </tr> <tr> <td>Save Results</td> <td>Grants access to the Save Results button in PBFT Control Center.</td> </tr> <tr> <td>Print Results</td> <td>Grants access to the Print Results button in PBFT Control Center.</td> </tr> <tr> <td>SPC Analysis</td> <td>Grants access to SPC Analysis and Period Selection.</td> </tr> <tr> <td>Chinese Buttons</td> <td>START, STOP, and EXIT buttons in the PBFT Control Center window are displayed in Chinese and English.</td> </tr> </table> | PBFT Config | Grants access to calibrating the PBFT speed dial and strain gauge. | PBFT Active | Controls access to all PBFT Active access rights on the Create/Modify User window. At a minimum, also activate at least the Start/Stop access right. | Start/Stop | Grants access to operating the Start and Stop button in PBFT Control Center. | Options | Grants access to test parameter options via the Options button in PBFT Control Center. | Unit of Force | Grants access to the Unit of Force button in PBFT Control Center. | Load Results | Grants access to the Load Results button in PBFT Control Center. | Save Results | Grants access to the Save Results button in PBFT Control Center. | Print Results | Grants access to the Print Results button in PBFT Control Center. | SPC Analysis | Grants access to SPC Analysis and Period Selection. | Chinese Buttons | START, STOP, and EXIT buttons in the PBFT Control Center window are displayed in Chinese and English. |
| PBFT Config | Grants access to calibrating the PBFT speed dial and strain gauge. | | | | | | | | | | | | | | | | | | | | |
| PBFT Active | Controls access to all PBFT Active access rights on the Create/Modify User window. At a minimum, also activate at least the Start/Stop access right. | | | | | | | | | | | | | | | | | | | | |
| Start/Stop | Grants access to operating the Start and Stop button in PBFT Control Center. | | | | | | | | | | | | | | | | | | | | |
| Options | Grants access to test parameter options via the Options button in PBFT Control Center. | | | | | | | | | | | | | | | | | | | | |
| Unit of Force | Grants access to the Unit of Force button in PBFT Control Center. | | | | | | | | | | | | | | | | | | | | |
| Load Results | Grants access to the Load Results button in PBFT Control Center. | | | | | | | | | | | | | | | | | | | | |
| Save Results | Grants access to the Save Results button in PBFT Control Center. | | | | | | | | | | | | | | | | | | | | |
| Print Results | Grants access to the Print Results button in PBFT Control Center. | | | | | | | | | | | | | | | | | | | | |
| SPC Analysis | Grants access to SPC Analysis and Period Selection. | | | | | | | | | | | | | | | | | | | | |
| Chinese Buttons | START, STOP, and EXIT buttons in the PBFT Control Center window are displayed in Chinese and English. | | | | | | | | | | | | | | | | | | | | |
| Data Storage Options | Establishes the defaults for data storage and printer configuration options unless overridden in the respective window by users with access to those areas. | | | | | | | | | | | | | | | | | | | | |
| | <table border="0"> <tr> <td>Automatic Save</td> <td>Automatically saves test result files.</td> </tr> </table> | Automatic Save | Automatically saves test result files. | | | | | | | | | | | | | | | | | | |
| Automatic Save | Automatically saves test result files. | | | | | | | | | | | | | | | | | | | | |
| Data Collection Options | Establishes the defaults for test parameter options unless overridden in the respective window by users with access to those areas. | | | | | | | | | | | | | | | | | | | | |

Data Storage Window

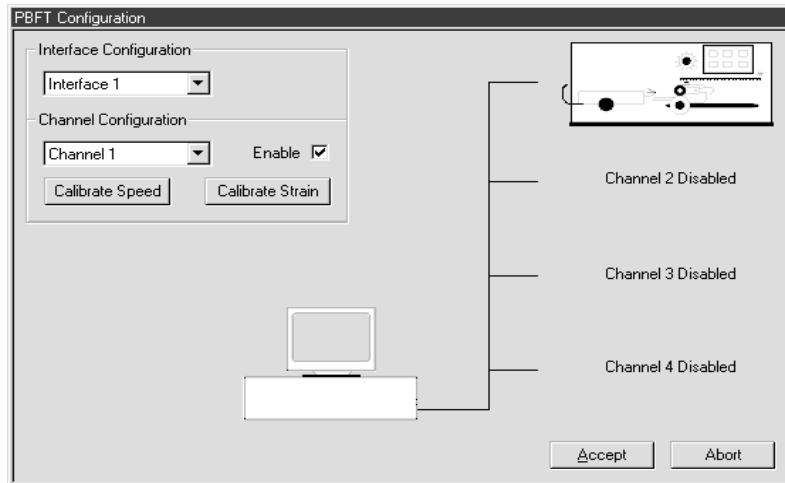
Use the Data Storage options to establish the defaults for data storage. These defaults can be overridden from the Create/Modify User window by users with access to that area.



| Element | Description |
|----------------|--|
| Data | Saves test results in raw data format. |
| Add to SPC | Saves test results in SPC format. |
| BROWSE | Designates the specific location to which file is to be saved. |
| SET AS DEFAULT | Designates the save directory defaults, for both Data and SPC files, for the next time the user logs in. |

PBFT Configuration Window

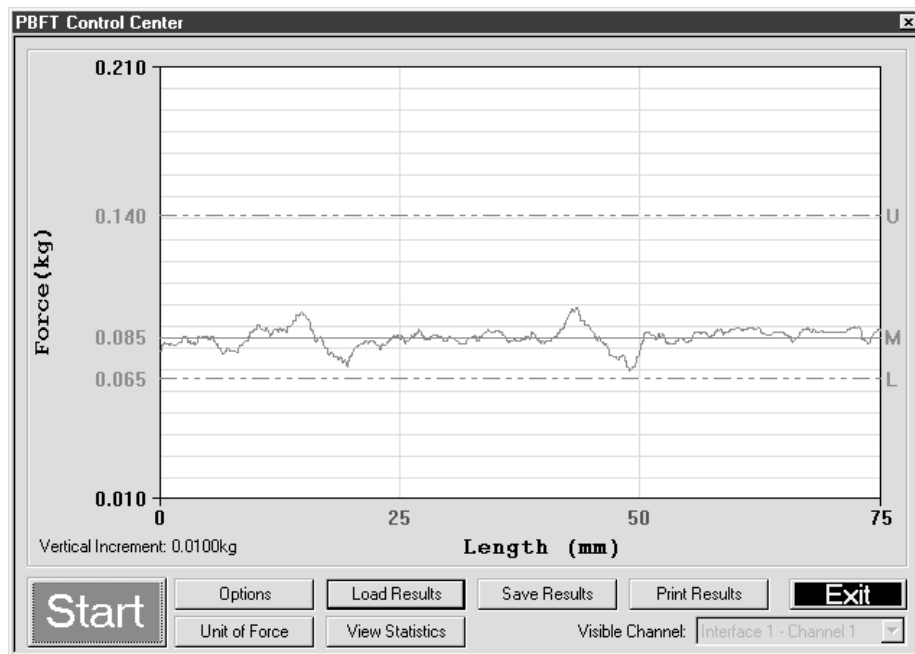
Use the PBFT Configuration window to configure the PBFT and its interaction with the PC interface card, and access the PBFT speed indicator and strain gauge calibration functions.



| Element | Description |
|---------------------------|---|
| Interface Configuration | Defines the interface converter card in the computer to which the PBFT is connected. Defaults to Interface 1 (only currently active interface). |
| Channel Configuration | Defines the PC interface card channel to which the PBFT is connected. |
| Enable | Enables the PC interface card channel to which the PBFT is connected. |
| CALIBRATE SPEED | Calibrates the control software with the PBFT speed indicator. |
| CALIBRATE STRAIN | Calibrates the control software with the PBFT strain gauge. |
| Channel <i>n</i> Disabled | Indicates which channels are enabled. A picture of the PBFT replaces the "Channel <i>n</i> Disabled" to indicate an enabled channel. Currently, only Channel 1 can be configured. |

