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# **PBFT VS SPC**

## **User Guide**

for  
Peel Back Force Tester with SPC Capability

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for  
**FORCEWare™ Software with SPC, version 3.3**

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*PBFT VS SPC User Guide*  
Prepared by GPD Global Documentation Dept.  
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# Legal

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## Safety Notices



### 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 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 readings.



### Attachments

DO NOT use attachments not recommended by GPD Global 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

<b>Getting Started</b> .....	1	<b>Maintenance</b> .....	44
<b>Overview</b> .....	1	Preventive Maintenance Schedule .....	44
Function .....	1	Replace Lamp .....	45
Theory of Operation .....	1	Calibration Accuracy .....	
Mechanical Controls .....	2	Verify Motor Speed .....	45
Software Control .....	3	Motor Speed Re-calibration .....	46
<b>Installation</b> .....	4	Verify Strain Gauge Operations .....	47
1 - Unpack & Assemble .....	4	Installing Calibration Kit .....	49
2 - Verify Mechanical Operations .....	5	Jumper Settings for A/D PCI Card .....	50
3 - Install Interface Card Software .....	6	<b>Troubleshooting</b> .....	51
4 - Install PC Hardware .....		<b>Spare Parts &amp; Accessories</b> .....	53
Install Converter Card .....	8	Suggested Spare Parts .....	53
Install Adapter .....	8	Suggested Accessory Item .....	53
Install Amplifier Cable .....	8	<b>Specifications</b> .....	54
5 - Configure Interface Card Software .....	9	<b>Appendices</b> .....	55
6 - Install SPC Software .....	13	SPC Analysis Tools .....	56
7 - Install Reader Software .....	15	Report & Label Samples .....	58
8 - Initial Start Up .....	16	User Access .....	61
<b>Configure &amp; Calibrate</b> .....	18	Language Selection .....	63
1 - Configure PBFT with Computer .....	18	Window References .....	64
2 - Calibrate PBFT Speed .....	20	Assembly Drawings .....	
3 - Calibrate PBFT Strain Gauge .....	22	Electrical Diagrams & Schematics .....	
<b>Basic Operations</b> .....	24	<b>Warranty</b> .....	83
1 - Start Up .....	24		
2 - Verify Speed .....	25		
3 - Configure Printer .....	26		
Advanced Printer Configuration .....	26		
4 - Open PBFT Control Center .....	28		
5 - Modify Test Parameters .....	29		
6 - Load Carrier Tape .....			
Prepare PBFT .....	30		
Load Tape .....	30		
7 - Run a Test .....	32		
8 - Additional Operations .....			
Save Test Results .....	33		
Save Data Log Files .....	35		
Print Test Results .....	37		
Change Unit of Force .....	38		
Load Results .....	39		
SPC Analysis .....	40		
9 - Shutdown .....	43		

NOTES

## Getting Started

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

1. Tour the *Overview* section (immediately below) to gain an understanding of the purpose of the PBFT, its theory of operations, and the location and name of its mechanical and software controls.
2. Use the *Installation* instructions (starting on page 4) and *Configure & Calibrate* instructions (starting on page 18) to properly install and prepare your PBFT for operations.
3. Follow *Basic Operations* (starting on page 24) to put your software-driven PBFT into operation.
4. For a description of each element used in each window, refer to *Window References* (page 64).

## Overview

This document describes how to use the PBFT (Peel Back Force Tester) VS and its FORCEWare™ control software. FORCEWare software 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.

The FORCEWare software package was designed by GPD Global to be compatible with Windows® 95, Windows® 98, Windows Me®, Windows NT® 4.0, Windows 2000®, and Windows XP® operating systems.

FORCEWare software 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

The GPD Global PBFT accurately measures and records the peel-back force required to remove the cover tape from surface mount component carrier tape. 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

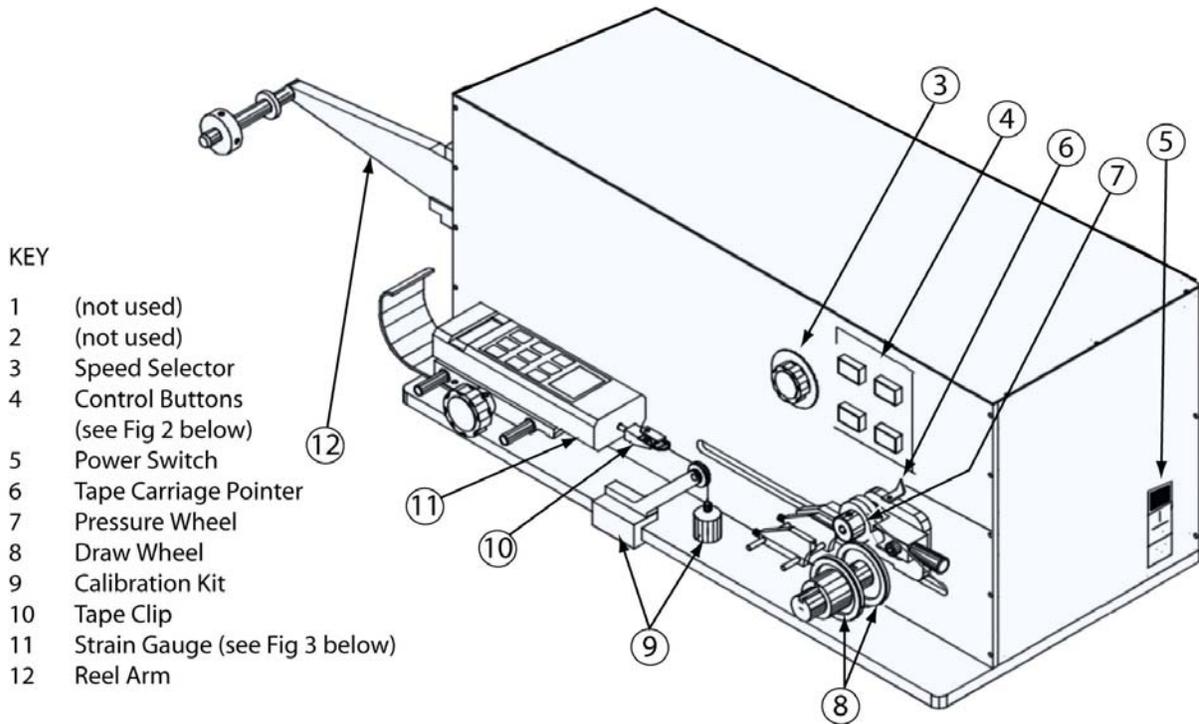


Figure 1 PBFT VS - Key elements (shown with Calibration Kit installed)

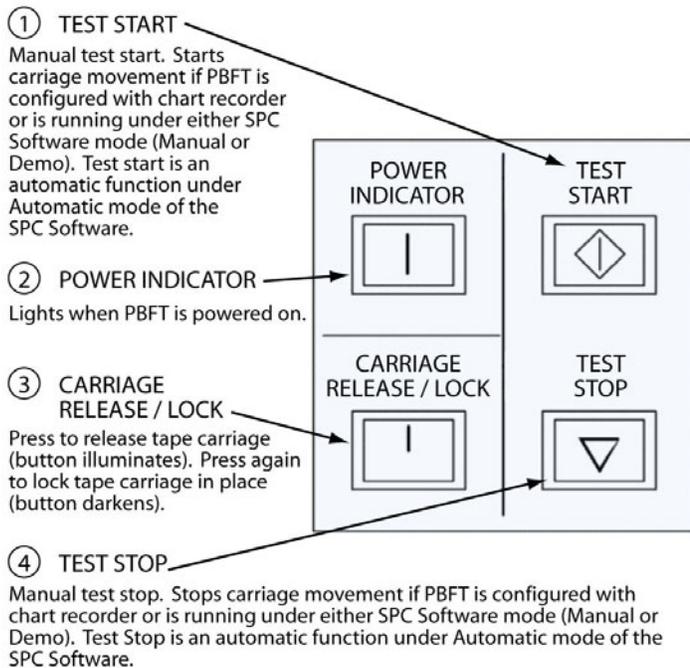


Figure 2 PBFT VS Control Buttons

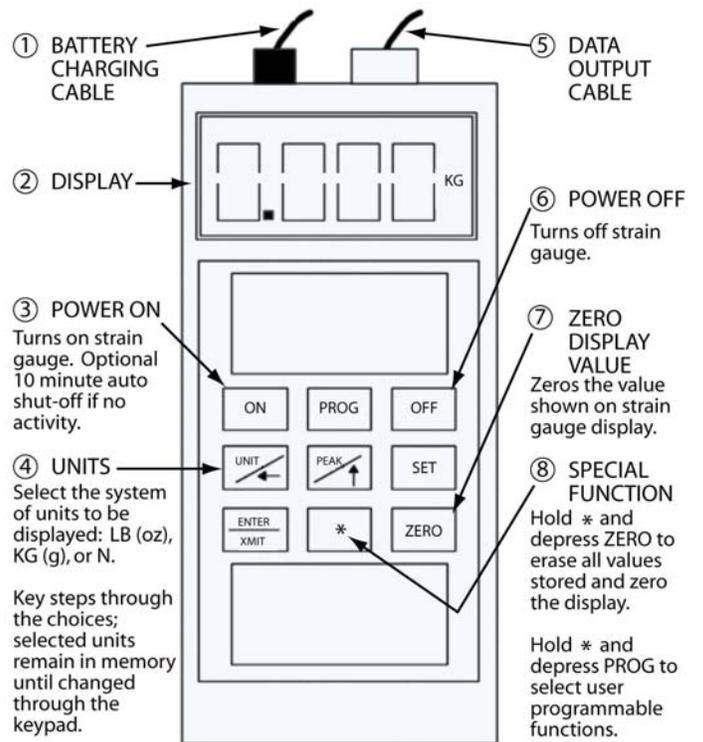
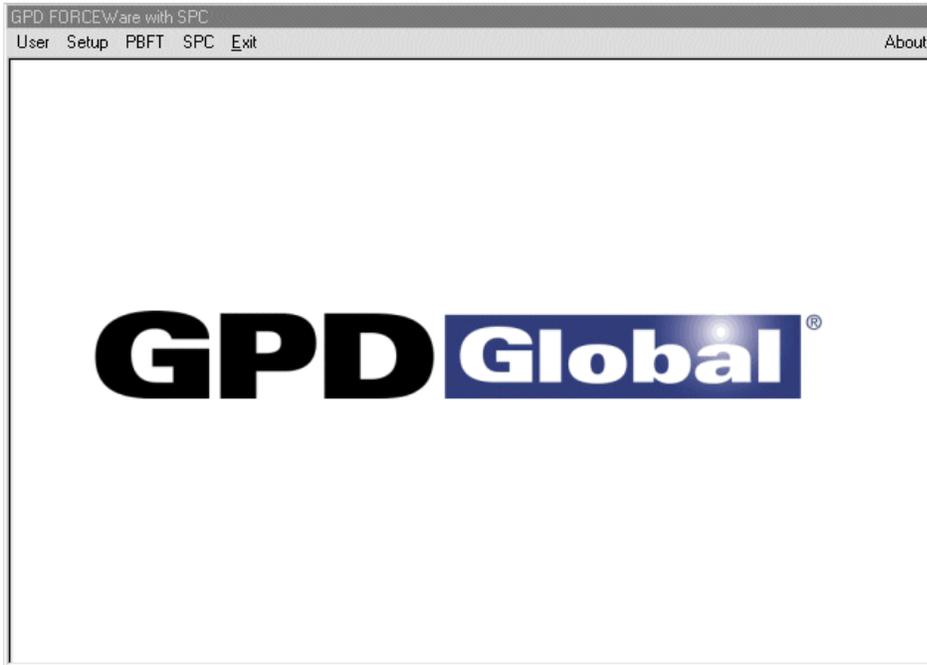


Figure 3 Strain Gauge - key elements

## Software Control

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



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.
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 notices (page ii) before proceeding with installation.

## Installation Procedure

Installing your PBFT is an eight step process. Perform all of the following steps in the order listed.

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

## 1 - Unpack & Assemble

Carefully unpack machine - this is a PRECISION INSTRUMENT:

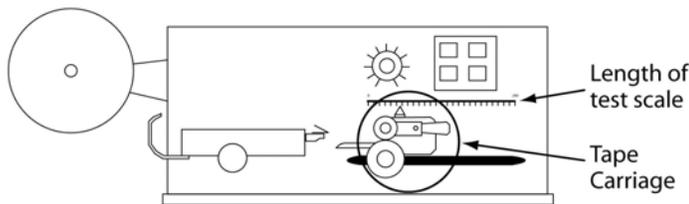
1. Place the machine on a stable, level surface.
2. Visually inspect the machine for any damage due to shipping. If any obvious damage is observed, contact the GPD Global Service Dept. at (970) 245-0408 (in USA and Canada, call 1-800-742-5473).

 **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 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 54) 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*

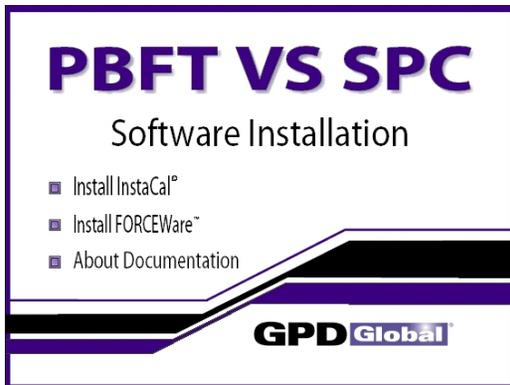
- c. Press CARRIAGE RELEASE/LOCK to lock the carriage in place.
- d. Select a speed on the speed selector (Figure 1, Item 3).
- e. Press TEST START (Figure 2, Item 1). The following should occur:
  - The tape carriage will automatically travel to the end of its range and stop.
  - The TEST START lamp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

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

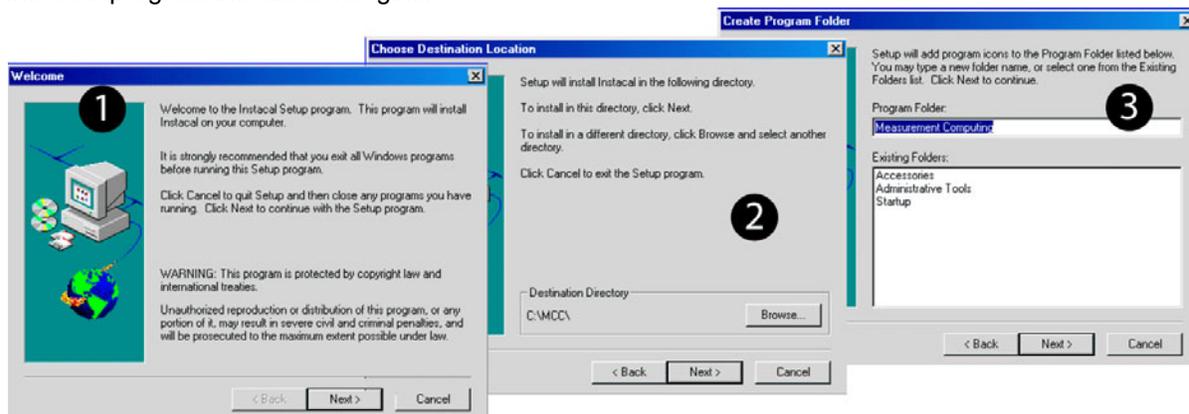
### 3 - Install Interface Card Software

The InstaCal® interface card software must be installed prior to installation of the FORCEWare software, the PBFT control software. InstaCal sets up the interface card and enables testing of card functionality.

1. Insert the PBFT VS SPC Software disk in the CD-ROM drive. The following screen will display. If this installation sequence does not begin automatically, click on Start > Run > D:\Instacal\DISK1\setup.exe (where D:\ is the CD-ROM drive) and skip to step 5.



2. Click on the INSTALL INSTACAL button.
3. A series of windows for InstaCal for Windows will display. Click NEXT on the following three windows, making sure that Measurement Computing is selected on the third window before clicking NEXT. InstaCal program installation begins.



4. Review the README information that displays and then continue.
5. When the following window displays, select YES and click OK. The computer will automatically boot and install the appropriate driver for the new software.



6. Remove the PBFT VS SPC Software disk from the CD-ROM drive.

## 4 - Install PC Hardware

Installation requires placing a converter card in a compatible computer and connecting the computer to the PBFT with an amplifier cable. 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 and Video Requirement* (page 54).

### 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.

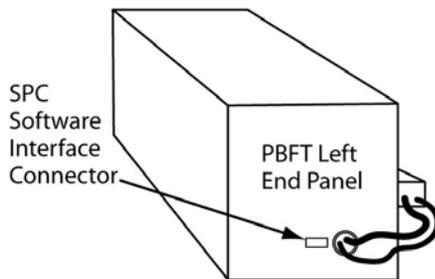


**CAUTION:** Always power off the PBFT and computer prior to connecting or disconnecting the amplifier cable or damage to the cable and/or computer board could result.

2. If you are installing FORCEWare software as a retrofit, remove the existing converter card from the computer.
3. Install the provided PCIM-DAS 1602/16 card (A/D board) in any of your computer's empty PCI slots.

### Install Adapter

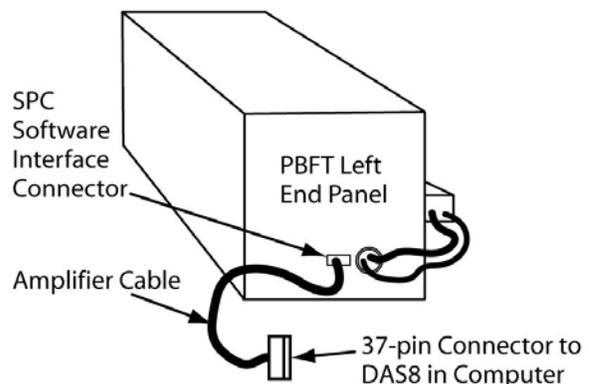
If you are installing the FORCEWare software package as a retrofit to an existing PBFT, connect the provided adapter to the SPC Software Interface Connector in the left end panel of the PBFT; otherwise, skip this step.



Adapter installation for retrofits

### Install Amplifier Cable

1. Connect the provided Amplifier Cable's 37-pin connector to the PCIM-DAS 1602/16 card at rear of the computer.
2. Plug the other cable end into the PBFT SPC Software Interface Connector (or adapter for those installing the FORCEWare software package as a retrofit).



Amplifier cable installation

## 5 - Configure Interface Card Software

The InstaCal interface card software must be configured prior to installation of the FORCEWare software, the PBFT control software. To configure the InstaCal interface card software:

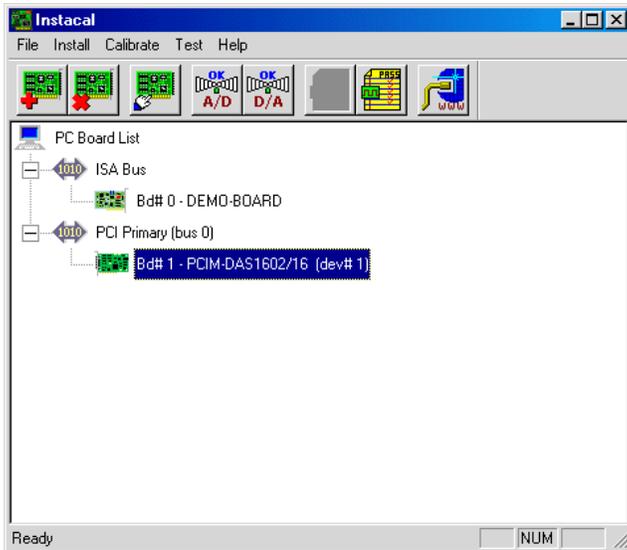
1. Run InstaCal by clicking on Start > Programs > Measurement Computing > Install. The following window displays.



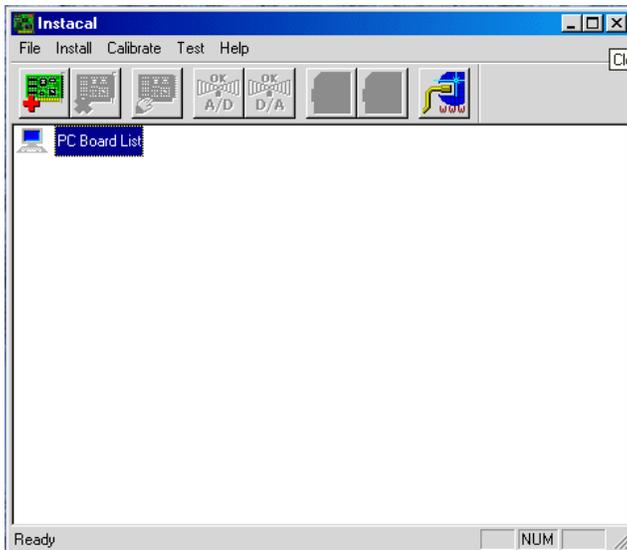
2. When windows similar to the following display, click OK on the Plug and Play Board Detection window.



3. A window similar to the following will display. To ensure the correct board is designated as the #0 board, first remove all existing boards from the list:
  - a. Highlight the Bd#1 selection.

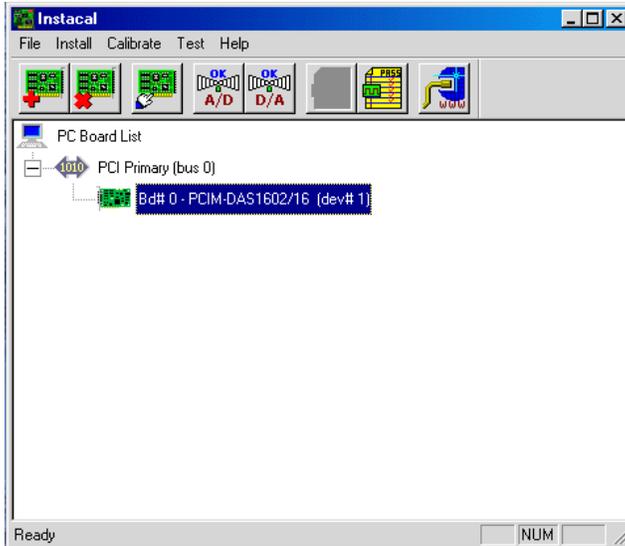


- b. Click on Install > Remove All, and then click OK.

