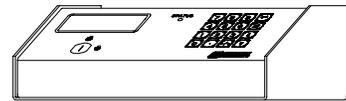
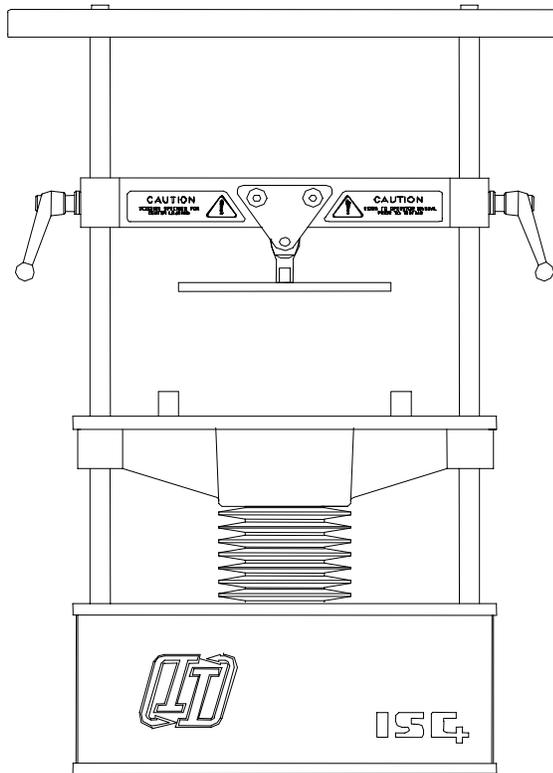


*INTERACTIVE  
INSTRUMENTS*



# Interactive Strength Challenger Plus <sup>TM</sup>

32 Bit Windows <sup>TM</sup> Edition  
Instruction Manual

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Printed: November 24, 2004

## Table of Contents

Welcome.....	4
System Requirements.....	5
Optional Requirements.....	5
Getting Started.....	6
Installation.....	6
Connecting the Challenger to the computer.....	6
Installing the Software.....	6
Configuring the Challenger Control Program.....	7
Working with the Control Program.....	8
A quick tour of the screen.....	8
Toolbar Items.....	9
Menu Items.....	10
Files.....	11
System.....	12
Test.....	13
Overlay.....	15
View.....	15
Help.....	15
Materials Analysis Kit.....	16
Summary of the commands.....	19
Troubleshooting.....	20
Limited Warranty.....	21
Glossary.....	22

## Welcome

The Interactive Strength Challenger Plus™ (Challenger) Control Program is an easy to use interface which allows full functional control of the Challenger. The software is an easy to use 32 bit Microsoft Windows™ interface with built-in help that will allow you to quickly master the features of the Challenger (see **Figure #1** below). The system force is displayed graphically in real time with respect to the compression or tension displacement. The spring constant (K) can also easily be displayed graphically to show the rigidity of a structure or material specimen. Once a test is complete, the graphical data can be printed or stored to disk for further comparison.