PBFT Control Center Window

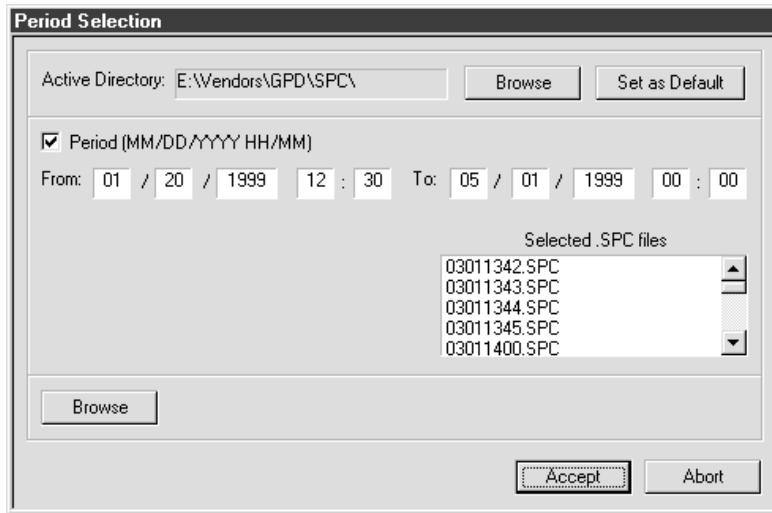
Use PBFT Control Center to define test parameters and unit of measure, run a test, and view, print, and/or save test results. Also use this window to review prior test results.



| Element | Description |
|--------------------|--|
| Force (kg or g) | Indicates the current unit of force used in the displayed graph and resulting test data. |
| Vertical Increment | Indicates the number of units per vertical bar (blue) in the current unit of force. |
| Length (mm) | Indicates in millimeters the length of the test. |
| Start/Stop | Enables control of test execution with the mouse or ENTER key. To initiate a test, click on the START button or press ENTER. |
| Options | Defines test parameters. |
| Load Results | Loads a saved set of run data files to view or print. |
| Save Results | Saves active test results to a user-defined location. (Available only after a test has been run.) |
| Print Results | Prints test results in graph or label format. (Available only after a test has been run.) |
| Unit of Force | Defines the active unit of force. This unit of force measure may be changed at any time - before a run, after a run has been completed, or even for data loaded from a previous run. |
| View Statistics | Displays the test results window. |
| Visible Channel | Not currently functional. |

Period Selection Window

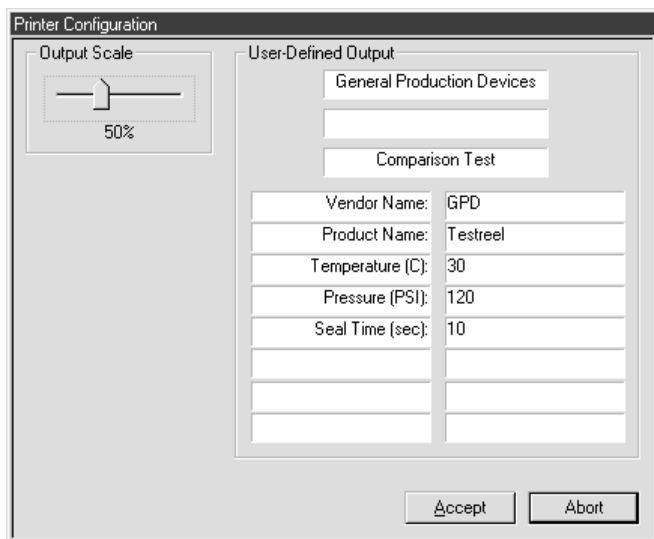
Use Period Selection in conjunction with the SPC Analysis window to display and/or generate reports of SPC data for a user-defined group of test results over a user-defined date and time span.



| Element | Description |
|---------------------|--|
| Active Directory | Displays the directory from which SPC files are to be selected. This directory is selected in the Save As SPC and Create/Modify User windows. |
| BROWSE | Designates the specific location from which SPC files are to be selected. |
| SET AS DEFAULT | Designates the selection location for SPC files which are used in the SPC Analysis portion of the software. |
| Period | Designates the time span in "MM/DD/YY HH/MM" format over which SPC data is reported. |
| Selected .SPC Files | A minimum of 5 files is required to run SPC analysis. SPC files generated during the period of time designated by the specified dates and times. |
| BROWSE | Multiple file selections can be made using standard Windows® file selection tools. |

Printer Configuration Window

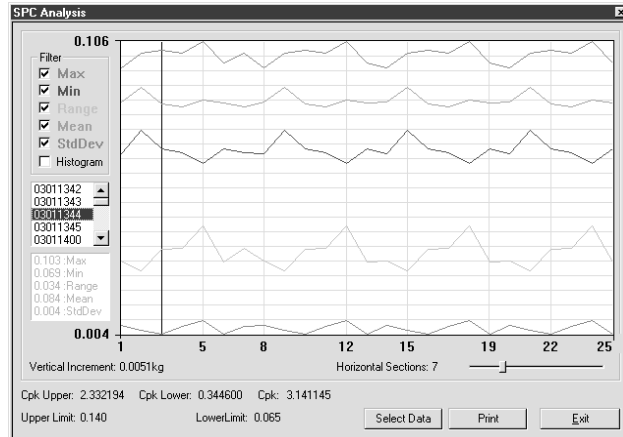
Use Printer Configuration to establish defaults for the printer configuration options of report dimensions and appending report text. These defaults can be overridden from the Create/Modify User window by users with access to that area.



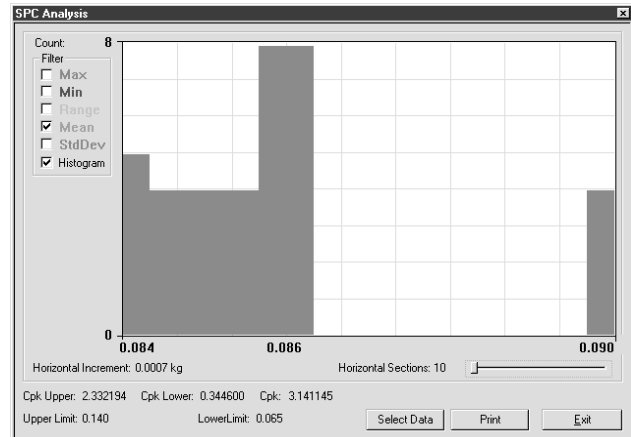
| Element | Description |
|--------------|---|
| Output Scale | Controls the overall size of actual graph or label report dimensions. A range of 25% to 100% of full size is available. |
| Fixed Output | Text from all filled-in fields will print at the bottom of all SPC data and graph reports. Text in all of these fields can be changed or deleted. |

SPC Analysis Window

Use SPC Analysis in conjunction with the Period Selection window to display and/or generate reports of SPC data for a user-defined group of test results over a user-defined date and time span.



