

OPERATION AND MAINTENANCE MANUAL FOR INSIGHT IC DC ELECTRIC TORQUE MANAGEMENT CONTROLLER

Models PD1G, PD2G, PD1G3, & PD2G3 Insight IC controllers are designed for industrial torque angle or yield management of assembly operations.



⚠ WARNING

IMPORTANT SAFETY INFORMATION ENCLOSED

SAVE THESE INSTRUCTIONS

READ AND UNDERSTAND THIS MANUAL BEFORE OPERATING THIS PRODUCT

**IT IS YOUR RESPONSIBILITY TO MAKE THIS SAFETY INFORMATION AVAILABLE
TO OTHERS THAT WILL OPERATE THIS PRODUCT**

**FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN ELECTRIC SHOCK, FIRE
AND/OR SERIOUS PERSONAL INJURY**

- **Keep your work area clean and well lit.** Cluttered benches and dark areas invite accidents.
- **Do not operate this product in explosive atmospheres, such as in the presence of flammable liquids, gases, or dust.** Electrical products can create sparks which may ignite the dust or fumes.
- **Grounded products must be plugged into an outlet properly installed and grounded in accordance with all codes and ordinances.** Never remove the grounding prong or modify the plug in any way. **Do not use any adapter plugs.** Check with a qualified electrician if you are in doubt as to whether the outlet is properly grounded. If this product should electrically malfunction or break down, grounding provides a low resistance path to carry electricity away from the user.
- **Avoid body contact with grounded surfaces such as pipes, metal structures or other electrical products.** There is an increased risk of electric shock if your body is grounded.
- **Don't expose this product to rain or wet conditions.** Water entering this product will increase the risk of electric shock.
- **Don't abuse the cord.** Never use the cord to pull the plug from an outlet. Keep cords away from heat, oil, sharp edges or moving parts. Replace damaged cords immediately. Damaged cords increase the risk of electric shock.
- **Stay alert, watch what you are doing and use common sense when operating this product.** Do not use this product while tired or under the influence of drugs, alcohol, or medication. A moment of inattention while operating this product may result in personal injury.
- **Use only accessories that are recommended by Ingersoll-Rand for your model.** Accessories that may be suitable for one product may become hazardous when used on another product.
- **Service must be performed only by qualified repair personnel.** Service or maintenance performed by unqualified personnel could result in a risk of injury.
- **When servicing this product, use only identical replacement parts.** Follow instructions in the Maintenance Section of this manual. Use of unauthorized parts or failure to follow Maintenance Instructions may create a risk of electric shock or injury.
- **Always install, operate, inspect and maintain this product in accordance with all applicable standards and regulations (local, state, country, federal, etc.).** Failure to follow standards and regulations can cause personal injury.
- **Always use specified supply voltage.** Incorrect voltage can cause electrical shock, fire, abnormal operation and may result in personal injury.
- **Be sure all electric cords and cables are the correct size and all plugs and connectors are tightly secured.** Under-sized wire and loose connections can cause electrical shock, fire and may result in personal injury.
- **Ensure an accessible emergency electric power shut off has been installed, and make others aware of its location.** In the event of an accident, this shut off may minimize personal injury.
- **Do not remove any labels.** Replace any damaged label. Labels provide information required for safe use of the product.
- **Do not modify this product, safety devices, or accessories.** Unauthorized modifications may result in electric shock, fire or personal injury.
- **Do not use this product for purposes other than those recommended.** Personal injury may result.
- **Disconnect power and lockout/tagout machine prior to removal, insertion or servicing of any component or module within this product.** Failure to follow instructions can result in risk of electric shock and personal injury.
- **Install this product to a vertical structure capable of safely supporting its total weight.** Failure to follow installation instructions properly can result in structure collapse and personal injury.
- **Verify the operation of the Earth Leakage Circuit Breaker (ELCB) once per month with the test button.** A malfunctioning ELCB can result in risk of electric shock or injury.
- **Do not attach or place external loads on any part of the Controller.** Loading may cause hinge or mounting failure and result in personal injury.
- **Replace battery with the same or equivalent type recommended by the battery manufacturer.** Observe correct polarity when installing battery. Dispose of used batteries according to battery manufacturer's instructions. Failure to follow instructions could result in personal injury.

Refer All Communications to the Nearest
Ingersoll-Rand Office or Distributor.

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NOTICE

- Ingersoll-Rand Company makes no warranty or implies any warranty or liabilities due to the misuse or damage resulting from the application of information supplied by this manual. Liabilities due to errors in the manual are only limited to replacement of the manual. Ingersoll-Rand reserves the right to change information contained in this manual or the program without notice at any time.
- Repairs should be attempted only by authorized, trained personnel. Consult your service center listing for your nearest Ingersoll-Rand authorized service center.
- Use of other than genuine Ingersoll-Rand replacement parts may result in safety hazards, decreased tool performance, and increased maintenance, and may invalidate all warranties.
- All programs and the manual are copyrighted and rights reserved. Reproduction is prohibited without prior permission of Ingersoll-Rand.

GROUNDING INSTRUCTIONS

DANGER

**FAILURE TO OBSERVE THE FOLLOWING INSTRUCTIONS
COULD RESULT IN SEVERE INJURY OR DEATH.**

THE CONTROLLER MUST BE EARTH GROUNDED. The controller is equipped with a three prong plug and cable. Comply with all local electrical codes for connecting to Power Supply. The Power Supply must be within voltage and frequency requirements as specified below. DO NOT use the controller on a 2-prong plug outlet with an adapter. Always check that your ground is operating properly on the outlet by a qualified electrician before using the controller.

Model #	Voltage Requirement
PD1G & PD2G	Single Phase 120 Volts, 50/60 Hz, 20 Amp
PD1G3 & PD2G3	Single Phase 230 Volts, 50/60 Hz, 10 Amp

EU WIRING


WARNING


THIS APPARATUS MUST BE EARTH GROUNDED


The three conductors of the mains lead attached to this apparatus are identified with color as shown in the table, together with the matching terminal plug. When connecting the mains lead to a plug, be sure to connect each conductor to the correct terminal as indicated.

MAINS LEAD		PLUG
Conductor	Color	Mark on the Matching Terminal
Live	Brown	Red or letter L
Neutral	Blue	Black or letter N
Grounding	Green-Yellow	Green, Green-Yellow letter G or symbol \perp


WARNING SYMBOL IDENTIFICATION


	⚠ WARNING This symbol is to alert the users and service personnel to the presence of uninsulated dangerous voltage that will cause a risk of electrical shock.
---	--

	⚠ WARNING This symbol is to alert the user and service personnel to the presence of important operating instructions must be read to prevent injury, electrical shock or damage to the equipment.
---	---


	⚠ WARNING You must read this manual before operating the system.
---	--


AGENCY SYMBOL IDENTIFICATION

European Community Mark	
	Indicates compliance with relevant CE directives.

Underwriters Laboratory Mark	
	Indicates compliance with both Canadian and U.S. requirements.

EXPLANATION OF SYMBOLS USED

Electrostatic Sensitive Devices	
	This symbol is to inform the user and service personnel to the presence of electrostatic sensitive devices. ESD precautions should be used when handling these devices or component damage could result.

Protective Conductor Terminal	
	This symbol is to inform the user and service personnel to the presence of the protective ground point.

DECLARATION OF CONFORMITY

We Ingersoll-Rand, Co.
(supplier's name)

Swan Lane, Hindley Green, Nr Wigan WN2 4EZ, U.K.

(address)

declare under our sole responsibility that the product,

PD1G2, PD2G2, PD1G3, PD2G3 Insight-IC Tightening System

to which this declaration relates, is in compliance with the provisions of

73/23/EEC, 89/336/EEC Directives.

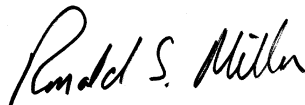
EN60335-1, EN55011/A, EN61000-3-2,

By using the following Principle Standards: EN61000-3-3, EN61000-6-2

Serial No. Range: P01H00001 →



D. Vose
Name and signature of authorised persons



Ronald S. Miller
Name and signature of authorised persons

November, 2001

Date

November, 2001

Date

NOTICE

SAVE THESE INSTRUCTIONS. DO NOT DESTROY.

When the life of the Product has expired, it is recommended that the Product be disassembled, degreased and parts be separated by material so that they can be recycled.

Introduction

In this CD you will learn about your Insight IC Fastening System with Graphics Display, and how to install, setup, program, operate, and troubleshoot your controller.

In addition to this Introduction, this CD is divided into eight additional main topics, as indicated by the links below. Roll your mouse over the link to see the topics covered. Click on one of the links to go directly to the topic, or click on the arrows below to continue your tour. You can also click on a topic in the detailed Table of Contents at the left.

[Insight Orientation](#)

[Insight Installation](#)

[Quick Start](#)

[Menu Screens](#)

[Parameters](#)

[FAQ: How Do I?](#)

[Contact Ingersoll-Rand](#)

[Services: System Specifications](#)

Insight Orientation

Orientation

The **Insight IC Fastening System with Graphics Display** is an electronic tightening controller that can be programmed to operate one or two Ingersoll-Rand DC **spindles** to perform repetitive fastening operations. The spindles may be individual hand-held tools, or several may be mounted together (called a **powerhead**) for automated assembly tasks. This manual addresses the Insight control unit only; the spindles come with their own operating manuals.

It is generally not necessary to access the Insight's interior components, so they are not explained in this orientation section. For a description of the user-accessible components inside the Insight controller go to [Services: System Specifications](#).

This section describes the Insight's key hardware components. It also explains the screen layout, how to navigate on the screen using the membrane keypad, how to enter data using the numeric keypad, and the function and meaning of the various Insight status lights. Finally, this section introduces the Insight's six main menu keys that control all aspects of the system's operation. Click on one of the links to go directly to the topic, or continue your tour and the topics will be introduced in the sequence shown.

[Components on the Front Panel](#)

[Components on the Side Panels](#)

[Understanding the Status Lights](#)

[How to Use the Navigation Keypad](#)

[How to Enter Data Using the Numeric Keypad](#)

[Understanding the Six Insight Menus: Run, Statistics, Set-up, Diagnostics, Print, Help](#)

[Understanding the Graphics Display Screen Layout](#)

[Understanding the Screen Elements](#)

Orientation: Front Panel

The figure below shows the Insight's front panel and identifies the key components. Roll your mouse over each component to learn its function.



Screen Element	Description
Graphics Display Screen	A full-color display for text and graphics.
Main Menu Keys	These keys bring up the main menu screen for the labeled function.
Sub-Menu Keys	These keys access sub-menus for each Main Menu Key. The sub-menus are different for each Main Menu.
Numeric Keypad	These keys are used to enter alphanumeric data into Insight.
Navigation Keypad	These arrow keys are used to navigate on the screen.
Expand Key	This key is called the Expand key. It allows selected elements on the graphics display screen to expand, revealing additional options or values. Only the elements that can be expanded display this symbol.
Enter Key	After selecting a parameter or entering a value, pressing either Enter Key enters that information into the Insight.
Escape Key	This key allows the user to cancel certain operations.
Status Lights	Various lights and lighted arrows illuminate during fastening operations to indicate whether the fastening was within specification.
Spindle Power Switch	The red button disconnects power to the fastening tools attached to the Insight; the green button supplies power to these tools.
Cabinet Lockout	A key lock to prevent access to the internal components.

Some of these front panel components require more explanation than is contained in the roll-overs above. Click on the links below for complete information, or continue your tour and these topics will be introduced later.

[How to Use the Navigation Keypad](#)

[Entering Data Using the Numeric Keypad](#)

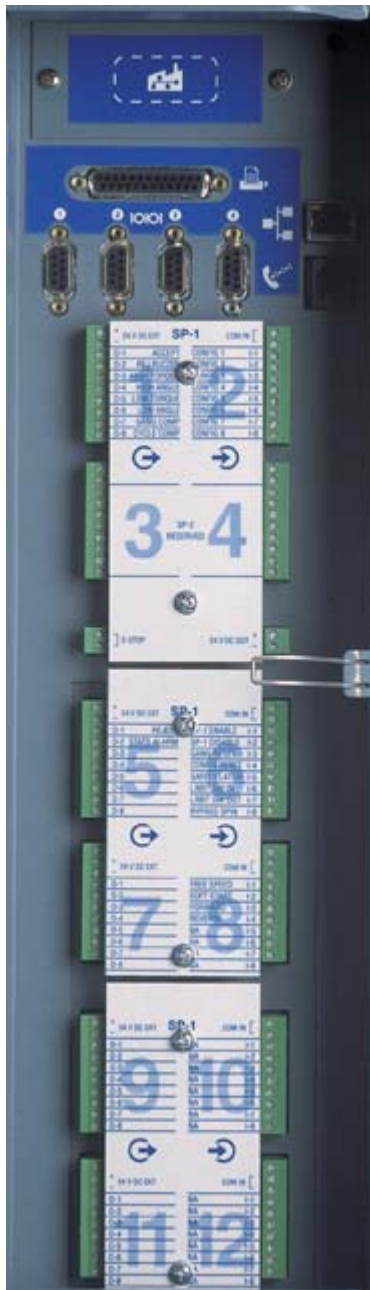
[Understanding the Status Lights](#)

This is the end of the *Components on the Front Panel* section. To continue your tour click below or click on another topic at the left.