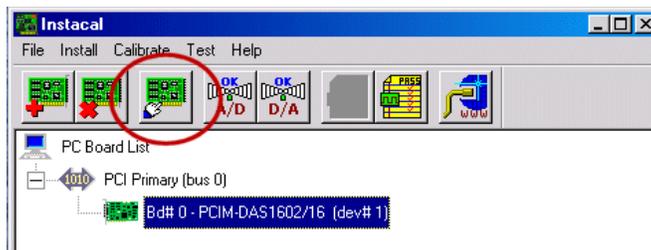


- c. Close the InstaCal window.

4. Select the primary board:
  - a. Restart the InstaCal program by clicking on Start > Programs > Measurement Computing.
  - b. Click OK on the Plug and Play Board Detection window. A window similar to the following one should display with only the GPD Global A/D board listed and labeled as the primary board.

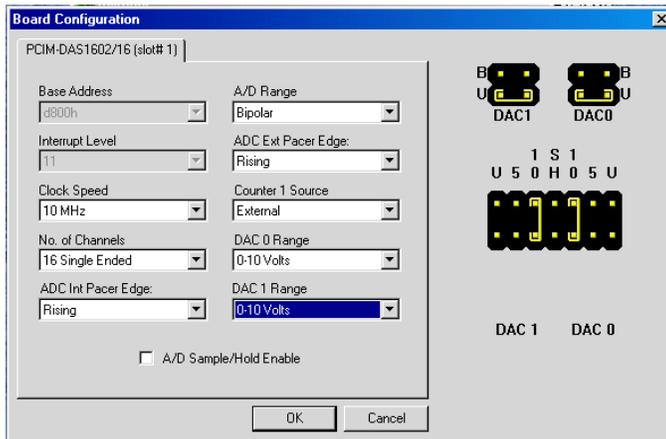


5. Configure the board:
  - a. Click on the Configure Board Settings button. The Board Configuration window displays.

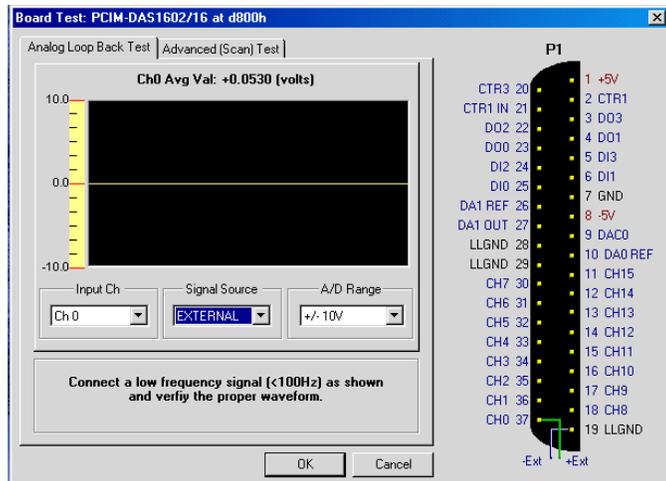


- b. Select all of the entries listed below and then press OK:

<u>Field</u>	<u>Entry</u>
Clock Speed	10 MHZ
No. Of Channels	16 Single Ended
ADC Int Pacer Edge	Rising
A/D Range	Bipolar
ADC Exit Pacer Edge	Rising
Counter 1 Source	External
DAC 0 Range	0 - 10 Volts
DAC 1 Range	0 - 10 Volts



- 6. Test the interface card/strain gauge/cable setup:
  - a. Click on Test > Analog.
  - b. Select a Signal Source of EXTERNAL and click OK. Spikes in the line, prior to selecting EXTERNAL, are normal due to random environmental noise. Spikes should disappear once EXTERNAL is selected.



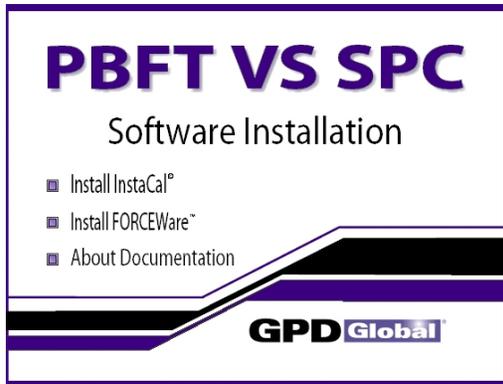
- c. Apply force to the strain gauge. The Analog Loop Back Test panel should display strain gauge changes. If changes are not evident, check for power to the PBFT and Strain Gauge and repeat interface card setup to verify correct configuration. If problems persist, call the GPD Global Service Dept.

- 7. Exit InstaCal software.

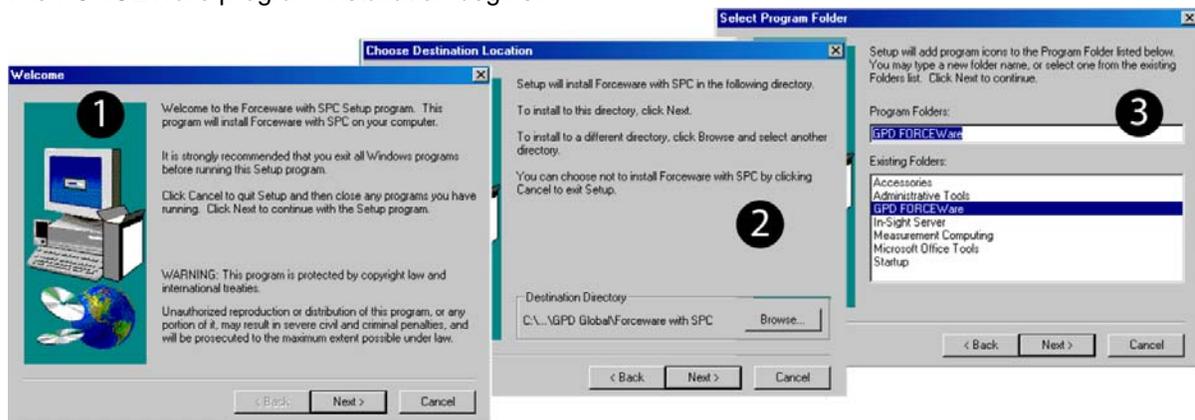
## 6 - Install SPC Software

Prior to installing the FORCEWare SPC software, the InstaCal interface card software must be installed. Be sure to perform all installation steps in the order presented in the *Installation* section of this manual.

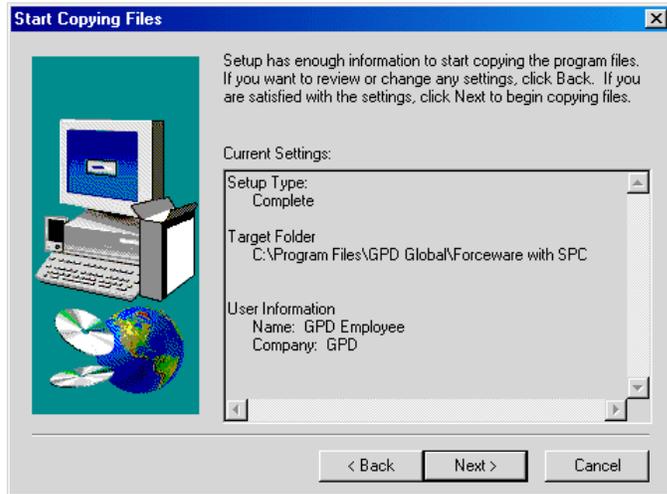
1. Insert the PBFT VS SPC Software disk in the CD-ROM drive. The following screen will display. If this installation sequence does not begin automatically, click on Start > Run > D:\Forceware\setup.exe (where D:\ is the CD-ROM drive) and skip to step 3.



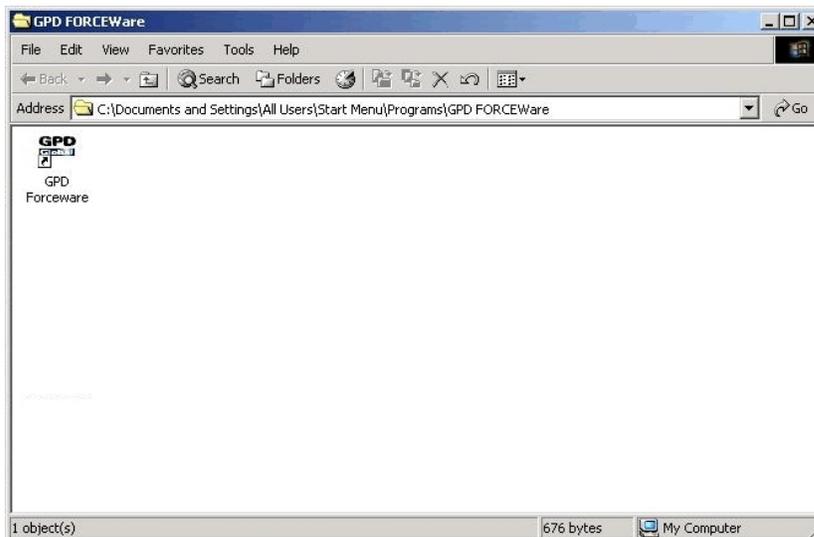
2. Click on the INSTALL FORCEWARE button.
3. A series of windows for FORCEWare with SPC Setup will display. Click NEXT on the following three windows, making sure that GPD FORCEWare is selected on the third window before clicking NEXT. The FORCEWare program installation begins.



- When the following window displays, click NEXT. Automatic setup will begin.



- When the following window displays, installation is complete.

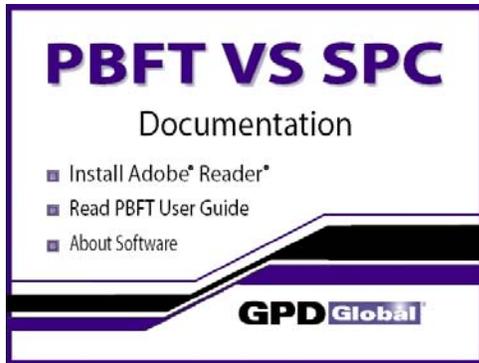


- Remove the PBFT VS SPC Software disk from the CD-ROM drive.

## 7 - Install Reader Software

*OPTIONAL* – In order to read this user guide in electronic format as provided on the PBFT VS SPC Documentation disk, Adobe Reader must be installed. Skip this section if Adobe Reader is already installed on your computer.

1. Insert the PBFT VS SPC Documentation disk in the CD-ROM drive. The following screen will display. If this installation sequence does not begin automatically, click on Start > Run > D:\ar505enu.exe (where D:\ is the CD-ROM drive) and skip to step 3.



2. Click on the INSTALL ADOBE READER button.
3. A series of windows for Acrobat Reader 5.0.5 Setup will display. Click NEXT on the following windows. Adobe Reader program installation begins.



4. Click OK when the "Thank you for choosing Acrobat Reader" prompt displays.
5. Remove the PBFT VS SPC Documentation disk from the CD-ROM drive.

## 8 - Initial Start Up

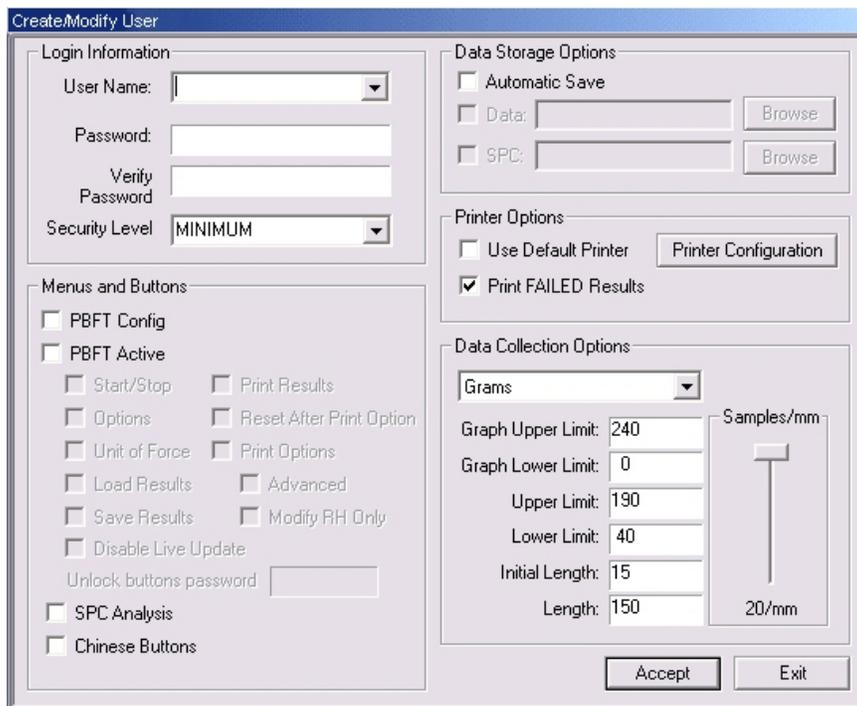
Create an initial user account with access to all aspects of the control software:

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. The User Login window 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 an 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. The settings you select may vary from those shown in the window above.
- e. As necessary, set the defaults in the Data Storage Options and Data Collection Options panels. For details, see *Create/Modify User Window* (page 68).
- f. Click ACCEPT.
- g. Click OK on the "User created/modified" prompt that appears.
- h. Exit the FORCEWare software.

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 18).

## 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

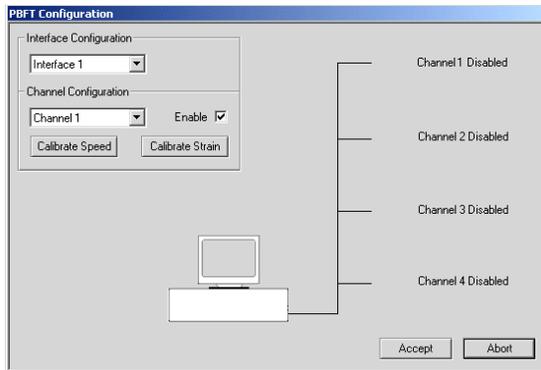
### 1 - Configure PBFT with Computer

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

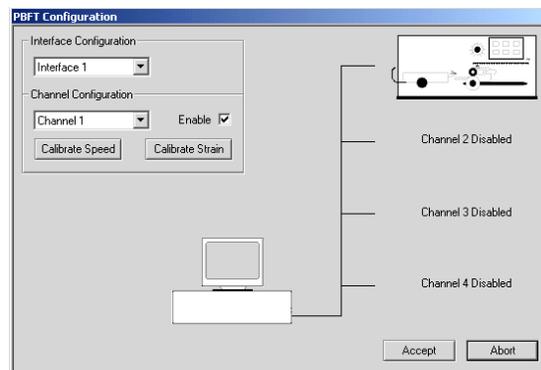
To configure the PBFT with the computer interface card:

1. Verify that both the computer and PBFT are powered on.
2. If not already done, perform *Initial Start Up* (page 16).
3. In the FORCEWare software, go to the main window menu bar and click on Setup > Configure PBFT. The PBFT Configuration window appears.

4. If the PBFT Configuration window looks like the window below at left, with no PBFT pictured in the upper right hand corner, proceed to step 5. If, like the window below at right, a PBFT is pictured in the upper right hand corner, skip to step 8.

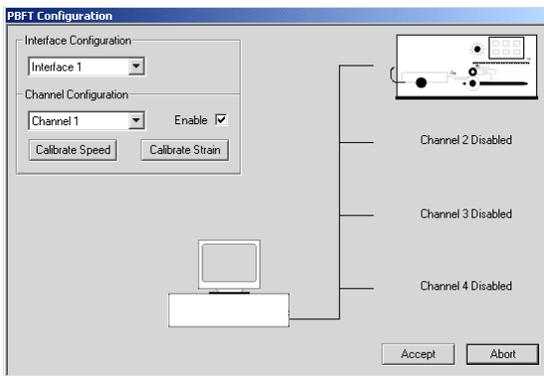


*Not previously configured*



*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. To indicate the channel is now enabled, a picture of a PBFT replaces the "Channel 1 Disabled" label.



*PBFT configured with computer interface card*

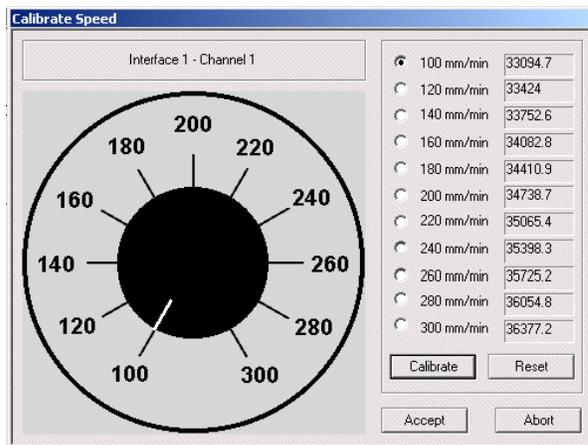
8. Perform the following *Calibrate PBFT Speed* procedure.

## 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 the FORCEWare software to the PBFT speed indicator:

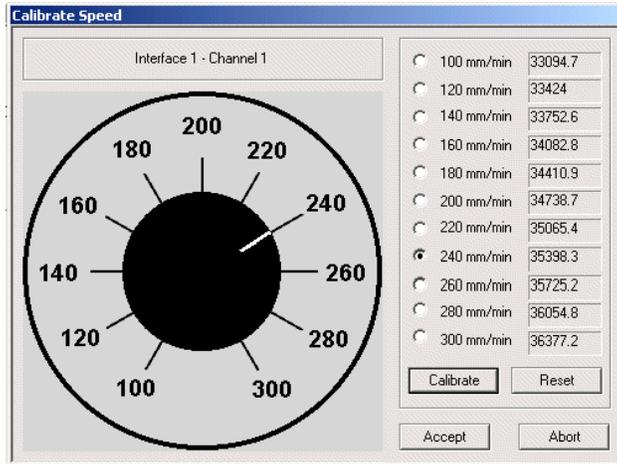
1. If this is an initial set up, first perform *Configure PBFT with Computer* (page 18).
2. From the main window menu bar, click on Setup > Configure PBFT. PBFT Configuration appears.
3. Click on the CALIBRATE SPEED button. The Calibrate Speed window appears.



*Prior to calibration or in reset condition*

4. Coordinate the PBFT Speed Selector dial with the simulated dial displayed in the Calibrate Speed window:
  - a. Turn the Speed Selector dial on the PBFT until it points to the 100 mm/min setting.
  - b. Click the CALIBRATE button displayed in the window (using 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.*

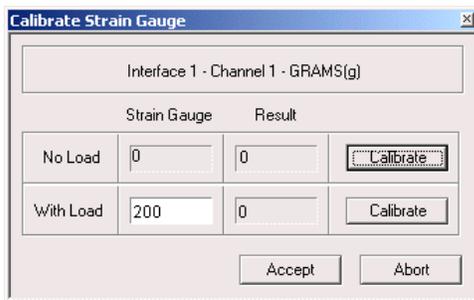
- e. The incremental difference between the displayed values should be a consistently similar amount. If they are not, re-calibrate the PBFT by clicking on RESET and repeating steps 3 and 4.
5. When you are satisfied with the displayed calibration values, verify that the PBFT Speed Selector dial and the simulated dial are synchronized. For example, notice that the simulated dial in the illustration above is set to 240 mm/min. This indicates the Speed Selector dial on the PBFT is set to 240 mm/min. To coordinate the dials:
- C Turn the Speed Selector dial on the PBFT, in turn, to each speed increment.
  - C 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 Global Strain Gauge Calibration Kit (PBT-107) to verify strain gauge operations.

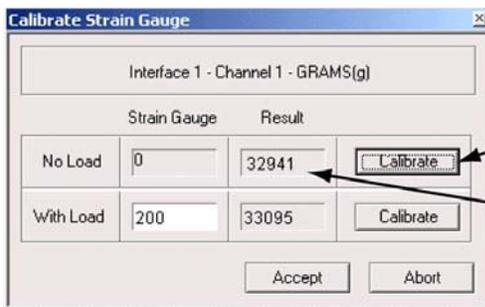
To calibrate the FORCEWare software to the PBFT strain gauge:

1. If this is an initial set up, first perform *Calibrate PBFT Speed* (page 20), otherwise, skip to the next step.
2. From the main window menu bar, click on Setup > Configure PBFT.
3. Click on the CALIBRATE STRAIN button. The Calibrate Strain Gauge window appears.



*Prior to strain gauge calibration*

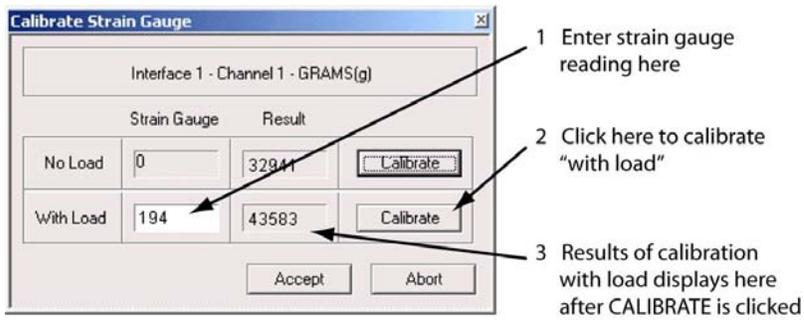
4. Prepare the PBFT strain gauge:
  - a. Verify that the PBFT strain gauge is powered on.
  - b. With no load on the strain gauge, press the strain gauge ZERO button.
  - c. Verify that the unit of force (g, kg, N, or lb) displayed by the strain gauge is the same unit as that displayed in the Calibrate 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.