All filter data displayed for selected data file

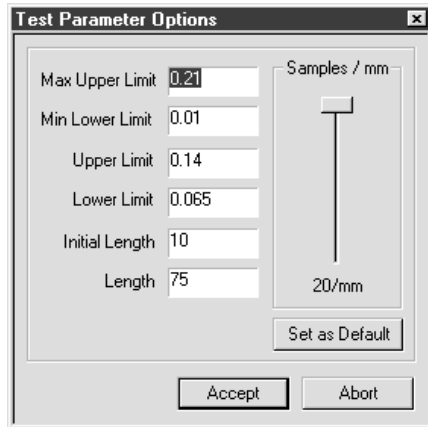


Histogram with Mean filter selected

| Element | Description |
|----------------------|---|
| Count | For Histogram filter only. Number of occurrences a data point fell into the given range. |
| Filter | Determines the type of test data results displayed/printed. |
| Max | Maximum data point of all selected SPC files. |
| Min | Minimum data point of all selected SPC files. |
| Range | Difference between minimum and maximum data point. |
| Mean | Mean data point of all selected SPC files. |
| StdDev | Measure of dispersion in distribution beyond mean for all selected SPC files. |
| Histogram | Uncovers non-normal behavior of the tests. Includes bar width for the histogram as computed by the program. The value can be changed to suit the user for a given analysis. |
| list of files | List of all file names selected in Period Selection window. |
| file data | The SPC data of the selected file in the SPC Analysis window. As an example, notice the box of statistics for the 03011344 file selected in the window above at left. |
| Vertical Increment | Increment between the grid lines. |
| Horizontal Increment | |
| Horizontal Sections | Designates the number of horizontal sections displayed. Adjusts the range (Horizontal Increment) in histograms and acts as a visual reference in line graphs. Range is from 3 to 20 sections. |
| Cpk Upper | Cpk of the MAXIMUM data point of all selected SPC files. |
| Cpk Lower | Cpk of the MINIMUM data point of all selected SPC files. |
| Cpk | Cpk of the MEAN data point of all selected SPC files. |
| Upper Limit | Maximum allowed upper and lower limits - synonymous with the upper and lower test limits on the graph display. These are taken from the first file selected in Period Selection. |
| Lower Limit | |
| SELECT DATA | Select the data to be analyzed by file location and date/time span. |

Test Parameter Options Window

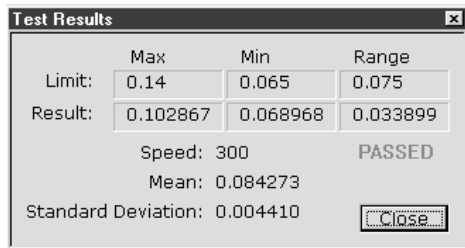
Use the Test Parameter options to establish the defaults for data storage, test parameters, and printer configuration options. These defaults can be overridden from the Create/Modify User window by users with access to that area.



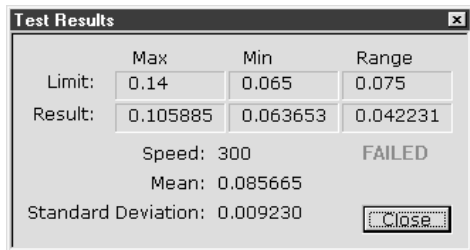
| Element | Description |
|------------------------------------|---|
| Max Upper Limit Min Lower Limit | Maximum and minimum values displayed on the graph. For screen display only, these values will not alter the actual data collected. If the data extends beyond the range of either the maximum or minimum limit, the data will be plotted on that extreme. |
| Upper Limit Lower Limit | Upper and lower threshold limits that determines whether a live run passes or fails. If the data extends beyond these limits, the software will fail the run. |
| Initial Length | Length of tape to be ignored while the material and data stabilize during the initial take-up. Default value for all tests run under the current user account. |
| Length | Actual length (in mm) of tape to be tested. |
| Samples/mm | Regulates the number of samples collected during every millimeter of a test. Ranges from 1 to 20 samples per millimeter. Slower computers may require a lower setting. |
| Set as Default | Sets the currently displayed values and Samples/mm setting as the defaults for all tests for the current user account. |

Test Results Window

Test Results quantifies test parameter results and displays whether or not the values were within the defined test parameters with PASSED or FAILED.



Successful test - PASSED



Unsuccessful test - FAILED

| Element | Description |
|--------------------|--|
| PASSED/FAILED | Result of test within the defined test parameters. |
| Limit | Maximum allowed. Test threshold limits in order to pass the test. |
| Result | Resulting test threshold limits. |
| Speed | Speed, in millimeters, at which the cover tape was peeled from the carrier tape during the test. |
| Mean | The average of the points collected. |
| Standard Deviation | The measure of dispersion in the distribution beyond the mean; the square root of the arithmetic average of the squares of the deviations from the mean. |

Unit of Force Window

Use the Unit of Force window to establish the active unit of force.



| Element | Description |
|---------|---|
| Units | <p>Recognized units of force: gram, kilogram, pound, newton.</p> <p>Designates the active unit of force. This unit of force measure may be changed at any time - before a run, after a run has been completed, or even for data loaded from a previous run.</p> |

REFERENCE

| ITEM | PART NO. | DESCRIPTION | QTY |
|------|------------|--------------------------|-----|
| 1 | PBT-0001 | Block Shaft Mount | 4 |
| 2 | PBT-0002 | Mounting Block | 4 |
| 3 | | | |
| 4 | PBT-0004-B | Bearing Mount Lock | 2 |
| 5 | PBT-0005 | Pressure Roller | 2 |
| 6 | PBT-0006VS | Drive Motor Mount | 1 |
| 7 | PBT-0052 | Front Panel | 1 |
| 8 | PBT-0009 | Electrical Panel | 1 |
| 9 | PBT-100F | Draw Wheel Assembly | 1 |
| 10 | 10/1424 | Nylon Standoff | 2 |
| 11 | 10/1425 | Aluminum Standoff | 2 |
| 12 | PBT-0020 | Bearing Shaft | 1 |
| 13 | PBT-0021 | Shaft Pressure Roller | 1 |
| 14 | PBT-0022 | Pointer | 1 |
| 15 | 4000-0023 | Power Supply | 1 |
| 16 | PBT-0024 | Adjustment Rod | 1 |
| 17 | PBT-0026 | Slide Shaft | 2 |
| 18 | PBT-0027 | Instrument Mount Bar | 1 |
| 19 | L0306 | Bronze Bushing | 1 |
| 20 | PBT-0029 | Guide Mount | 2 |
| 21 | PBT-0030 | Arm Pressure Roller | 1 |
| 22 | PBT-0031 | Spacer Bar | 1 |
| 23 | PBT-0033 | Bearing Collar | 1 |
| 24 | D1504 | Set Collar | 1 |
| 25 | B0201 | Bearing | 4 |
| 26 | PBT-0036 | Bearing | 2 |
| 27 | PBT-0038 | Battery Charger Holder | 1 |
| 28 | PBT-0040 | Tape Clamp Holder | 1 |
| 29 | PBT-0041 | Clutch Holder | 1 |
| 30 | PBT-0053 | Reel Arm | 1 |
| 31 | PBT-0056 | Reel Shaft | 1 |
| 32 | 10/1397 | Power Entry Module | 1 |
| 33 | 10/1399 | Power Entry Module Cover | 1 |
| 34 | PBT-0046 | Reel Collar Assembly | 1 |
| 35 | 10/1692 | Knob | 2 |
| 36 | PBT-0048 | Tape Deflector | 1 |
| 37 | PBT-0108M | Sprocket | 1 |
| 38 | PBT-0103 | Gear Rack | 1 |
| 39 | PBT-0060 | Cover | 1 |