Components on the Side Panels

The figures below show the Insight's right-side and left-side panels, and identify important components. Roll your mouse over the components with red highlights to learn their function.

Left Side



Right Side



Screen Element	Description
Main Power Switch	A rotary switch. The power is off when the rotating handle pointer points to the front of the Insight. The power is on when the pointer points up. This switch can be locked or tagged out for service.
Insight Label	This permanent label lists important information, including electrical circuit ratings and the Insight Model Number and Serial Number (also called a Date Code).
Mounting Bracket	For mounting the Insight to walls, rails, etc.
Spindle 1 Connector	The Insight's Spindle 1 attaches here. Ingersoll-Rand spindles have a 23-pin, twist-to-lock connector at the end of their cables that plug in here.
Spindle 2 Connector	The Insight's Spindle 2 attaches here. If you have a single spindle model, this connector will be absent.
Floppy Disk Drive (Optional)	Optional Floppy disk drive for saving /loading Data and software
Terminal Blocks	The cables that carry the input and output signals for the spindle(s) attach here.
Parallel Port	For attaching a parallel printer.
Serial Ports	For attaching a PC or other serial device.
Ethernet Port	For attaching an Ethernet computer network cable.
Data Bus Port	Optional port for attaching field bus cards.
Modem Port	For attaching a phone line for an optional modem.
Power Cord Receptacle	The AC power cord (supplied) plugs in here.

Some of these screen elements require more explanation than is contained in the roll-overs above. Click on the links below for complete information, or continue your tour and these topics will be introduced later.

[The Pin-Out for the Terminal Blocks](#)

[Attaching Peripheral Devices](#)

[The Pin-Out for the Insight's Serial Port](#)

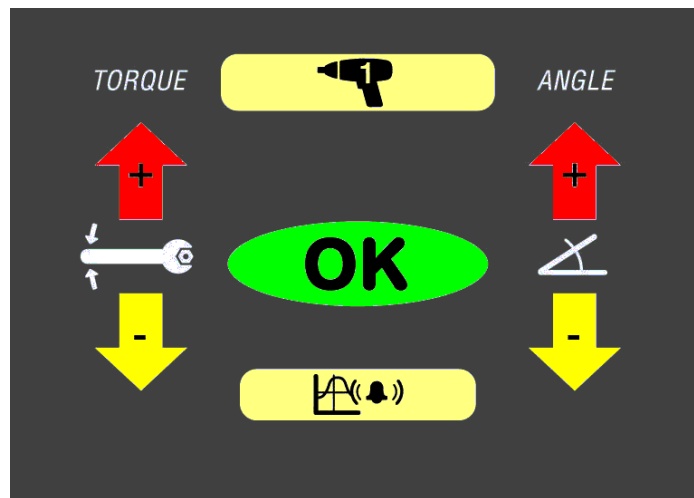
This is the end of the *Components on the Side Panels* section. To continue your tour click below or click on another topic at the left.

Understanding the Status Lights

The graphic below shows the Status Lights located on the front panel above the graphics display screen. These LEDs give the operator an instant visual indication of the quality of every tightening operation. Operators may use these various lights to assess the quality of each fastening, and may want to take specific actions based

on these indicators. Roll your mouse over the components with red highlights to learn their function.

Each Ingersoll-Rand hand-held **spindle** also has an indicating light on the tool itself that mimics the Status Lights. If the fastening is within specification the tool light will be green. If either the torque or angle value is too high the tool light will be red, if either value is too low the tool light will be yellow.



Screen Element	Description
SPINDLE	The Spindle 1 or Spindle 2 light will illuminate white, indicating power is being applied to that spindle.
OK	The green OK LED will light if the tightening met all of the programmed specifications and requirements.
Torque ↑	Lights red if the torque exceeded the specified upper limit.
Torque ↓	Lights yellow if the torque was less than the specified minimum value.
Angle ↑	Lights red if the angle exceeded the specified upper limit.
Angle ↓	Lights yellow if the angle was less than the specified minimum value.
STATS ALARM	Lights if the statistical parameters are outside the user-defined limits.

The explanations in the roll-overs above are largely self-explanatory, with the exception of STATS ALARM. For complete information on STATS ALARM click on the link below, or continue your tour and this topic will be introduced later.

Setting the Statistics Alarm

This is the end of the *Understanding the Status Lights* section. To continue your tour click below, or click on another topic at the left.

How to Use the Navigation Keypad

The arrows on the navigation keypad (see graphic below) are used to navigate among the screen elements (buttons, drop boxes, etc.). When you have navigated to a screen element it becomes highlighted with a border. Pressing the *Enter* key on the navigation keypad (or the one on the numeric keypad) will activate the highlighted screen element. (The action is similar to clicking on a screen button with a computer mouse.)



If you activate or enter a screen element with the *Expand* symbol on it, that symbol indicates the element can be opened to reveal additional options. Pressing the Expand symbol located in the center of the navigation keypad will open the element and display the options. You can then use the arrow keys to move to the option you want, and then select that option by pressing *Enter*. The *Escape* key on the navigation keypad can be used to cancel certain operations.

This is the end of the *How to Use the Navigation Keypad* section. To continue your tour click below, or click on another topic at the left.

How to Enter Data Using the Numeric Keypad

If you have navigated to a screen element that requires data entry (a **data entry box**), you will use the numeric keypad to enter information (numbers and/or letters). As shown on the graphic below, selected number keys are also labeled with three letters.



Most of the data entry boxes are for entering numeric data only. Simply enter a numeric value directly from the keyboard. If you make a mistake, press the *Backspace* key (←) to delete the number. When the correct number is displayed, press either **Enter** key to enter the value.

There are a few data entry boxes that allow you to enter alphanumeric information. For example, there are boxes that allow you to enter a plant name (such as *Assembly Plant #2*) or an assembly configuration name (*Right Door*). When you are in these data entry boxes the Insight system automatically puts the numeric keypad in alphanumeric mode. In that mode, pressing a numeric key once will enter the first letter on that key, twice the second letter, three times the third letter, four times the number. When you have the correct character displayed, pressing the right arrow key places that character and moves the cursor to the next data entry space within that box. If you want to enter a space, simply press the right arrow key a second time. If you make a mistake, press **Backspace** (←) to delete the character. When the correct character string is displayed, press either **Enter** key to enter that value.

This is the end of the *How to Enter Data Using the Numeric Keypad* section. To continue your tour click below, or click on another topic at the left.

Understanding the Six Insight Menus

There are six Main Menu Keys above the graphics display screen. Four of these are the principal menu keys (Run, Statistics, Set-up, and Diagnostics), that, when pressed, bring up an initial menu screen and a series of sub-menu options. Once learned, Insight navigation is quick. Pressing one menu key and one sub-menu key will take you to any Insight function.

The function of each Main Menu Key is described below.

Run	The Run menu displays fastening data (torque, angle, and many other parameters) in tabular form after each fastening operation. Actual torque vs. angle fastening curves can also be displayed. In addition, Run mode provides access to other useful data, such as statistical summaries and historical logs of fastening performance. Run screens provide quick, view-only access to information.
Statistics	The Statistics menu displays raw fastening data as well as statistical analyses. Individual tightening curves can be overlaid for comparison and analysis. The operator can display statistical trends and set alarm functions to identify off-normal fastening statistics.
Set-up	The Set-up menu allows for programming the fastening strategies. A quick setup feature allows rapid programming of standard strategies, while advanced setup offers customized strategies. Set-up also controls numerous basic system parameters, such as selecting the display language, setting torque measurement units, and creating operator access passwords.
Diagnostics	The Diagnostics menu controls Insight's self-diagnosis programs. Insight continually looks for operating problems or component failures. It alerts the operator to problems with the tools or with the controller electronics, and can even suggest root causes and corrective action.
Print	The Print menu allows for printing a variety of fixed-format reports on fastening data, statistics, system settings, and so on.

Help

The Help menu allows the user to access operating help and displays the information on the graphics display screen.

This is the end of the *Understanding the Six Insight Menus* section. To continue your tour click below, or click on another topic at the left.

Understanding the Graphics Display Screen Layout

The Graphics Display Screen has six distinct sections or regions, as shown in the graphic below. Roll your mouse over the screen elements that have red highlights to learn their function.

SETUP
System Initialization

06/26/01
13:42:31

System Initialization Wizard

General

System Name IR INSIGHT	Plant Name	Version: Insight: 000.000.000	Language English
<input type="checkbox"/> Confirm for configuration change		MCE Version	E.O.R. Filter

Date/Time

Time	Date Format MM/DD/YY	Spring Forward Date MM/DD/YY
Date	Daylight Savings	Fall Back Date MM/DD/YY

Communications

Data Port COM 1	Parity None	Bits Per Character 7	Comm Protocol None
Baud Rate 1200	# of Stop Bits 1	Multi Drop Address	

Quick Set-up

Advanced Set-up

System Initialization

Spindle Initialization

Password & Powerhead Settings

Parameter Transfer & Smart Chip

Screen Element	Description
Header	The Header shows the Insight's current menu and sub-menu, the date and the time, and whether the system is locked or unlocked (the padlock icon). When the system is locked, the padlock icon is closed and red, when unlocked it is open and green. If unlocked, the password level to which the system is unlocked (there are four levels) is also shown.
Wizard Box	The Wizard Box displays short descriptions of whatever is highlighted on the screen, or may provide abbreviated instructions for performing a task.
Sub-Menu Names	The sub-menus are different for each of the four principal Main Menu keys (Run, Statistics, Set-up, and Diagnostics).
Main Window	The Main Window displays all the parameter selection and data entry fields, and may display tabular or graphical tightening data.
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

This is the end of the *Understanding the Graphics Display Screen Layout* section. To continue your tour click below, or click on another topic at the left.

Understanding the Screen Elements

All the different menu screens that can appear on the Insight graphics display panel have certain design elements in common. These design elements, called screen elements, appear in the Main Window section of the display, and are shown in the graphics below. Click on each element to learn its function.

In actual operation, the user will use the arrows on the directional keypad to navigate the cursor to the individual screen elements. A dark border around the screen element indicates that the cursor is at that screen element.

Button

Clear Cycle Data

Data Entry Box

4 Torque Target

10.0 Nm

Drop Box

Spindle 1 ▼

Check Box

☒ All Cycles

Display Box

Cycle #	Config #	Date	Time	Cycle Result	Torque	Torque Result	Angle	Angle Result	Step #
145	12	11/16/00	16:00	PASS	2.01	PASS	214.35	PASS	35
144	27	11/16/00	16:00	PASS	1.75	PASS	120.00	PASS	59
143	11	11/16/00	16:00	PASS	4.05	PASS	89.11	PASS	83
142	11	11/16/00	16:00	PASS	4.76	PASS	102.23	PASS	127
141	10	11/16/00	16:00	PASS	4.12	PASS	291.97	PASS	65
140	14	11/16/00	16:00	PASS	0.82	PASS	198.74	PASS	62
139	31	11/16/00	16:00	PASS	0.57	PASS	254.21	PASS	76
138	3	11/16/00	16:00	PASS	0.33	PASS	32.87	PASS	67
137	3	11/16/00	16:00	PASS	4.68	PASS	93.19	PASS	60
136	23	11/16/00	16:00	PASS	8.72	PASS	188.49	PASS	32
135	30	11/16/00	16:00	PASS	6.05	PASS	209.75	PASS	18
134	26	11/16/00	16:00	PASS	9.43	PASS	184.70	PASS	6

Screen Element	Description
Button	To click on a button, navigate to it with the arrow keys and press either <i>Enter</i> key.
Drop Box	Drop boxes are indicated by the Expand symbol. To open a drop box, navigate to it with the arrow keys and press the Expand key. Use the arrow keys to move to the desired option, and then press either <i>Enter</i> key to select that option.
Data Entry Box	Navigate to a data entry box with the arrow keys and then use the numeric keypad to enter a value. Press either <i>Enter</i> key to place that value in the data entry box.
Check Box	Navigate to a check box using the arrow keys. Press either <i>Enter</i> key to check or uncheck the box.
Display Box	Display boxes contain view-only information. Navigate to the display box with the arrow keys and press Expand to enter the box. Use the arrow keys to scroll up/down and left/right. Press Expand again to move the cursor out of the display box

This is the end of the *Understanding the Screen Elements* section and the end of the *Insight Orientation* topic. To continue your tour click below, or click on another topic at the left.