- 1 Click here to calibrate for no load
- 2 Results of no load calibration display here

*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.



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

## 1 - Start Up



**IMPORTANT:** You must perform *Configure & Calibrate* (page 18) prior to initial operation.

Power on equipment and log on to the control software:

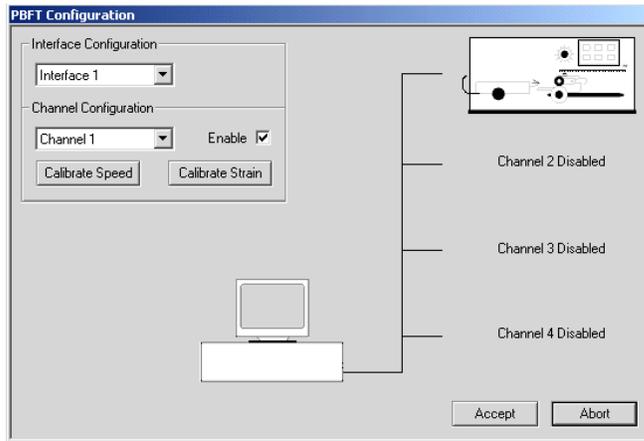
- Power on the PBFT and its strain gauge:
  - Verify the PBFT power switch (page 2, Figure 1, Item 5) is turned on.
  - Turn the speed selector (Figure 1, Item 3) to desired testing speed.
  - Press and hold the strain gauge ON button (page 2, Figure 3, Item 3) until a display (Figure 3, Item 2) appears.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

The image shows a 'User Login' dialog box with a blue title bar. It contains two text input fields: 'User Name:' and 'Password:'. Below the fields are two buttons: 'Accept' and 'Exit'.

## 2 - Verify Speed

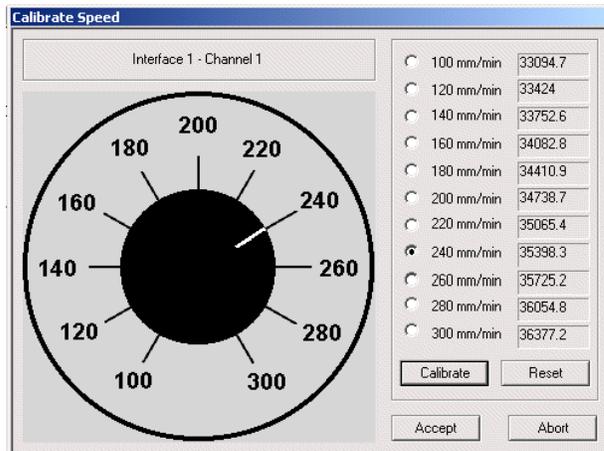
Verify that the PBFT Speed Selector dial and the simulated software dial are synchronized:

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

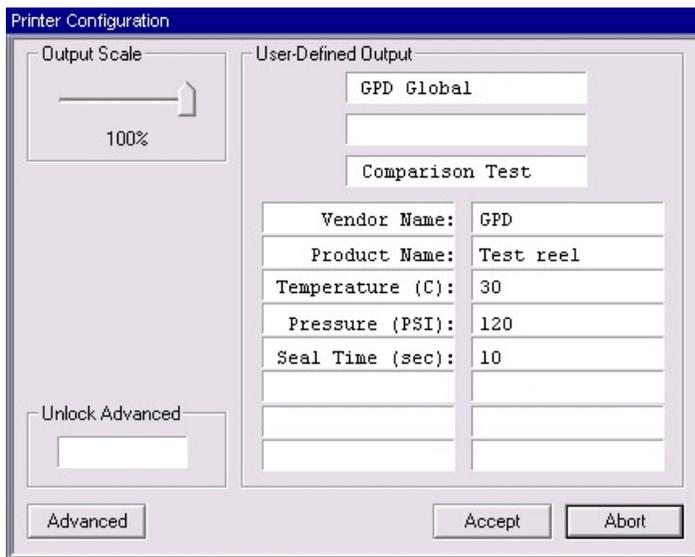
4. Choose one:
  - C If the dials are synchronized properly, click ABORT. Click ABORT again on PBFT Configuration.
  - C If the dials are NOT synchronized properly, perform *Calibrate PBFT Speed* (page 20).

### 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, refer to *Report & Label Samples* (page 58).

To change printer configuration:

1. From the main window menu bar, click on User > Create/Modify. Then click on the PRINTER CONFIGURATION button. The Printer Configuration window appears.



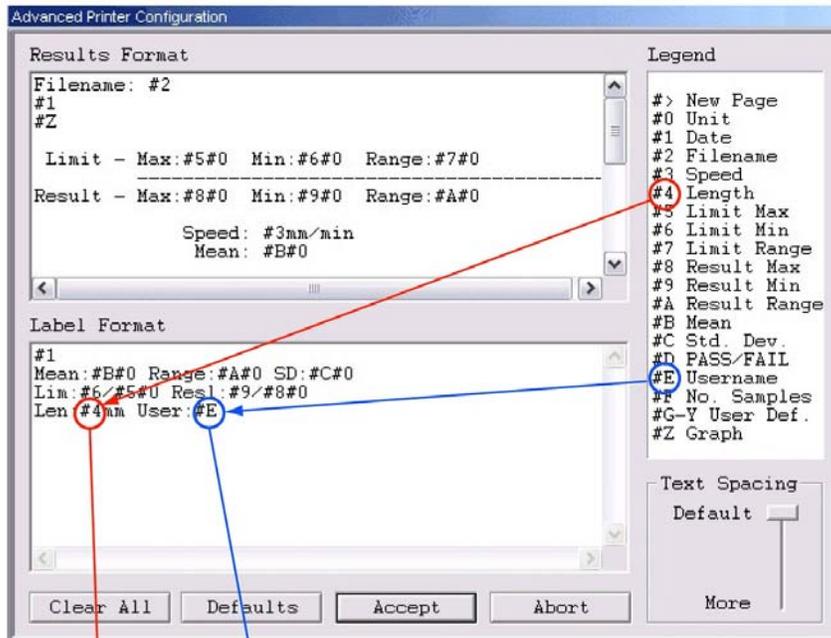
2. As needed, change the report dimensions by sliding the Output Scale slider to the desired percentage of full size.
3. As needed, add, change, or delete text from any of the fields in the User-Defined Output panel. If the Modify RH Only print option has been selected in the Create/Modify User window, changes can be made to only the right hand text fields; the left hand fields are inaccessible when they appear in grey.
4. As needed, use the advanced printer configuration to design your own report and label format. For details, refer to the following section, *Advanced Printer Configuration*.
5. When all changes are complete, click ACCEPT to save them and exit the window.

#### **Advanced Printer Configuration**

The Advanced Printer Configuration window lets you customize the format of reports and labels by defining the content and the order in which the content prints on the report or label. Basically, report format is defined in the Results Format panel, label format is defined in the Label Format panel, and the variables available for use in both format panels are listed in the Legend panel. Once your report or label is formatted, you can adjust the printed line spacing using the Text Spacing slider.

1. Open the Advanced Printer Configuration window:
  - a. If it is not already open, open the Printer Configuration window by going to the main window menu bar and clicking on User > Create/Modify.

- b. Click on the ADVANCED button. If the Advanced Printer Configuration window does not open, then it has been password protected in the Create/Modify User window and you must first enter the proper password in the Unlock Advanced field to gain access to Advanced Printer Configuration.
2. Format a report or label:
    - a. Type text in the Results Format panel (for reports) or in the Label Format panel (for labels) exactly the way you want it to appear when printed.
    - b. Make use of the Legend variables by typing the pound symbol (#) and the variable numeral wherever you want data associated with that variable to print. Review how variables are used in the label format in the graphic below:



**Using Legend Variables to Format Printed Results**

Assuming test length is "100" and User Name is "Demo", note how the Legend variables correlate to the defined format and printed results.

```

October 20, 2004
Mean:0.085kg Range:0.030kg SD:0.005kg
Lim:0/240mm Resl:40/190mm
Len:100mm User:Demo
    
```

Another example: Notice that Legend variable #1 equates to date and variable #2 equates to file name. These variables equate to the file name and test date of a particular peel test. If you were to type the following in the Results Format panel:

```

Filename: #2
#1
    
```

and, assuming the test date is 10/20/04 and the file name is TEST FILE, then the resulting report would look like this:

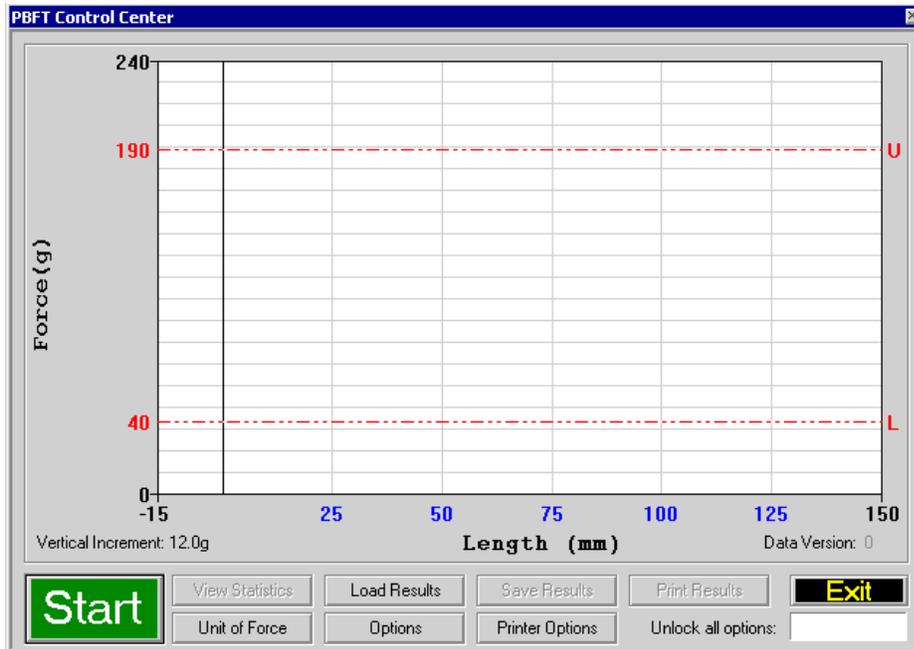
```

Filename: TEST FILE
10/20/04
    
```

3. As needed use the Text Spacing slider to adjust the height of the space between the lines of printed text.

## 4 - Open PBFT Control Center

From the main menu bar, click on PBFT > Activate PBFT. The PBFT Control Center window appears.

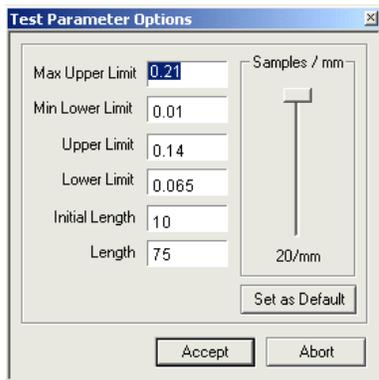


For user accounts with the appropriate access rights, the OPTIONS, LOAD RESULTS, and UNIT OF FORCE buttons will be available for use. For further details about these options, refer to 8 - Additional Operations (page 33).

## 5 - Modify Test Parameters

As needed, change the test parameters:

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



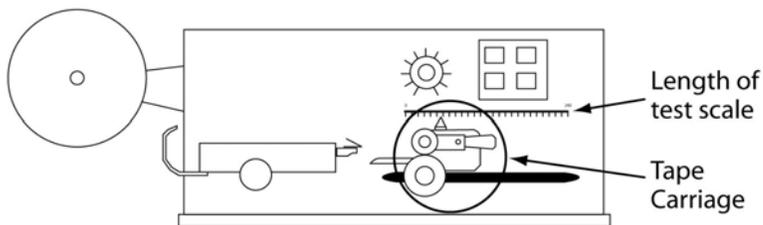
2. As needed, change parameters and the Samples/mm setting. When entering parameters, enter the data in keeping with the current unit of force. Slower computers may require a lower sampling setting, i.e., decrease the number of Samples/mm.
3. Click ACCEPT.

## 6 - Load Carrier Tape

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

### Prepare PBFT

1. Verify the 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. The tape carriage should move freely.
  - b. Manually move the tape carriage toward the left until its pointer (Figure 1, Item 6) aligns with zero (0) on the Length of Test scale.

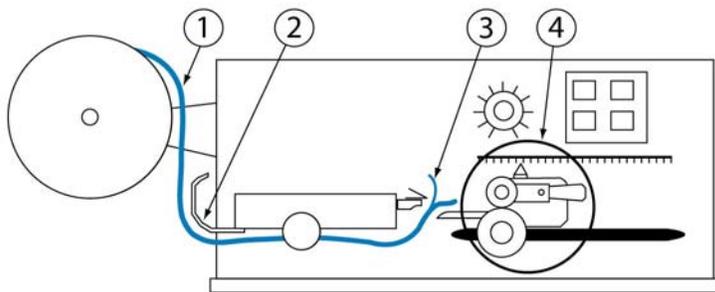


*Align draw wheel carriage*

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

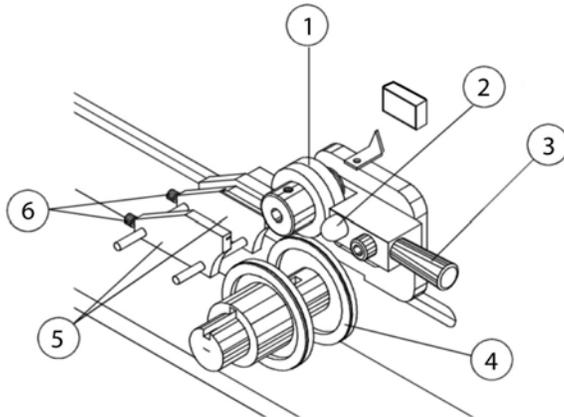
### Load Tape

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



*Feed tape to tape carriage*

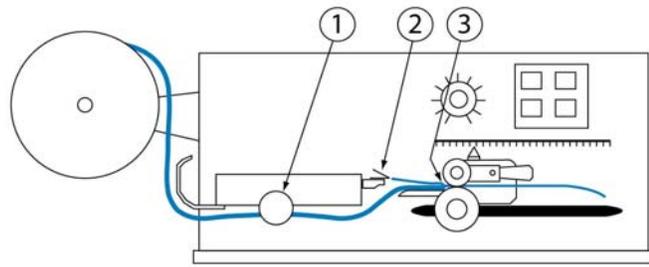
3. Feed carrier tape through the tape carriage:
  - a. Press the draw wheel handle (see figure below, Item 3) down and push the spring-loaded knob (Item 2). This locks the draw wheel rollers (Item 1) in the open position.



*Tape carriage*

- b. To accommodate the width of the carrier tape, 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 else peel back force values will be affected.
  - c. Lay the tape over the draw wheel (Item 4), aligning the tape holes with the 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 lateral position of the strain gauge 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.

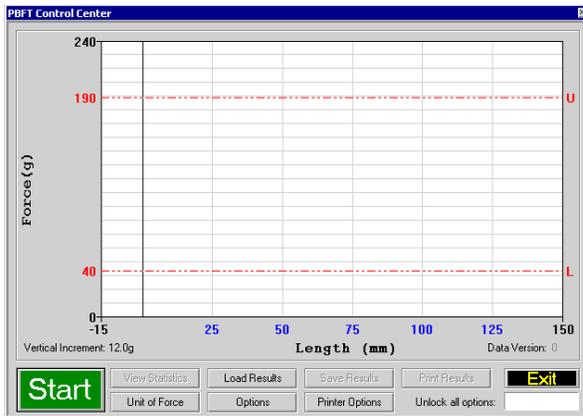
**⚠ CAUTION:** DO NOT strike or jar the strain gauge. Apply pressure to the strain gauge clip in a gentle pulling or pushing motion, not by hitting or jarring it. Applying force to this precision instrument at an excessive speed may result in permanent damage to the unit.

**⚠ 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.

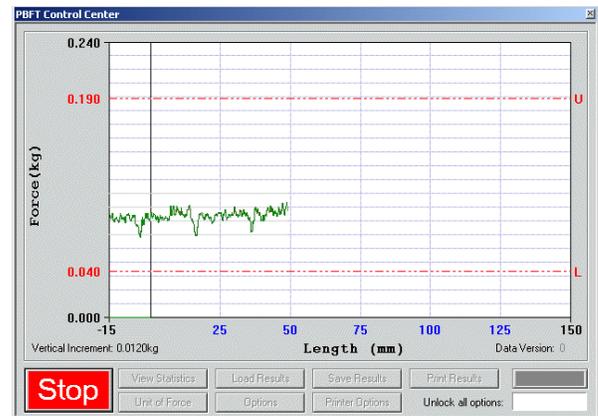
## 7 - Run a Test

To run a peel back force test:

1. Click the START button in the PBFT Control Center window. When the test starts, the appearance of the START button will change – it becomes a STOP button. You may stop the test at any time by clicking on the STOP button or pressing ENTER on the keyboard.

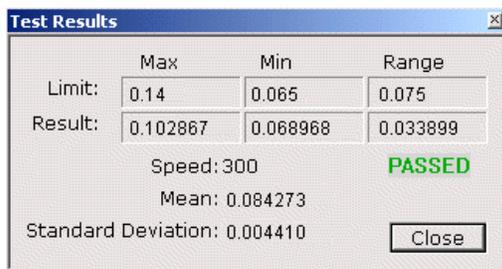


Ready to run test - click on START



Test stopped by clicking on STOP

2. When the test is complete, the Test Results window appears. Note the Pass or Fail status and then click CLOSE to exit Test Results. The mean will now be displayed on the graph, indicated by a solid red line followed by an M. To view these test results again, click the VIEW STATISTICS button in PBFT Control Center.



3. Choose one:
  - C To save or print results, continue with *Save Test Results* (page 33) and/or *Print Test Results* (page 37).
  - C To exit the PBFT Control Center window and return to the main window, click EXIT.

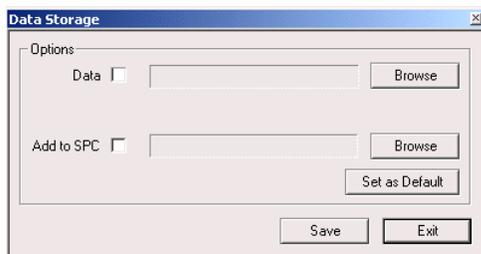
## 8 - Additional Operations

After a test is run, various operations are available with the proper password access: saving and printing test results, saving log files, changing the unit of force, loading previous test results, and SPC analysis.

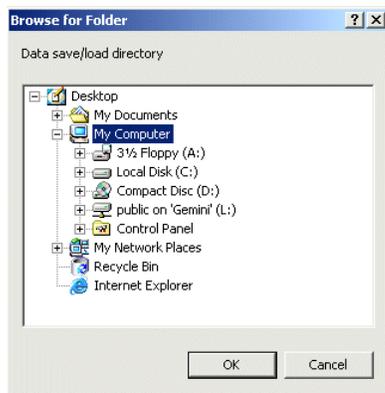
### SAVE TEST RESULTS

As needed, save test results:

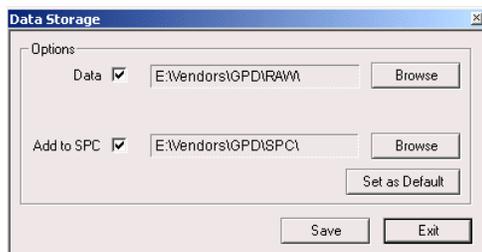
1. Click SAVE RESULTS in the PBFT Control Center window. Data Storage appears. If a prompt to set a default path appears, click OK or press ENTER to continue.



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 in the Data Storage window.



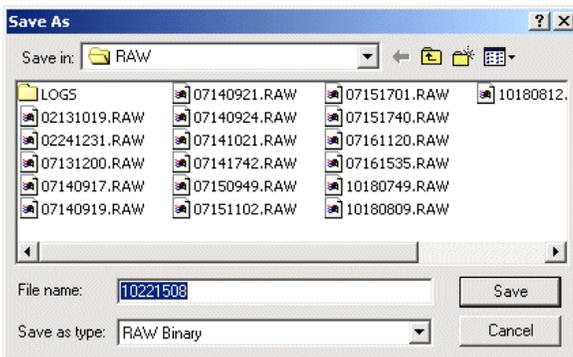
3. If desired, set the newly selected path as the default by clicking on the SET AS DEFAULT button in Data Storage. The next time the save function is activated, the default path will appear automatically in Data Storage.

**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. 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.

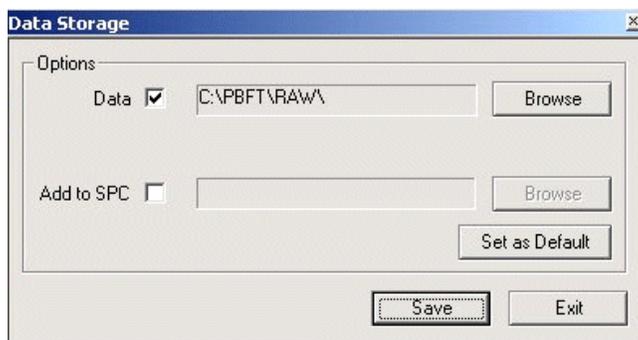
## SAVE DATA LOG FILES

Data log files will be saved automatically whenever test results are saved if you set up a Logs directory and define its location for the data storage feature.