REFERENCE

| ITEM | PART NO. | DESCRIPTION | QTY |
|------|-----------|---------------------------|-----|
| 40 | PBT-0517 | Guide Bar | 2 |
| 41 | G4002 | Snap Ring | 2 |
| 42 | PBT-0032 | Pressure Wheel Mt. Plt. | 1 |
| 43 | PBT-0007 | Motor Mount Plate | 1 |
| 44 | PBT-0054 | Base Plate | 1 |
| 45 | PBT-0104 | Rack Gear | 1 |
| 46 | PBT-0408 | Drive Sprocket | 1 |
| 47 | RC025 | Roller Chain | 1 |
| 48 | DA18075 | Dowel Pin | 1 |
| 49 | L0506 | Bushing | 4 |
| 50 | G4001 | Snap Ring | 8 |
| 51 | PBT-0119 | Spring Anchor | 2 |
| 52 | 10/0173 | Gear Motor | 1 |
| 53 | 5100-0022 | Green Lens | 2 |
| 54 | 5100-0013 | Red Lens | 1 |
| 55 | | | |
| 56 | 5100-0011 | White Lens | 1 |
| 57 | 5100-0010 | Switch | 2 |
| 58 | 5100-0009 | Latching Switch | 1 |
| 59 | 5100-0084 | Pilot Light | 1 |
| 60 | 2450-0010 | Switch Bulb | 4 |
| 61 | 3500-0005 | Rotor Clutch | 1 |
| 62 | 2400-0002 | Knob | 1 |
| 63 | 10/1422 | Battery Charger | 1 |
| 64 | 2825-0014 | Stand Off | 4 |
| 65 | 10/1398 | Fuse Holder | 1 |
| 66 | 10/1423 | Fuse | 2 |
| 67 | 2400-0005 | Knob | 1 |
| 68 | PBT-0309 | Rubber Foot | 4 |
| 69 | PBT-0310 | Handle | 1 |
| 70 | PBT-0312 | Spring | 1 |
| 71 | PBT-0313 | Clip | 1 |
| 72 | B8003 | Ball Bearing | 2 |
| 73 | PBT-0101 | Travel Shaft | 2 |
| 74 | 10/0287 | Strain Gauge Force Tester | 1 |
| 75 | | | |
| 76 | PBT-0051 | Linear Washer | 4 |
| 77 | F5453 | Shoulder Bolt | 1 |

CONTINUED ON NEXT PAGE



GENERAL PRODUCTION DEVICES

PBFT Assembly Parts Listing

PBFT-3D2 Listing

06/01/99

REFERENCE

| ITEM | PART NO. | DESCRIPTION | QTY |
|------|-----------|------------------------|-----|
| 78 | PBT-0512 | Power Supply Mt Frame | 1 |
| 79 | PBT-0513 | Power Supply Cover | 1 |
| 80 | 10/1453 | Power Label | 1 |
| 81 | | | |
| 82 | 10/1455 | Test Start Label | 1 |
| 83 | 10/1456 | Carriage Release Label | 1 |
| 84 | | | |
| 85 | 10/1458 | Test Stop Label | 1 |
| 86 | L0307 | Bushing | 1 |
| 87 | D1503 | Set Collar | 1 |
| 88 | 10/1752 | Knob | 1 |
| 89 | 10/1694 | Spring | 1 |
| 90 | PBT-0515 | Rear Tape Guide | 1 |
| 91 | PBT-0514 | Guide Back Plate | 1 |
| 92 | PBT-0516 | Front Tape Guide | 1 |
| 93 | PBT-0519 | Guide Catch | 1 |
| 94 | 3500-0000 | Clutch Coil | 1 |
| 95 | 3500-0006 | Clutch Armature | 1 |
| 96 | 3500-0007 | Retainer Ring | 1 |
| 97 | PBT-0039 | Switch Bracket | 1 |
| 98 | S5004 | Plunger | 4 |
| 99 | RPAC06087 | Roll Pin | 1 |