Insight Installation

Installation

This section describes how to mount the Insight controller, attach fastening tools (spindles) to the controller, attach printers and other peripheral devices, and startup the system. Click on one of the links to go directly to the topic, or click on the arrows below to continue your tour.

[Mounting the Insight Enclosure](#)

[Attaching Spindles](#)

[Attaching Peripheral Devices](#)

[Initial Startup](#)

Mounting the Insight Enclosure

Bolt the Insight controller enclosure to a suitable surface near the assembly area using the mounting brackets on the back of the enclosure. For a drawing of the Insight system with dimensions, information on bracket hole spacing, recommended mounting bolts, door opening clearances, and other mounting information, click on [Insight Dimensional Drawings](#). Make sure the mounting is stable, secure, and level.



Attach the Insight enclosure to a structure capable of safely supporting its total weight. ([Click here for the weight of the enclosure.](#)) Failure to follow installation instructions properly can result in structure collapse and personal injury.

Make sure the [Main Power Switch](#) is in the **Off** position.

In the United States, the Insight controller enclosure comes pre-wired with a power cord and the appropriate plug. Insight systems sold internationally have a power cord with a pigtail, and the user must supply the correct connector. Review the electrical circuit information on the Insight's label (on the right-side panel) and in the [specifications table](#). Verify that your electrical circuit meets the Insight's power requirements and circuit breaker ratings. Plug the AC power cord into an appropriate receptacle.



It is the user's responsibility to ensure that the Insight controller is installed and wired by a qualified electrician.

This is the end of the *Mounting the Insight Enclosure* section. To continue your tour click below, or click on another topic at the left.

Attaching Spindles

Attach your Ingersoll-Rand **spindles** (or **powerheads**) on the right side of the Insight enclosure. (If you are not sure where they attach, click [here](#).) At the end of each spindle's cable is a twist-to-lock 23-pin connector. In general, any spindle may be plugged into any spindle connector. However, the user may have preferred locations for the spindles based on the fastening applications. Plug each tool(s) into the appropriate connector and lock it in place. If you wish to change your Insight Controller from handheld operation to machine mount mode, click [here](#) for more information.

There should be a tool(s) attached to each connector. If no tool is present, when the unit is powered up, no power will be delivered to the empty connector. This is a safety feature. The Insight interprets the lack of a tool as a tool with a possible ground fault, and does not energize that circuit.

Note: It is not necessary to have a tool attached to the Insight IC in order to program it.

If a connector is left empty and a tool is added at a later time, turn the Insight **Main Power Switch** off, wait five seconds, and turn it back on. Or press the red button on the front panel **Spindle Power Switch**, wait five seconds, then press the green button. Either process will allow the Insight to recognize the new tool.

This is the end of the *Attaching Spindles* section. To continue your tour click below, or click on another topic at the left.

Attaching Peripheral Devices

This section provides instructions for attaching various devices to the Insight IC Fastening System with Graphics Display. Click on a link below to review that topic, or continue your tour and these topics will be introduced in the order shown.

[Socket Tray Connection and Setup](#)

[External Configuration Switch Connection and Setup](#)

[How to Test a Socket Tray or Configuration Switch](#)

[Light Box Connection and Setup](#)

[Parallel Printer Connection and Setup](#)

[Serial Printer Connection and Setup](#)

[Computer Connection and Setup via the Serial Port](#)

[PLC Connection and Setup](#)

[Modem Connection](#)

[Ethernet Connection](#)

[Field Bus Card Connection](#)

Socket Tray Connection and Setup

1. Connect the socket tray to the Insight controller's terminal blocks (located on the controller's left side) with the appropriate accessory cable.
2. Attach a tool to the Insight controller and turn the controller on using the rotary switch.
3. Push the green Start button on the Spindle Power Switch on the front panel to power the Motor Controller and the tool.
4. Go to the *Set-up* menu and the *Spindle Initialization* sub-menu screen.
5. If your socket tray has more than eight positions, go to Step 6 below. If your socket tray has eight or less positions, go to Step 7 below.
6. Select External Binary from the Config. Select drop box and then go to Step 8.
7. Select External Discrete from the Config. Select drop box and then go to Step 8.

8. You have now completed setup of your socket tray. Click [here](#) for information on how to test your socket tray.

External Configuration Switch Connection and Setup

1. Connect the configuration switch to the Insight controller's terminal blocks (located on the controller's left side) with the appropriate accessory cable.
2. Attach a tool to the Insight controller and turn the controller on using the rotary switch.
3. Push the green Start button on the Spindle Power Switch on the front panel to power the Motor Controller and the tool.
4. Go to the *Set-up* menu and the *Spindle Initialization* sub-menu screen.
5. If your configuration switch has more than eight positions, go to Step 6 below. If your socket tray has eight or less positions, go to Step 7 below.
6. Select External Binary from the Config. Select drop box and then go to Step 8.
7. Select External Discrete from the Config. Select drop box and then go to Step 8.
8. You have now completed setup of your configuration switch. Click [here](#) for information on how to test your configuration switch.

How to Test a Socket Tray or Configuration Switch

1. After you have connected and setup the device, go to the *Diagnostics* menu and the *Discrete Inputs* sub-menu screen.
2. As you lift the sockets or move the switch you should see the appropriate indicators light up on the screen, indicating activity on the configuration lines. (Note: if you selected External Binary in the Config Select drop box on the *Set-Up* menu's *Spindle Initialization* screen, then the first four configuration lines will indicate the binary encoded number for the configuration selection, with 0000 indicating configuration 1 is selected.)

Light Box Connection and Setup

1. Connect the light box to the Insight controller's terminal blocks (located on the controller's left side) on the controller's left side with the appropriate accessory cable.
2. Attach a tool to the Insight controller and turn it on using the controller's rotary switch.
3. Push the green Start button on the Spindle Power Switch on the front panel to power the Motor Controller and the tool.
4. If you are going to connect a socket tray to the light box, connect it with the appropriate cable and follow the procedure to install the socket tray starting from Step 4. Click [here](#) for that procedure.
5. You have now completed your light box setup.

Parallel Printer Connection and Setup

1. Connect your printer via a standard parallel printer cable to the 25-pin port labeled with a printer icon located on the left side of the Insight controller.
2. Turn on the printer and make sure it is on line.
3. Print a test report to ensure the printer is setup correctly.

Serial Printer Connection and Setup

1. Connect your printer via a standard 9-pin serial cable to a serial port located on the left side of the Insight controller labeled I0I0I. Click [here](#) to see the correct port.
2. Go to the *Set-up* menu's *System Initialization* sub-menu screen and select the desired COM port from the Data Port drop box.
3. On the same screen, check that the settings for Baud Rate, Parity, # of Stop Bits, and Bits Per Character match those settings on the serial printer. Change the settings as necessary.
4. Turn on the printer and make sure it is on line.
5. Print a test report to ensure the printer is setup correctly. If you get odd characters on the printout, verify the settings in Step 3 match those settings on the printer.

Computer Connection and Setup via the Serial Port

Note: To connect a computer to the Insight controller you will need Insight Controller Software (ICS) or a terminal software package, such as Windows 95, 98, or 2000 HyperTerminal, or Win 3.1 Terminal.

1. Connect your computer via a Null Modem 9-pin serial cable to the port located on the left side of the Insight controller labeled I0I0I. Click [here](#) to see the correct port.
2. Go to the *Set-up* menu's *System Initialization* sub-menu screen and select the desired COM port from the Data Port drop box.
3. On the same screen, check that the settings for Baud Rate, Parity, # of Stop Bits, and Bits Per Character match those settings on the terminal software package of your computer. Change the settings as necessary.
4. Print a test report to ensure the computer is setup correctly. If you get odd characters on the printout, verify the settings in Step 3 match those settings on the computer.

PLC Connection and Setup

Note: All connections to a PLC are made via the Insight's terminal blocks, except data collection. Data collection is done via the serial ports. For data collection, click [here](#) and follow the procedures for setup via the serial port. To connect a PLC to the terminal blocks, see the procedure below.

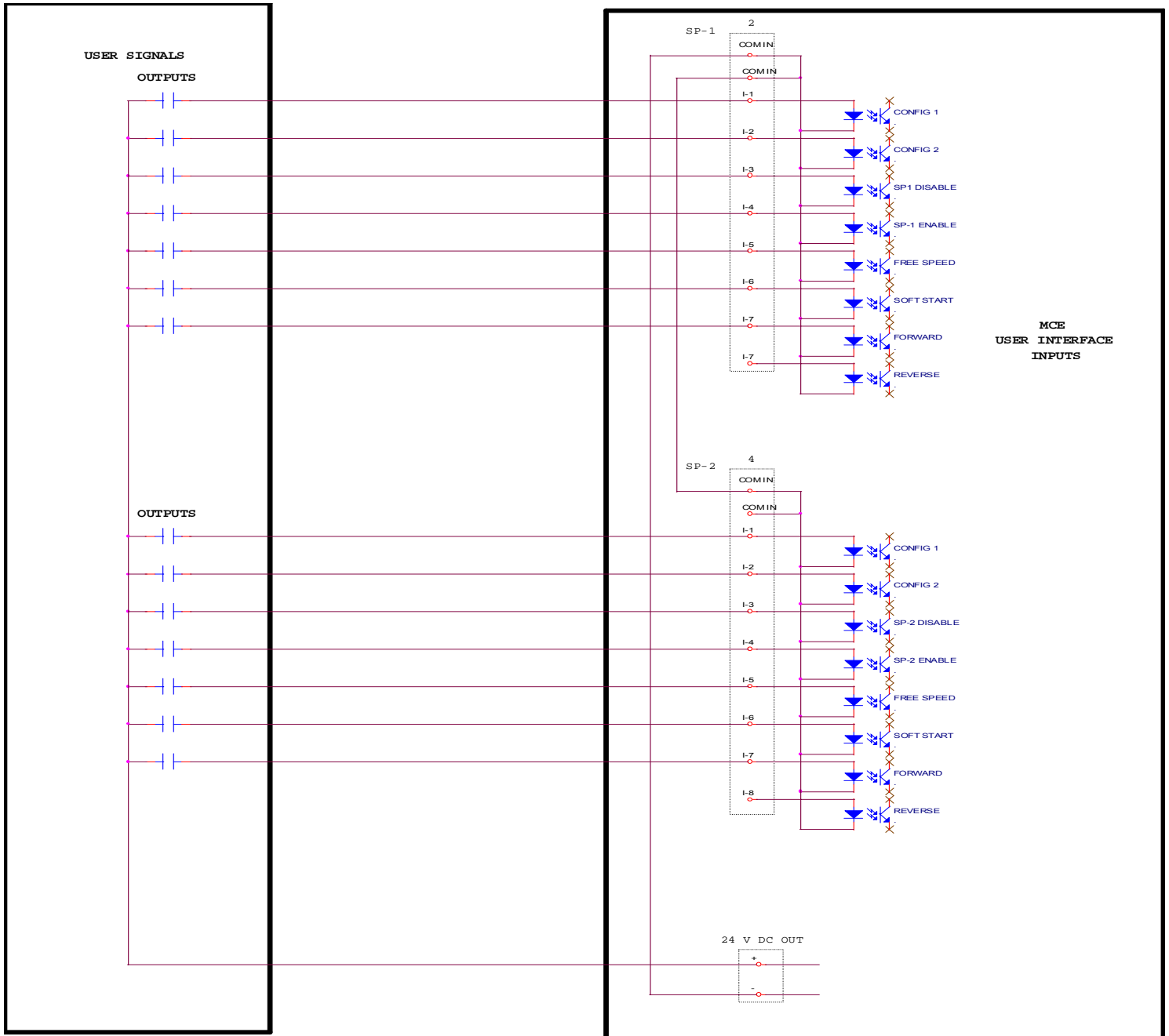
Through the terminal blocks, a PLC can send and receive a variety of outputs to and from the Insight controller. (Click [here](#) to see a terminal block pinout.) It is important to always use a shielded cable for all PLC signals to the Insight controller, and the shielded cable should only be terminated at one end. All inputs and outputs are activated/received in the same way, as discussed below.