### Windows Control Program Screen

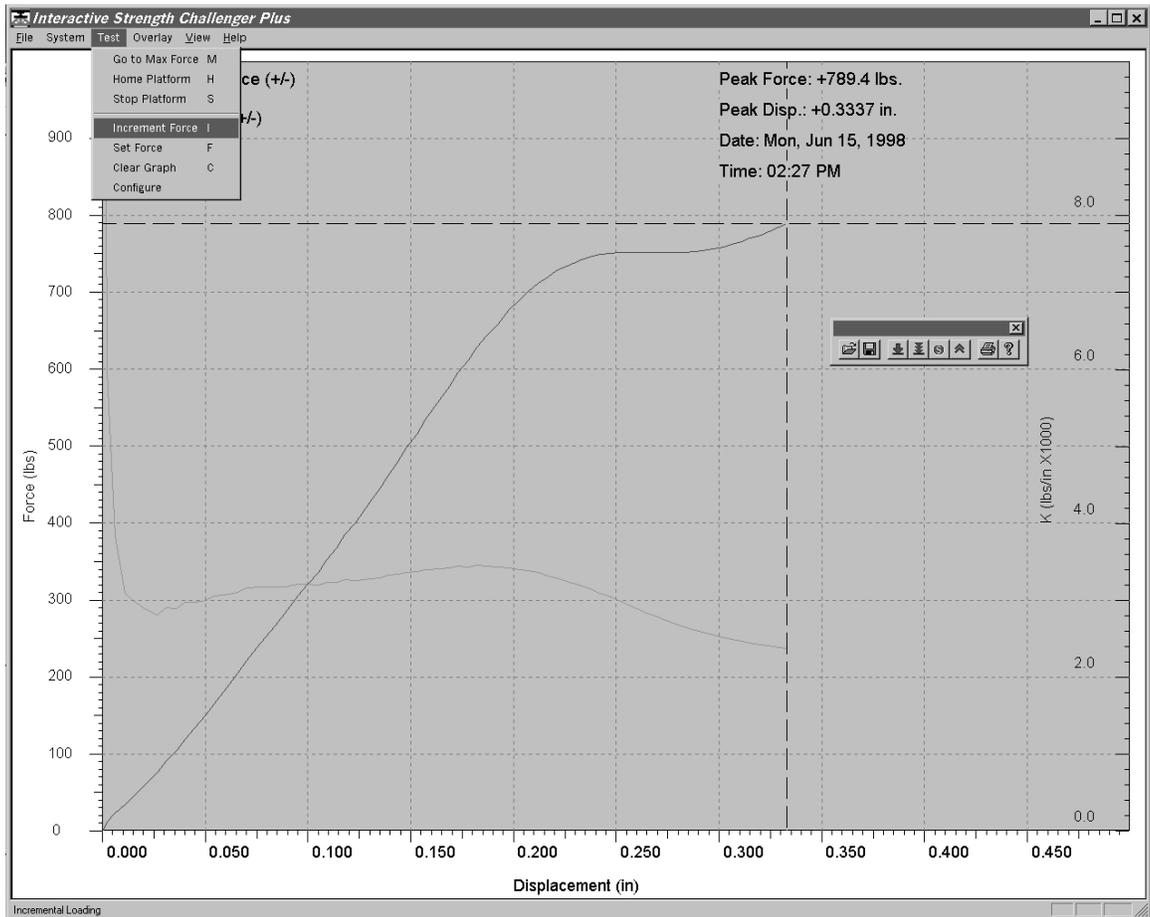


Figure 1

## **System Requirements**

Be sure your PC is 100% IBM or compatible and has at least:

- Windows 95/98/ME/NT/XP or newer
- 90 MHz Pentium or faster preferred
- Minimum required for operating system
- (800 x 600 256 color or better is preferred
- CD ROM Drive (for loading software).
- 1 serial port (COM1 to COM9)

## **Optional Requirements**

The following requirements enhance the use of the program:

- Color or B/W Inkjet or Laser printer

## **Getting Started**

### **Installation**

#### **Connecting the Challenger to the computer**

- Locate the 9 pin serial cable supplied with this software package. Plug the male end of the 9 pin serial cable into the rear of the control panel, and the female end into the 9 pin connector on the rear of the computer. If the computer has a 25 pin serial connector instead of a 9 pin, be sure to use an adapter to convert the 9 pin to a 25 pin (Radio Shack part number 26-287).
- Secure both ends of the cables with screws.
- Be sure that both the computer and the Challenger are plugged into the same wall outlet so they share the same power ground.
- Turn on the Challenger using the power switch located in the rear of the Challenger load frame next to the power cord.

#### **Installing the Software**

- Set the computer screen resolution as high as the video display and video adapter allow. This will allow the software the best graphical detail.
- Insert the Challenger installation CD in the CD drive.
- If the installation program doesn't automatically run the program then locate and run the program **SETUP** and follow directions on the screen.
- Once the Challenger control program is installed it will run automatically.

## Configuring the Challenger Control Program

After the software is installed, run the Challenger (ISC Materials) program. If the program is run for the first time a dialog box is displayed (figure 2). Select the serial port that will be used to communicate with the Challenger from the drop down menu and press OK. The serial port number will be saved to the hard drive in a configuration file so the serial port selection is made once.