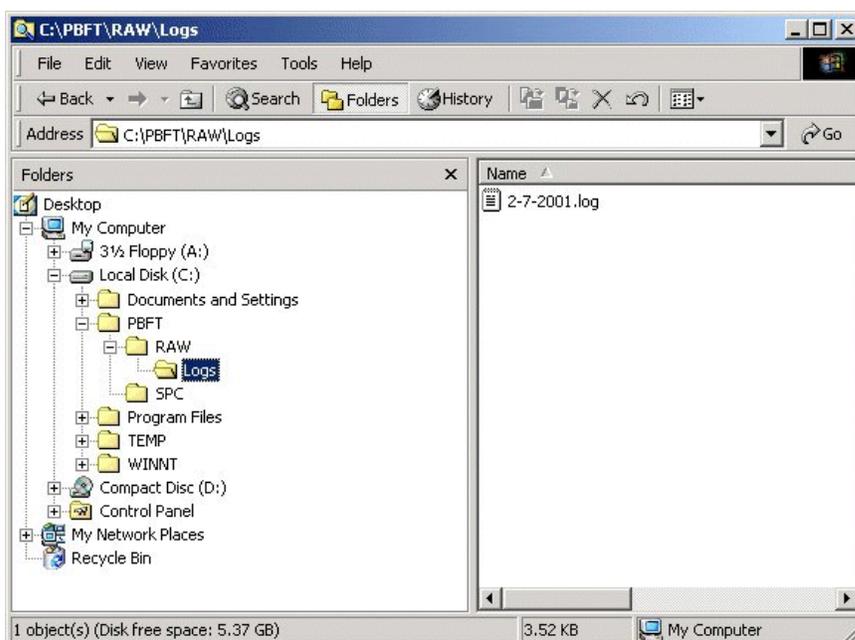
REQUIREMENT: The data logging feature requires FORCEWare software version 3.15 or above.

To set up automatic data logging:

1. Determine where test data (.raw files) is saved:
  - a. Open the Data Storage window by opening the PBFT Control Center window and clicking on the SAVE RESULTS button.
  - b. Make a note of the path shown in the Data field; you will need this information for the next step. This path defines where the data storage directory is located. In the example below, the path to the test data save directory is C:\PBFT\RAW.



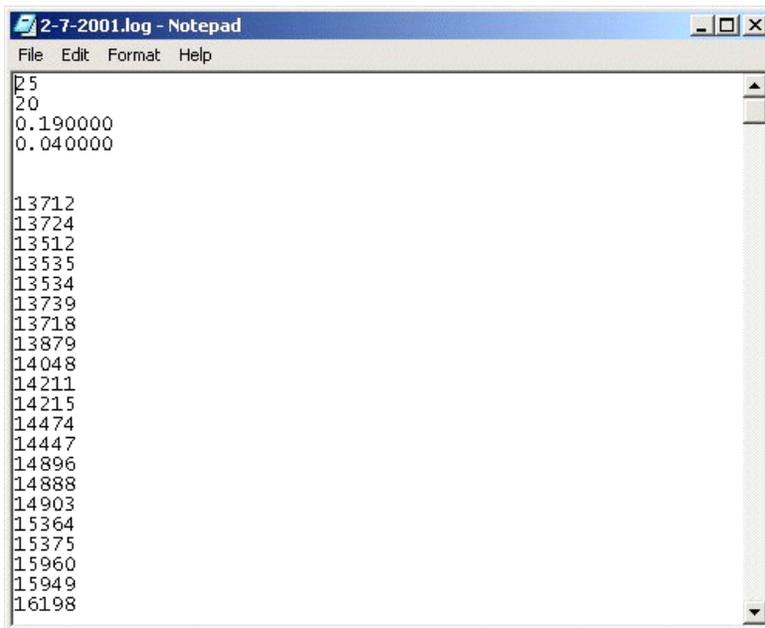
2. Open Windows Explorer and create a directory named "Logs" in the test data storage directory that you located in the prior step. The name of the new directory must be typed exactly as shown here matching the upper and lower case letters. In the example shown below, the new Logs directory is highlighted.



- 3. You are done with the set up process for saving log files. The next time you save a test, a .log file will be created automatically in the "Logs" directory. The contents of the log file will look similar to the screen grab below with a format as follows:

Length  
Samples per mm  
Upper limit  
Lower limit

Raw data...

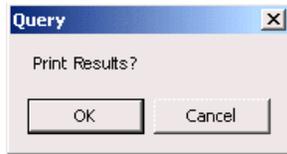


**PRINT TEST RESULTS**

SPC test results can be printed in graph and label formats. See examples in *Report & Label Samples* (page 58).

As needed, print test results:

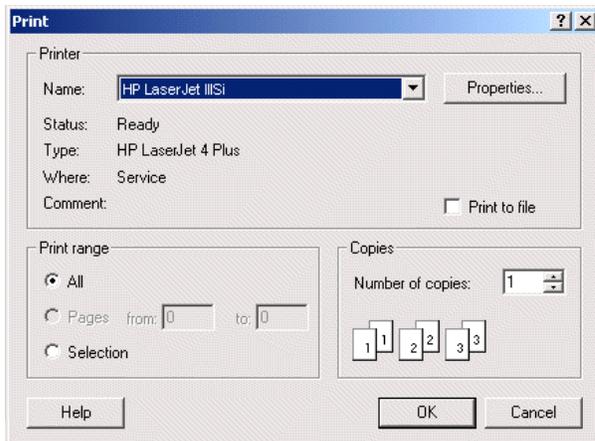
1. Click the PRINT RESULTS button in the PBFT Control Center window. A Print Graph prompt appears.



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



3. A standard print window appears (unless the Use Default Printer option has been selected in Create/Modify User). 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 and the number of desired labels, and then click OK.

**CHANGE UNIT OF FORCE**

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

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

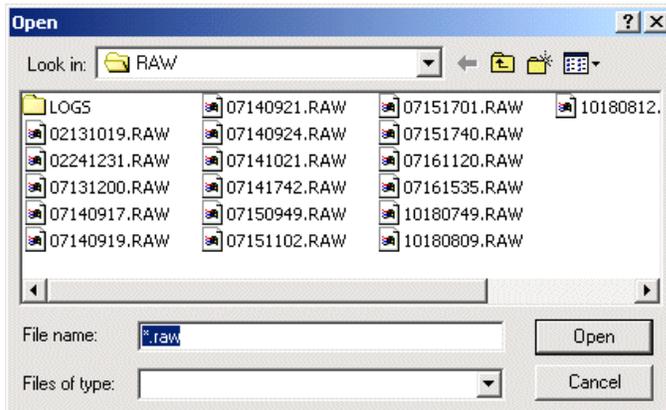


2. Select the desired unit.
3. Click ACCEPT. The Force and Vertical Increment indicators on the PBFT Control Center reflect the current unit of force. The same will be reflected on the printed graph as well.

## 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 the LOAD RESULTS button in the PBFT Control Center window. The Open window appears.



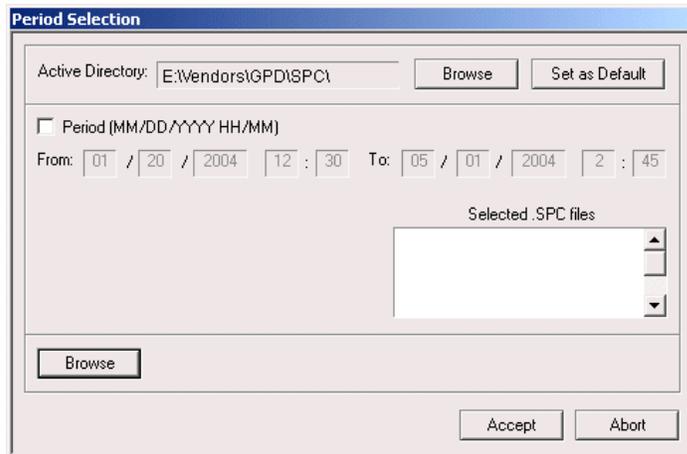
2. Select a single file and click OPEN. The data for the selected file will display as a graph in the PBFT Control Center.
3. You may now act on this data with any of the following PBFT Control Center buttons:
  - VIEW STATISTICS
  - UNIT OF FORCE
  - PRINT RESULTS
  - SAVE RESULTS

## SPC ANALYSIS

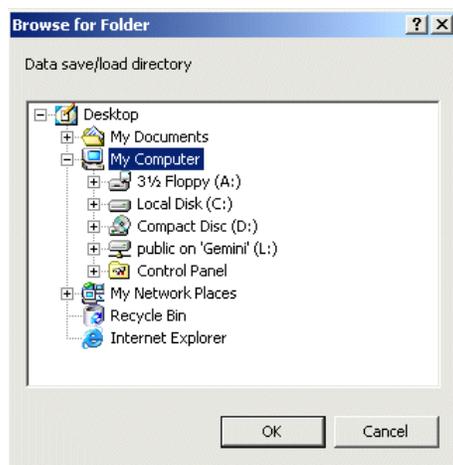
As needed, process test results using SPC Analysis. SPC analysis basically consists of selecting the SPC files to be analyzed and then choosing the appropriate analysis tools. Analysis results may also be printed.

To select the appropriate files for analysis:

1. Click SPC > SPC Analysis in the main window menu bar. The Period Selection window 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 the Active Directory field 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.

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:

**METHOD A: Period of Time**

To select test results from a user-defined date and time span:

- 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.

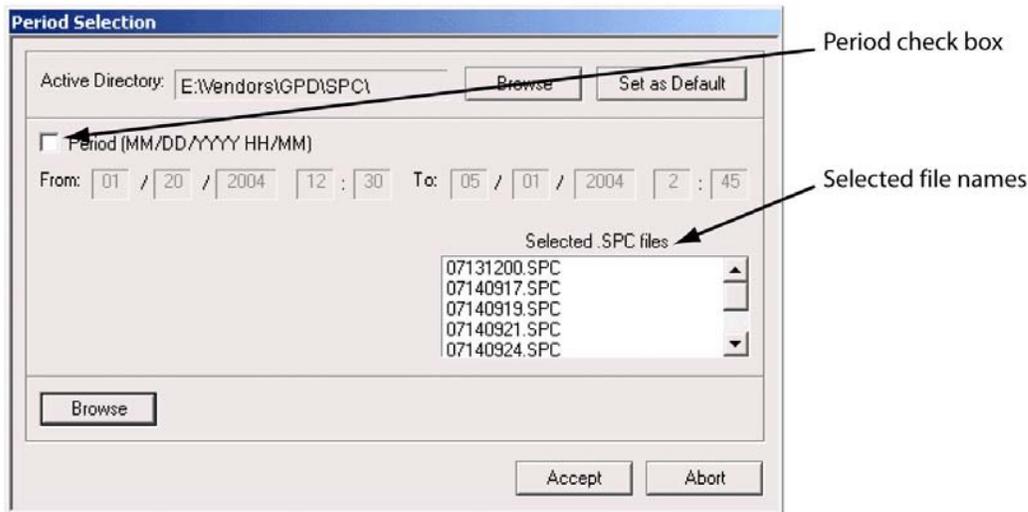
**METHOD B: Active Directory**

To select test results from the directory defined in the Active Directory field:

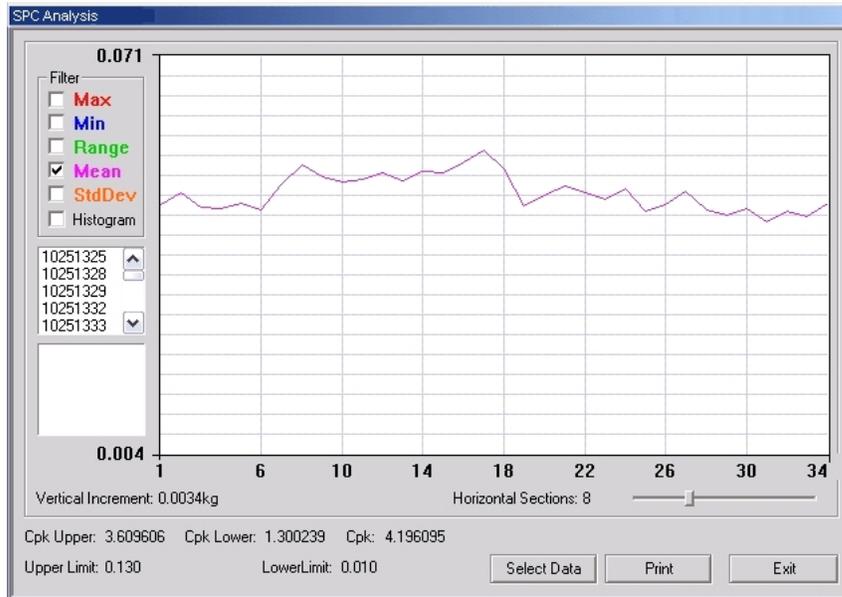
- a. Click the BROWSE button (lower left hand corner). Select SPC Files appears.
- b. Select as many files from this location as needed and click OPEN. The file names of the selected files will display in a panel in the Period Selection window.

**HINT:** Select a minimum of 5 files.

- c. Go to step 5.



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



6. As needed, analyze the data using the tools available in the SPC Analysis window. For details, refer to SPC Analysis Tools (page 56).

For further details about each entity on the SPC Analysis window, refer to *SPC Analysis Window* (page 77). For examples of available reports, refer to *Report & Label Samples* (page 58).

7. As needed, click PRINT to print the displayed data.
8. As 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 NOTICES (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
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 51).
Monthly	Carriage Motor	Verify motor speed with <i>Verify Motor Speed</i> (page 45).
	Strain Gauge	Verify operations with <i>Verify Strain Gauge Operations</i> (page 47).
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): 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 53).
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.

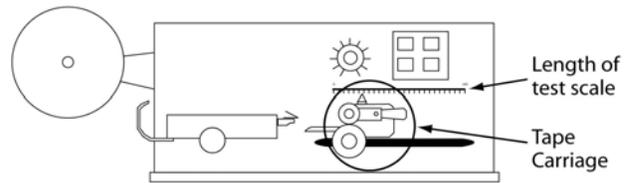
## Calibration Accuracy

Motor speed and strain gauge operations are verified at the factory for accuracy of operations; however, if these need to be re-verified, re-calibrate 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 Re-calibration* procedure (page 46).

4. Verify the rest of the motor speeds shown in the chart below, re-calibrating as necessary.

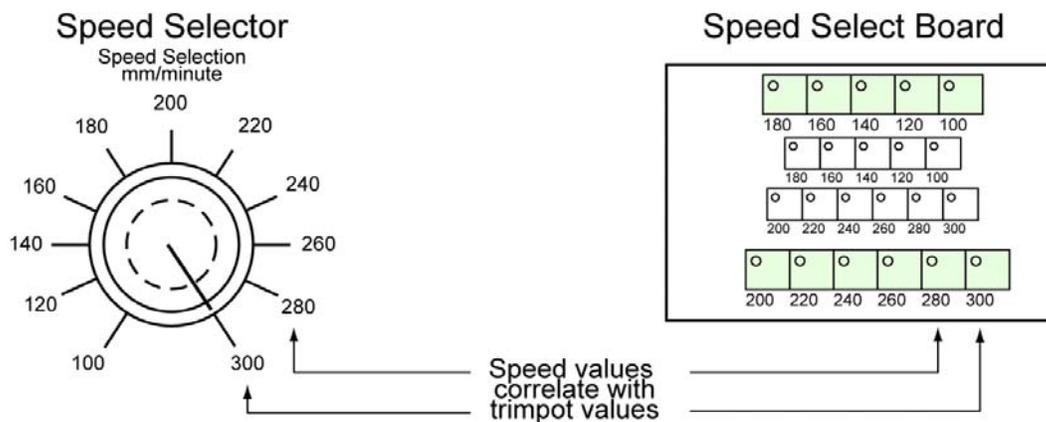
TO TEST THIS SPEED:	THE POINTER SHOULD BE ALIGNED AT:	WHEN THE STOP WATCH HAS TIMED:
100 mm	100 mm	60 seconds
120 mm	120 mm	
140 mm	140 mm	
160 mm	160 mm	
180 mm	180 mm	
220 mm	110 mm	30 seconds
240 mm	120 mm	
260 mm	130 mm	
280 mm	140 mm	
300 mm	150 mm	

### Motor Speed Re-calibration

Re-calibrating motor speed consists of adjusting the voltage to the motor by varying the related trim pot.

To re-calibrate motor speed:

1. Remove the top cover from the PBFT 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 speed selector to the speed to be calibrated.
3. Locate the correlating trim pot on the speed select board.



Correlation of speed to trim pot

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 45) and repeating the above motor speed Re-calibration steps as necessary.

## Verify Strain Gauge Operations

Use the following procedure to verify strain gauge operations. To install the GPD Global Strain Gauge Calibration Kit (PBT-107), see *Installing Calibration Kit* instructions on page 49.

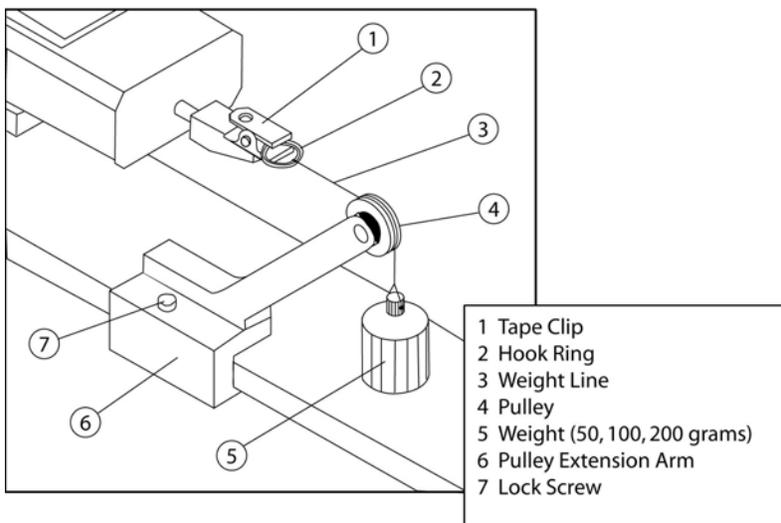
**!** **IMPORTANT:** Re-calibration will be necessary if the strain gauge is replaced or repaired.

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*

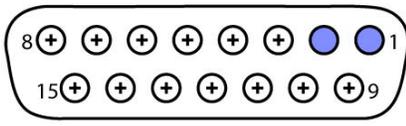
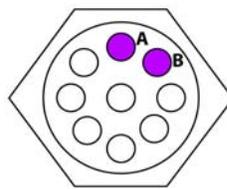
5. Position the arm so that a weight will hang.

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

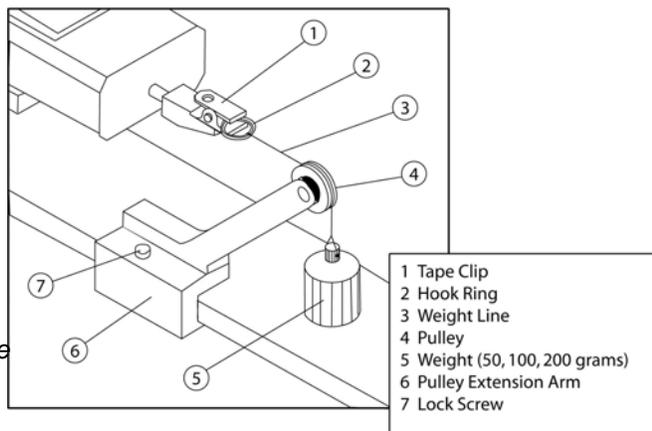
Voltage measured at the connector on the side of the PBFT should be at or near zero (0) volts. Older strain gauges typically have a + or ! voltage (with zero weight) which could vary from one unit to the next. This "offset" voltage is neutralized with circuits in the chart recorder and/or the SPC amplifier 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 ±.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 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 6.b. 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 6.b. 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 6.b. 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 the GPD Global Service Dept. at (970) 245-0408 (in USA & Canada: 1-800-742-5473).*

7. Remove the calibration kit.

**PBFT Weight Declaration**  
*Issued by:*  
**GPD Global**

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

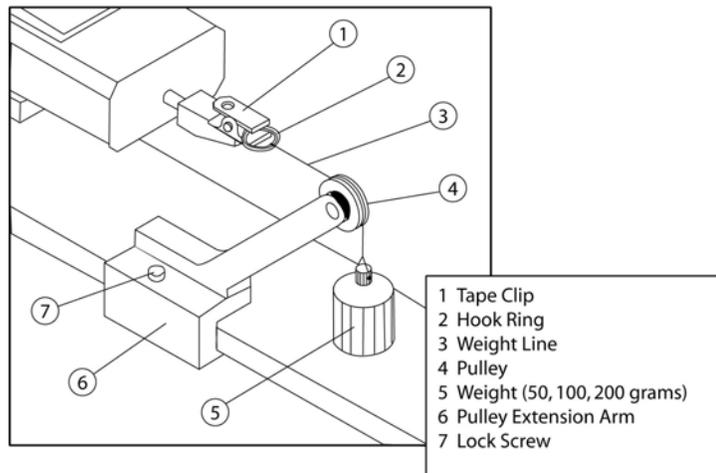
**Part Nos:** PBT-0505 (50 gram weight)  
 PBT-0506 (100 gram weight)  
 PBT-0507 (200 gram weight)

**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.

**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 kit 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 pulley and clipping the hook ring in the tape clip.
  - b. GENTLY release the weight onto the strain gauge.
- 4. Verify that the strain gauge displays the actual mass of the weight.