Activating an Input

All input signals operate at 24VDC. The Return for the 24V signal must be connected to **COM IN** for each input bank. It is recommended that you use the internal 24VDC located at the terminals marked **24VDC OUT +/-**. Switch the 24VDC back to the desired input signal (**FORWARD, REVERSE, FREE SPEED** etc).

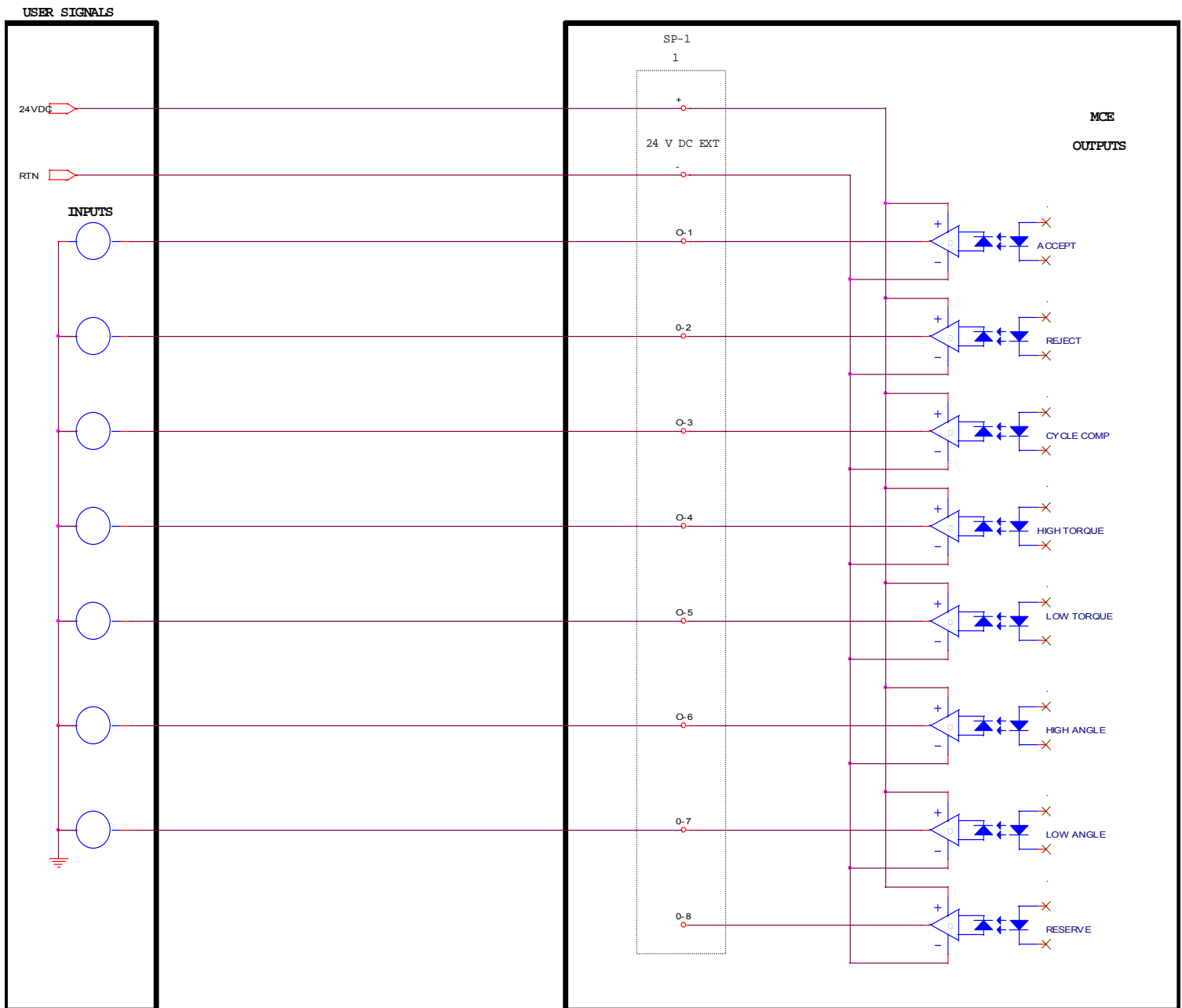
To use the internal 24VDC, you must connect a jumper wire from **24VDC OUT (-)** to **COM IN** of the input bank. To activate an input you would then provide a contact closure between the desired inputs signals and **24VDC OUT**

(+). You can daisy chain the **COM IN** signal to the next input terminal bank as shown in the Input Signal drawing.



Receiving an Output

All output signals operate at 24VDC. The 24V signal and its return must be connected to the terminal blocks labeled **+/- 24VDC EXT** on each output connector bank. It is recommended that you use an external 24VDC supply. The output signals will be switched back to you from the appropriate output signal (**ACCEPT**, **REJECT**, **HIGH TORQUE** etc). See the Output Signal drawing. You can daisy chain the +/- 24VDC to the next output bank.



Modem Connection and Setup

This capability will be in a future release of the Insight IC.

Ethernet Connection

This capability will be in a future release of the Insight IC.

Field Bus Card Connection

The Insight IC can connect to a field bus network using either a Profibus card or a Devicenet card. Make sure one of these field bus cards is installed in your system then click on the link below. Scroll to the section on the appropriate card for setup instructions.

[Communications Protocol Setup](#)

This is the end of the *Attaching Peripheral Devices* section. To continue your tour click below or click on another topic at the left.

Initial Startup

Before starting the Insight IC Fastening System with Graphics Display for the first time, you must go through the following checklist and verify that all of the steps have been completed. Click on the links below for specific instructions. If in doubt about any aspect of this checklist, [contact Ingersoll-Rand](#).

- The Insight controller enclosure is vertical, level, and [securely mounted](#).
- For every spindle location that will be used there is a [spindle attached](#) to that location in the connector panel (located on the controller's right side), and each spindle connector is locked down.
- If the Insight is equipped for [attaching external devices](#) (printers, computers, etc.), the proper devices have been attached to the appropriate ports in the connector panel (located on the controller's left side).
- The main enclosure is closed and locked.
- The AC power cord is plugged into a [properly rated electrical circuit](#).

Once the above checklist is verified, you are ready to power-up the Insight IC Fastening System with Graphics Display. Turn the [Main Power Switch](#) to **On**. This switch sends power to the internal Motor Controllers, the graphics display, and the keypads, but does not send power to the [spindle\(s\)](#) or [powerhead\(s\)](#).

Push the green button on the **Spindle Power Switch** located on the front panel. The *SPINDLE* LED on the Status Lights will illuminate, indicating power is now going to the spindle(s). The *Run Main* screen will be displayed on the graphics display panel, indicating the startup was successful and the Insight IC is ready to operate.

When you want to turn the entire Insight system on or off use the **Main Power Switch**. After turning the system off, wait at least five seconds before turning it on again. When you want to turn only the spindles on and off use the **Spindle Power Switch**.

This is the end of *Initial Startup* section and the entire *Insight Installation* topic. To continue your tour click below or click on another topic at the left.

Quick Start

Quick Start: Be Operational in Minutes

The goal of this section is to have your Insight IC Fastening System with Graphics Display up and running in just a few minutes. Before proceeding with the steps below, make sure the Insight controller is properly mounted, a **spindle** has been attached to each **spindle connector**, and you have completed the steps described in [Initial Startup](#).

1. Turn the **Main Power Switch** to **On**.
2. Push the green button on the **Spindle Power Switch** to power the spindle(s) and initialize the internal controller. (You can follow this sequence from the messages displayed on the screen.) The *Run Main* screen will be displayed indicating the start-up was successful.
3. Press the *Set-up* **Main Menu Key**.
4. Press the *Spindle Initialization* **Sub-Menu Key**. When the screen appears the cursor will be on the *Select Spindle* **drop box**. (If your Insight is a one-spindle model you will not have a *Select Spindle* drop box; skip Step 5.)
5. If you want to use Spindle 1, proceed to Step 6. If you want to use Spindle 2, press the **Expand** key, use the arrow keys to scroll to Spindle 2, and press **Enter**.

6. Press the arrow keys until the cursor is on the drop box labeled *Tool Type*.
7. Press the *Expand* key and scroll down the list until the cursor is on the model number of the spindle attached, press *Enter*. When you select a spindle the Insight searches its internal database and finds the generic values for two important tool parameters – *Transducer Range* and *Angle Constant* (or *Angle Scale Constant*) – and inserts these values in the appropriate boxes on the screen.
8. Check the values in the *Transducer Range* and *Angle Constant* boxes with those same values on the spindle's **calibration label** to verify they are the same or close. (This serves as a check that you have selected the correct spindle model number.) You may enter your tool's specific values into these boxes, or – if the values are identical or close – you may leave the generic values. (If you do change the *Transducer Range* value, make sure the torque units – usually Newton-meters – are the same on the calibration label and the screen box.)
9. Press the *Quick Set-Up* Sub-Menu Key.
10. Use the arrow keys and navigate to the *Strategy* drop box.
11. Press the *Expand* key and scroll down the list until the cursor is on the type of fastening strategy desired, press *Enter*.
12. Use the arrow keys and navigate to the data entry box where you will enter the fastening target value. For torque control go to the *Torque Target* box; for angle control go to the *Angle Target* box; for yield control go to the *Yield Point %* box.
13. Using the numeric keypad, enter a target value appropriate for the strategy selected, and for your particular fastening operation.
14. Review the default values in the on-screen boxes and edit as desired.
15. Press the *Run* Main Menu Key (when the dialogue box appears, press *Yes* if you want to save the configuration you have just programmed).

Congratulations! You have just programmed your Insight IC Fastening System with Graphics Display, and you are ready to begin fastening operations.

This is the end of *Quick Start: Be Operational in Minutes* section. To continue your tour click below, or click on another topic at the left.

Menu Screens

Menus and Sub-Menus: Overview

As explained in the *Insight Orientation* section above, the Insight IC Fastening System with Graphics Display has six **Main Menu Keys** located just above the graphics display screen on the front panel. To review the main menu functions, click on a link ([Run](#), [Statistics](#), [Set-up](#), [Diagnostics](#), [Print](#), [Help](#)).

Pressing a Main Menu Key brings up the first screen for that menu item on the graphics display panel. Each main menu item will also have up to six sub-menus. The sub-menu screens are displayed by pressing one of the **Sub-Menu Keys** located to the right of the graphics display panel. It is these menu and sub-menu screens that are used to setup and program the Insight, review and display fastening data, print out statistical analysis of fastening operations, and control all of the many other operations that the Insight performs. In this section we describe the main menu and the sub-menu screens in detail.

At this point you can continue your tour for an explanation of each main menu and its sub-menus in turn, or you can click on a link below to go directly to a particular menu series. The main menu explanations are presented in the left-to-right order of the Main Menu Keys on the Insight front panel (beginning with *Run* and ending with *Help*). If this is your first time through this manual you may want to begin your tour with the *Set-up* menu, since these are the screens you will use to set basic fastening parameters and strategies. Of course, at any time you can scroll through the detailed Table of Contents at the left and click on a topic to access that specific information.

[The Run Menu](#)

[The Statistics Menu](#)

[The Set-up Menu](#)

[The Diagnostics Menu](#)

[The Print Menu](#)

[The Help Menu](#)

Menu Screens: The Run Menus

The *Run* menu allows the user to view fastening parameters and fastener tightening curves in real time during fastening operations. It also gives the user quick access to statistics, fastening logs, and other useful information. This section discusses each of the *Run* sub-menu screens. The thumbnails above the links below will help you recognize each screen's layout. To go to a discussion of a *Run* screen click on the link, or continue your tour and these topics will be introduced in the sequence shown.

[Run Main Screen](#)

[Tightening Curves Screen](#)

[Stats Summary Screen](#)

[Cycle Log Screen](#)

[View Parameters Screen](#)

Run Menu: Run Main Screen

This screen displays the actual torque and angle values following each fastening. Below is a typical *Run Main* screen. Click on the screen elements that have red highlights to learn their function.

