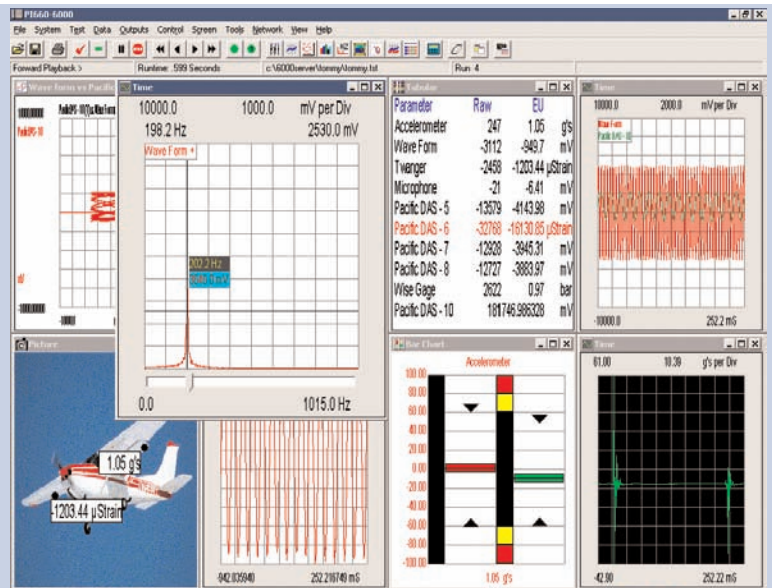


## INTRODUCTION

PI660-6000 is the choice for test management, data acquisition, and data display. It is a 32-bit application that runs on Microsoft Windows NT, XP, 2K, & 98 Operating Systems.

PI660, as it is known, controls the Pacific Instruments model 6000 data acquisition system (DAS). It provides all the tools for test definition, test setup & tracking, transducer calibration, data acquisition & display, data replay, data export, and test quality validation.



PI660 is turn-key, and it also has a programming interface known as the Component Module DLL (CMD). The CMD interface encapsulates the real time core of PI660 and allows the user/programmer to modify the appearance and functionality of PI660 without needing to decipher the internals of PI660. Examples of its use include making PI660 look exactly like a legacy data acquisition system, adding control to PI660 based on real time data, merging PI660 with existing code for other systems, etc.



## PI660 DELIVERS PROFESSIONAL TEST MANAGEMENT

Testing requires software capable of effective test management. Without such software the probability of collecting erroneous data for the test increases. PI660 has been built with this problem in mind.


Throughout PI660 the user will find features that help track whether or not the 6000 DAS is setup correctly and whether or not the channels are properly configured and calibrated.

Channel setups can change often during a test program. Tracking these changes is important, but making sure that the setup changes are sent to the DAS is more important. PI660 flags a channel's setup screen with the  graphical icon whenever the channel's setup is changed in the software. This icon is visible in many of PI660's other screens also. When the user instructs PI660 to send the new setup information to the channel the  icon is changed to the **OK** icon.

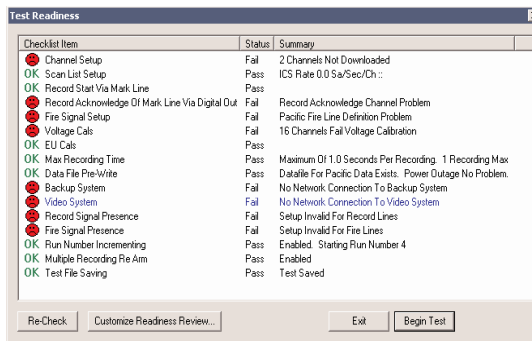
PI660 contains tools that allow the user to read back the channel hardware settings, compare those settings to the software settings, and to create report files showing the hardware setup and any differences noted between hardware and software setup. The report files are named using the current time and date so that overwriting the files is virtually impossible.

Transducer calibrations are performed during a test program, and for best accuracy they should be re-performed when channel setup changes. PI660 tracks the changes in the channels and can invalidate the transducer calibrations if the channel setups change.

All of the tools for test management and test validity form a basis for quality test assurance. Prior to performing a test with PI660 the user can view the Test Readiness screen to see an overview of potential test problems.

The test readiness screen allows the user to visualize functions that need to be performed. Clicking on a function that needs to be performed (indicated by the  icon) takes the user to the screen that allows the function to be carried out. When all icons indicate **OK**, the user is ready to perform the test.

PI660 was written by test engineers for test engineers. It includes test management features requested and recommended by test facility operators throughout the world. The features are well tested, and they have helped more than one facility avert the acquisition of data that is inaccurate due to operator error.