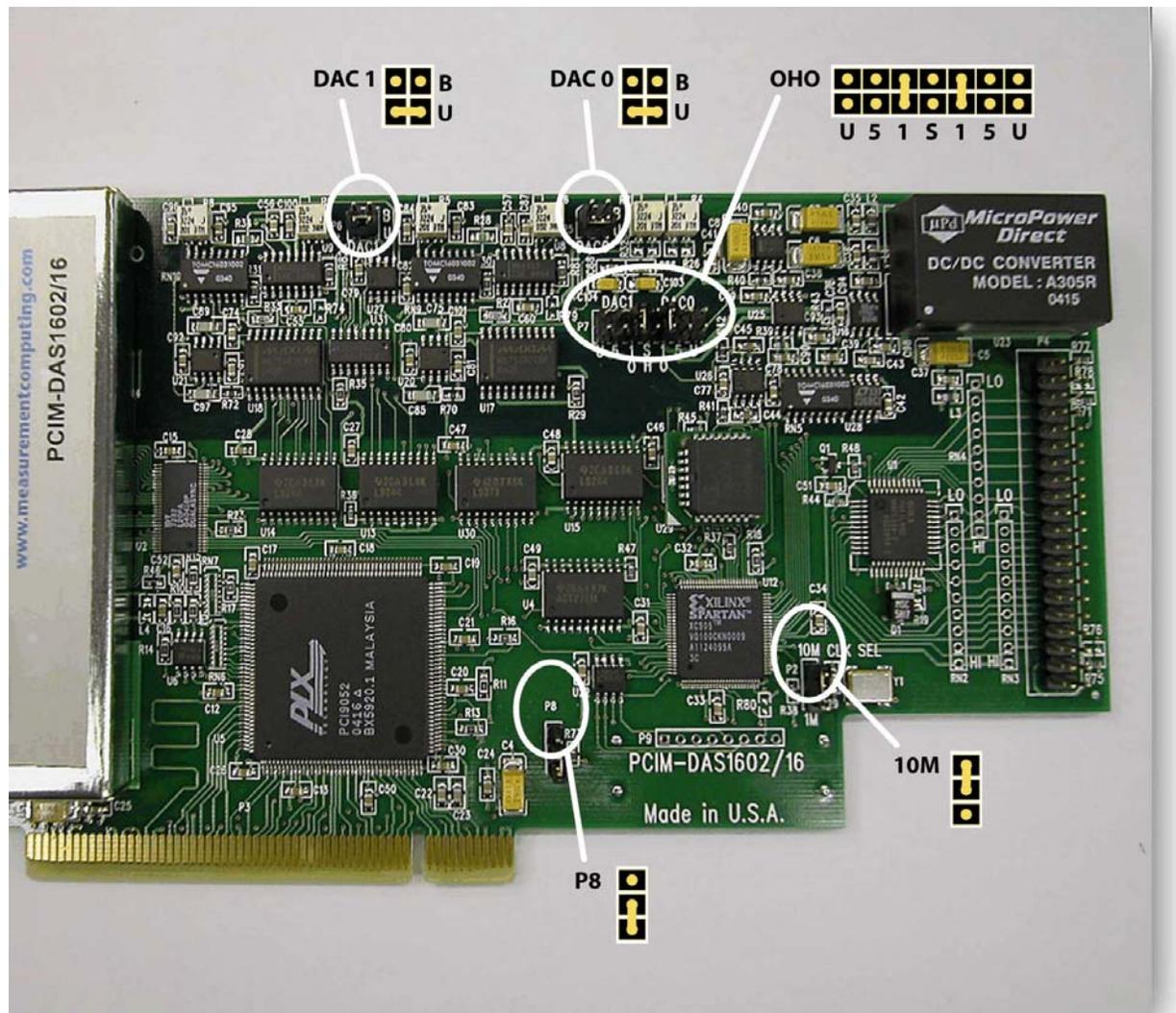


*Calibration Kit installed*

## Jumper Settings for A/D PCI Card

The following jumper setting information is intended for use with **replacement** A/D PCI cards (part number 2200-0224); the original card accompanying a PBFT is factory set to the proper jumper settings.

Before installing a replacement A/D PCI card in your computer, be sure to set the jumpers on the new card to match the settings shown.



# 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): <ol style="list-style-type: none"> <li>1. Obtain new lamp. See <i>Suggested Spare Parts</i> (page 53).</li> <li>2. Pull off plastic button cover (Assembly Drawing PBFT-3D2, Items 53, 54, 55, or 56)</li> <li>3. Twist and pull out old lamp.</li> <li>4. Install new lamp and reinstall cover.</li> </ol>
No power to the machine.	Input power module fuses are defective.	Replace fuses (Assembly Drawing PBFT-3D2, Item 66) - see <i>Specifications</i> (page 54): <ol style="list-style-type: none"> <li>1. Obtain new fuse. See <i>Suggested Spare Parts</i> (page 53).</li> <li>2. Remove fuse holder (Item 65).</li> <li>3. Replace defective fuses (Item 66)</li> <li>4. Return fuse holder to machine.</li> </ol>
	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): <ol style="list-style-type: none"> <li>1. Obtain new switch. See <i>Suggested Spare Parts</i> (page 53).</li> <li>2. Remove defective switch:                             <ol style="list-style-type: none"> <li>a. Remove PBFT cover (Assembly Drawing PBFT-3D2, Item 39).</li> <li>b. Squeeze top and bottom clips at the base of the socket and pull socket base off the switch.</li> <li>c. Remove threaded switch retainer and washer.</li> <li>d. Pull switch lamp socket out from the front of the PBFT.</li> <li>e. De-solder and remove the defective switch.</li> </ol> </li> <li>3. Install and solder a new switch base.</li> <li>4. Install switch lamp socket and replace PBFT cover.</li> </ol>
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: <ol style="list-style-type: none"> <li>1. Press strain gauge ON button to reactivate.</li> <li>2. Press strain gauge ZERO button to zero the strain gauge or else inaccurate value will result.</li> </ol>

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"> <li>The strain gauge is equipped with a rechargeable NiCad (nickel cadmium) battery pack.</li> <li>The PBFT has a built-in battery charger. DO NOT use any other type of charger.</li> </ul> <p>To recharge the strain gauge battery pack:</p> <ol style="list-style-type: none"> <li>Power on the PBFT and strain gauge (Assembly Drawing PBFT-3D2, Item 74).</li> <li>Press strain gauge ZERO button to zero out gauge.</li> <li>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.</li> </ol>
	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"> <li>If 20-24 volts with no load, replace the strain gauge battery.</li> <li>If unequal to 20-24 volts, replace the strain gauge charger. See <i>Strain gauge charger defective</i> (next "Possible Cause" in this table).</li> </ul> <p>To replace the strain gauge battery pack:</p> <ul style="list-style-type: none"> <li>The strain gauge battery pack contains rechargeable NiCad batteries. DO NOT replace with any other type of battery.</li> <li>Nickel cadmium (NiCad) batteries must be recycled or disposed of properly.</li> <li>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.</li> </ul> <ol style="list-style-type: none"> <li>Remove the strain gauge from the PBFT:               <ol style="list-style-type: none"> <li>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).</li> <li>Unplug the battery charging and data output cables (page 2, Figure 3, Items 1, 2) and remove the strain gauge.</li> </ol> </li> <li>Use a 7/64" Allen wrench to remove the two hex screws from the strain gauge cover. Remove cover.</li> <li>Unscrew and de-solder battery pack from the charging socket.</li> <li>Solder a new battery pack in place.</li> <li>Reassemble the strain gauge and reinstall on the PBFT.</li> </ol>
Strain gauge display values do not coordinate with SPC software.	<p>Strain gauge charger is defective.</p> <p>Strain gauge is defective.</p> <p>Strain gauge has been replaced or repaired.</p>	<p>Replace the strain gauge charger (Assembly Drawing PBFT-3D2, Item 63):</p> <ol style="list-style-type: none"> <li>Remove the PBFT cover (Item 39).</li> <li>Remove the battery charger clamp (Item 27), battery charger (Item 63), and its cables.</li> <li>Cut and splice new battery charger cables to length.</li> <li>Secure new battery charger in place with the battery charger clamp and connect the new cables.</li> <li>Secure the PBFT cover in place.</li> </ol> <ol style="list-style-type: none"> <li>If necessary, obtain new strain gauge.</li> <li>Perform steps 1 and 2 of <i>Verify Mechanical Operations</i> (page 5).</li> <li>Perform <i>Verify Strain Gauge Operations</i> (page 47).</li> </ol>

## Spare Parts & Accessories

### Suggested Spare Parts

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

Kit includes:

- C Pulley extension arm w/pulley
- C Weights (50, 100, & 200 grams) each with a line and hook ring
- C Nylon lock screw
- C 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 55011, Class A  
 EMI, Conducted, 100-240 VAC Input ..... EN 55011, Class A

## 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 - with most current service pack ..... Windows 95, Windows 98, Windows Me,  
 Windows NT 4.0, Windows 2000, or Windows XP  
 Computer ..... Pentium 133 MHZ or better; 1 available PCI slot required; CD-ROM drive  
 Memory ..... 16 MB of RAM minimum (32 MB is recommended)  
 Printer ..... Any printer configured for & supported by the operating system

## Video Requirement - PROVIDED BY CUSTOMER

Monitor ..... 640 x 480 pixels with 256 colors minimum

## 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
<b>SPC Analysis Tools</b>	
Filters .....	56
Single File Statistics .....	56
Histogram .....	57
Horizontal Sections .....	57
<b>Report &amp; Label Samples</b>	
Sizing .....	58
Fixed Text .....	58
Samples:	
Line Graph .....	59
SPC Data Graph .....	60
Label .....	60
<b>User Access</b>	
Add User .....	61
Delete User .....	62
Change Access Rights .....	62
Change Password .....	62
<b>Language Selection</b> .....	63
<b>Window References</b>	
About FORCEWare .....	64
Advanced Printer Configuration .....	65
Calibrate Speed .....	66
Calibrate Strain Gauge .....	67
Create/Modify User .....	68
Data Storage .....	70
GPD FORCEWare with SPC .....	71
PBFT Configuration .....	72
PBFT Control Center .....	73
Period Selection .....	75
Printer Configuration .....	76
SPC Analysis .....	77
Test Parameter Options .....	79
Test Results .....	80
Unit of Force .....	81
User Login .....	82
<b>Assembly Drawings</b>	
PBFT Mechanical Assembly Drawing .....	PBFT-3D2
PBFT Assembly Parts Listing .....	PBFT-3D2 LISTING
<b>Electrical Diagrams &amp; Schematics</b>	
System Block Diagram .....	PBT-0414A
SPC Components .....	8568003A
PBFT Electrical Schematic .....	8568012B

# SPC Analysis Tools

## Filters

Select from one to five of the available filters or select any combination of filters. The filters selected determine the type of test data results displayed and printed.

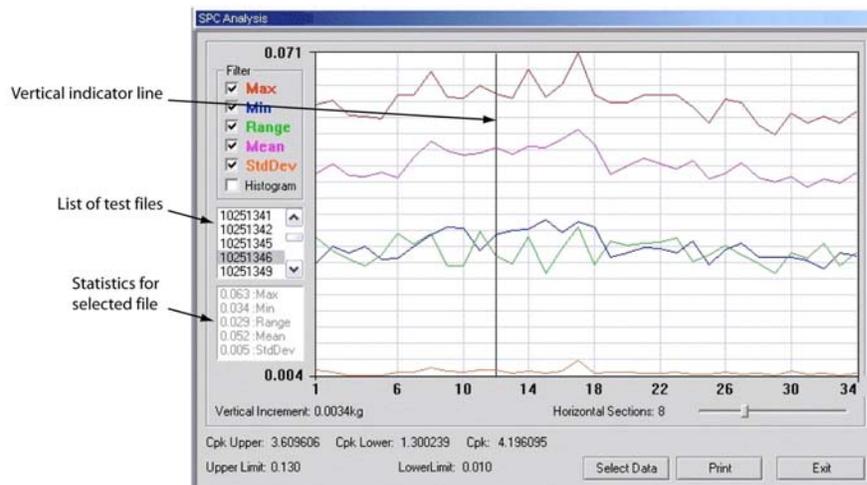


Use filters to control the type of test data results displayed and printed

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

## Single File Statistics

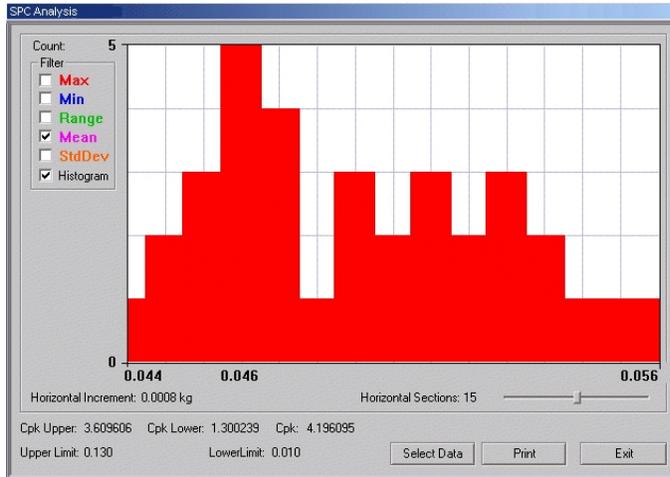
You may view the statistics for any file within a reporting group. Clicking on a single test in the list of test files will display the statistics for that file. Additionally, a heavy black vertical line in the graph indicates the location of the points for the selected test within the graph.



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

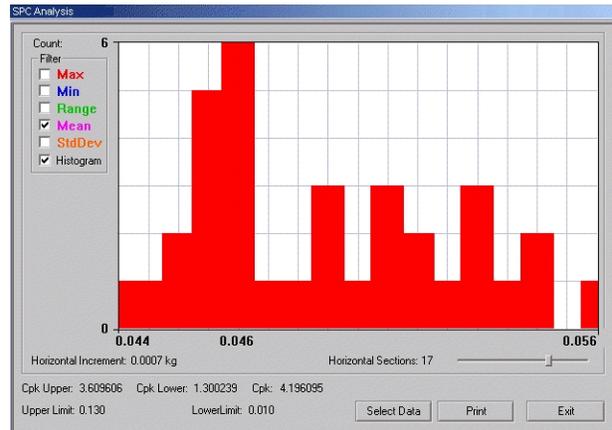
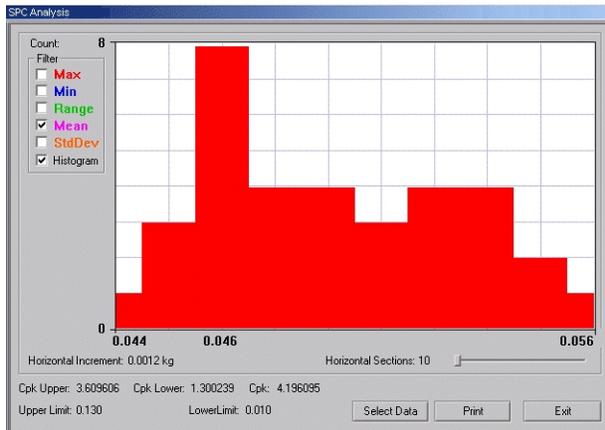
Select the Histogram check box to display a histogram in bar graph format. Any of the filters can be used one at a time with the Histogram.



*An example of a Histogram with the Mean filter selected*

## Horizontal Sections

You may change the number of horizontal sections in a histogram. 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.*

# Report & Label Samples

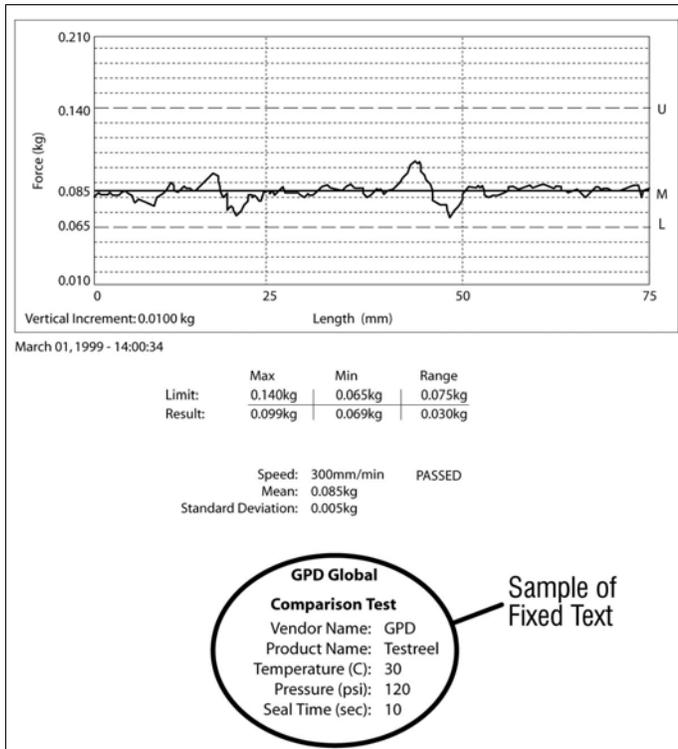
SPC test results can be printed in several different formats: SPC data, line graphs and labels. You may control the overall dimensions for all of these formats. You may also opt to have user-defined text print at the bottom of SPC data and line graphs reports.

## Sizing

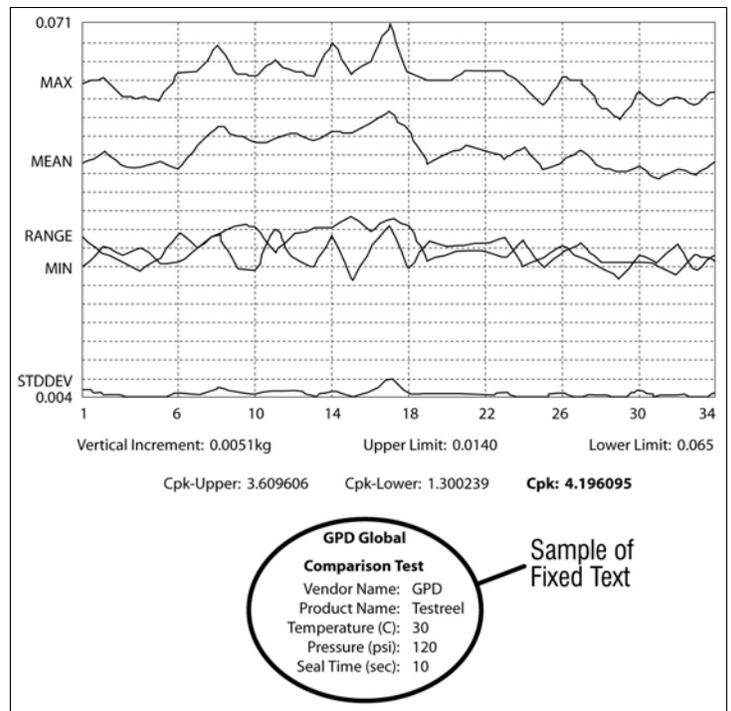
SPC data, graphs, and labels can be generated in a range of sizes, from full size down to 25% of full size. For details about how to change output scale, see *Configure Printer* (page 26).