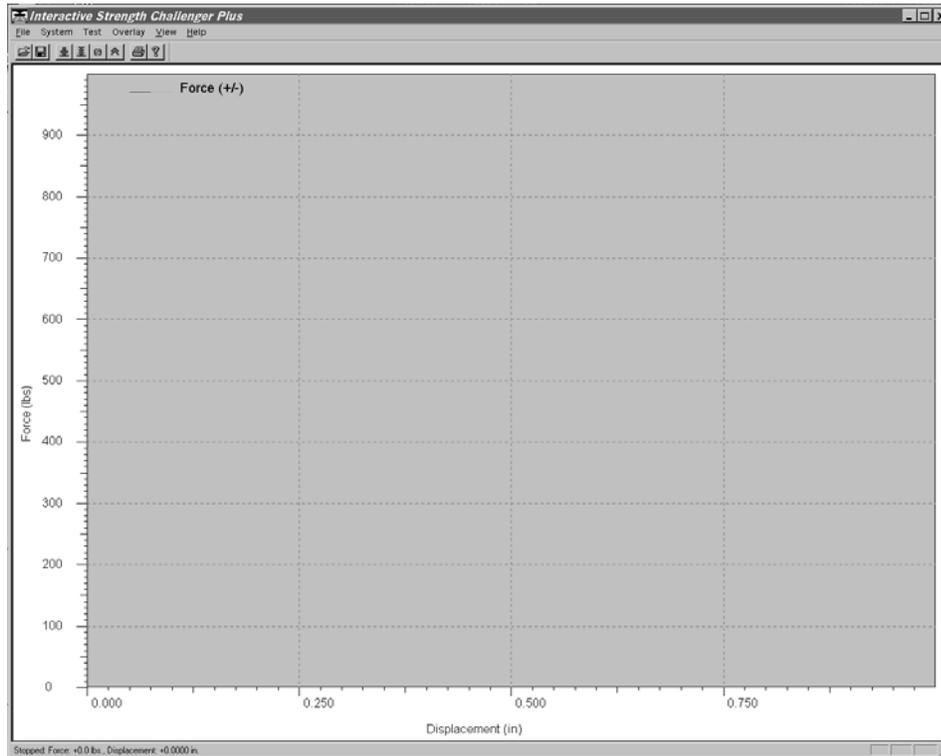


Figure 2

If the computer display prompts with: **Serial Port not Detected!** means the software did not recognize the Challenger connected to the computer's serial port. Be sure to check the following:

- Is the serial cable securely connected to the control panel and the computer's serial port? If not, secure the cables with the screws supplied.
- If the computer is connected to a network, be sure the network card interrupt does not conflict with the serial port (COM) interrupt (COM1 and COM3 use IRQ4, COM2 and COM4 use IRQ3). Many network cards default to the same interrupt (IRQ3) as COM2. Review the network card manual to change interrupt or consult with the network administrator for help.
- Is the computer serial port and COM number correct? If not, reconfigure the software using the proper COM port number. Refer to the operating guide that was supplied with the computer.
- Check to see that the computer and Challenger are powered from the same wall outlet
- Check that the Challenger is powered up and ready (security key activated and shield in place). If not, power up the unit before starting the program.

If the software recognizes the Challenger the PC will display a window as shown in figure 3.



**Figure 3**

You may adjust the program window for any size. The graph will automatically adjust to fill the window. The software is now fully configured and ready to run.

## **Working with the Control Program**

### **A quick tour of the screen**

Looking at the Challenger Control Program window you will see the real time display graph area in gray. The Y (vertical) axis represents the force and the X (horizontal) axis represents displacement. If the K (spring constant) axis is enabled, the K scale will be to the right side of the graph. The graph will display the compression or tension forces on the test specimen with respect to the contact displacement.

**Note:** Tension and compression graphs will be represented with different colors to distinguish between positive and negative forces.

At the top of the display is the menu and toolbar. The menu and toolbar are used to configure and run the various tests. Just below the graph is a status line. The status line displays the current force, displacement and spring constant (if enabled). During a test, these values represent the current status of the specimen under test. This line is also used to display a quick one line help message for the menu and toolbar items.

## Toolbar Items

The Challenger tool bar is used for quick access to the most frequently used features. The toolbar is made up of three groups of buttons. The first group recalls or saves the graphical information to disk. The second group controls the operation of the Challenger. The third group is for miscellaneous system features such as printing and displaying the about dialog box.



Figure 4

The toolbar can be relocated or disabled to increase the size of the graphical viewing area. This may be useful to increase the graphing area for low resolution video modes (800 X 600 and below). To enable and disable the toolbar, toggle the toolbar option in the **View** menu selection. The toolbar can be moved to the side of the graph or moved away from the Challenger window to become a stand alone Toolbar. This is done by placing the mouse over the toolbar and dragging it to the desired location.

The toolbar buttons are defined below.

### Open

Open an existing Challenger file (*filename.ISC*) and restore the graphical data. Opening the file also restores the peak detector status, the test rate, the compression/tension configuration and peak comment text. See **Open** menu item below.