The screenshot shows the 'RUN Main' interface. At the top left, 'RUN' is in large blue letters with 'Main' below it. A red stop button icon is in the top center. The date '06/27/01' and time '14:30:13' are in the top right. Below the date/time, a 'Main' button is highlighted. The interface includes a 'Select Spindle:' dropdown menu set to 'Spindle 1', a 'Config #' dropdown set to 'Config 1', and a 'Strategy: Torque Control' label. The 'Data From:' section displays a large '0.0' with a small '0°' below it, and 'Nm' to the right. To the right of the main display are three colored boxes (red, green, yellow) each containing '(0)'. At the bottom, 'Var 1:' and 'Var 2:' are both set to 'None'. A vertical sidebar on the right contains buttons for 'Main', 'Tightening Curves', 'Stats Summary', 'Cycle Log', and 'View Parameters'.

Screen Element	Description
Spindle	Use this drop box to select the spindle for which the tightening data will display. You can display the data for Spindle 1, Spindle 2, for both spindles, or for a powerhead. This drop box will not be present if your Insight is a one-spindle model.
Configuration ID	Automatically displayed beneath the Spindle drop box are the Configuration name, the Configuration number, and the Strategy name for the tightening sequence. If it is a multi-step sequence, the Strategy name is that of the last step. When the Config Select drop box on the Spindle Initialization screen is set to "Internal," this drop box sets which configuration the controller will run.
Tightening Values	The large primary number is the torque value for the last tightening, unless the strategy is angle control (in which case it will be the angle value). The smaller secondary number is the angle value, unless the strategy is angle control (in which case it will be the torque value). Note that both the primary and secondary numbers show either a degree symbol or torque units, making it clear which parameter is displayed.
Limit Values	The three numbers to the right of the primary number are (from top to bottom) the high limit, the target value, and the low limit for the primary parameter. The values displayed are those that were programmed during either the Quick Set-up or Advanced Set-up operations for the selected configuration.
Var. 1	This drop box has a list of tightening variables. The user can select one of these variables to display here during each fastening operation. Below is the description of the tightening variables.

Var. 2	This drop box has a list of tightening variables. The user can select one of these variables to display here during each fastening operation. Below is the description of the tightening variables.
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

The tightening variables that the user can display in the Var. 1 and Var. 2 drop boxes (see graphic above) are listed below. Each drop box can display only one variable. To select the desired tightening variable, first navigate to the drop box using the arrow keys. Press the *Expand* key to display the variables, then use the arrow keys to scroll through the list to the desired variable (or enter the number of the variable), and finally press the *Enter* key to select the variable. The user can change the variable displayed at any time.

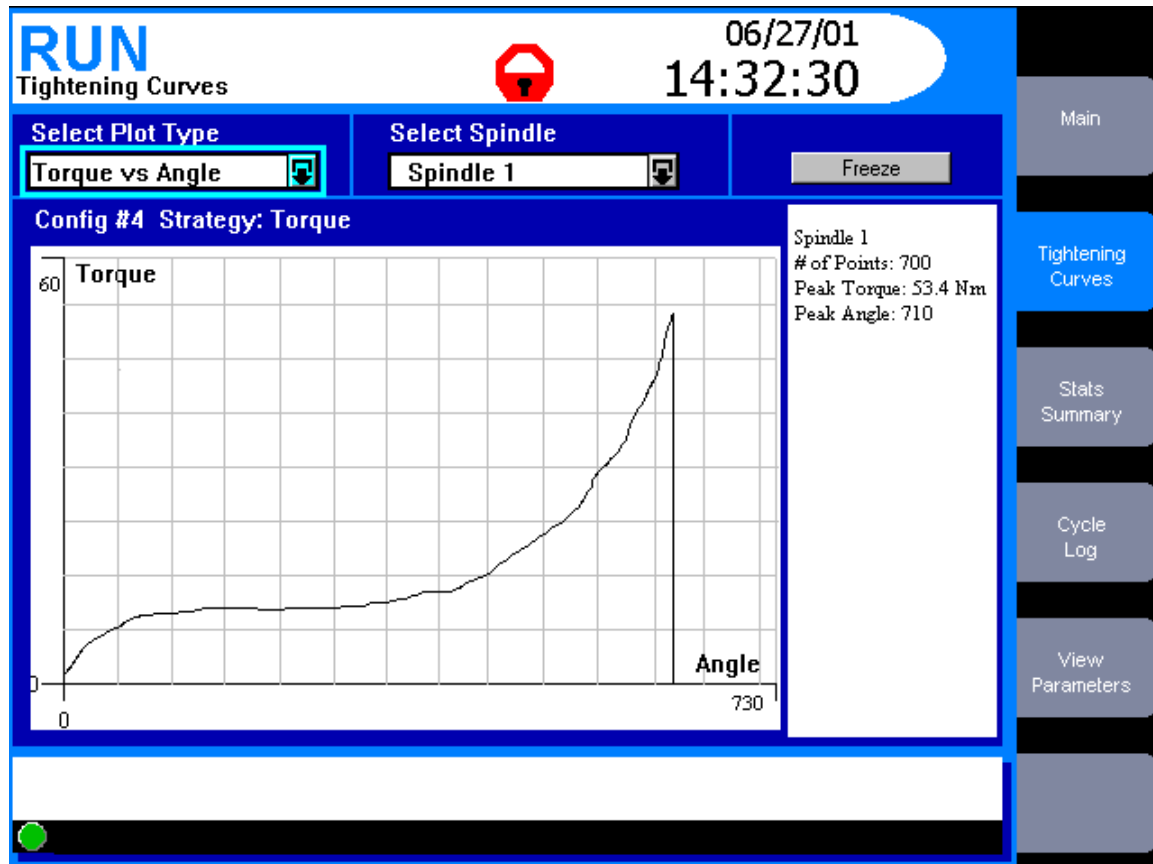
Variable	Explanation
None	No variable will be displayed
#OK %	Number and % of PASS tightenings
# Rejects %	Number and % of FAIL tightenings
# Rejects Hi\Lo	The number of fastenings that were over \ under the tightening limits
Sigma/6 sigma	Standard deviation / six times the standard deviation (used for statistical calcs)
CAM	A statistical parameter to evaluate tightening performance; for details click here
Capability	A statistical parameter to evaluate tightening performance; for details click here
Cp/CpK	A statistical parameter to evaluate tightening performance; for details click here
Cycle #	Each fastening is one cycle, and is incremented by one to give it a unique number
Cycle Time	The elapsed time for the fastening cycle
Gang Count	For a multiple fastener process, the current count and total count (e.g., 1 of 4)
Mean/Range	The average value and the max. less the min. value for the control parameter

Meanshift	The difference between the mean value and the control point value
Peak Current	The maximum current the tool drew during the fastening cycle
Barcode	Displays the bar code value attached to the cycle
Pk. Drag Torque	Peak drag torque reached (only displays for a drag torque strategy)
Peak Prevailing Torque	Displays the peak prevailing torque value (only for a prevailing torque strategy)
Prevailing Torque Slope	Displays the slope value of the prevailing torque curve (only for a prevailing torque strategy)
Peak Cut-in Torque	Displays the peak cut-in torque for the prevailing torque and drag torque strategies
Avg Prevailing Torque	The average prevailing torque (only displays for a prevailing torque strategy)
Avg. Drag Torque	The average torque over the target inspection angle.
Seating Angle	Degrees of angle rotated when seating torque is reached
Torque at Seat	Peak torque at seating point
Min. Drag Torque	Minimum drag torque reached (only displays for a drag torque strategy)
Tool Type	Displays the tool model number.
Shutdown Code	A code created after every cycle; for details click here

This is the end of the *Run Menu: Run Main Screen* section. To continue your tour click below, or click on another topic at the left.

Run Menu: Tightening Curves Screen

This screen is used to display tightening curves in real time during fastening operations. It allows the user to view tightening curves, freeze the curves for closer inspection, and display selected parameters. Below is a typical *Tightening Curves* screen. Click on the screen elements that have red highlights to learn their function.



The information this screen displays depends upon how the *Run Main* screen is set. Above the main window the spindle number, configuration number, configuration name, and strategy name will be displayed, as described under [Run Menu: Run Main Screen](#).

Screen Element	Description
Select Spindle	Use this drop box to select the spindle for which the tightening data will display. You can display the data for Spindle 1, Spindle 2, for both spindles, or for a powerhead. This drop box will not be present if your Insight is a one-spindle model
Select Plot Type	Use this drop box to select the plot type: Torque vs. Angle, Torque vs. Time, or Current vs. Time.
Freeze	This button freezes the tightening curve for study. Fastening will continue but the new curves do not display. The frozen curve remains until the user presses the button again, or until the user exists this screen.

Tightening Curve	This window displays the current tightening curve in real time. When a fastening is completed and another fastening begins, the previous curve clears and the new curve is drawn. The window will display one curve for each spindle selected, or one curve for each spindle in the powerhead selected. Each spindle's curve will be different color.
Data Display Box	This display box has a list of tightening data results captured in real time. The user can scroll through this list to observe the data recorded during each fastening operation. The data results are described below.
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

Below is the list of tightening parameters that appear in the parameter display boxes located to the right of the tightening curves (see graphic above).

Parameter	Explanation
Peak Torque	Maximum torque value achieved
Angle	Maximum angle value achieved
Peak Current	Peak current tool drew during the cycle
Cycle Time	Total time for the fastening cycle
Torque Hi Limit	Maximum permissible torque value
Torque Lo Limit	Minimum required torque value
Angle Hi Limit	Maximum permissible angle value
Angle Lo Limit	Minimum required angle value


This is the end of the *Run Menu: Tightening Curves Screen* section. To continue your tour click below, or click on another topic at the left.

Run Menu: Stats Summary Screen

This a view-only screen in which selected statistical parameters are calculated and displayed. Below is a typical *Stats Summary* screen. Click on the screen elements that have red highlights to learn their function.

RUN

Stats Summary



06/27/01
14:49:49

Select Spindle

Spindle 1

Select Configuration

Config 1

Population

Total Cycle Count:		30
	Torque	Angle
Target	0.00	360
X-Bar	37.12	362
Meanshift	0.0	2
Range	5.50	10
Max Value	39.5	366
Min Value	34.0	356
# for Sigma	30	30
Sigma	2.080	1.079
6Sigma	12.480	6.472
Capability	12.7	7.7
Cp	5.66	7.89
Cpk	7.99	8.04
CAM	2.14	2.08
# Hi Rejects	0	0
# Lo Rejects	0	0

Sample

Sample Stats Size:		30
	Torque	Angle
Target	0.00	360
X-Bar	37.12	362
Meanshift	0.0	2
Range	5.50	10
Max Value	39.5	366
Min Value	34.0	356
# for Sigma	30	30
Sigma	2.080	1.079
6Sigma	12.480	6.472
Capability	12.7	7.7
Cp	5.66	7.89
Cpk	7.99	8.04
CAM	2.14	2.08
# Hi Rejects	0	0
# Lo Rejects	0	0

Main

Tightening
Curves

Stats
Summary

Cycle
Log

View
Parameters

Screen Element	Description
Select Spindle	Use this drop box to select the spindle or powerhead for which the tightening data will display. This drop box will not be present if your Insight is a one-spindle model.
Select Configuration	Use this drop box to select the tightening configuration (by number and name) whose statistics summary will display.
Main Window	Show tables of the Population and Sample tightening statistics. Below is additional information on these tables.
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

This screen's main window displays information for the one spindle or powerhead selected. The left-hand table lists the statistics for the total number of fastenings performed for that configuration since the statistics were last reset (called the Population statistics), and the right-hand table lists the statistics for

the fastening sample size (called the Sample statistics). (The number of fastenings in the Sample statistics is set in the *Statistics Alarm Set-Up* screen within the *Statistics* menu. To go to that screen now, click [here](#).)

If a spindle has been selected, the statistical parameters displayed on the *Stats Summary* screen are:

Parameter	Explanation
Target	The target value for this tightening configuration
X-Bar	The average (mean) value for the control parameter
Meanshift	The difference between the mean value and the control point value
Range	The maximum less the minimum value for the control parameter
Max Value	The maximum value for the control parameter
Min Value	The minimum value for the control parameter
# for Sigma	The number of cycles used for the standard deviation calculation
Sigma	Standard deviation (used for statistical calculations)
6 Sigma	Six times the standard deviation (used for statistical calculations)
Capability	A statistical parameter used to evaluate tightening performance; for details click here
Cp	A statistical parameter used to evaluate tightening performance; for details click here
CpK	A statistical parameter used to evaluate tightening performance; for details click here
CAM	A statistical parameter used to evaluate tightening performance; for details click here
# Hi Rejects	Number of fastenings that failed for control parameter being too high
# Lo Rejects	Number of fastenings that failed for control parameter being too low

If a powerhead has been selected, the statistical parameters displayed on the *Stats Summary* screen are:

Parameter	Explanation
Total number of powerhead cycles	The number of powerhead fastenings performed
Sample stats size	The number of cycles used to calculate the fastening statistics
# of powerhead OK	Number of PASS tightenings
% of powerhead OK	Percent of PASS tightenings
# of powerhead reject	Number of FAIL tightenings
% of powerhead reject	Percent of FAIL tightenings
# of rejects for each spindle in the powerhead	Number of FAIL tightenings for each spindle
% of rejects for each spindle in the powerhead	Percent of FAIL tightenings for each spindle
Last cycle time for the powerhead	The elapsed time for the last fastening cycle

This is the end of the *Run Menu: Stats Summary Screen* section. To continue your tour click below, or click on another topic at the left.