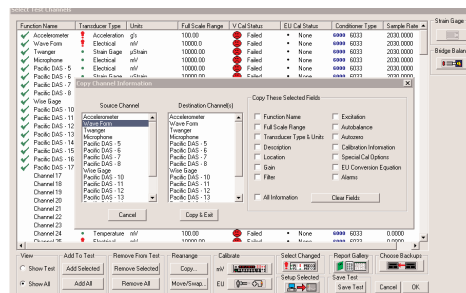
**TEST READINESS SCREEN**

### PI660 Makes Test Setup & Definition Easy

Test setup is one of the primary time consuming activities of any test program. Transducers need to be connected, amplifiers need to be setup, signals need to be verified, and data accuracy needs to be assured. PI660 aids the user in performing all these tasks, and using PI660 greatly reduces test setup time.

PI660 provides setup screens tailored for each channel type in the 6000 system. When the user sets up a channel with PI660 he can rest assured that the channel setup screen will only contain the parameters pertinent to the channel type.

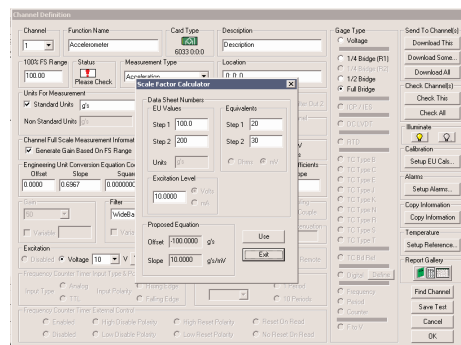
Once one channel is setup, channels with identical setups can be created using PI660's Copy Channel Information utility. If the user makes a mistake and needs to move a channel definition he can use PI660's Swap or Move Channel Information utility.



**CHANNEL SELECTION & COPY INFORMATION SCREENS**

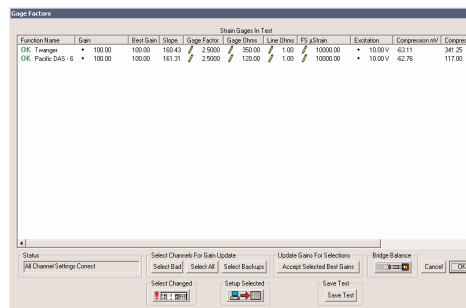
PI660 contains lookup tables for all standard thermocouple types, and can convert temperature measurements to °C, K, °F, or R automatically. It also has the ability to perform reference junction temperature corrections based on another input channel's temperature value (for instance an RTD), a fixed known temperature, or card level reference devices.

Transducer data sheets are welcome in PI660 since it contains a transducer data sheet calculator. The calculator allows the user to enter values directly from the transducer data sheet and to have PI660 calculate the engineering unit conversion equation for the transducer automatically.



**CHANNEL DEFINITION & SCALE FACTOR CALCULATOR SCREENS**

The user defines a full scale range for each channel he is going to use, and PI660 can use that full scale range and the engineering unit conversion equation to select an appropriate gain for each channel. PI660 also uses the full scale range's digits of precision to determine the number of digits of precision that should display for each measurement channel.



**STRAIN GAGE SETUP SCREEN**

For strain gages PI660 includes a Strain Gage Setup screen that allows the user to enter the gage resistance, line resistance, expected full scale range, and gage factor. When the user enters the information PI660 determines the best gain for the gages and allows the user to accept those gains and to setup the channels.








Bridge gages benefit from PI660's Automatic Bridge Balance screen. The screen shows the pre-balance and post balance results for all bridge type gages in the user's test and uses the hardware based "true bridge balance" circuit on each 6000 bridge measurement channel to balance the bridges.

Function Name	Status	Pre Balance mV	Post Balance mV	Delta mV	Pre Balance EU	Post Balance EU	Delta EU
OK Accelerometer	Good	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OK Pacific DAS - 5	Good	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OK Pacific DAS - 7	Good	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
OK Pacific DAS - 8	Good	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

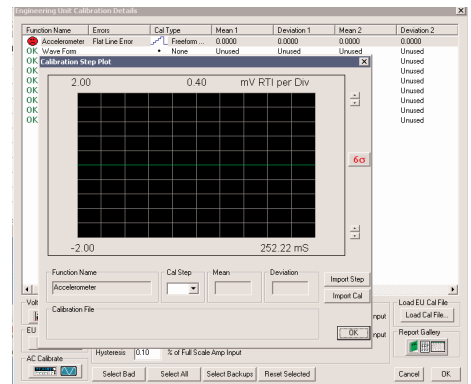
**AUTOMATIC BRIDGE BALANCE SCREEN**

### Calibration Is Easy & Precise With PI660

PI660 contains two distinct types of calibration. They are amplifier (or channel) calibration and Engineering Unit (EU) calibration. The user can choose to perform one, both, or none of the calibrations on a channel-by-channel basis. Calibration is necessary only if the user wants to improve the accuracy of his measurements. The user can enter the EU conversion equation or PI660 can calculate it based on the results of an EU calibration.