### Save

Store the graphical test results along with the peak detector status, test rate, compression/tension configuration and peak comment text. See **Save As** menu item below.

### Max Force

Ramps the specimen load up to the maximum force. See **Go to Max Force** menu item below.

### Increment Force

Increment the force a fixed amount every time it is selected. See **Increment Force** menu item below.

### Stop

Stops the platform and holds the current position. See **Stop Platform** menu item below.

### Home

Stops the platform if in motion and returns the platform to the home position. See **Home Platform** menu item below.

### Print

Displays the Print dialog. See **Print** menu item below.

### About

Displays the About dialog.

## Menu Items

The Challenger Menu organizes the functions into 6 groups.



### Files

Open an ISC file, Save test results, Print or Exit the program. Once a test is complete, the test results can be saved for future reference. The data can be loaded in the same directory as the Challenger Control Program or under a different subdirectory. *See Files Menu* below.

### System

Configure the system communications port and axis scales. The serial communications port is typically configured once but if the Challenge must be moved to a different port, use this menu item to change the port number. The force, displacement and K axis scales can be altered to make full use of the screen resolution. *See System Menu* below.

### Test

Configures a test and selects an operation for the Challenger.. Once a test begins, the control panel attached to the load frame has no control over the Challenger other than halting the remote access. Controlling the Challenger is accomplished by using the computer. As the computer instructs the Challenger to change the force, the Control Program gathers data from the Challenger and the Windows program reads the data using the serial port. The Windows program then displays the results it graphically. *See Test Menu* below.

### Overlay

Data from a previous test can overlay another test result so that visual comparisons can be made. The overlay data color will be different than new data to allow for easy visual comparison between two curves. To clear an overlay, select Clear from the Overlay Menu. *See Overlay Menu* below.

### View

The status bar and tool bar are enabled by default. They can be disabled to gain more viewing area. *See View Menu* below.

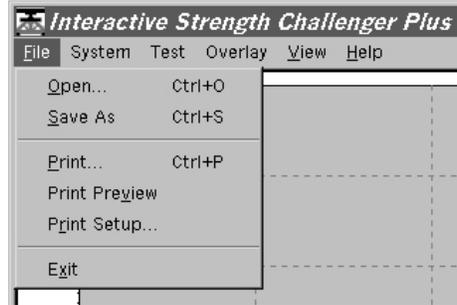
### Help

On Line Help.

Each menu group contains sub-menu items as shown below.

**Note:** Some of the menu items have a letter or control key next to them. This is an accelerator key that can be typed at any time to select the function. For example to go to a force, type the letter F and the "Go To Force" dialog will appear.

## Files



### Open (Ctrl+O)

Load a pre-saved Challenger data file (*filename.ISC*) from disk or network. Once a file is saved to a disk, the file can be loaded back into the Challenger Control Program to view the information, overlay with another test and/or reprint the results.

### Save As (Ctrl+S)

Save the current test results to disk. Once a test has been completed on a model, the data can be saved to disk or onto a network for future evaluation. If the file already exists, a dialog will appear asking if it should be overwritten. Press **Save** to save the file or **Cancel** to exit the dialog. The data is stored in ASCII format so the results can be read into a spreadsheet program (eg. Excel) for further analysis and graphing.

### Print (Ctrl+P)

Displays the default printer dialog box for your printer. Press **OK** to begin printing.

### Print Preview

Displays on the screen the way the graph will look after it is printed. If the print does not look acceptable, you can alter the graph or printer options before the graph is printed.

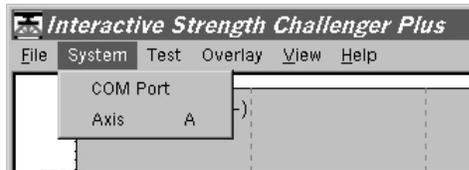
### Print Setup

Displays the printer setup dialog. Use this dialog to select a printer (if more than one are available) and configure the print options before printing. Since the graphs are better suited for landscape mode (horizontal) be sure the printer is set to landscape mode before printing. This can be done in the printer properties dialog for the selected printer. If you have a color printer, the graph will print the load vs. displacement data in color.

### Exit

Exit the Challenger control program.