## 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 26).

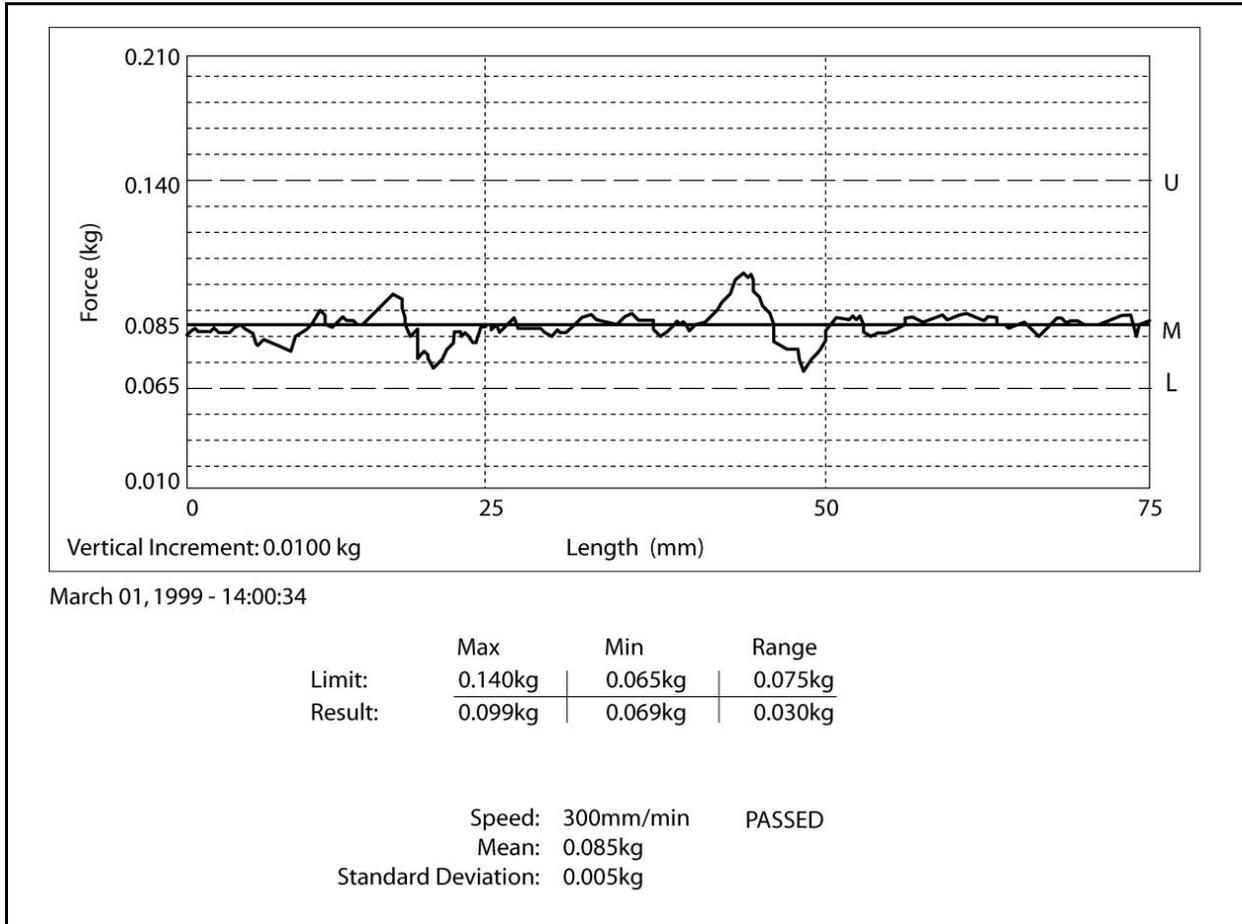


Fixed text printed on test results report



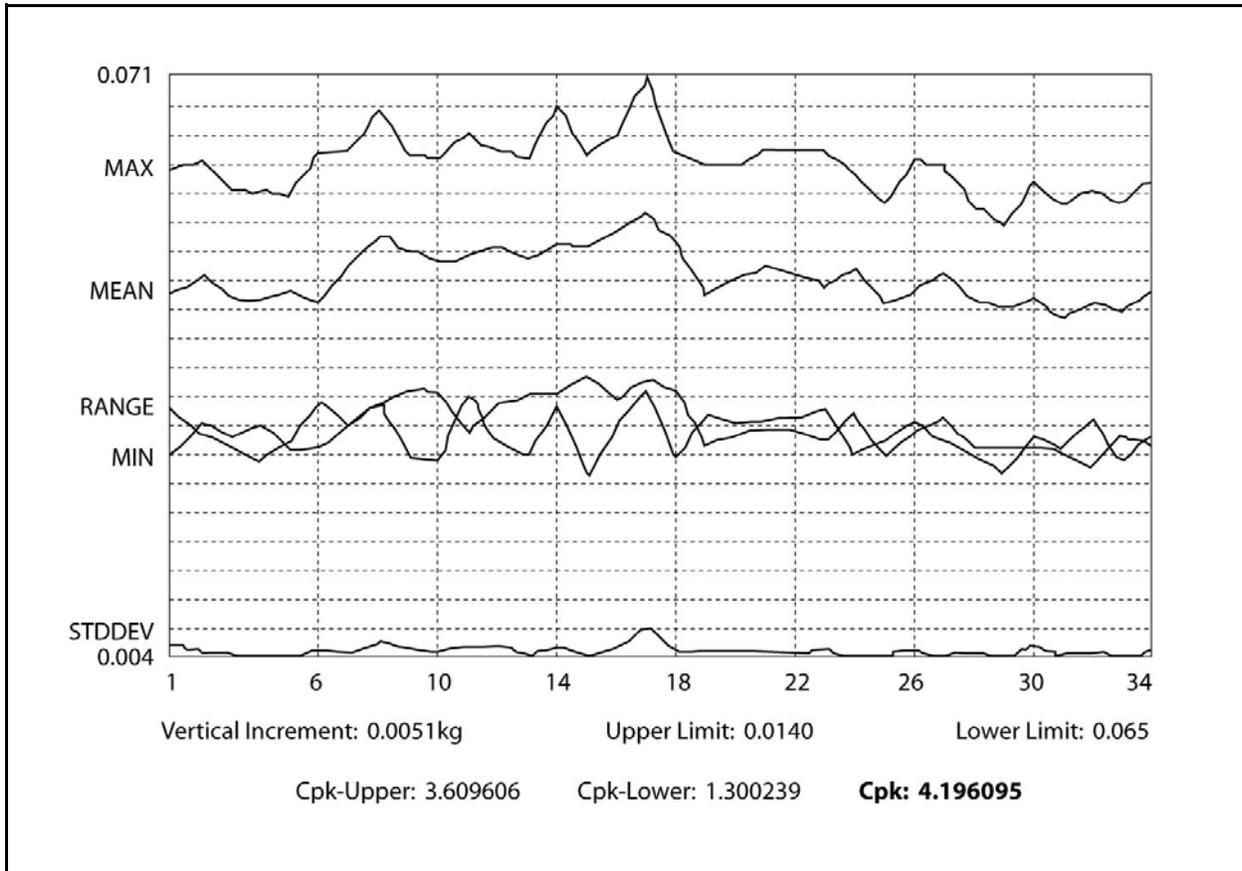
Fixed text printed on SPC line graph report

**Sample - Line Graph**



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

### Sample - SPC Data Graph



Sample of printed SPC line graph report with all filters selected

### Sample - Label

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

Sample of printed label

## 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:

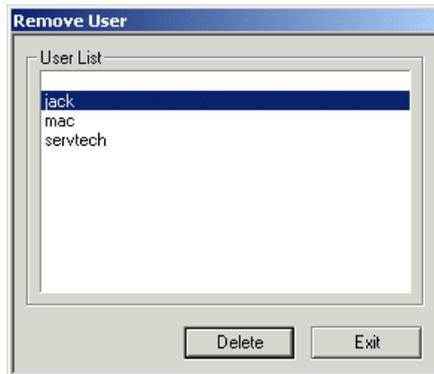
1. Log on with a Maximum security level user name.
2. Click on User > Create/Modify. Create/Modify User appears.

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. 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.

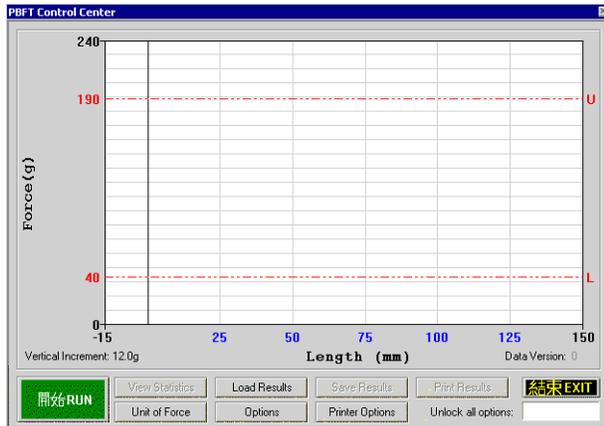
## Change Password

To change a password for a user account:

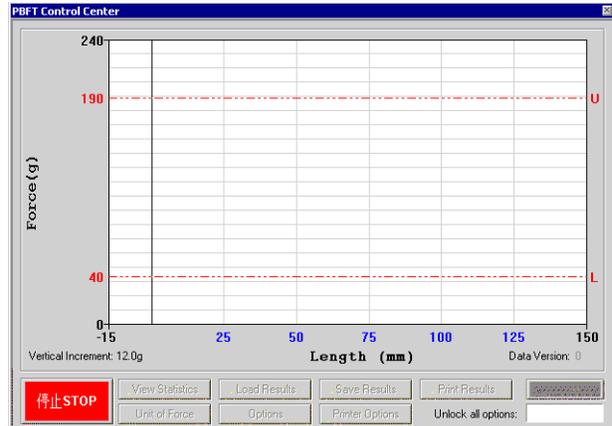
1. Log on with a Maximum security level user name.
2. Click on User > Create/Modify. Create/Modify User appears.
3. Type a new password over the existing entry.
4. Type the new password again as a confirming entry in Verify Password.
5. Click ACCEPT and OK.
6. Click EXIT.

# 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.



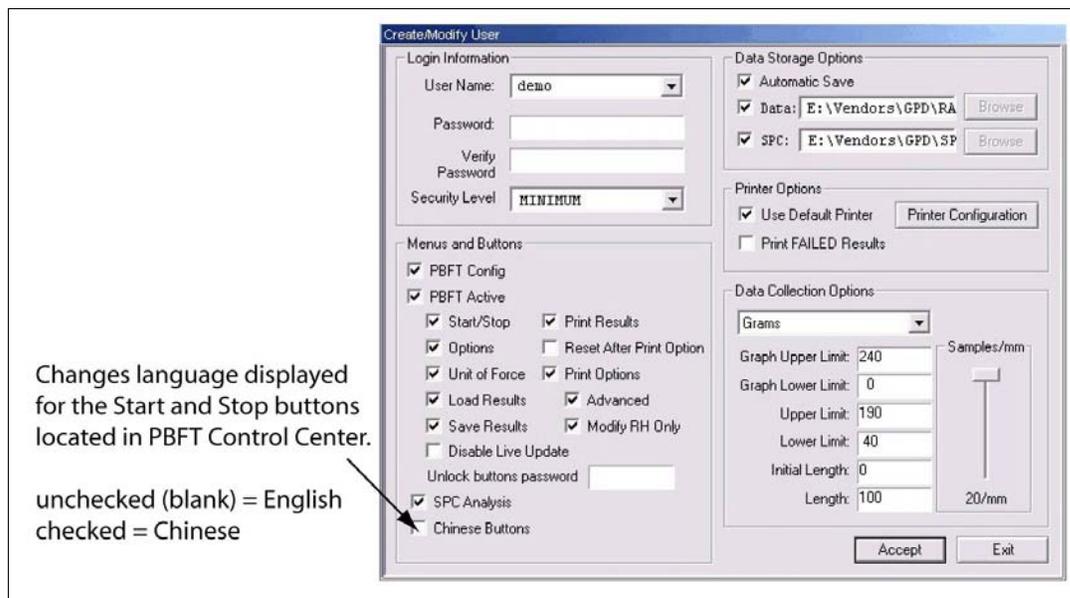
START button displayed in Chinese and English



STOP button displayed in Chinese and English

To change the 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 9 through 11 for additional user accounts.
7. Click EXIT.

## Window References

A sample of each FORCEWare software window is included in this section with a detailed description of each element used in the window. Windows are presented in alphabetic title order.

### About FORCEWare

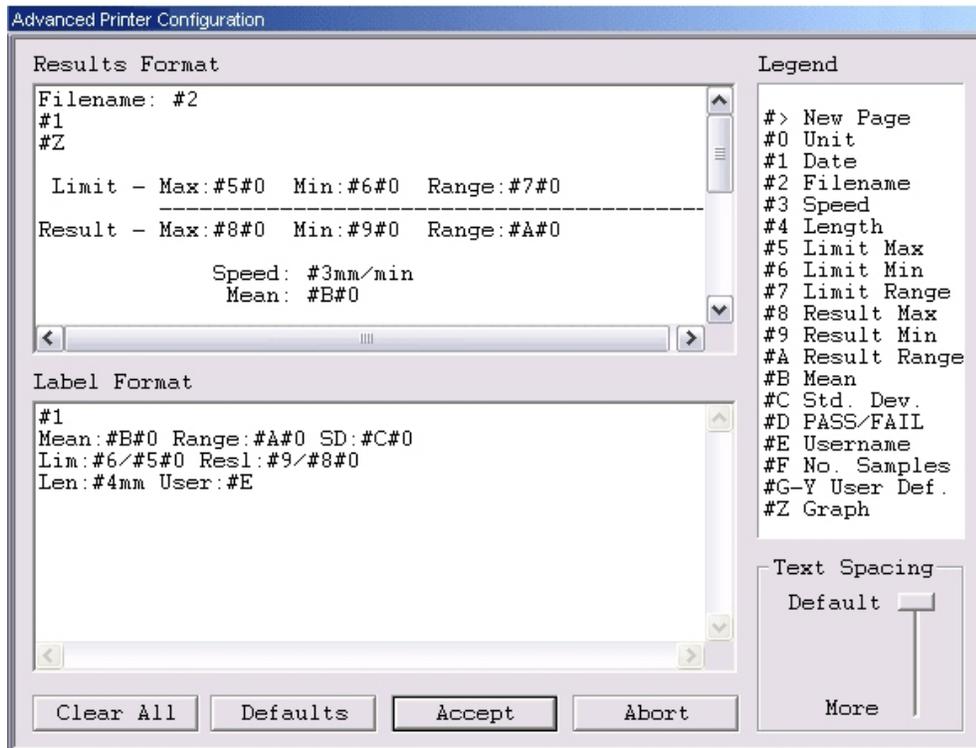
The About FORCEWare window describes the name, version, and release date of the software controlling the PBFT machine. To open the About FORCEWare window, click on the About button in main menu bar.



## Advanced Printer Configuration

Use the Advanced Printer Configuration window to customize the format of reports and/or labels by defining the content and the order in which the content will print on a report or label.

To open the Advanced Printer Configuration window, click on the ADVANCED button in Printer Configuration.

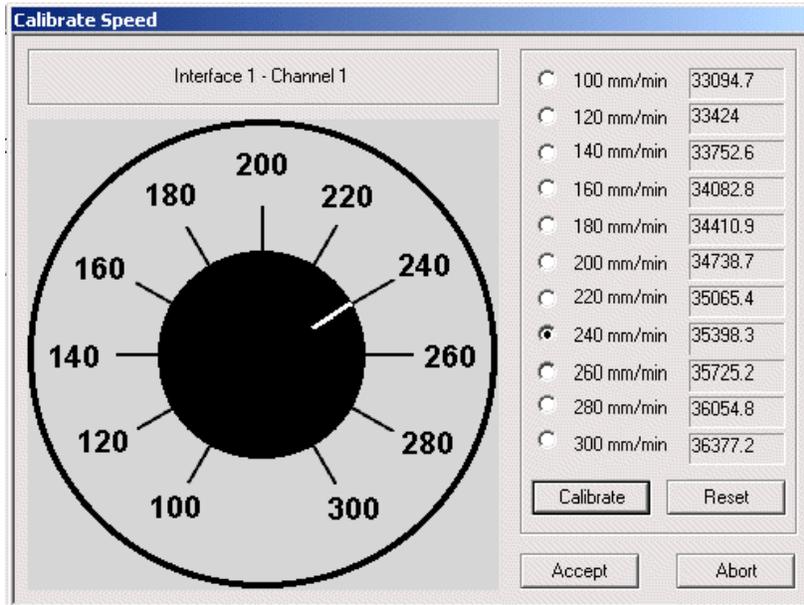


Element	Description
Results Format	Any text entered here will print exactly as typed on a report.
Label Format	Any text entered here will print exactly as typed on a label.
Legend	A list of variables and the data they represent. Any time a Legend variable (#n) is typed in the Results Format panel or the Label Format panel, the data associated with that variable will be printed (rather than the "#n" representing the variable).
Text Spacing	This slider controls the height of the space between the lines of text on the report and/or the label.

## Calibrate Speed

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

To open the Calibrate Speed window, click on the CALIBRATE SPEED button in PBFT Configuration.

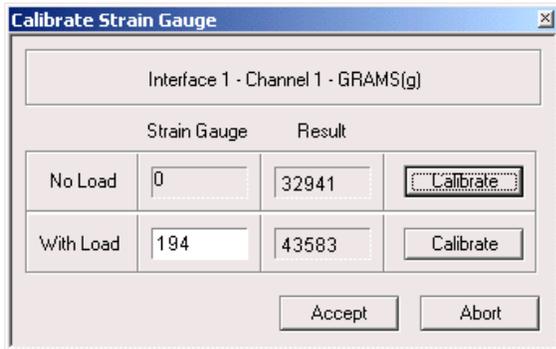


Element	Description
Speed Dial	Simulated speed selector used to calibrate the PBFT mechanical speed selector dial.
nn mm/min	Rate of peel speed in millimeters per minute. Values are in a raw data format for the PC interface card. A successful calibration will display values differing by a consistently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

## Calibrate Strain Gauge

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

To open the Calibrate Strain Gauge window, click on the CALIBRATE STRAIN GAUGE button in PBFT Configuration.



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.
With Load	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

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

To open the Create/Modify User window, go to the main menu bar and click on User > Create/Modify.

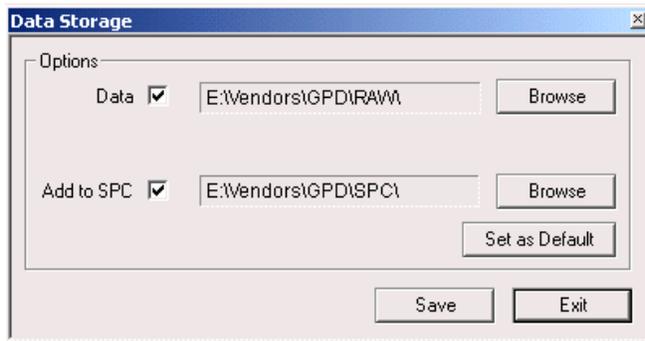
Element	Description										
User Name	Can represent a user or a vendor. Case sensitive and may consist of 12 alphanumeric characters.										
Password	Not revealed when typed; a "*" displays for each character typed. Requires a confirming entry in Verify Password. Case sensitive and may consist of 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> </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.
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.										

Element	Description
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.
Disable Live Update	Delays the printing of plotted data until after the run is complete (reducing the temptation to alter test results by manually pushing on the strain gauge during the run).
Print Results	Grants access to the Print Results button in PBFT Control Center.
Reset After Print Option	Resets the test parameters on the PBFT Control Center window and requires a new test be run each time values are changed in the Test Parameter Options window.
Print Options	Grants access to Printer Options.
Advanced	Grants access to and activates the Advanced button on the Printer Configuration window.
Modify RH Only	Grants access to only the right hand column of text in the Printer Configuration window; the left hand column of text appears to be greyed out and becomes inaccessible.
Unlock buttons password	Defines the password that permits access to: <ul style="list-style-type: none"> <li>• all buttons on the PBFT Control Center window.</li> <li>• the Advanced button via the Unlock Advanced field. (Referenced button and field are both located on the Printer Configuration window).</li> </ul>
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.
Automatic Save	Automatically saves test result files.
Printer Options	Use Default Printer Prints using the default settings, skipping the page setup and printer setup dialogs.
Print Failed Results	Grants access to printing any report whether failed or not. The default (unchecked) disallows printing of failed results.
Printer Configuration	Opens the Printer Configuration window.
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

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.

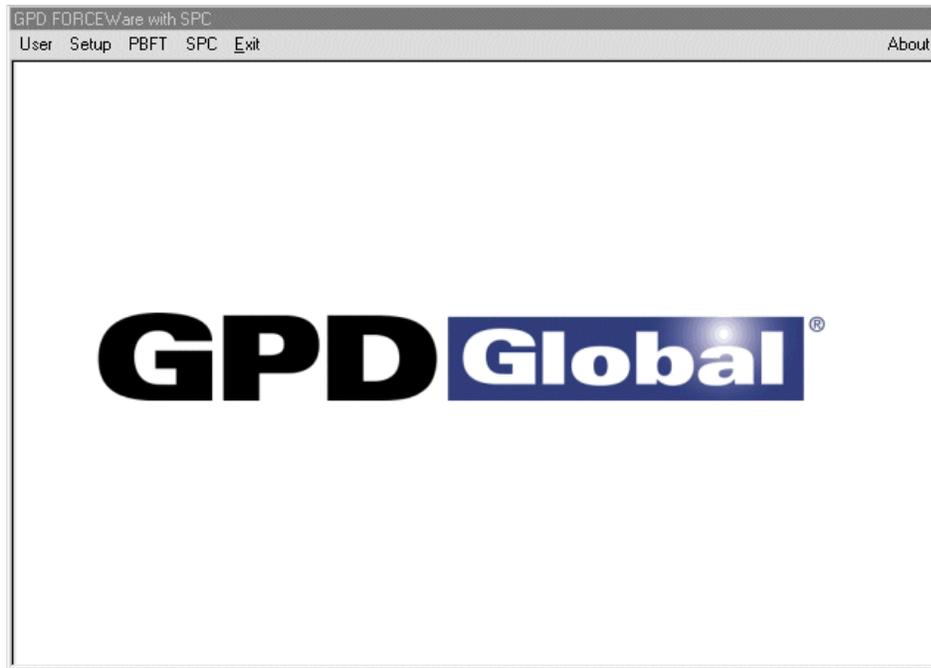
To open the Data Storage window, click on the SAVE RESULTS button in PBFT Control Center.



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 to the system..

## GPD FORCEWare with SPC

The GPD FORCEWare with SPC window is the main control window from which all software control is exercised.

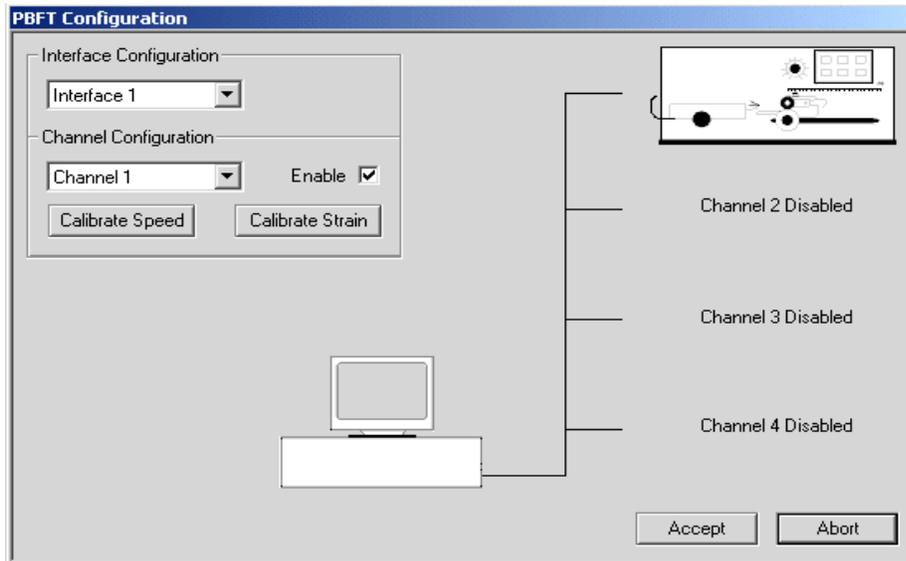


Menu Bar	Pull-down Menu	Description
User	Login	Enter a valid user (or vendor) account and password.
	Create/Modify	Add or change user/vendor password, security level, and access rights. Also set defaults for save, print, and test parameters options by user/vendor.
	Remove	Delete a user account.
Setup	Configure PBFT	Configure the PBFT and its interaction with the PC interface card, and calibrate the PBFT speed indicator and strain gauge.
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.

## PBFT Configuration

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.

To open the PBFT Configuration window, go to the main menu bar and click on Setup > Configure PBFT.