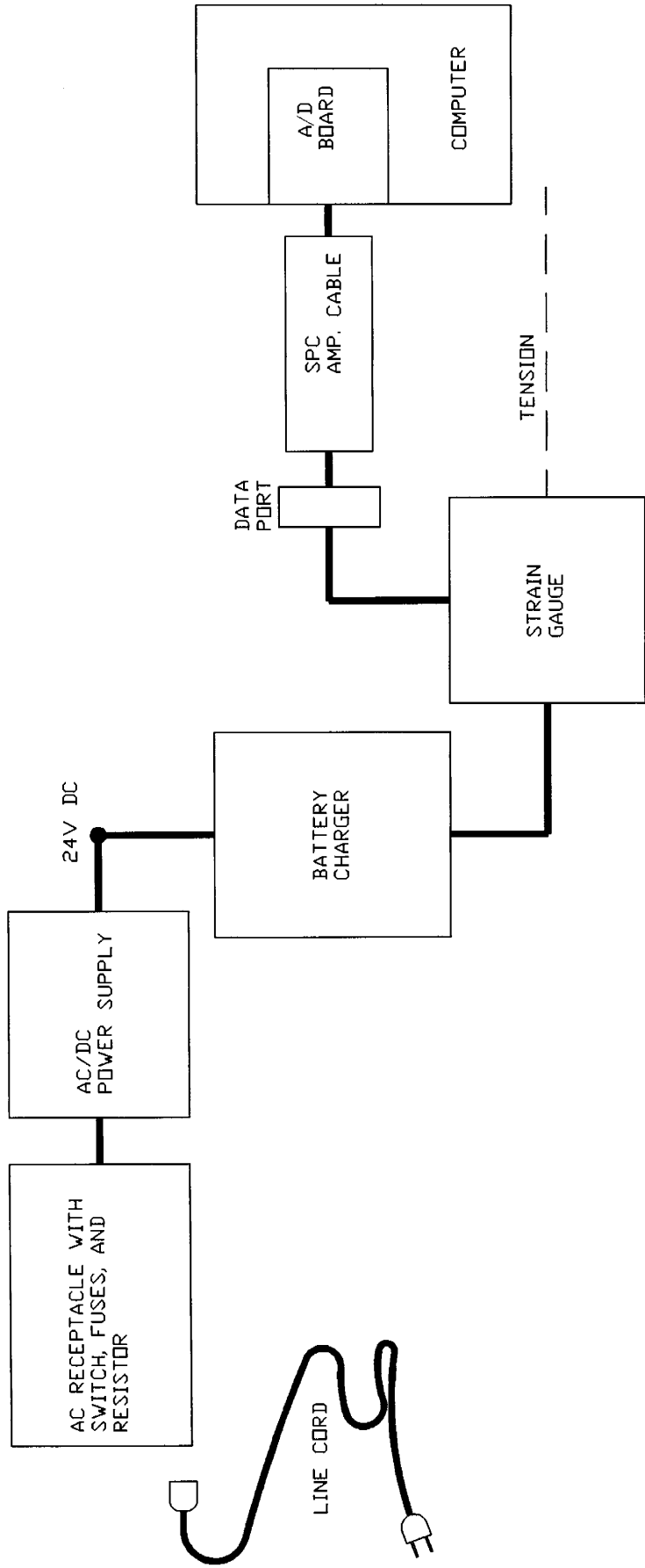


GENERAL PRODUCTION DEVICES

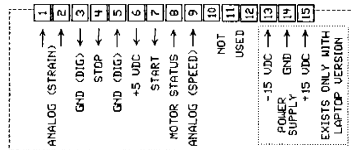
PBFT Assembly Parts Listing

PBFT-3D2 Listing

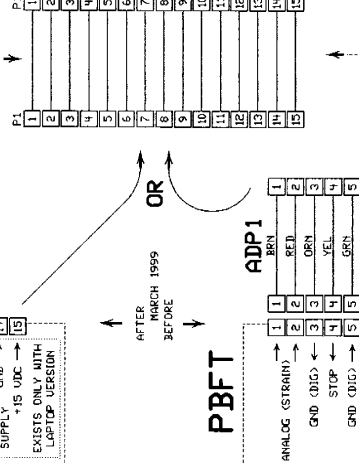
06/01/99



PBFT



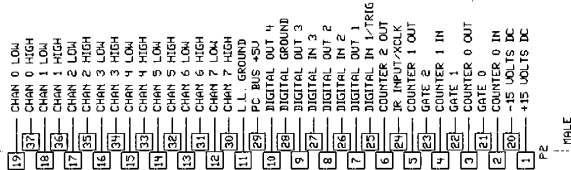
INTERFACE CABLE



SPC "98" AMPLIFIER MODULE

GPD # 1100-0015

COMPUTER



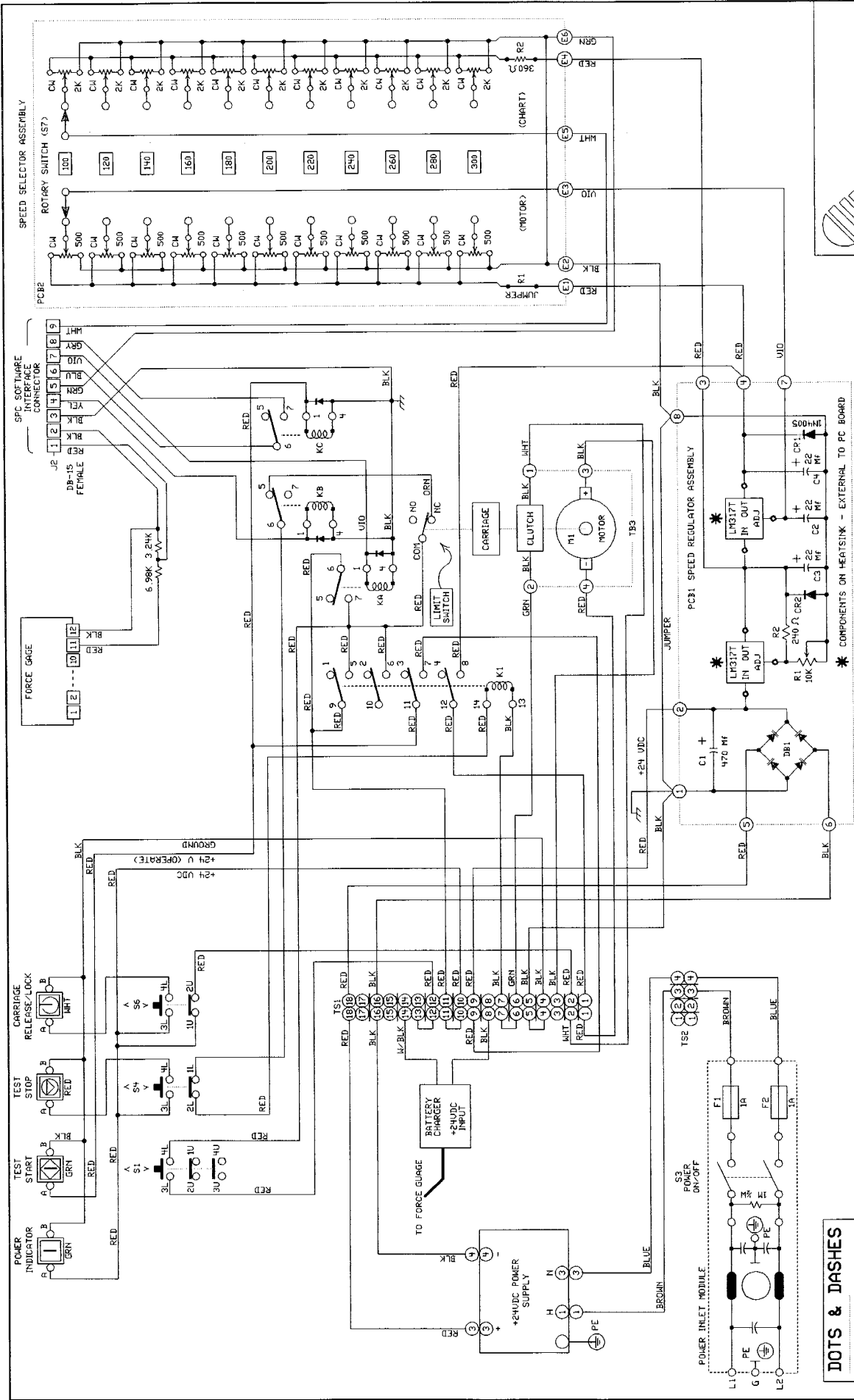
16 BIT - 16 CHAN
A/D BOARD
GPD # R200-0169

| TOTAL QTY | GPD PART No. | SYMBOL REFERENCE | DESCRIPTION |
|-----------|--------------|------------------|------------------------------------|
| 2 | 1700-0056 | PC3 | PRINTED CIRCUIT BOARD, SPC 98 AMP |
| 1 | 2100-0164 | J2 | CONNECTOR, 37-PIN FEMALE D-SUB |
| 1 | 2100-0072 | J1 | CONNECTOR, 15-PIN FEMALE D-SUB |
| 2 | 2800-0070 | J1 | BRACKET, DB15 TO BACKSHELL |
| 1 | 3130-0023 | U3 | +8 VOLT REGULATOR, 78L08 |
| 1 | 3130-0024 | U4 | +8 VOLT REGULATOR, 78L08 |
| 1 | 3130-0064 | U5 | +5 VOLT REGULATOR, 78L05 |
| 1 | 3130-0063 | U1 | INSTRUMENTATION AMPLIFIER |
| 1 | 3130-0043 | U2 | DUAL OPTO-COUPLER, ACT-62 |
| 4 | 4800-0004 | D1,2,3,4 | DIODE, SWITCHING, 1N4148 |
| 2 | 4700-0025 | R1, R9 | POT, 5 K, 1/4 W, MULTI-TURN |
| 2 | 4700-0045 | R3, R5 | RESISTOR, 360 OHM, 1/4 W, 5% |
| 2 | 4700-0053 | R7, R8 | RESISTOR, 1 K, 1/4 W, 5% |
| 2 | 4700-0026 | R4 | RESISTOR, 2.2 K, 1/4 W, 5% |
| 2 | 4700-0012 | R2, R3 | RESISTOR, 100 K, 1/8 W, 1% |
| 4 | 101444 | C5,6,10,11 | CAPACITOR, 0.1 MF, RAD |
| 5 | 1500-0004 | C1,2,3,4,7 | CAPACITOR, 0.1 MF, RAD |
| 2 | 1500-0029 | C8, C9 | CAPACITOR, 2.2 MF, RAD, TANT. |
| 1 | 2100-0166 | | CONNECTOR, BACKSHELL, 37-PIN D-SUB |

| TOTAL QTY | GPD PART No. | DESCRIPTION |
|-----------|--------------|---------------------------------------|
| 1 | 1100-0012 | SPC98, HARDWARE/SOFTWARE PACKAGE |
| 1 | 2200-0169 | 16-BIT, 16-CHAN, A/D COMPUTER BOARD |
| 1 | 1100-0015 | SPC 98 AMPLIFIER MODULE |
| 1 | 2000-0006 | INTERFACE CABLE |
| 1 | PBT-010 | SOFTWARE, PBT, SPC98, VERSION 1.0 |
| 1 | PBT-011 | MANUAL, PBT, US, SPC98 SOFTWARE GUIDE |
| 1 | 1100-0014 | ADAPTER CABLE, FOR PRE - 3-99 PBT's |

| TOTAL QTY | GPD PART No. | SYMBOL REFERENCE | DESCRIPTION |
|-----------|--------------|------------------|--|
| 1 | 1100-0014 | ADP1 | ADAPTER CABLE, SPC 98 / PREVIOUS PBFT |
| 1 | 2100-0072 | | CONNECTOR, D-SUB, 15-PIN FEMALE |
| 1 | 2100-0081 | | CONNECTOR, HOOD, DB15, METALIZED PLASTIC |
| 1 | 6000-0008 | | CABLE, SHIELDED, 10-COND, 24 AWG |
| 1 | 2100-0069 | | CONNECTOR, 9-PIN M4E INSERT (SERIES 126) |
| 1 | 2100-0044 | | CONNECTOR, CLAMP W/HOOD (SERIES 126) |
| 1 | 2100-0015 | | CONNECTOR, HOOD LOCKING SLEEVE (SER 126) |

| TOTAL QTY | GPD PART No. | SYMBOL REFERENCE | DESCRIPTION |
|-----------|--------------|------------------|---|
| 1 | 2000-0006 | P1 | INTERFACE CABLE |
| 1 | 2000-0006 | P1 | CABLE ASSEMBLY, DB15, M/M, 10 FT., SHIELDED |