## System



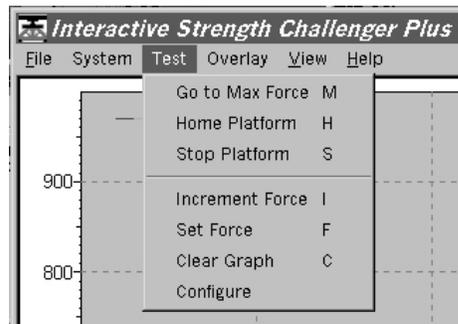
### COM Port

Change the computer's serial COM port for the Challenger. Before making the changes to the port, be sure you know which COM port the Challenger is plugged into. The port number will be saved in the Windows directory under the file "**ISC.INI**".

### Axis (A)

Set the maximum scale value for the force, displacement and K axis (both compression and tension). Select the appropriate maximum value from each drop down menu and the Challenger software will scale the axis appropriately. The Force and/or the K graph can also be enabled or disabled to view only the desired data. When a graph is enabled, the data for the curve is graphically displayed on the screen. If a curve is disabled during a test, the data is still collected so it can be re displayed at a later time. Don't worry about setting up the axis before a test because the software will automatically adjust the force and displacement axis if the data exceeds the scale. Once a test is finished, the axis can be altered to fill the display window.

## Test



### **Go to Max Force (M)**

Ramp the specimen load up to maximum force. The test stops when the peak force is found, an out of range error is encountered, or if interrupted by the operator.

**Note:** If previous test results are still on the display at the time the **Test Menu** is selected, a prompt will ask if the data is to be cleared before new test results are gathered. Selecting *Yes* will clear the results from the screen before starting the next test, selecting *No* will overwrite the new test results over the old.

### **Home Platform (H)**

Home the platform. This command quickly returns the platform without clearing the graphical test data. The home position varies depending on whether the ISC+ is in tension or compression mode. This gives the unit maximum platform range for each mode. When tension is selected the platform will move up 1.5 inches from the normal position giving a full 2 inches of stroke. The home position in compression mode will give a full 2 inches of stroke in the compression direction.

### **Stop Platform (S)**

Stop the test in progress and holds the platform at the current position

### **Increment Force (I)**

Increment the force in discrete levels until the peak force is found or an out of range error is encountered. The first time increment force is selected a dialog will appear requesting the Incremental Force value. Enter the value and press OK. Once contact is made with the specimen, the Challenger will attempt to reach the incremental force. Once the force is reached, the Challenger will maintain the load. Each time the increment force feature is selected, the force will increase by the incremental value. This feature simulates adding a fixed weight to a structure until it fails.

### **Set Force (F)**

Ramp the specimen force to the desired setting and maintain a constant load. Using this command allows precise loading or unloading of the applied force so structural integrity can be monitored. Positive force values set the force in the compression or tension direction as configured. Negative values will reverse the force direction. For example in compression mode going to -1000 lbs. will apply a tension load of 1000 lbs.

**Clear Graph (C)**

Clear the test data from the screen. This command will not clear the overlay data, use **Overlay Clear** to remove the overlay results.

**Configure**

Changes the test configurations. The force direction can be set for compression (+ force) or tension (- force) testing. This setting is saved with each test results and restored when the results are read back into memory.

*Note:* Data collection is not limited to the selected force display mode, tension and compression data can be collected independent of the force display mode. After a test, each curve can be displayed by switching between the compression and tension force display

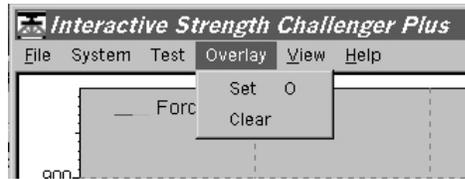
Limit the maximum allowed force. This is useful to restrict unnecessarily high forces when testing light specimens. The default maximum force is 1250 lbs and is the highest force allowed by the Challenger. The maximum specimen force can be set between 50 and 1250 lbs

Select between English and Metric units. English units are displayed in inches and pounds. Metric units are displayed in centimeters and kilograms. The type of units are also saved with each test results and restored when the results are read back into memory. This is to restore the display to the same units as tested.

Modify the test platform rate from 0.00001 in/min to 3.50 in/min. This configuration item will be saved along with the test results when the test results are saved to disk. When the results are read back into memory, this configuration will also be restored.

Enable or disable the peak force detector. This configuration item will be saved along with the test results when the test results are saved to disk. When the results are read back into memory, this configuration will also be restored.