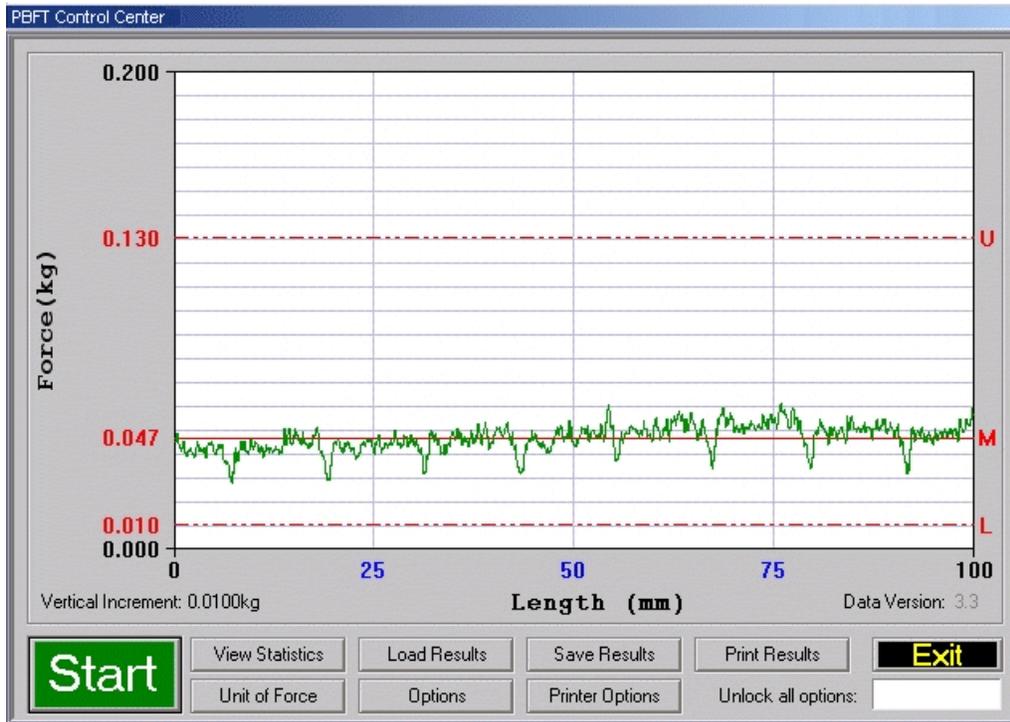


Element	Description
Interface Configuration	Defines the interface converter card in the computer to which the PBFT is connected. Defaults to Interface 1 (only currently active interface).
Channel Configuration	Defines the PC interface card channel to which the PBFT is connected.
Enable	Enables the PC 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

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.

To open the PBFT Control Center window, go to the main menu bar and click on PBFT > Activate PBFT.



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.
Data Version	Version of FORCEWare under which the data was saved.
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.
U	Maximum upper limit as defined in Test Parameter Options window.
M	The mean displays on the graph with a solid red line followed by an M after the test completes.
L	Minimum lower limit as defined in Test Parameter Options window.
View Statistics	Displays the test results window. (Available only after a test has been run.)
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.)

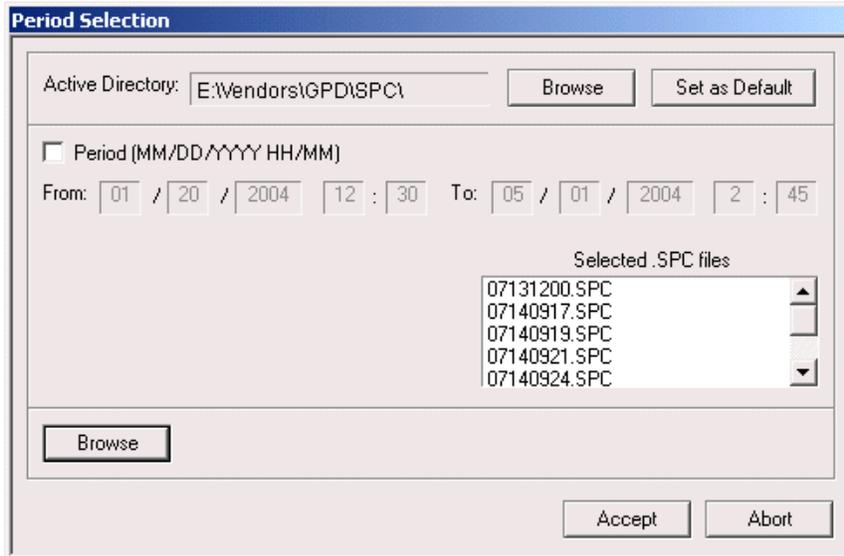
~ continued ~

<b>Element</b>	<b>Description</b>
Print Results	Prints test results in graph or label format. (Available only after a test has been run.)
Exit	Closes and resets the window.
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.
Options	Defines test parameters.
Printer Options	Opens the Printer Configuration window.
Unlock all options	Entry here of the proper password grants access to all PBFT Control Center buttons. (Password is defined in the Unlock Buttons Password field on the Create/Modify User window.)

## Period Selection

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.

To open the Period Selection window, go to the main menu bar and click on SPC > SPC Analysis.

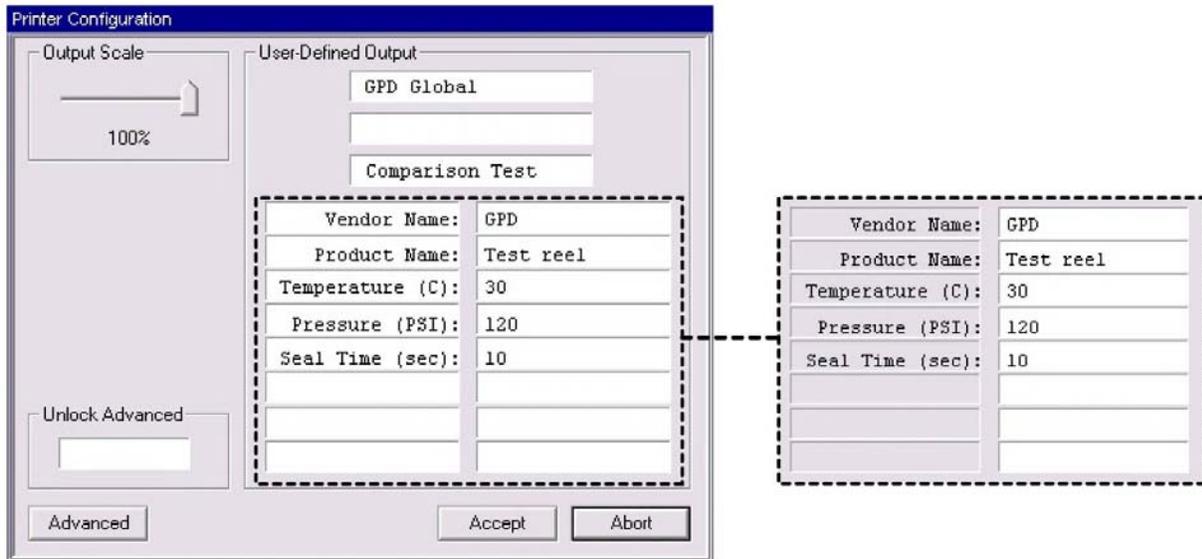


Element	Description
Active Directory	Displays the directory from which SPC files are to be selected. This directory is selected in the Save As SPC and Create/Modify User windows.
BROWSE	Designates the specific location from which SPC files are to be selected.
SET AS DEFAULT	Designates the selection location 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

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.

To open the Printer Configuration window, click on the PRINTER CONFIGURATION button in Create/Modify User.

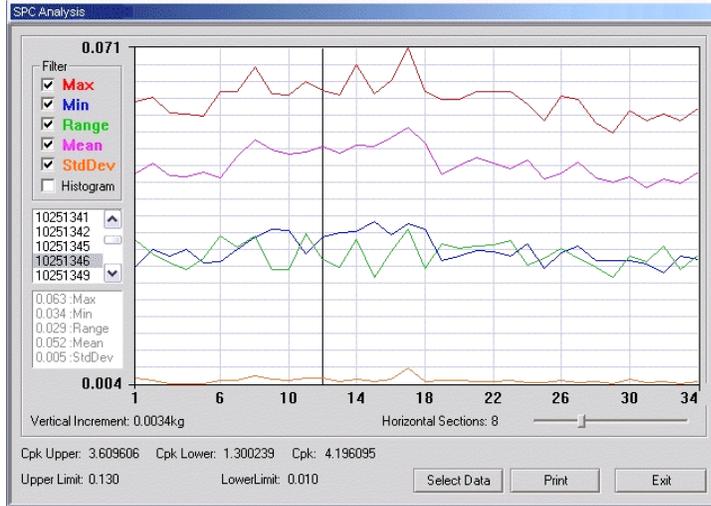


Element	Description
Output Scale	Controls the overall size of actual graph or label report dimensions. A range of 25% to 100% of full size is available.
Unlock Advanced	Entry here of the proper password grants access to the Advanced Printer Configuration via the Advanced button. (Password is defined in the Unlock Buttons Password field on the Create/Modify User window.)
Advanced button	Opens the Advanced Printer Configuration window.
User-Defined Output	The text from all filled-in fields will print at the bottom of all SPC data and graph reports.  When the User-Defined Output fields appear in white (see above at left), text in all of these fields can be changed or deleted.  When the User-Defined Output fields appear in grey (see above at right), the user cannot change or delete text in any of these grey fields. The grey color indicates that the Modify RH Only flag has been turned on in the Create/Modify User window. The text in grey can only be defined and modified when the Printer Configuration window is accessed through the Create/Modify User window.

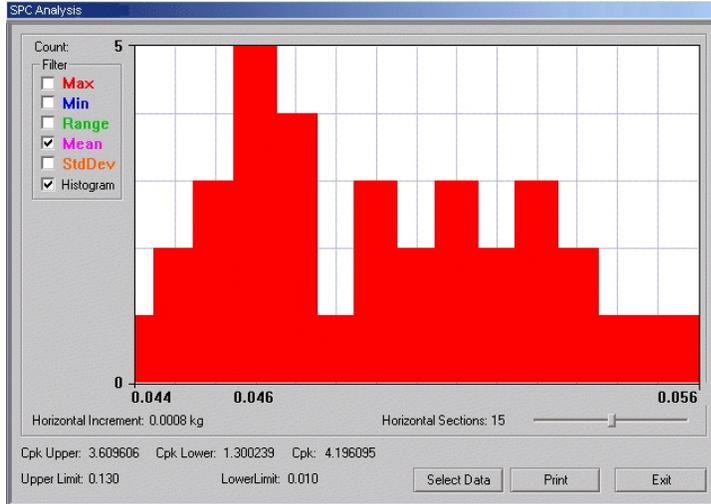
## SPC Analysis

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.

To open the SPC Analysis window, click on the ACCEPT button in Period Selection.



All filter data displayed for selected data file



Histogram with Mean filter selected

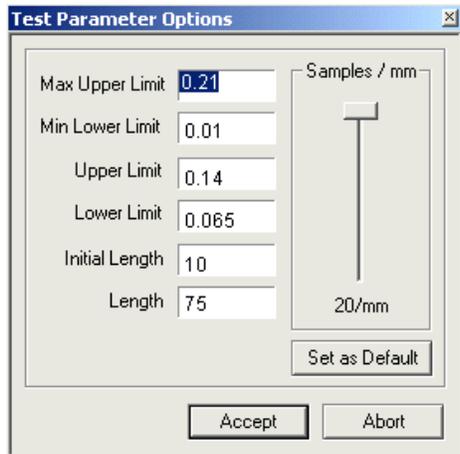
Element	Description
Count	For Histogram filter only. Number of occurrences a data point fell into the given range.
Filter	Determines the type of test data results displayed/printed.
	Max            Maximum data point of all selected SPC files.
	Min            Minimum data point of all selected SPC files.
	~ continued ~

Element	Description
	<p>Range            Difference between minimum and maximum data point.</p> <p>Mean             Mean data point of all selected SPC files.</p> <p>StdDev           Measure of dispersion in distribution beyond mean for all selected SPC files.</p> <p>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.</p>
<i>list of files</i>	List of all file names selected in Period Selection window.
<i>file data</i>	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 Horizontal Increment	Increment between the grid lines.
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 Lower Cpk	<p>Cpk of the MAXIMUM data point of all selected SPC files.</p> <p>Cpk of the MINIMUM data point of all selected SPC files.</p> <p>Cpk of the MEAN data point of all selected SPC files.</p>
Upper Limit Lower 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.
SELECT DATA	Select the data to be analyzed by file location and date/time span.

## Test Parameter Options

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.

To open the Test Parameter Options window, click on the OPTIONS button in PBFT Control Center.

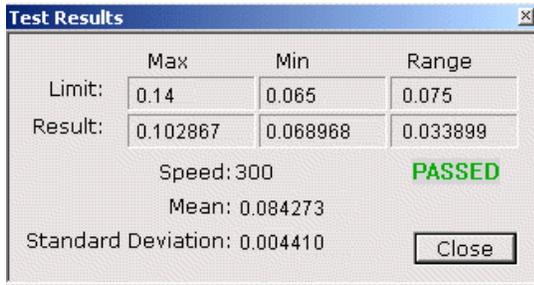


Element	Description
Max Upper Limit Min Lower Limit	Maximum and minimum values displayed on the graph. For screen display only, these values will not alter the actual data collected. If the data extends beyond the range of either the maximum or minimum limit, the data will be plotted on that extreme.
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.

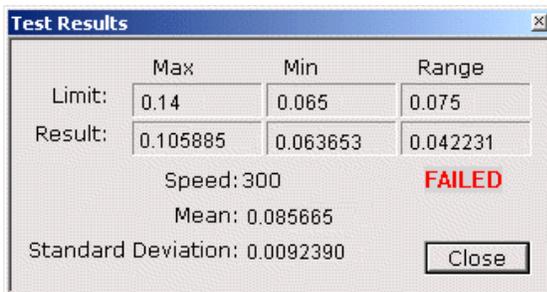
## Test Results

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

To open the Test Results window, click on the VIEW STATISTICS button in PBFT Control Center.



*PASSED - Successful test*



*FAILED - Unsuccessful test*

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

Use the Unit of Force window to establish the active unit of force. To open the Unit of Force window, click on the UNIT OF FORCE button in PBFT Control Center.



Element	Description
Units	Recognized units of force: gram, kilogram, pound, newton. 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.

## User Login

Use the User Login window to gain access to the FORCEWare software. To open the User Login window, go to the main menu bar and click on User.

Element	Description
User Name	A user name may consist of 12 alphanumeric characters. Spaces are allowed. Any user name can have any combination of access rights assigned to it by means of a password.
Password	Passwords are case sensitive and may consist of up to 12 alphanumeric characters. Spaces are allows. A password is not revealed when typed; each character/space is displayed as a "*". A password is not required if you do not care about security.

## Warranty

**GENERAL WARRANTY:** Subject to the remedy limitation and procedures set forth in the Section "Warranty Procedures and Remedy Limitations," GPD Global® warrants that the system will conform to the written description and specifications furnished to Buyer in GPD Global®'s proposal and specified in the Buyer's purchase order, and that it will be free from defects in materials and workmanship for a period of one (1) year. GPD Global® will repair, or, at its option, replace any part which proves defective in the sole judgment of GPD Global® within one (1) year of date of shipment/invoice. Separate manufacturers' warranties may apply to components or subassemblies purchased from others and incorporated into the system. THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

**LIMITATIONS:**

- GPD Global® reserves the right to refuse warranty replacement, where, in the sole opinion of GPD Global® the defect is due to the use of incompatible materials or other damages from the result of improper use or neglect.
- This warranty does not apply if the GPD Global® product has been damaged by accident, abuse, or has been modified without the written permission of GPD Global®.
- Items considered replaceable or rendered unusable under normal wear and tear are not covered under the terms of this warranty. Such items include fuses, lights, filters, belts, etc.

**WARRANTY PROCEDURES AND REMEDY LIMITATIONS:** The sole and exclusive remedy of the buyer in the event that the system or any components of the system do not conform to the express warranties stated in the Section "Warranties" shall be the replacement of the component or part. If on-site labor of GPD Global® personnel is required to replace the non-warranted defective component, GPD Global® reserves the right to invoice the Buyer for component cost, personnel compensation, travel expenses and all subsistence costs. GPD Global®'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. In no event and under no circumstances shall GPD Global® be liable for any incidental or consequential damages; its liability is limited to the cost of the defective part or parts, regardless of the legal theory of any such claim. As to any part claimed to be defective within one (1) year of date of shipment/invoice, Buyer will order a replacement part which will be invoiced in ordinary fashion. If the replaced part is returned to GPD Global® by Buyer and found by GPD Global® in its sole judgment to be defective, GPD Global® will issue to Buyer a credit in the amount of the price of the replacement part. GPD Global®'s acceptance of any parts so shipped to it shall not be deemed an admission that such parts are defective.

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*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.*

# INDEX

## A

A/D PCI card, jumper settings 50  
About  
    main menu item 3  
    FORCEWare, window 64  
access  
    rights, changing 62  
    super user 16  
accessories 53  
Activate PBFT, description 3  
adapter, install 8  
Add User 61  
Additional Operations 33  
Advanced Printer Configuration 26, 65  
amplifier cable, install 8

## B

Basic Operations 24  
board configuration 11-12

## C

Calibrate  
    PBFT Speed 20  
    PBFT Strain Gauge 22  
    Speed, window 66  
    Strain Gauge, window 67  
calibration kit  
    installation 49  
    part no. & contents 53  
    using 47  
Calibration Accuracy 45  
carriage release/lock 30  
Change  
    Access Rights 62  
    Password 62  
    Unit of Force 38  
Chinese & English, start/stop button display 63  
Configure  
    & Calibrate 18  
    Interface Card Software 9  
    PBFT, description 3  
    PBFT with Computer 18  
    Printer 26  
control buttons 2  
converter card, install 8  
Create/Modify  
    description 3  
    User, set up 16  
    User, window 68

## D, E

Data Storage 33, 70  
Delete User 62  
English & Chinese, start/stop button display 63

## F, G, H

fail status 32  
filters, SPC analysis 56  
Fixed Text 58  
FORCEWare software 1, 24  
format, reports & labels 27, 58  
Getting Started 1  
GPD FORCEWare with SPC, window 71  
Histogram 57  
Horizontal Sections 57

## I, J

Initial Start Up 16  
InstaCal software 6, 9  
Install  
    Adapter 8  
    Amplifier Cable 8  
    Converter Card 8  
    FORCEWare software 13  
    Interface Card Software 6  
    PC Hardware 8  
    Reader Software 15  
    SPC Software 13  
Installation 4  
interface card  
    configure software 9  
    configure with PBFT 18  
    software 6  
Jumper Settings for A/D PCI Card 50

## L

label  
    fixed text 58  
    format 27  
    dimensions, & user-defined text 58  
    sample 60  
    sizing 58  
    text spacing 27  
Language Selection 63  
Legend 27, 65  
Line Graph, sample 59  
Load  
    Carrier Tape 30  
    Results 39

Log files, save 35  
Log on 24  
Login 3, 24

## **M**

Main menu 3  
Maintenance 44  
Modify RH Only, option 26  
Modify Test Parameters 29  
Motor Speed  
    Re-calibration 46  
    verify 45

## **O**

Open PBFT Control Center 28  
Overview 1

## **P**

pass status 32  
password  
    add user 61  
    changing 62  
PBFT  
    assemble 4  
    calibrate 18  
    Configuration, window 72  
    configure 18  
    Control Center 28, 73  
    function 1  
    main menu item 3  
    mechanical controls 2  
    power off 43  
    power on 24  
    prepare to load tape 30  
    speed, calibrate 20  
    speed, verify 25  
    strain gauge, calibrate 22  
    theory of operation 1  
Period Selection, window 75  
power indicator, verify operations 5  
power on 24  
Prepare PBFT 30  
preventive maintenance schedule 44  
Print Test Results 37  
Printer  
    advanced configuration 26  
    Configuration, window 76  
    configure 26  
procedure  
    basic operations 24  
    configure & calibrate PBFT 18  
    installation 4

## **R**

Remove, description 3  
Report  
    & Label Samples 58  
    dimensions 26  
    fixed text 58  
    format 27  
    sizing 58  
    text spacing 27  
    user-defined text 58  
requirements 54  
Run a Test 32