Run Menu: Cycle Log Screen

This is a view-only screen that displays various tightening parameters monitored, recorded, and stored in memory for all readings in the current fastening series, up to a maximum of 5,000. This screen displays the most recent 1,000 cycles. To view the rest go to the *Statistics* menu's [Cycle Log](#) screen. Below is a typical *Run* menu *Cycle Log* screen. Click on the screen elements that have red highlights to learn their function.

The *Cycle Log* table will always display the following parameters:

Parameter	Explanation
Cycle #	The unique number for the cycle
Powerhead #	Powerhead number for the data collected
Spindle #	Spindle number for the data collected
Config #	The fastening configuration used (01 through 32)
Step #	Step number for the data collected
Date	The date the fastening was made
Time	The time the fastening was made
Barcode	The bar code value for the cycle (only if bar code functionality is turned on)
Cycle result	PASS or FAIL
Torque	Measured torque value
Torque Result	Whether measured torque value was PASS, HIGH, or LOW
Angle	Measured angle value
Angle Result	Whether measured torque angle was PASS, HIGH, or LOW

The following parameters may or may not appear in the *Cycle Log* window, depending on how the **End of Run Filter** was set. (The End of Run Filter is set in the *System Initialization* screen within the *Set-up* menu. Click [here](#) to go to the End of Run Filter.)

Parameter	Explanation
Shutdown Code	A code created after every cycle; for details click here
Peak Current	The maximum current the tool drew during the fastening cycle
Cycle Time	The elapsed time for the fastening cycle
Peak Slope	Peak slope of the torque vs. angle curve
Final Slope	Final slope of the torque vs. angle curve
Prevailing Torque Slope	The slope of the tightening curve for a prevailing torque strategy
Peak Cut-in Torque	The peak cut-in torque for the prevailing torque and drag torque strategies
Peak Prevailing Torque	The maximum torque measured during the prevailing torque phase of a prevailing torque strategy
Average Prevailing Torque	The average torque measured during the prevailing torque phase

	of a prevailing torque strategy
Angle at Seat	The degrees of angle rotated when seating torque is reached
Torque at Seat	The measured torque value when seating torque is reached
Peak Drag torque	The maximum torque measured during the drag torque phase of a drag torque strategy
Average Drag Torque	The average torque measured during the drag torque phase of a drag torque strategy
Minimum Drag Torque	The minimum torque measured during the drag torque phase of a drag torque strategy

This is the end of the *Run Menu: Cycle Log Screen* section. To continue your tour click below, or click on another topic at the left.

Run Menu: View Parameters Screen

This is a view-only screen that displays a tabular summary of all of the parameters the user has set for all of the steps in a fastening configuration. Below is a typical *View Parameters* screen. Click on the screen elements that have red highlights to learn their function.

RUN

07/02/01
13:37:22

Select Spindle

Spindle 1

Select Configuration

Config 1

Main

Programmed Steps

Engage Step

Torque Control

Step Parameters

Sync Enable	False
EOR Data Enable	False
Fail on Yield Override	False
Yield Override Enable	False
High Angle Limit (deg)	360
Low Angle Limit (deg)	30
High Torque Limit (Nm)	20
Low Torque Limit (Nm)	10
Torque Threshold (Nm)	5
Torque Target (Nm)	15
Torque Overshoot Compensation (Nm)	0.00
Torque Downshift Threshold (Nm)	5
Free Speed	395
Torque Downshift	100
Slope Interval	0
Yield Point % of Peak Slope	0
Angle Into Yield (deg)	0

Tightening
Curves

Stats
Summary

Cycle
Log

View
Parameters

Screen Element	Description
Spindle	Use this drop box to select the spindle or powerhead whose parameters will display. This drop box will not be present if your Insight is a one-spindle model.
Select Configuration	Use this drop box to select the tightening configuration (by number and name) whose parameters will display.
Programmed Steps	Use this drop box to display all of the steps programmed for the spindle and configuration selected.
Step Parameters	This display box shows all the parameters and their values for the step selected in the Programmed Steps drop box.
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

Note that the *View Parameters* main window consists of two display boxes. The user can enter the *Programmed Steps* drop box by navigating to it with the arrow keys and then pressing the *Expand* key. Then select a fastening step by using the arrow keys to scroll through the table until the desired step is highlighted, then press *Enter*. The parameters and their values for the fastening step selected are then shown in the *Step Parameters* display box on the right side of the main window.

If there are parameters in the *Step Parameters* display box with which you are not familiar, they are described in detail in the [Parameters](#) section.

This is the end of the *Run Menu: View Parameters Screen* section and the end of *Menu Screens: The Run Menus* topic. To continue your tour click below, or click on another topic at the left.

Menu Screens: The Statistics Menus

The *Statistics* menu allows the user to view a variety of statistical data on completed fastenings. The user can view actual fastening parameters as well as statistical measurements, and can compare them to desired (target) values. Individual tightening curves can be displayed and overlaid for comparison. The user can set alarm values to alert the operator to fastenings that do not meet the required statistical parameters. Finally, cycle data are exportable to PCs or other devices for additional analysis.

This section discusses each of the *Statistics* sub-menu screens. The thumbnails above the links below will help you recognize each screen's layout. To go to a discussion of a *Statistics* screen click on the link, or continue your tour and these topics will be introduced in the sequence shown. The thumbnails above each menu screen link below will help you recognize their look and screen layout.

[Summary Screen](#)

[Export Cycle Log Screen](#)

[Tightening Curves Screen](#)

[Cycle Log Screen](#)

[Stats Alarm Screen](#)

Statistics Menu: Summary Screen

This screen displays a large number of fastening statistics for either one or two spindles. If you have a single spindle Insight IC system, the *Statistics Summary* screen is as shown below. Note that on the left side it displays the statistical data for all the fastenings performed since the statistics were last reset (the Population statistics) and on the right side the statistics for a subset of the cycle (the Sample statistics). Click on the screen elements that have red highlights to learn their function.

The screenshot shows the 'STATS Summary' screen. At the top left, the word 'STATS' is in large blue letters, with 'Summary' below it. To the right, the date '08/24/2001' and time '08:14:16' are displayed. A red octagonal icon with a white 'Y' is in the center. Below the header, there are two 'Clear' buttons: 'All' and 'Sample'. A 'Select config' dropdown menu shows 'Config 18'. The main area is divided into two columns: 'Population Statistics' on the left and 'Sample Statistics' on the right. Each column contains a table with three columns: 'Parameter', 'Torque', and 'Angle'. The 'Population Statistics' table has values: Target (0.00, 0), X-Bar (0.00, 0.00), Meanshift (0.00, 0.00), Range (0.00, 0), Max Value (0.00, 0), Min Value (0.00, 0), # for Sigma (0, 0), Sigma (0.000, 0.000), 6Sigma (0.000, 0.000), Capability (0.0, 0.0), Cp (0.00, 0.00), and Cpk (0.00, 0.00). The 'Sample Statistics' table has identical values. On the right side of the screen, there is a vertical menu with buttons: 'Summary' (highlighted in red), 'Export Cycle Log', 'Tightening Curves', 'Cycle Log', 'Stats Alarm', and a green button at the bottom.

Parameter	Torque	Angle
Target	0.00	0
X-Bar	0.00	0.00
Meanshift	0.00	0.00
Range	0.00	0
Max Value	0.00	0
Min Value	0.00	0
# for Sigma	0	0
Sigma	0.000	0.000
6Sigma	0.000	0.000
Capability	0.0	0.0
Cp	0.00	0.00
Cpk	0.00	0.00

Parameter	Torque	Angle
Target	0.00	0
X-Bar	0.00	0.00
Meanshift	0.00	0.00
Range	0.00	0
Max Value	0.00	0
Min Value	0.00	0
# for Sigma	0	0
Sigma	0.000	0.000
6Sigma	0.000	0.000
Capability	0.0	0.0
Cp	0.00	0.00
Cpk	0.00	0.00

Screen Element	Description
Select Config	Use this drop box to select the tightening configuration (by number and name) whose statistics will display.
Clear All	Press this button to clear both the population and the sample statistics. Note that this clears the data for statistical analysis only; the raw data remain in memory and may be retrieved using the Statistics Cycle Log screen.
Clear Sample	Press this button to clear only the sample statistics. Note that this clears the data for statistical analysis only; the raw data remain in memory and may be retrieved using the Statistics Cycle Log screen.
Populations Statistics	The statistics for the entire fastening population are displayed here.
Sample Statistics	The statistics for the sample subset of the population are displayed here.
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

Below is a typical *Statistics Summary* screen for a two-spindle Insight IC system. Note that both the left side and right side of the screen have boxes for selecting a spindle and a configuration, and a box for displaying statistics. The statistics boxes display either the Population statistics or the Sample statistics. Click on the screen elements that have red highlights to learn their function.

STATS
Summary

08/22/2001
14:33:51

Select Spindle: Spindle 1 | Clear: All | Clear: Sample

Select Config: Config 18 | Stats from: Population | Select Config: Config 18

Parameter	Torque	Angle
Target	0.00	0
X-Bar	0.00	0.00
Meanshift	0.00	0.00
Range	0.00	0
Max Value	0.00	0
Min Value	0.00	0
# for Sigma	0	0
Sigma	0.000	0.000
6Sigma	0.000	0.000

Parameter	Torque	Angle
Target	0.00	0
X-Bar	0.00	0.00
Meanshift	0.00	0.00
Range	0.00	0
Max Value	0.00	0
Min Value	0.00	0
# for Sigma	0	0
Sigma	0.000	0.000
6Sigma	0.000	0.000

Summary
Export Cycle Log
Tightening Curves
Cycle Log
Stats Alarm

Screen Element	Description
Select Spindle	Use this drop box to select the spindle for which the tightening data will display. You can display the data for Spindle 1, Spindle 2, for both spindles, or for a powerhead.
Clear All	Press this button to clear both the population and the sample statistics. Note that this clears the data for statistical analysis only; the raw data remain in memory and may be retrieved using the Statistics Cycle Log screen.
Clear Sample	Press this button to clear only the sample statistics. Note that this clears the data for statistical analysis only; the raw data remain in memory and may be retrieved using the Statistics Cycle Log screen.
Stats from	Use this drop box to select the entire fastening population or a sample of that population.
Select Config	Use this drop box to select the tightening configuration (by number and name) whose statistics will display.

Main Window	The statistical data display here. Below is additional information on the parameters displayed.
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

For both single spindle and dual spindle Insight IC controllers, the following statistical parameters display on the *Statistics Summary* screen if a spindle is selected. These same statistical parameters display for both the fastening population and the fastening sample.

Parameter	Explanation
Target	The target value for this tightening configuration
X-Bar	The average (mean) value for the control parameter
Meanshift	The difference between the mean value and the control point value
Range	The maximum less the minimum value for the control parameter
Max Value	The maximum value for the control parameter
Min Value	The minimum value for the control parameter
Sigma	Standard deviation (used for statistical calculations)
6 Sigma	Six times the standard deviation (used for statistical calculations)
# for Sigma	The number of cycles used for the standard deviation calculation
Cp	A statistical parameter used to evaluate tightening performance; for details click here
CpK	A statistical parameter used to evaluate tightening performance; for details click here
Capability	A statistical parameter used to evaluate tightening performance; for details click here
CAM	A statistical parameter used to evaluate tightening performance; for details click here
# Rej.	Total number of fastenings that failed to meet the fastening criteria
# Hi Rejects	Number of fastenings that failed for control parameter being too high
# Lo Rejects	Number of fastenings that failed for control parameter being too low
# H/W rej.	Number of equipment-related (hardware) fastening failures

However, if a powerhead (rather than a spindle) is selected, a different set of parameters is displayed, as shown below.