## Overlay



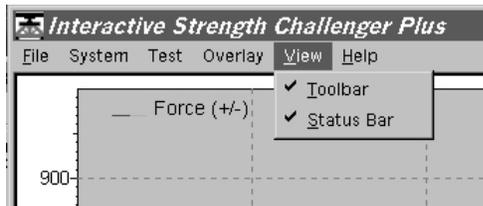
### Set (O)

Data from a previous test or disk file can overlay another test result so that visual comparisons can be made. This is useful to view variations between different test models or materials because load vs. displacement variations can be compared visually. To set an overlay, first display the first (overlay) data sample on the screen by performing a test or loading it from disk. Then select the Overlay Menu and select **Set** to copy the data into the overlay display. Be sure to save test data before setting it as an overlay because data sent to the overlay display can't be saved. The curve colors will change to reflect the overlay data. Next, perform another test or read the second data sample from diskette. You should be able to view the differences between the data samples by noting the variations between the two curves.

### Clear

To clear an overlay, select Clear from the Overlay Menu.

## View



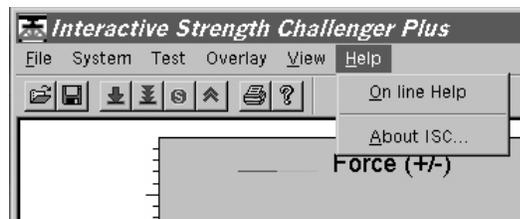
### Toolbar

Enable or disable the toolbar.

### Status Bar

Enable or disable the Status bar.

## Help



### On Line Help (F1)

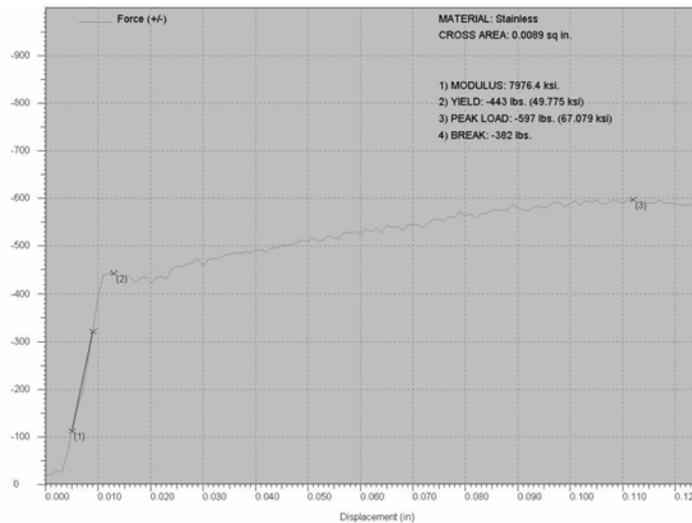
Displays the on line help Table of Contents.

### About ISC

Displays about screen with Version Number and Copyright notice.

## Materials Analysis Kit

If you purchased the Materials Analysis Kit, several additional menu options are added to the standard ISC+ software to better support materials testing. The kit includes a flat tensile grip (upper and lower), test specimens and the Windows software. With this kit students will evaluate the different properties of aluminum, brass, copper and stainless steel and graph the results just like professional materials testing machines. Once the tensile adapter is installed in the ISC+, specimens can be easily pinned in place for quick installation and removal without the need for tools. With the software installed on a Windows based PC, testing can begin by filling in the properties dialog and selecting "Go to Max Force" menu item. Once all of the data is collected, the results will be analyzed by the software and displayed graphically as shown below.



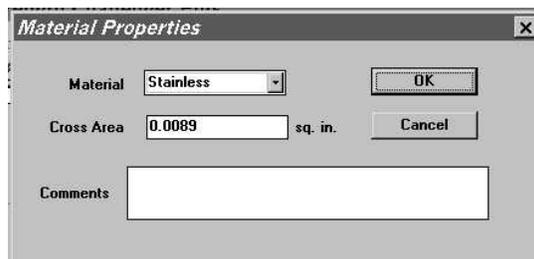
### To install the Materials Analysis adapter do the following:

- 1) Power down the ISC+
- 2) Bolt the lower grip securely into the center of the test platform using the supplied bolts.
- 3) Remove the compression plate pinned to the upper cross bar and replace it with the upper tensile grip. Be sure the locking pin is pressed all the way in. **Do not install a specimen at this time.**
- 4) Power up the ISC+ and return the platform to the home position.
- 5) Start the ISC+ Materials software on the computer.
- 6) Press the H key to home the platform to the Tensile home position. This will move the platform up for maximum tensile stroke.
- 7) Loosen the upper cross bar by turning both side handles counter clockwise.
- 8) Insert the first tensile specimen by pinning each end in each half of the grip using the smaller grip pins (supplied).
- 9) Once the cross bar is at the proper position (specimen installed but loose in the grips) lock the upper cross bar by turning the handles clockwise. With the cross bar locked in place, you should not have to reposition it because all specimens are of the same length and the platform always returns to the same position.