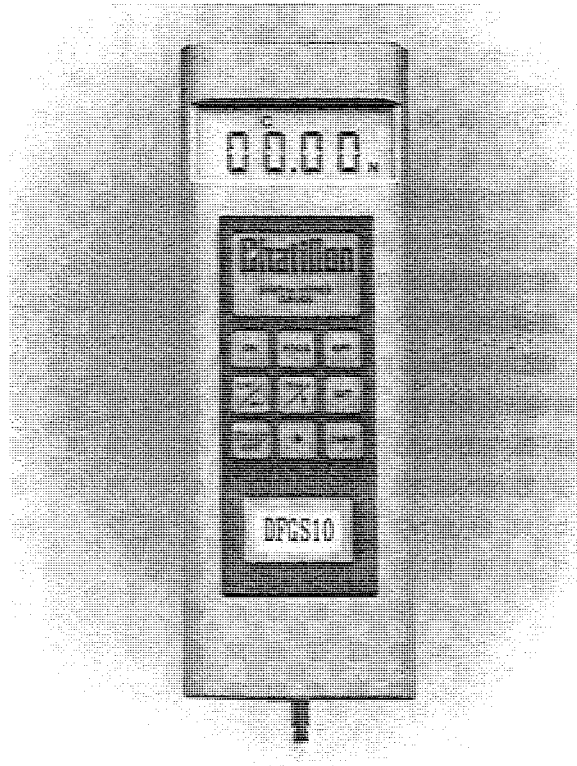


DOTS & DASHES
 ↑ INDICATORS OF MECHANICAL CONNECTIONS OR BOUNDARIES
 ↓

GPD
 GENERAL PRODUCTION DEVICES
 GRAND JUNCTION, CO 81502

Chatillon®

DFGS DIGITAL FORCE GAUGES



AMETEK

TEST AND CALIBRATION INSTRUMENTS

NC001563 rev.2

Table of Contents

| Subject | Page # |
|--|--------|
| A. General Information | 1 |
| B. Operating Instructions | 4 |
| C. Analog and Digital Outputs (Output Formats) | 7 |
| D. External Control with Computer, Terminal or Data Collector | 10 |
| E. Setting Communication Parameters | 12 |
| F. Interconnecting Cable Setup | 13 |
| I. Specifications | 16 |

Model DFGS Series Digital Force Instruments

Thank you for purchasing the Chatillon Digital Force Gauge, Model DFGS. It is a quality instrument, designed and manufactured to give continued maintenance-free service. Please read this booklet in its entirety for best results.

A. General Information

1. The gauge utilizes a 16 bit microprocessor. The internal sampling rate is 5000 times per second.
2. Prior to reaching overload limits of the load cells, the gauge will indicate an overload condition by displaying a series of dashes (- - - -).
3. The DFGS/DGGS are factory assembled with the shaft down for stand mounted operation. If the gauge is to be handheld (shaft up), the front housing can be rotated 180° in order to return the readout to an "upright" position. Simply remove the two screws in the rear housing, carefully rotate the front housing and then reassemble. Care should be taken not to pull, twist or pinch the wires inside the case.
4. DFGS2-100/DGGS – Two #10-32 tapped holes are provided in the back of the gauge to facilitate test stand mounting. Be sure to use screws that extend no more than $\frac{3}{8}$ inch into the gauge.
5. DFGS – Remote Mounting

Kits are available to mount remote load cells to Chatillon Manual and Motorized Test Stands. The kits include all necessary hardware to mount the load cells, but do not include any accessories for applying a load.

NC000225 Kit, DFGS-R to HTC mounting. Provides mounting hardware for 50 pound through 200 pound remote load cells. All of these load cells have a 1/4"-28 female thread for attaching accessories or fixtures.

NC000300 Kit, DFGS-R to TCM 201/TCD 200 mounting. Provides mounting hardware for 250 g through 200 pound remote load cells. The 250 g through 10 pound load cells have a #10-32 female thread while the 50 through 200 pound load cells have a 1/4"-28 female thread for attaching any accessories or fixtures.

NC000626 Kit, DFGS-R to TCD/TCM-500 mounting. Provides mounting hardware for 50 pound through 500 pound remote load cells. The 50 pound through 200 pound load cells have a 1/4"-28 female thread while the 500 pound load cell has a 1/2"-20 female thread for attaching any accessories or fixtures.

NC000627 Kit, DFGS-R to TCD/TCM-1000 mounting. Provides mounting hardware for 50 pound through 1000 pound remote load cells. The 50 pound through 200 pound load cells have a 1/4"-28 female thread while the 500 or 1000 pound load cell has a 1/2"-20 female thread for attaching any accessories or fixtures.

6. The gauge is powered by a rechargeable NiCad battery. Since NiCad batteries will discharge while not in use, it may be necessary to recharge the unit when it has not been used for a while. A "BATT" indicator on the display indicates a limited amount of time is remaining (approximately 1/2 hour) before the battery requires recharging.

NOTE: The product you have purchased contains a rechargeable battery. The battery is recyclable. At

the end of its useful life, under various state and local laws, it may be illegal to dispose of this battery into the municipal waste stream. Check with your local solid waste officials for details in your area for recycling options at your disposal.

7. Two battery chargers are available, one for 115 Vac and one for 220 Vac. To charge the gauge battery, plug the accompanying charger into a proper voltage source and insert the charger jack into the receptacle on the end of the gauge. Charge the battery for 12-14 hours, which will yield approximately 8 hours of continuous operation. (The battery can be recharged more than 500 times.)

NOTE: Do not use a charger other than the one supplied with the gauge. The charger is specially designed to prevent overcharge, which could damage the battery. The gauge can also be operated continuously with the charger connected.

8. Force Direction – There is no negative sign in the display. The display will automatically indicate "T" for tension or "C" for Compression corresponding to the direction of the applied load.
9. Automatic Shut-Off – After 10 minutes of non-use the gauge will automatically turn off if this function is activated.

10. Normal and Peak Readings

- a. Normal reading is an average of 600 instantaneous readings over a 120 millisecond time period and is the force displayed when the peak mode is not in use.
- b. Peak reading is the maximum value of the individual instantaneous readings which the gauge captures.

11. Set Points – Two (2) set points may be entered

using the keypad. When set points are entered one or both of the following functions can be activated:

- a. Sound an audible buzzer indicating that a set point has been reached, or
- b. Send a signal to a TCD Series Test Stand to stop the ram or cycle the ram between force set points.

NOTE: With set points entered and the buzzer activated, the audible signal will be on continuously any time the measured force is above or below the set point values.

12. Communications

Digital and Analog output signals are standard:

Analog – DC Voltage proportional to the applied load.

Digital – RS-232 Bidirectional Interface. Modified BCD (Mitutoyo) format.