Parameter	Explanation
Total number of powerhead cycles	The number of powerhead fastenings performed
Sample stats size	The number of cycles used to calculate the fastening statistics
# of powerhead OK	Number of PASS tightenings
% of powerhead OK	Percent of PASS tightenings
# of powerhead reject	Number of FAIL tightenings
% of powerhead reject	Percent of FAIL tightenings
# of rejects for each spindle in the powerhead	Number of FAIL tightenings for each spindle
% of rejects for each spindle in the powerhead	Percent of FAIL tightenings for each spindle
Last cycle time for the powerhead	The elapsed time for the last fastening cycle


This is the end of the *Statistics Menu: Summary Screen* section. To continue your tour click below, or click on another topic at the left.

Statistics Menu: Export Screen

Using the *Statistics Export* screen, the user can select, filter, and format cycle data and export that data, via the serial port, to a PC or other device. Below is a typical *Statistics Export* screen. Click on the screen elements that have red highlights to learn their function.

STATS

Export Cycle Log



06/27/01

15:30:45

Export Wizard

The Export function allows you to filter and send data out through the serial port. The format and type of data sent can be changed to suit your specific needs. Use this screen to select the criteria of the data to be exported.

Send

Data Port

COM 1

Select Spindle:

Spindle 1

↓

☐ All Cycles

Or From Last

To Last

Cycles

Sort By:

Then Select

Separate Data Fields By:

☐ Send Header With Data

☒ Comma

☐ Space

Edit Data Format

Summary

Export Cycle Log

Tightening Curves

Cycle Log

Stats Alarm

Screen Element	Description
Wizard Box	Displays information or instructions for the screen element that is highlighted.
Send	After you have selected and formatted the cycle parameters using other elements on this screen, click this button to send the data to an external device over the serial port.
Data Port	Use this drop box to select the serial port for exporting data (COM 1, COM 2, COM 3, or COM 4, floppy disk, or flash memory disk).
All Cycles	Check this box if you want to export all cycle data in memory.
From Last	If you want to export data from only a portion of the fastening cycles, enter the range here.
Sort By	Use this drop box to select the cycle sorting parameter. Options include Configuration, Cycle Results, Torque Results, or Angle Results.
Then Select	This drop box will display different options depending upon the Sort By parameter. If the user sorts by Configuration, he can select either all configurations or a specific one (by number from 1 to 32). If the user sorts by Cycle Result, Torque Result, or Angle Result, he can select either Pass/Fail or Pass/High/Low, as appropriate.
Separate Data Fields by	The user has two check boxes to specify data separation by either a comma or a space.
Send Header with Data	Checking this box allows a data header to be sent with the data.

Edit Data Format	Clicking this button brings up a second Export screen to select the specific tightening data for export. Below is additional information on this screen.
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

Clicking on the Edit Data Format button on the screen above brings up the following Export screen.

STATS
Export Cycle Log

09/19/2001
10:26:44

Export Wizard
Use this screen to choose the order in which data is sent.
Number the parameters in the order they are to be sent out.
Parameters set to zero will not be sent.

1	Cycle #	10	Torque Result	0	Minimum Drag Torque
2	Powerhead #	11	Angle	0	Peak Slope
3	Spindle #	12	Angle Result	0	Prevailing Torque Slope
4	Config #	13	Shutdown Code	0	Peak Cut-in Torque
5	Step #	14	Peak Current	0	Peak Prevailing Torque
6	Date	15	Cycle Time	0	Avg. Prevailing Torque
7	Time	0	Final Slope	0	Peak Drag Torque
8	Cycle Result	0	Torque at Seat	0	Avg. Drag Torque
9	Torque	0	Angle at Seat	0	Barcode

Ok Cancel ☐ Make E.O.R. Data Out Same Format

Summary
Export Cycle Log
Tightening Curves
Cycle Log
Stats Alarm

This second Export screen above lists numerous statistical parameters. As explained in the screen's wizard box, the user can select the specific statistical parameters and their order by entering a sequential number in each parameter box. Entering a zero means that parameter will not be exported. Click on the screen elements that have red highlights to learn their function.

Screen Element	Description
Make E.O.R. Data Out Same Format	Checking this box gives the "End of Run Data Out " serial protocol the same format as the statistics export data.
Make Host Data Out Same Format	Checking this box gives the "Host Data Out" serial protocol the same format as the statistics export data.
OK	Clicking this button sets the data export order and returns the user to the main Export screen.
Cancel	Clicking this button cancels all changes and returns the user to the main Export screen.

The parameters available on this screen are listed below.

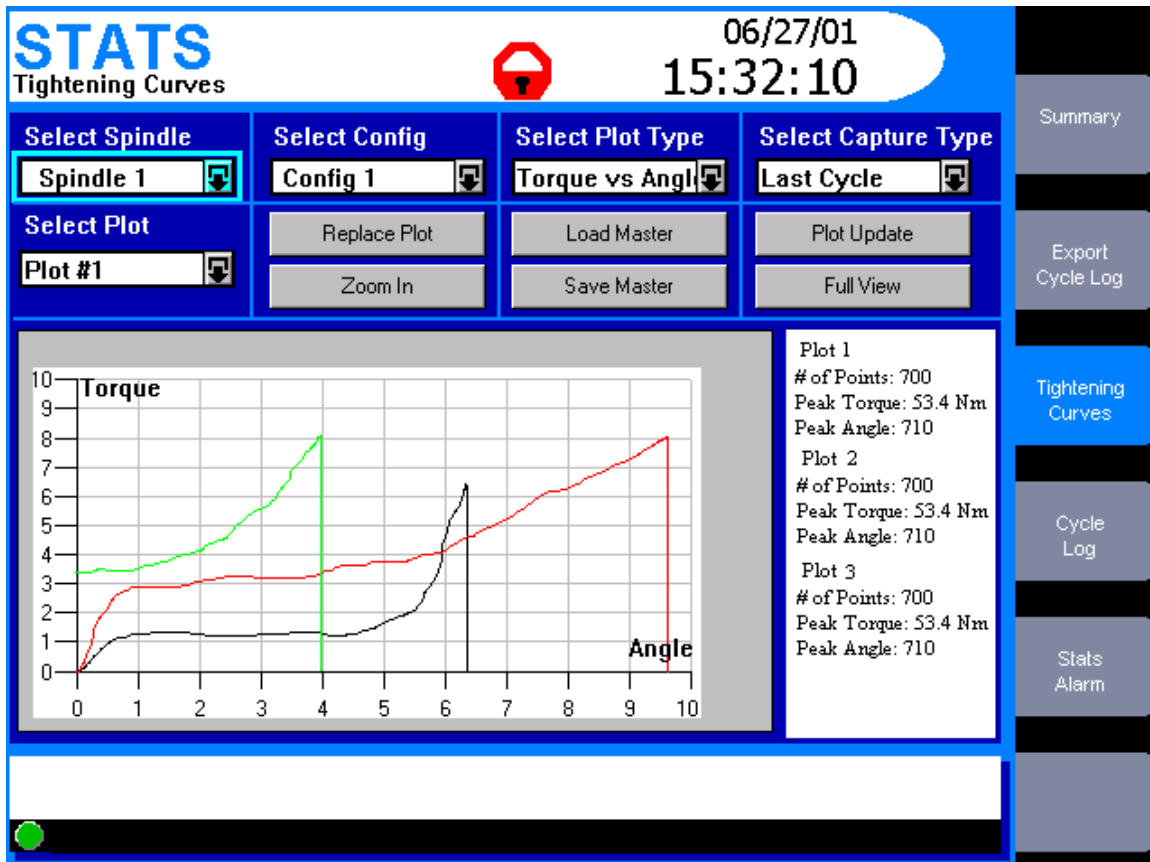
Parameter	Explanation
Cycle #	The unique number for the cycle
Powerhead #	Powerhead number for the data collected
Spindle #	Spindle number for the data collected
Config #	The fastening configuration used (01 through 32)
Step #	Step number for the data collected
Date	The date the fastening was made
Time	The time the fastening was made
Barcode	The bar code value for the cycle (only if bar code functionality is turned on)
Cycle result	PASS or FAIL
Torque	Measured torque value
Torque Result	Whether measured torque value was PASS, HIGH, or LOW
Angle	Measured angle value
Angle Result	Whether measured torque angle was PASS, HIGH, or LOW
Shutdown Code	A code created after every cycle; for details click here
Peak Current	The maximum current the tool drew during the fastening cycle
Cycle Time	The elapsed time for the fastening cycle
Peak Slope	Peak slope of the torque vs. angle curve
Final Slope	Final slope of the torque vs. angle curve
Prevailing Torque Slope	The slope of the tightening curve for a prevailing torque strategy
Peak Cut-in Torque	The peak cut-in torque for the prevailing torque and drag torque strategies

Peak Prevailing Torque	The maximum torque measured during the prevailing torque phase of a prevailing torque strategy
Average Prevailing Torque	The average torque measured during the prevailing torque phase of a prevailing torque strategy
Angle at Seat	The degrees of angle rotated when seating torque is reached
Torque at Seat	The measured torque value when seating torque is reached
Peak Drag torque	The maximum torque measured during the drag torque phase of a drag torque strategy
Average Drag Torque	The average torque measured during the drag torque phase of a drag torque strategy
Minimum Drag Torque	The minimum torque measured during the drag torque phase of a drag torque strategy

This is the end of the *Statistics Menu: Export Screen* section. To continue your tour click below, or click on another topic at the left.

Statistics Menu: Tightening Curves Screen

To improve a fastening sequence or to resolve fastening problems, it is often important to understand the tightening curve in detail. With this screen, the user can view tightening curves and zoom in on those curves to analyze them. In addition, important aspects of the curve—such as the number of data points, peak torque value, and so on—are automatically calculated and displayed. Below is a typical *Tightening Curves* screen. Click on the screen elements that have red highlights to learn their function.



Screen Element	Description
Select Spindle	Use this drop box to select the spindle whose tightening curves will be displayed. This drop box will not be present if your Insight is a one-spindle model.
Select Config	Use this drop box to select the tightening configuration whose curves will display. The options include configuration 01 through 32.
Select Plot Type	Use this drop box to select the plot type: Torque vs. Angle, Torque vs. Time, or Current vs. Time.
Select Capture Type	Use this drop box to select which fastening curves will be captured and displayed. Options include Last Cycle, Last Reject, Next Cycle, Next 2 Cycles, ... Next 5 Cycles.
Select Plot	If you have multiple plots displayed on the screen, use this drop box to select one for analysis. The selected plot becomes a solid line, distinguishing it from the other plots displayed.
Replace Plot	Clicking this button replaces the plot selected in the Select Plot drop box with the next valid plot.
Load Master	You may have tightening curves stored in memory that you want to use as a reference or master; a curve against which you can compare other fastenings. Pressing this button brings up a float box that allows you to select one of the stored curves and display it on the screen as the master plot. The button name then toggles to Remove Master, and now pressing it removes the master and displays the previous curve.
Plot Update	Pressing this button removes any plots on the screen (except a Master plot) and places new plots on the screen, as determined by the setting in the Select Capture Type drop box.
Zoom In	Clicking this button will zoom in on the tightening curve displayed on the screen. The button name then toggles to Zoom Out, and now clicking it returns the display to normal scale. When zoomed in, use the left and right arrow keys to move along the plot.
Save Master	You may have a particular tightening curve that you want to use as a reference or master; a curve against which you can compare other fastenings. Select the plot you want to save with the Select Plot drop box, then press this button to save it as the Master plot. A float box comes up that allows you to select a location to save the plot.
Full View	This button expands the plot window to full screen. Pressing the Close button on the bottom of the expanded screen will return the screen to normal view.
Plot Window	The tightening curves you have selected with the buttons and drop boxes above display here. Below is additional information on how to analyze the plot(s) displayed.
Plot Summary Window	This window to the right of the tightening curves lists information about the plots displayed. This includes the Plot Number, the number of data points used to create the plot, the Peak Angle, and the Peak Torque (or Peak Time or Peak Current, depending upon the selection made in the Select Plot Type drop box).
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

You can examine in detail the tightening curve displayed in the screen's main window by navigating to the plot window and pressing the *Expand* key. This allows you to take control of the cross hairs in the plot window. (The cross hairs will appear on the curve selected in the Select Plot drop box.) Use the directional keypad's arrow keys to move the cross hairs to the region of interest on the tightening curve. Note that the numerical values for the curve at the cross hair's location display on the screen.

This is the end of the *Statistics Menu: Tightening Curves Screen* section. To continue your tour click below, or click on another topic at the left.