### Properties (P)

Displays a dialog to enter the properties of the test specimen. Select the appropriate material from the drop down menu. The name of the material is displayed for your reference on the screen once the test results are analyzed. Enter the cross area of the specimen. This is the area of the narrow (gage) section of the specimen. Since the cross section is a rectangle, the area is calculated by measuring the width and multiplying it by the depth. Typical areas range from 0.0085 to 0.011 square inches. It is important to measure as accurately as possible because this number is used in analyzing the test results. The comment section can be used to document the pre-test conditions of the specimen (temperature, finish, etc.). The comment will be added to the screen once the test results are analyzed.



### Analyze (N)

Once a test is underway the program will collect the tensile load and stroke data. After the specimen breaks, the software automatically stops the ISC+, analyzes the data and calculates several important parameters. The results are displayed in the comment section of the graph. Since the program automatically analyzes the data once a specimen breaks it is usually not required to select the "Analyze" menu option. It may be necessary to select "Analyze" if the specimen cross section area is modified after the data is collected and you would like to display the new results.

The analyzer will measure the test results and calculate several properties. The first property calculated is the **Modulus of Elasticity** or Young's Modulus. This is the ratio of the change in load vs. change in length of a given cross section area before the material is stretched beyond the elastic limits. Materials with a higher modulus (e.g. steel) do not stretch as much as lower modulus material (aluminum). Typical materials property values are shown in table 1

The analyzer also displays the materials **Yield point**. The yield point is where the material is pulled beyond the elastic limit and begins to distort the material. Once material is pulled beyond the yield point the material will not return to the original shape and size. This value is shown as both the load (lbs) and the load across the cross section area of the specimen (ksi).

The analyzer will also locate the materials **Peak Load** or tensile strength. This load is the maximum load obtained before breaking. This value is shown as both the load (lbs) and the load across the cross section area of the specimen (ksi).

The analyzer will also display the materials **Break Load** or the final load on the specimen just before breaking into two.

All of these parameters are useful in identifying the material properties of various metals.

**Sample parameters**

<b>Material</b>	<b>Modulus (ksi)</b>	<b>Yield Strength (ksi)</b>	<b>Peak (ksi)</b>
Aluminum .....	10000 to 11400	4 to 73	10 to 83
Brass .....	12000 to 17000	12 to 62	32 to 130
Copper .....	17000	10 to 53	32 to 66
Steel .....	30000	40 to 200	60 to 220
Stainless steel.....	28000 to 29000	35 to 195	85 to 230

Table 1

**Several important steps must be checked to insure the data is accurate and repeatable.**

- 1) Be sure the specimen mounting holes are clean, round and without burrs. Any distortion in the pin area will assume to be from the narrow gage section. To measure the modulus, the gage section is expected to stretch 0.001 to 0.003 inches over 300 lbs. so any error in the pin area will lower the calculated modulus number. It may help to "Set" the specimen by loading it up to 75% of the typical yield load and returning it back home once or twice. This will compress any burrs in the pin holes.
- 2) Make sure the cross section area is measured as accurately as possible. Any error in this number reflects directly in errors in the modulus, yield load and peak load. It is best to measure the dimensions with a dial caliper or micrometer.
- 3) Run the platform rate slow (0.30 to 0.01 inch per minute) to obtain the best results and highest data resolution.
- 4) Make sure the ISC has had a chance to warm up for 10 to 15 minutes before testing. It is important that the electronic measurement components are at a constant temperature for maximum accuracy.
- 5) Be sure the cross bar handles are very tight. The tensile adapters can pull over 500 lbs. so if the bar is not tight the data will not be correct.