PI660 checks all calibrations for several adverse conditions. These conditions include an over scale measurement, indicated by the  icon, a flat line or no response error , a noise error , a non-linearity error , a hysteresis error , a slope error , and an offset error .

Engineering Unit calibration results are stored to files named with the time and date of acquisition. Data can be plotted since PI660 acquires 512 points of information for each calibration step for each channel. Further, the user can restore data from previously calibrations for a single step of a calibration, all steps of a calibration for a channel, or all steps for all channels.



**EU CALIBRATION & STEP PLOT SCREENS**

When the EU calibration data are acquired PI660 can calculate a linear conversion equation using either a least squares fit or a two-point straight line fit. Once the conversion equation is calculated it is used to convert data to engineering units in real time.

PI660 can perform EU calibrations in an interactive fashion or in a free running fashion where there is no user interaction required. In the interactive EU calibration method the user has the ability to enter the current EU value for each calibration step if he desires. This is useful for calibration of gages wherein the current stimulus to the gages is not known until time of calibration.

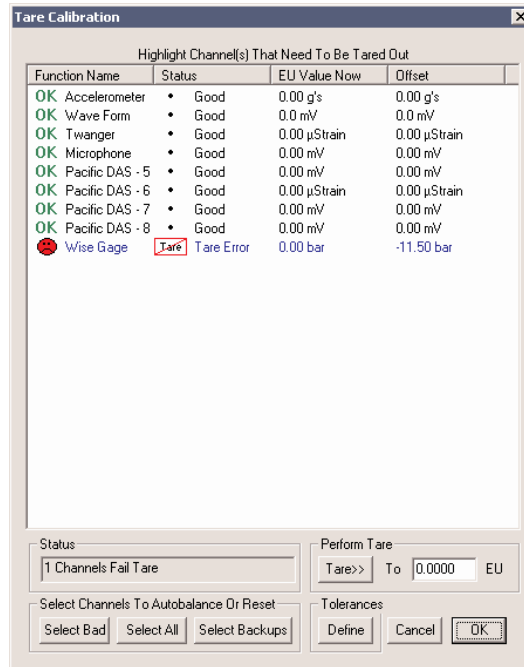
Amplifier calibration with PI660 is automated and easy to perform. The 6000 system amplifiers are factory aligned and calibrated, so daily amplifier calibration is only necessary for the most critical of measurements. PI660 has built in support for the EDC model 522 programmable DC voltage source. The EDC is a 19 inch rack mountable precision source, and it can easily be sent to a calibration lab for yearly certifications. The amplifier calibration screen is shown right.

Function Name	Status	Mean +80%	Deviation +80%	Mean -80%	Deviation -80%	Mean +50%
OK Accelerometer	Flat Line Error	1.5852	0.0001	-1.6154	0.0001	1.1885
OK Wave Form	Flat Line Error	1.5866	0.0007	-1.6150	0.0002	1.1887
OK Twanger	Flat Line Error	1.5850	0.0007	-1.6138	0.0007	1.1854
OK Microphone	Flat Line Error	1.5723	0.0004	-1.5745	0.0003	1.1820
Pacific DAS - 5	Flat Line Error	1.5861	0.0001	-1.6144	0.0002	1.1883
Pacific DAS - 6	Flat Line Error	1.5851	0.0004	-1.6135	0.0005	1.1895
Pacific DAS - 7	Flat Line Error	1.5855	0.0002	-1.6144	0.0003	1.1858
Pacific DAS - 8	Flat Line Error	1.5841	0.0006	-1.6132	0.0006	1.1848
Pacific DAS - 9	Flat Line Error	1.5869	0.0001	-1.6094	0.0001	1.1881
Pacific DAS - 10	Flat Line Error	1.5884	0.0001	-1.6094	0.0001	1.1887
Pacific DAS - 11	Flat Line Error	1.5888	0.0002	-1.6095	0.0001	1.1890
Pacific DAS - 12	Flat Line Error	1.5869	0.0001	-1.6094	0.0001	1.1881
Pacific DAS - 13	Flat Line Error	1.5884	0.0002	-1.6093	0.0001	1.1887
Pacific DAS - 14	Flat Line Error	1.5890	0.0002	-1.6090	0.0002	1.1893
Pacific DAS - 15	Flat Line Error	1.5883	0.0001	-1.6096	0.0002	1.1894
Pacific DAS - 16	Flat Line Error	1.5883	0.0002	-1.6096	0.0001	1.1890

**AMPLIFIER CALIBRATION SCREEN**

PI660 uses the amplifier calibration to construct a slope for the voltage measured to voltage traceable conversion equation. For the offset of the equation PI660 uses the automatic zero circuit of the 6000 system amplifiers. This yields higher accuracy, and allows PI660 to improve on the specifications of the 6000 system amplifiers. Amplifier calibration spans +80% full scale input to -80% full scale input in 20% steps.