## **S**

Safety notices ii  
Save  
    Data Log Files 35  
    Test Results 33  
security, maximum 17  
Setup, main menu item 3  
Shutdown 43  
Single File Statistics 56  
Sizing, reports & labels 58  
software  
    Adobe Reader 15  
    configure interface card 9  
    Control 3  
    FORCEWare 1, 13  
    InstaCal 6  
    interface card 6  
    MASTERFORCE 1  
    PBFT 1  
    SPC software 13  
spare parts 53  
SPC  
    Analysis, description 3  
    Analysis, how to use 40  
    Analysis, Tools 56  
    Analysis, window 77  
    data 58  
    Data Graph, sample 60  
    graphs 58  
    main menu item 3  
Specifications 54  
Speed  
    dial, calibrate 20  
    motor, re-calibrate 46  
    motor, verify 45  
    verify 25  
Start  
    button 32  
    button, Chinese and English 63  
Up 24

statistics, view 56

Status, pass and fail 32

Stop button 32, 63

strain gauge

    calibrate 22

    elements of 2

    lateral position 31

    pin locations 48

    power off 43

    power on 24

    verify operations 5, 47

    voltage reading 48

## T

Tape

    carriage, verify operations 5

    load 30

    width 31

Test

    Parameter Options, window 79

    parameters, modify 29

    results, print 37

    results, save 33

    Results, window 80

    run 32

Text Spacing 27, 65

trim pot 46

Troubleshooting 51

## U

Unit of Force 38, 81

Unlock Advanced 27

User

    Access 61

    account, initial set up 16

    account, login with 24

    add new 61

    delete 62

    Login, initial start up 16

    Login, window 82

    main menu item 3

## V, W

Variables, advanced printer configuration 27

Verify

    Mechanical Operations 5

    Speed 25

    Strain Gauge Operations 47

Warranty 83

weight declaration 49

window

    About FORCEWare 64

    Advanced Printer Configuration 65

    Board Configuration 12

    Calibrate Speed 20, 25, 66

    Calibrate Strain Gauge 22, 67

    Create/Modify User 61, 68

    Data Storage 70

    GPD FORCEWare with SPC 71

    PBFT Configuration 25, 72

    PBFT Control Center 28, 73

    Period Selection 40, 75

    Printer Configuration 26, 76

    Remove User 62

    SPC Analysis 77

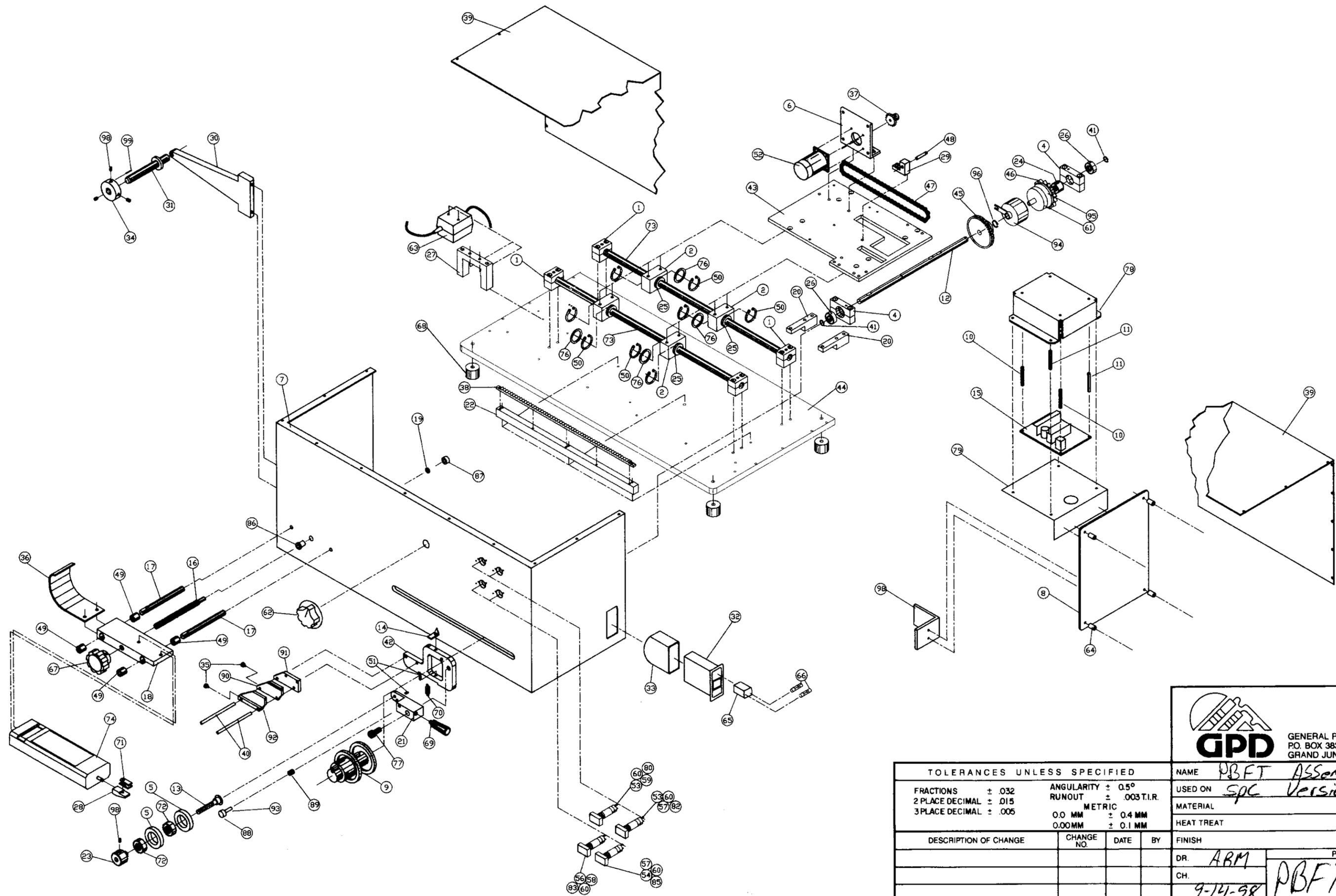
    Test Parameter Options 29, 79

    Test Results 32, 80

    Unit of Force 81

    User Login 24, 82

Window References 64



**GPD** GENERAL PRODUCTION DEVICES  
 P.O. BOX 3836  
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TOLERANCES UNLESS SPECIFIED	
FRACTIONS	± .032
2 PLACE DECIMAL	± .015
3 PLACE DECIMAL	± .005
ANGULARITY	± 0.5°
RUNOUT	± .003 T.I.R.
METRIC	
0.0 MM	± 0.4 MM
0.00MM	± 0.1 MM

NAME *PBFT Assembly*  
 USED ON *SPC Version*  
 MATERIAL  
 HEAT TREAT

DESCRIPTION OF CHANGE	CHANGE NO.	DATE	BY	FINISH

DR. *ARM*  
 CH. *9-14-98*  
 PART NO. *PBFT-3D2*

## REFERENCE

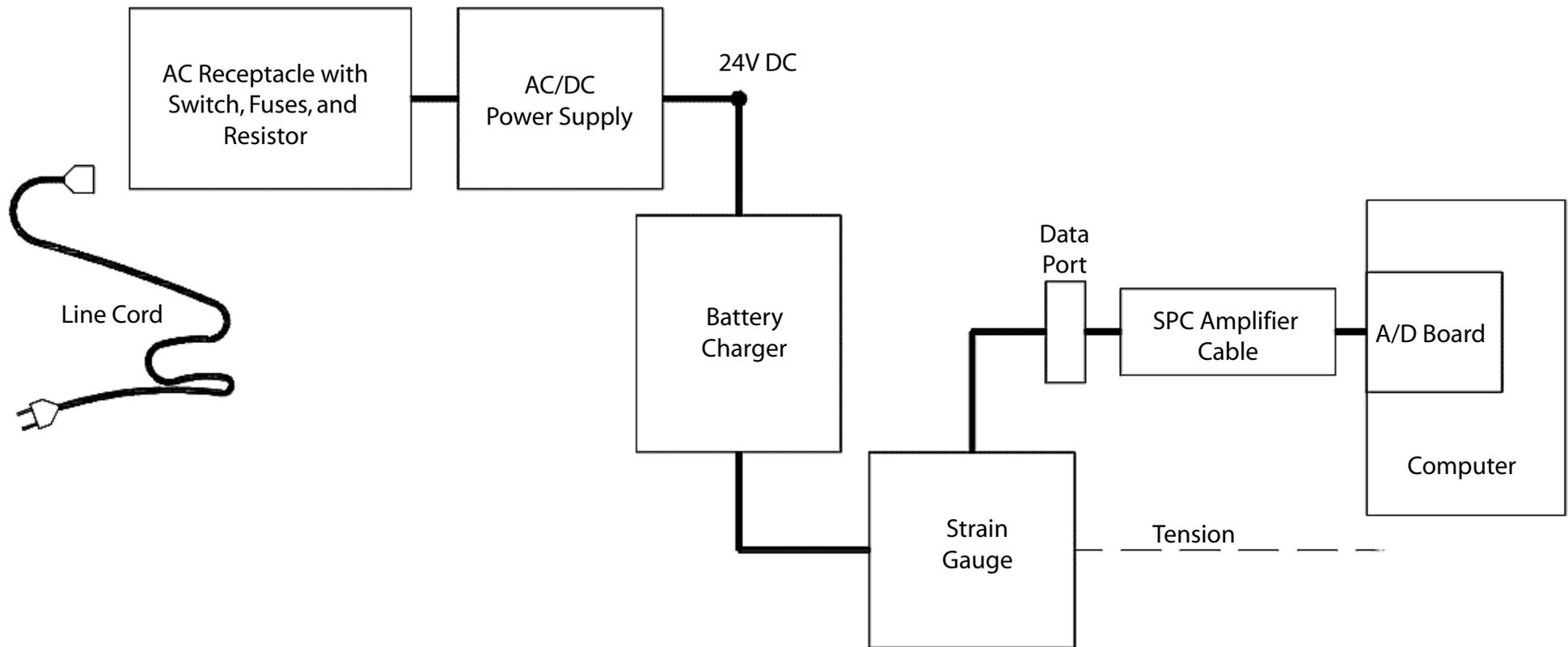
ITEM	PART NO.	DESCRIPTION	QTY
1	PBT-0001	Block Shaft Mount	4
2	PBT-0002	Mounting Block	4
3			
4	PBT-0004-B	Bearing Mount Lock	2
5	PBT-0005	Pressure Roller	2
6	PBT-0006VS	Drive Motor Mount	1
7	PBT-0052	Front Panel	1
8	PBT-0009	Electrical Panel	1
9	PBT-100F	Draw Wheel Assembly	1
10	10/1424	Nylon Standoff	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

## REFERENCE

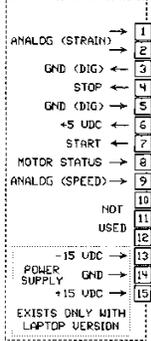
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35	10/1692	Knob	2
36	PBT-0048	Tape Deflector	1
37	PBT-0108M	Sprocket	1
38	PBT-0103	Gear Rack	1
39	PBT-0060	Cover	1
40	PBT-0517	Guide Bar	2
41	G4002	Snap Ring	2
42	PBT-0032	Pressure Wheel Mount Plate	1
43	PBT-0007	Motor Mount Plate	1
44	PBT-0054	Base 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

**REFERENCE****REFERENCE**

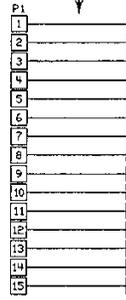
<b>ITEM</b>	<b>PART NO.</b>	<b>DESCRIPTION</b>	<b>QTY</b>
69	PBT-0310	Handle	1
70	PBT-0312	Spring	1
71	PBT-0313	Clip	1
72	B8003	Ball Bearing	2
73	PBT-0101	Travel Shaft	2
74	10/0287	Strain Gauge Force Tester	1
75			
76	PBT-0051	Linear Washer	4
77	F5453	Shoulder Bolt	1
78	PBT-0512	Power Supply Mounting 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	1
99	RPAC06087	Roll Pin	1



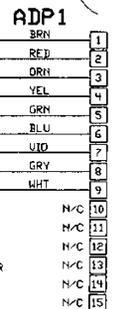
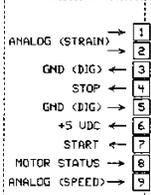
**PBFT**



**INTERFACE CABLE**

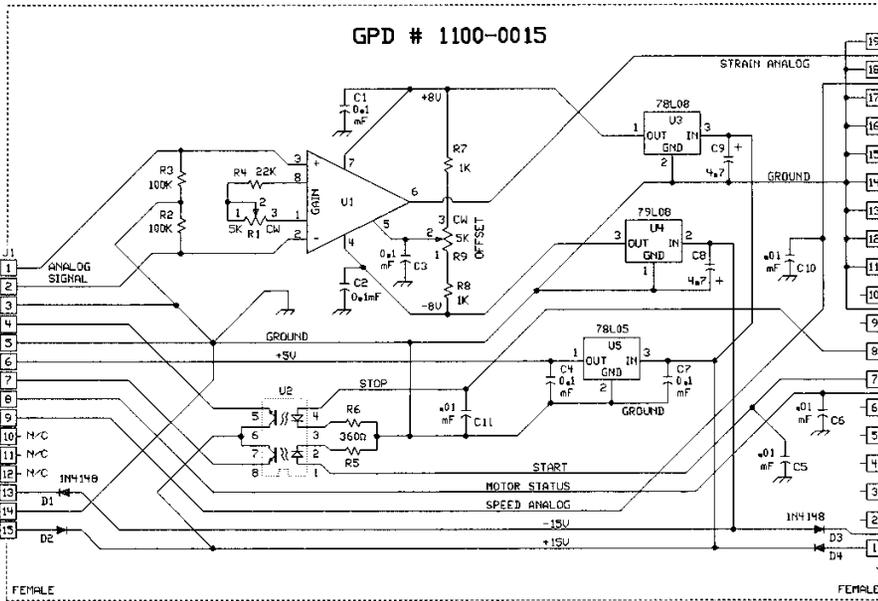


**PBFT**

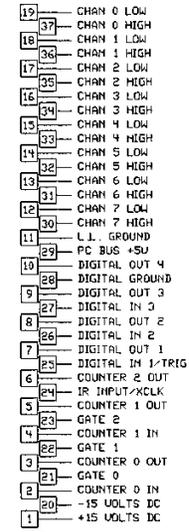


**SPC "98" AMPLIFIER MODULE**

GPD # 1100-0015



**COMPUTER**



16 BIT - 16 CHAN  
A/D BOARD  
GPD # 2200-0169

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	2100-0381		CONNECTOR, HOOD, DB15, METALIZED PLASTIC
1 Ft.	6000-0008		CABLE, SHIELDED, 10-COND, 24 AWG
1	2100-0069		CONNECTOR, 9-PIN MALE INSERT (SERIES 126)
1	2100-0014		CONNECTOR, CLAMP 4/HOOD (SERIES 126)
1	2100-0015		CONNECTOR, HOOD LOCKING SLEEVE (SER 126)

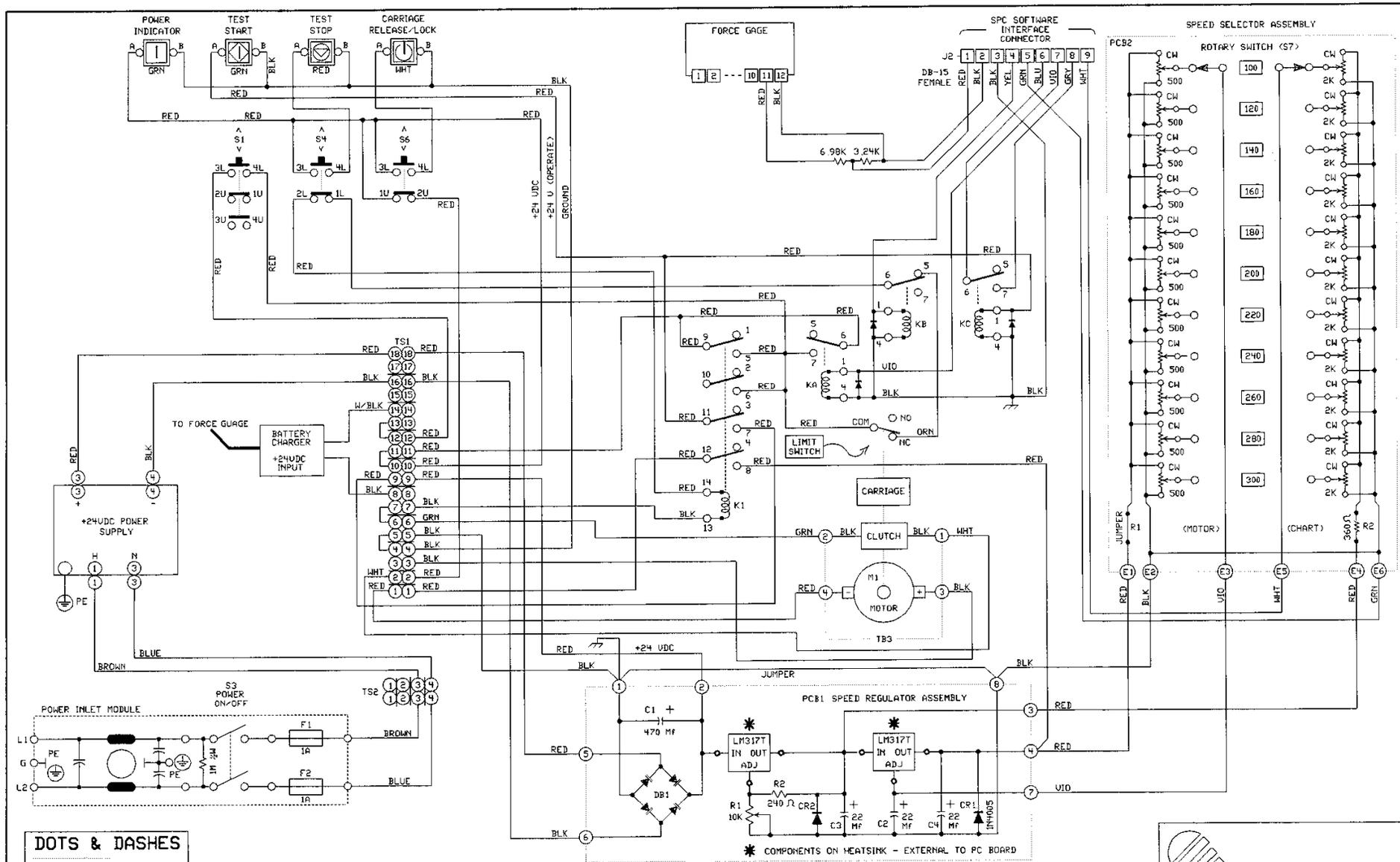
TOTAL QTY	GPD PART No.	SYMBOL REFERENCE	DESCRIPTION
1	2000-0006	P1	CABLE ASSEMBLY, DB15, M/M, 10 Ft., SHIELDED

TOTAL QTY	GPD PART No.	SYMBOL REFERENCE	DESCRIPTION
	1100-0015		SPC 98 AMPLIFIER MODULE
2	1700-0055A	PCB	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	PBT-0067	J1	BRACKET, DB15 TO BACKSHELL
2	2800-0070	J1	CONNECTOR HARDWARE, HEX JACK SCREW
1	3130-0023	U3	+8 VOLT REGULATOR, 78L08
1	3130-0024	U4	+8 VOLT REGULATOR, 79L08
1	3130-0064	U5	+5 VOLT REGULATOR, 78L05
1	3130-0063	U1	INSTRUMENTATION AMPLIFIER
1	3130-0043	U2	DUAL OPTO-COUPLER, MCT-62
4	4800-0004	D1,2,3,4	DIODE, SWITCHING, 1N4148
2	4750-0025	R1, R9	POT, 5 K, 1/4 W, MULTI-TURN
2	4700-0045	R5, R6	RESISTOR, 360 OHM, 1/4 W, 5 %
2	4700-0053	R7, R8	RESISTOR, 1 K, 1/4 W, 5%
1	4700-0026	R4	RESISTOR, 2.2 K, 1/4 W, 5%
2	4700-0012	R2, R3	RESISTOR, 100 K, 1/8 W, 1%
4	301444	C5,6,10,11	CAPACITOR, 0.01 uF, RAD.
5	3500-0004	C1,2,3,4,7	CAPACITOR, 0.1 uF, RAD.
2	3500-0029	C8, C9	CAPACITOR, 2.2 uF, 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, PBFT, SPC98, VERSION 1.0
1	PBT-011	MANUAL, PBFT, US, SPC98 SOFTWARE GUIDE
1	1100-0014	ADAPTER CABLE: FOR PRE - 3/99 PBFTs



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**DOTS & DASHES**

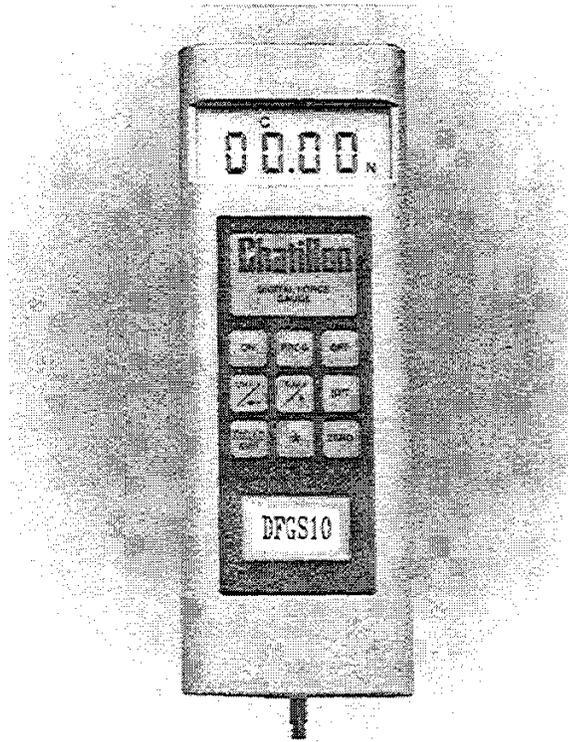
↑ INDICATORS OF MECHANICAL CONNECTIONS OR BOUNDARIES

↓ INDICATORS OF MECHANICAL CONNECTIONS OR BOUNDARIES

**GPD** GENERAL PRODUCTION DEVICES  
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# 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

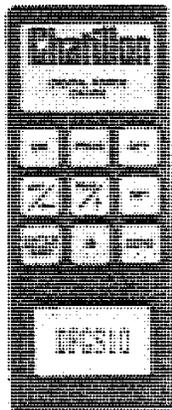
1. A 9 element keypad is used for operation of the instrument:

**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.)

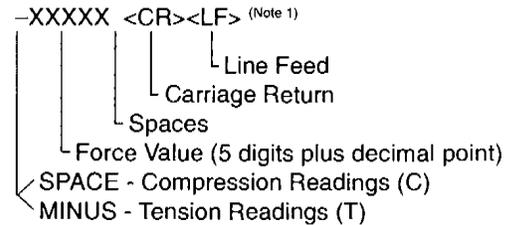
Data transmission may be initiated:

- 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:

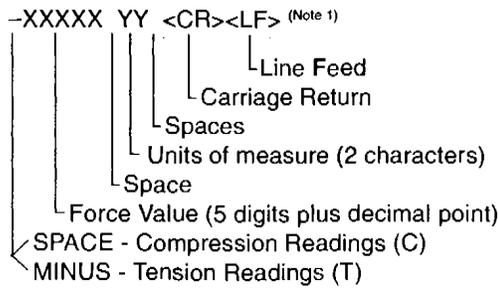
#### 1. Numerical data only—RS-232 Format

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		I	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	±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	±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 ±0.75% F.S.
	Digital Output	RS-232 (± 5V 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**

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