## Summary of the commands

### File

<b>Open</b>	Open an ISC+ file on disk or network and read
<b>Save As</b>	Save test results and configuration to disk
<b>Print</b>	Print the current graphical data on the printer
<b>Print Preview</b>	Preview graphical data
<b>Print Setup</b>	Select printer and print orientation
<b>Exit</b>	Exit the program

### System

<b>Com Port</b>	Select the Challenger test menu
<b>Axis</b>	List the files in disk so test results can be stored and recalled

### Test

<b>Go to Max Force</b>	Ramp to maximum force and hold
<b>Home Platform</b>	Return the platform to the home position
<b>Stop Platform</b>	Halt the platform
<b>Set Force</b>	Set the desired specimen force and hold
<b>Increase</b>	Increment force
<b>Clear</b>	Clear the data from the screen
<b>Configure</b>	Configure test parameters

### Material Menu (Option)

<b>Properties</b>	Set the measured materials properties
<b>Analyze</b>	Analyze the tensile data

### Overlay Menu

<b>Set</b>	Save current test results as overlay
<b>Clear</b>	Clear overlay data

### View

<b>Toolbar</b>	Enable or disable the tool bar
<b>Status Bar</b>	Enable or disable the Status bar

### Help

## **Troubleshooting**

### **Serial port not detected**

Check the COM port that the Challenger is attached to. Also, check the software configuration to see that the port configuration is correct (*see **Connecting the Challenger to the computer*** for more information). Verify that the serial cable is attached firmly to both the computer and the control panel.

### **Printer not printing graphics properly**

Check the printer configuration to be sure that the proper Windows printer driver is selected. Find the printer properties dialog box and print a test page.

### **Results appear to vary during test**

Be sure to allow time for the sensitive electronics to warm up before beginning your test. As the sensors come up to temperature, the data may vary. Also, be sure the Challenger is in a warm (70 ° to 80° F) room. Be sure the Challenger is on a stable, flat surface.

## **Limited Warranty**

Interactive Instruments, Inc. warrants the **Interactive Strength Challenger Control Program** and **cable** against defects in material and workmanship for a period of *one* year from receipt by the end user (*proof of purchase required*). If Interactive Instruments, Inc. receives notice of such defects during the warranty period, Interactive Instruments will either, at its option, repair or replace products which prove to be defective.

Should Interactive Instruments be unable to repair or replace the product within a reasonable amount of time, customer's alternative exclusive remedy shall be a refund of the purchased price upon return of the product.

If this product was purchased as part of a system in a coordinated shipment or as a system add-on, it is warranted against defects in material and workmanship during the same period as the system.

## **Exclusions**

***The above warranty shall not apply to defects resulting from:***

improper or inadequate maintenance by customer; customer-supplied software or interfacing; unauthorized modification or misuse; operation outside of the environmental specifications for the product; or improper site preparation and maintenance.

## Glossary

<b>Challenger</b>	Interactive Strength Challenger Plus
<b>COM1, COM2 etc.</b>	<i>See</i> <b>Serial port</b>
<b>Control panel</b>	The main control panel that is used to control the operation of the Challenger.
<b>Data cable</b>	15 pin cable that connects the Challenger load frame to the control panel.
<b>Displacement</b>	The deflection (compression) or elongation (tension) of a specimen resulting from the applied force
<b>Force sensor</b>	Electrical sensors that are used to measure the system force exerted on the specimen
<b>Force priority</b>	Testing a specimen to a force and monitoring the resulting displacement
<b>ISC+</b>	Interactive Strength Challenger Plus
<b>K</b>	<i>See</i> <b>Spring Constant</b>
<b>LCD</b>	Liquid Crystal Display which is used to display the test results and error conditions on the control panel.
<b>Microprocessor</b>	The digital controller that monitors the system force, control panel functions, updates the LCD panel, and performs the required calculations for operation
<b>Peak force</b>	A force that registers the highest over 0.075 inches
<b>Peak displacement</b>	The deflection displacement that is registered at the peak force.
<b>Power cord</b>	110v power cord which powers the control panel and Challenger.
<b>Security key</b>	A key that is located on the control panel that disables the operation of the Challenger when locked.
<b>Serial Port</b>	A connector on the computer and Challenger that allows them to exchange commands and data
<b>Spring Constant</b>	Spring constant (K) is calculated by dividing the specimen's deflection into the applied force (lbs/in)
<b>Strain gage</b>	<i>See</i> <b>Force Sensor</b> .
<b>Test adapter</b>	A clamp that is used to grip a test specimen for compression or tension
<b>Test platform</b>	The movable horizontal plate that is used to mount test specimens for tension or compression testing
<b>Test rate</b>	Rate at which the platform moves (inches/minute) during test
<b>Upper beam</b>	Adjustable bar above the test platform which is used to restrain the test specimen
<b>Upper beam handle</b>	Two handles on each side of the upper beam that secure the bar for various test heights