When calibrations are finished the user is ready to acquire data with PI660. In certain test situations the user's test article may change positions prior to the test run. PI660 accommodates this situation by providing a Tare Removal screen.


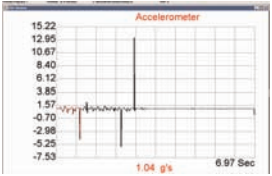
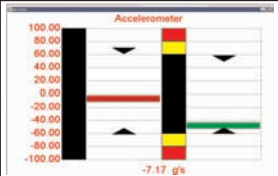
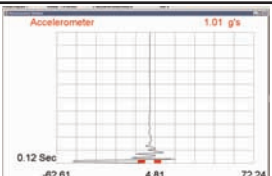
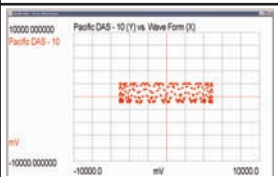

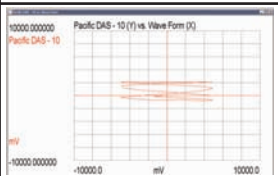
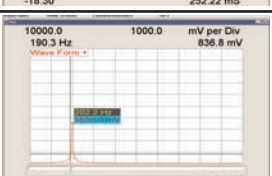
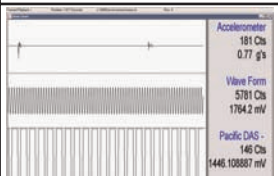
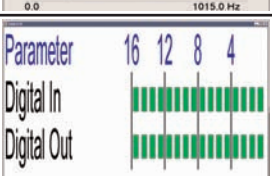
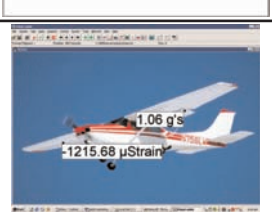


### TARE REMOVAL SCREEN

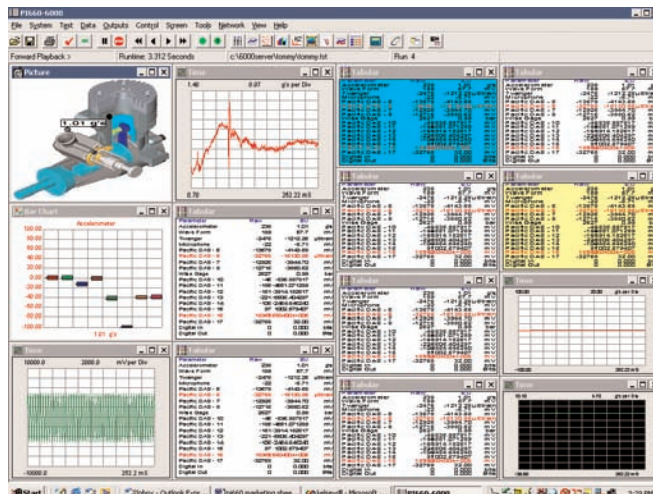
Using the Tare Removal screen the user can enter the current EU value for a group of channels and tell PI660 to adjust the offset portion of the EU conversion equation so that the gages read this current EU value. This operation is typically used for ensuring a proper zero point prior to testing, but PI660 also allows the point to be non-zero.

## Data Displays You've Only Dreamed Of

One of the most exciting features of PI660 is its display engine. There are currently 12 different types of data displays available with PI660. PI660 contains the following types of data displays:

Display Type	Max Channels Per Display	Display Image	Display Type	Max Channels Per Display	Display Image
Tabular	256		Background Plot	10	
Bar Chart	10		Dyno	1	
XY Chart	1 vs. 10		Scope	10	
High Speed XY Chart	1 vs. 10		Spectrum	10	
Strip Chart	10		Digital I/O	200	
			Picture	10	

The user can request as many of each display type that he wants. The amount of displays possible is limited only by PC memory and by the user's visual acuity. The following figure shows just one of the many possibilities.



EXAMPLE OF MANY DISPLAYS