B. Operating Instructions

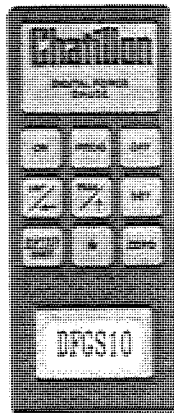
1. A 9 element keypad is used for operation of the instrument:

ON – Turns gauge on (with optional 10 minute auto shut-off if not in use)

OFF – Turns gauge off.

ZERO – Zeros the value shown on the display.

“★” – Hold “★” and depress zero to erase all values stored and zero display. Hold “★” and depress “PROG” to select user programmable functions.



SET – Used to set HI limit (stop TCD ram moving down when high force limit is reached), set LO limit (stop TCD ram moving up when LO limit is reached) and activate or deactivate the set point function.

UNIT/← – Dual function key used to:

- a. Select the system of units to be displayed. Choose LB (oz), KG (g) or N. Key steps through the choices (Selected units remain in memory until changed by the keypad).
- b. Move the digit being set across the display from right to left starting at the right most least significant count (LSC) and ending at the most significant count (MSC), then from the left most digit to T or C, then back to the right most least significant count (LSC). This secondary function is only used during the changing of set points.

PROG - Used to select user programmable functions such as activating/deactivating the buzzer, the communication with the TCD to stop the ram when a set point is reached and the auto shut-off timer.

PEAK/↑ – Dual function key used to:

- a. Activate/deactivate the Peak Hold feature which freezes the display at the peak value that occurred during a test. The display indicates T Peak or C Peak. Key steps through the choices.
- b. Change set point values. It is used after “SET” key is depressed.

2. Entering and Activating/Deactivating Set Points

- a. Depress “SET”. The display will show the Hi Limit value in memory and the LSC will flash. Press “↑” to change the flashing digit value. Each key stroke increases the value by one digit.

- b. Depress “←” to move to the next digit to the left. Repeat for each digit until the Hi set point value and desired test mode (T or C) are displayed. Press “ENTER” to record the Hi set point and move to the Lo set point.
- c. When the Lo Limit value in memory is displayed, repeat the procedure above using the “↑” and “←” keys. When the desired value is displayed, press “ENTER” to record the Lo set point and display “L Lo”.
- d. If “L Lo” is flashing, the set points are activated. To deactivate press “↑”, then press “ENTER”. If “L Lo” is not flashing the set points are turned off. To change the set point mode press “↑”, then press “ENTER” to store all of the set point information and return the gauge to normal operation.

NOTE: For the 10, 100, 1,000 and 10,000 lb units, the most significant count (half digit) will only be displayed when entered as part of a set point. Otherwise the half digit will be blank, that is for a 100 lb unit programmed for any set point below 100 lb, the half digit will not flash. Press “↑” to enter the 1 or “←” to move to the mode (T or C).

NOTE: For purposes of entering set points, Tension is considered as negative compression. Therefore, the more negative of the two set points must be stored as the Lo Limit (that is, for Tension set points of 5 lb and 20 lb the 20 lb is more negative and must be entered as the Lo Limit and 5 lb as the Hi Limit). Should the set points be entered incorrectly, (that is, 5 lb as the Lo Limit in tension and 20 lb as the Hi Limit) the buzzer will be activated to provide a continuous warning signal.

3. Activating/Deactivating the Buzzer, Machine Control and Auto Shut-Off Functions

NOTE: All three activate/deactivate functions must be completed each time this mode is entered.

- a. After the set points are entered into the gauge, hold “★” then depress “PROG”. The display will show “BEEP”. Press “ENTER” to activate or “PROG” to deactivate the audible buzzer when a programmed set point is reached. The display will now show “S SP”.
- b. This function is used to send the appropriate signal to the TCD test stand to stop the ram when the programmed set point is reached. Press “ENTER” to activate or “PROG” to deactivate the stop signal when a programmed set point is reached. The display will now show “L H”.
- c. This function is used to activate or deactivate the automatic shut off timer. When activated, the gauge will automatically shut off after an idle period of 10 minutes (that is, no changes in load on the load cell, no key actions or no communication with a peripheral device). Depress “ENTER” to activate the auto shut off or “PROG” to deactivate the auto shut off timer. The gauge will now return to normal operation.

4. Using the Force Capture on Contact Closure Function

When pins 8 and 10 on the output connector are shorted together, the gauge will stop reading data from the load cell and freeze both the displayed value and peak value in memory at the moment of contact closure. All remaining gauge functions remain operational. The peak value can be recalled from memory, the units changed, the data transmitted,

etc. When the short across pins 8 and 10 is re-opened, the gauge will return to normal operation.

5. Normal & Peak Modes

Digital filtering is used in the normal mode to eliminate false readings from noise and vibration. No filtering is used on Peak Hold, but a noise elimination technique is incorporated in the software.

6. Carefully screw the desired attachment on the end of the threaded shaft. Finger-tighten only to prevent damage.

7. Press "ON" to turn on. If the display does not light, or "BATT" is on, the gauge battery must be charged. See section A.4.

Select units by pressing "UNITS" until the desired units appear on the display.

Select "PEAK" mode of operation if desired. (Peak values are captured regardless of the mode selected.)

With gauge held or mounted in position, press "ZERO" to tare out the weight of any attachments.

Proceed with the desired test.

C. Analog and Digital Outputs

1. Analog output

An analog output signal is provided at the I/O connector for chart recorders. The analog output is zeroed with the display when the zero button is depressed. (See Section F-Interconnecting Cable Setup for connections.) The analog output is 0.0 to -2.0 Vdc \pm 0.75% F.S. in tension and 0.0 to +2.0 Vdc \pm 0.75% F.S. in compression.

For a positive output, reverse the input to the chart recorder.

2. Digital output – The gauge is a bidirectional communication device, transmitting the displayed data in digital format.

The transmitted data are equivalent to the value on the gauge display at the moment the transmission is initiated, except in the data collect mode. (See section D.2.)

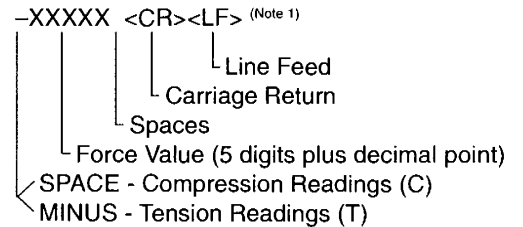
Data transmission may be initiated:

- By depressing the XMIT button on the front panel or...
- On request from the peripheral device through transmission of a ASCII "?" or "X" to the gauge.

Data output is available in two forms as follows:

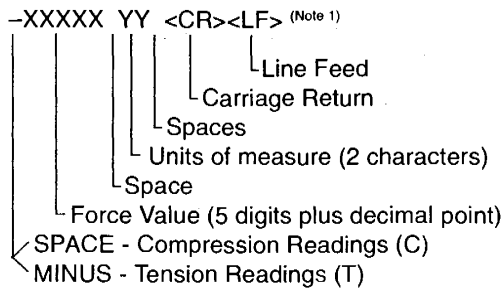
1. Numerical data only—RS-232 Format

When data transmission is initiated in this format, the value on the gauge display is sent in the following format:



2. Full Data - RS-232 Format

When data transmission is initiated in this mode by depressing the XMIT button, the value on the gauge display is sent in the following format:



NOTE 1: If the gauge is overranged (dashes on the display) the unit will transmit "ERROR".

The gauges come factory set with the following communication parameters:

Baud Rate – 9600
Word Length – 7
Stop Bits – 2
Parity – None

To select different parameters see Section E-Setting Communications Parameters.

D. External Control Via RS-232

1. Normal mode – There are 8 functions that an external device can use to control the gauge by sending the appropriate "ASCII" character. The following are the "ASCII" characters with their respective functions:

Z – Zero the gauge with its respective mode (for example, Zero tension peak when the gauge is in tension peak mode.)

R – Reset the gauge (that is, Zero all modes)

? or X – Requests data on the display to be transmitted.

U – Unit change.

P – Activate Peak mode.

F – Activate data collect mode. When the gauge is in this mode, it will start transmitting data after receiving a "?" or "X".

A – The gauge will send its operating unit to the external device (for example, Unit= KG)

S – The gauge will send its operating mode to the external device as follows:

N-MODE = Normal

TP-MODE = Tension Peak

CP-MODE = Compression Peak

DC-MODE = Data Collect Mode

2. Data Collect Mode – The external device (for example, PC computer) must be programmed to transmit an ASCII "F" to the gauge. This puts the gauge in the data collect mode.

The external device must keep sending an ASCII "?" or an "X" to the gauge. The gauge will always respond even if the instantaneous reading is zero. This allows real time data collection beginning at a force reading or zero.

The gauge will return to normal mode when the external device sends an ASCII "F".

The data which is transmitted in the data collect mode is a filtered average of 45 instantaneous force readings.

E. Setting Communication Parameters

1. To check current communications parameters:
 - a. Press and hold "XMIT". Press and release "ON". Then release "XMIT". The display will show OOOH. You are now ready to review the programmed communications parameters.
 - b. To step thru the parameters press "PROG". Each key operation will change the display to the next available parameter. A flashing display indicates the currently programmed value. The following sequence will be observed:

OOOH = MITUTOYO MODE

Baud 19.20 (19,200)
 9600 (Note 2)
 4800
 2400
 1200
 600
 300

Units 0 1 = Transmit with units (Note 2)
 0 2 = Transmit without units

Word Length/Stop Bits
 7 2 = 7 bit word/2 stop bits (Note 2)
 8 1 = 8 bit word/1 stop bit

Parity EP = Even Parity
 -P = No Parity (Note 2)

After parity, the display will return to normal operating mode.

Note 2: Factory settings shown

2. To reprogram the communication parameters, repeat program E.I. above. Press "ENTER" when the desired parameter is displayed.

F. Interconnecting Cable Setup

The gauges are supplied with a 12-pin female connector to provide both digital and analog output. Assemble a cable as required to connect the force gauge to the peripheral device using the mating connector provided. The pin-outs for the output connector on the gauge are:

| PIN # | SYMBOL | I/O | PURPOSE | DESCRIPTION |
|-------|--------|-----|------------|-----------------------------------|
| 1 | TXD | O | RS-232 | Transmitted Data |
| 2 | RXD | I | RS-232 | Received Data |
| 3 | GND | - | GROUND | Digital Ground |
| 4 | | - | CLOCK | Mitutoyo Clock |
| 5 | | I | READY | Mitutoyo Ready |
| 6 | | I | REQUEST | Mitutoyo Request |
| 7 | | O | DATA | Mitutoyo Data |
| 8 | | 1 | DETECT | Sense Contact - Closure (see B.4) |
| 9 | | O | SET POINT | Set Point Output Signal |
| 10 | | - | GROUND | Digital Ground |
| 11 | | - | ANALOG GND | Analog Ground |
| 12 | | O | ANALOG SIG | Analog Output |

I. Specifications

| Model | Accuracy | Tare Capacity | Deflection |
|------------------------|--|-----------------------------------|---|
| DGGS DFGS DFGS-R | $\pm 0.15\%$ of Full Scale ± 1 LSC | 10% of Full Scale (in Pound Mode) | Variable; 0.010" Max for Full Scale Load |
| DFGS-R-ND | $\pm 0.30\%$ of Full Scale ± 1 LSC | 10% of Full Scale (in Pound Mode) | Variable; 0.010" Max for Full Scale Load |

| Model | Item | Specification |
|------------|-----------------------|---|
| ALL MODELS | Operating Temperature | 40° F to 110° F (5° C to 45°C) |
| | Temperature Stability | 0.03% / ° F |
| | Analog Output | 0.0 to ± 2.0 Vdc $\pm 0.75\%$ F.S. |
| | Digital Output | RS-232 (± 5 V Output) |
| | Sampling Rate | 5000 SPS (Samples per Second) |
| | Display Update | 8 Updates per Second in Normal Mode; 15 Updates per Second in Peak Mode |
| | Battery Charge Life | 8-10 Hours with Full Charge |
| | Battery Life Span | Over 500 charges |

Operating Instructions Addendum DFGS Series

115 v~, 60 Hz, < 100 mA or
230 v~, 50–60 Hz, < 100 mA

If this equipment is used in a manner not specified by Chatillon, the protection provided by the equipment may be impaired causing damage to the equipment or injury to the user.

Maintenance:

Accuracy can be checked by suspending known weights from the hook.

If recalibration is required (6 to 12 months recommended), the instrument should be returned to the factory or authorized service center.

Chatillon declares that this product conforms to the requirements of directive 89/336/EEC Electromagnetic compatibility.

Product Warranty

This instrument is warranted against defects in workmanship, material and design for one (1) year from date of delivery to the extent that AMETEK will, at its sole option, repair or replace the instrument or any part thereof which is defective, provided, however, that this warranty shall not apply to instruments subjected to tampering or, abuse, or exposed to highly corrosive conditions.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED AND AMETEK HEREBY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY. AMETEK SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, ANY ANTICIPATED OR LOST PROFITS.

This warranty is voidable if the purchaser fails to follow any and all instructions, warnings or cautions in the instrument's Instruction Manual.

If a manufacturing defect is found, AMETEK will replace or repair the instrument or replace any defective part thereof without charge; however, AMETEK's obligation hereunder does not include the cost of transportation which must be borne by the customer. AMETEK assumes no responsibility for damage in transit, and any claims for such damage should be presented to the carrier by the purchaser.

ISO 9001 REGISTERED
MANUFACTURER

AMETEK

TEST AND CALIBRATION INSTRUMENTS DIVISION
8600 SOMERSET DRIVE, LARGO, FL 33773
TELEPHONE: (727) 536-7831 FAX: (727) 539-6882

Warranty

Limited Warranty: General Production Devices (GPD) warrants that this product will be free from defects in material and workmanship for a period of ninety (90) days from the date of shipment/invoice. This warranty applies only to products manufactured by or for GPD, which can be identified by the GPD trade name or logo affixed to them. GPD does not otherwise warrant any products not manufactured by GPD.

GPD will repair, or at its option, replace this GPD product during the warranty period at no charge, provided it is returned (shipping postage paid) to the GPD, Colorado service facility.

This warranty does not apply if the GPD product has been damaged by accident, abuse, misuse, or misapplication, has been modified without the written permission of GPD, or if any GPD serial number has been removed or defaced.

GPD is not responsible for incidental or consequential damages resulting from the breach of any express or implied warranty including any costs of damage to property, and, to the extent permitted by law, damages for personal injury. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES. CALIBRATION OF THIS PRODUCT IS THE SOLE RESPONSIBILITY OF THE USER. GPD's liability for a software error will be limited to the cost of correcting the software error and the replacement of any system components damaged as a result of the software error. Any implied warranties, including implied warranties of merchantability and fitness for a particular purpose, are limited in duration to ninety (90) days from the date of shipment/invoice. GPD's liability on any claim of any kind including negligence, for loss or damage arising out of, connected with or resulting from the breach of any express or implied warranty or the delivery, repair, or use of any GPD product shall in no case exceed the price allocable to the GPD product which gives rise to the claim.

Specifications, descriptions, and all information contained in this manual are subject to change and/or correction without notice.

Although reasonable care has been exercised in the preparation of this manual to make it complete and accurate, this manual does not purport to cover all conceivable problems or applications pertaining to this machine.