Statistics Menu: Cycle Log Screen

This is a view-only screen that displays various tightening parameters that are monitored, recorded, and stored in memory for up to the last 5,000 tightening cycles. This screen functions generally the same as the *Cycle Log* screen under the *Run Menu*, but with the added ability to sort data. Below is a typical *Cycle Log* screen. Click on the screen elements that have red highlights to learn their function.

STATS
Cycle Log

06/27/01
16:00:10

Select Spindle: **Spindle 1** | Sort By: **Cycle** | View By: **Prev. 1000 Cycles**

Cycle #	Config #	Date	Time	Cycle Result	Torque	Torque Result	Angle	Angle Result	Step #
286	21	11/16/00	16:00	Pass	4.35	Pass	150.62	Pass	36
285	0	11/16/00	16:00	Pass	4.96	Pass	117.55	Pass	23
284	31	11/16/00	16:00	Pass	0.18	Pass	276.84	Pass	87
283	19	11/16/00	16:00	Pass	2.99	Pass	106.06	Pass	122
282	10	11/16/00	16:00	Pass	4.69	Pass	132.07	Pass	56
281	7	11/16/00	16:00	Pass	6.12	Pass	236.73	Pass	21
280	29	11/16/00	16:00	Pass	6.94	Pass	114.86	Pass	12
279	9	11/16/00	16:00	Pass	9.02	Pass	109.91	Pass	126
278	9	11/16/00	16:00	Pass	10.05	Pass	84.77	Pass	12
277	10	11/16/00	16:00	Pass	5.66	Pass	88.84	Pass	75
276	3	11/16/00	16:00	Pass	0.80	Pass	65.57	Pass	14

Navigation buttons on the right: Summary, Export Cycle Log, Tightening Curves, **Cycle Log**, Stats Alarm.

Screen Element	Description
Select Spindle	Use this drop box to select the spindle or powerhead for which the cycle log data will display. This drop box will not be present if your Insight is a one-spindle model.
Sort By	Use this drop box to select the criteria by which the cycle log data display in the screen's main window. The options include: Cycle, Configuration, Cycle Result, Torque Result, and Angle Result.
View By	Use this drop box to select which fastening cycles display in the screen's main window. The options here depend on the criteria selected in the Sort By drop box.
Main Window	This window displays the cycle log summary table. The row order of the data will vary depending upon the sorting criteria selected in the Sort By drop box. Below is additional information on the parameters displayed.
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

Note that the *Cycle Log* screen window is a display box. The user can scroll through the table in this window using the arrow keys.

The *Cycle Log* table will always display the following parameters:

Parameter	Explanation
Cycle #	The unique number for the cycle
Powerhead #	Powerhead number for the data collected
Spindle #	Spindle number for the data collected
Config #	The fastening configuration used (01 through 32)
Step #	Step number for the data collected
Date	The date the fastening was made
Time	The time the fastening was made
Barcode	The bar code value for the cycle (only if bar code functionality is turned on)
Cycle result	PASS or FAIL
Torque	Measured torque value
Torque Result	Whether measured torque value was PASS, HIGH, or LOW
Angle	Measured angle value
Angle Result	Whether measured torque angle was PASS, HIGH, or LOW

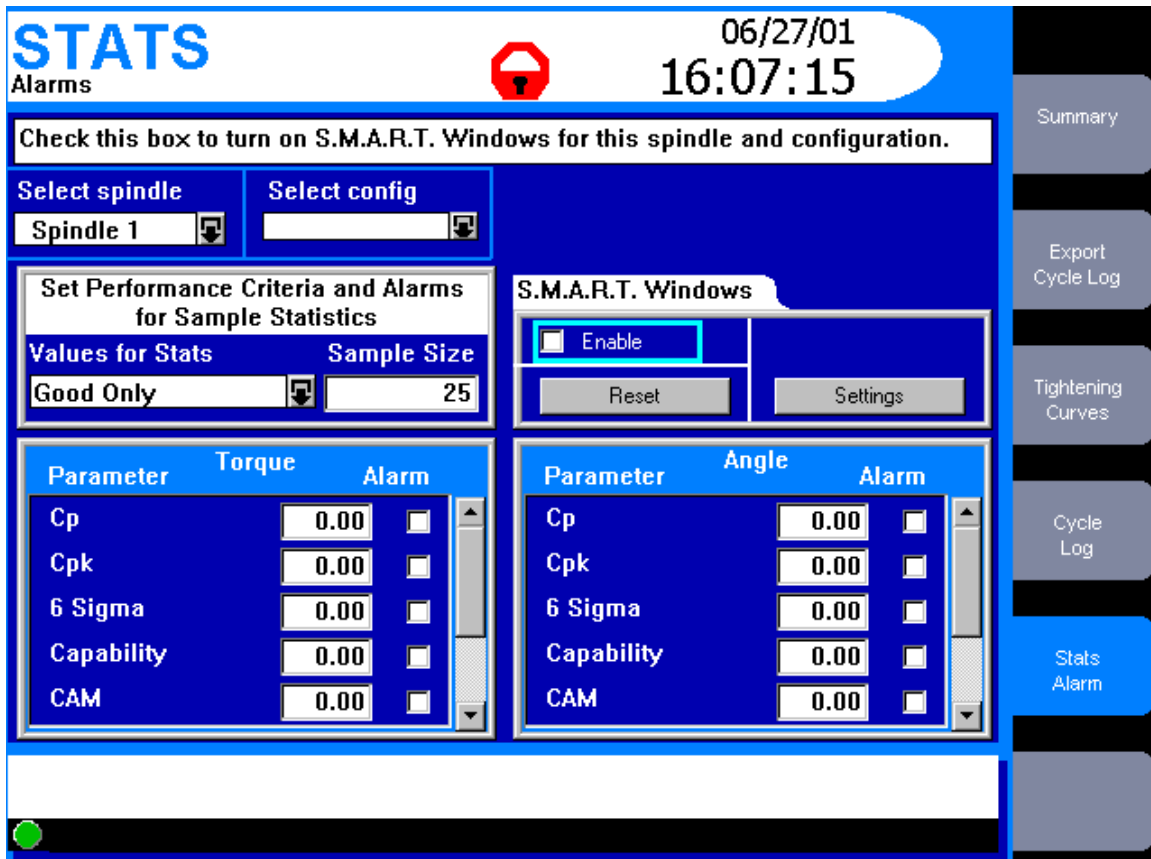
The following parameters may or may not appear in the *Cycle Log* table, depending on how the **End of Run Filter** was set. (The End of Run Filter is set in the *System Initialization* screen within the *Set-up* menu. Click [here](#) to go to the End of Run Filter.)

Parameter	Explanation
Shutdown Code	A code created after every cycle; for details click here
Peak Current	The maximum current the tool drew during the fastening cycle
Cycle Time	The elapsed time for the fastening cycle
Peak Slope	Peak slope of the torque vs. angle curve
Final Slope	Final slope of the torque vs. angle curve
Prevailing Torque Slope	The slope of the tightening curve for a prevailing torque strategy
Peak Cut-in Torque	The peak cut-in torque for the prevailing torque and drag torque strategies
Peak Prevailing Torque	The maximum torque measured during the prevailing torque phase of a prevailing torque strategy
Average Prevailing Torque	The average torque measured during the prevailing torque phase of a prevailing torque strategy
Angle at Seat	The degrees of angle rotated when seating torque is reached
Torque at Seat	The measured torque value when seating torque is reached
Peak Drag torque	The maximum torque measured during the drag torque phase of a drag torque strategy
Average Drag Torque	The average torque measured during the drag torque phase of a drag torque strategy
Minimum Drag Torque	The minimum torque measured during the drag torque phase of a drag torque strategy

This is the end of the *Statistics Menu: Cycle Log Screen* section. To continue your tour click below, or click on another topic at the left.

Statistics Menu: Statistics Alarm Set-Up Screen

In many applications it is important to systematically monitor tightening performance using statistical parameters. This screen allows the user to set alarms that will indicate deviations from selected fastening statistics, thereby alerting the Insight operator to a potential quality problem. Below is a typical *Statistics Alarm Set-Up* screen. Click on the screen elements that have red highlights to learn their function.



The screenshot shows the 'STATS Alarms' screen. At the top, the date '06/27/01' and time '16:07:15' are displayed. A red key icon is visible. Below the header, there is a checkbox labeled 'Check this box to turn on S.M.A.R.T. Windows for this spindle and configuration.' which is currently unchecked. To the left of this checkbox are two dropdown menus: 'Select spindle' (set to 'Spindle 1') and 'Select config'. Below these is a section titled 'Set Performance Criteria and Alarms for Sample Statistics' with two dropdowns: 'Values for Stats' (set to 'Good Only') and 'Sample Size' (set to '25'). To the right of this section is the 'S.M.A.R.T. Windows' section, which includes an 'Enable' checkbox (highlighted with a red box), a 'Reset' button, and a 'Settings' button. Below these sections are two tables. The left table is titled 'Torque' and the right table is titled 'Angle'. Both tables have columns for 'Parameter', 'Value', and 'Alarm'. The parameters listed are Cp, Cpk, 6 Sigma, Capability, and CAM. All values are currently set to 0.00, and all alarm checkboxes are unchecked. On the right side of the screen, there is a vertical menu with buttons: 'Summary', 'Export Cycle Log', 'Tightening Curves', 'Cycle Log', 'Stats Alarm' (highlighted in blue), and an unlabeled button at the bottom.

STATS
Alarms

06/27/01
16:07:15

Check this box to turn on S.M.A.R.T. Windows for this spindle and configuration.

Select spindle: Spindle 1
Select config: [Dropdown]

Set Performance Criteria and Alarms for Sample Statistics

Values for Stats: Good Only
Sample Size: 25

S.M.A.R.T. Windows

☐ Enable
Reset Settings

Parameter	Torque	Alarm
Cp	0.00	<input type="checkbox"/>
Cpk	0.00	<input type="checkbox"/>
6 Sigma	0.00	<input type="checkbox"/>
Capability	0.00	<input type="checkbox"/>
CAM	0.00	<input type="checkbox"/>

Parameter	Angle	Alarm
Cp	0.00	<input type="checkbox"/>
Cpk	0.00	<input type="checkbox"/>
6 Sigma	0.00	<input type="checkbox"/>
Capability	0.00	<input type="checkbox"/>
CAM	0.00	<input type="checkbox"/>

Summary
Export Cycle Log
Tightening Curves
Cycle Log
Stats Alarm

Screen Element	Description
Select Spindle	Use this drop box to select the spindle for which the alarms will display. This drop box will not be present if your Insight is a one-spindle model.
Select Config	Use this drop box to select the tightening configuration whose statistics alarms will display. The options include configuration 01 through 32.
S.M.A.R.T. Windows Enable	Checking this box enables S.M.A.R.T. (Self-Moving Automatic Range Test) Windows. With this function enabled, Insight calculates and sets certain tightening limits, and warns the user if the limits are exceeded. Below is additional information on this function.
Reset Button	Clicking on this button resets and recalculates the S.M.A.R.T. Windows limits. Below is additional information on this function.
Settings	Clicking on this button brings up a S.M.A.R.T. Windows screen. Below is a description of this screen.
Values for Stats	Use this drop box to select what tightening results are included in your statistical calculation. The options are Good Only, All, or All but hardware faults.
Sample Size	Using the numeric keypad, enter a sample size. This will be the number of samples used to calculate the sample statistics.
Main Window	This window has two boxes, to set the alarms for both torque and angle. The user can set alarms for all of the statistical parameters listed in these boxes, and can individually turn those alarms on or off. Below is additional information on these alarms.
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

S.M.A.R.T. Windows Discussion

S.M.A.R.T. stands for Self-Moving Automatic Range Test. Many first-time users of the Insight system, when operating in torque control (or angle control) strategy, set their high and low monitoring limits for the angle (or torque) measurement very loosely. They do this because they have little information on what the actual limits should be. By activating S.M.A.R.T., the Insight controller automatically calculates upper and lower limits based on a sampling of 25 fastenings, and then sets alarms to warn the operator if any fastening exceeds these limits.

Specifically, S.M.A.R.T. calculates two values commonly used in statistical process control: the Average Range value (R) and the Mean of the Means value (X). Insight then calculates an upper control limit and a lower control limit for the angle or torque as follows:

$$\text{Upper control limit} = X + 2.66R$$

$$\text{Lower control limit} = X - 2.66R$$

If the angle or torque value for a fastening is outside these limits, the Stats Alarm light on the Insight's front panel will flash.

The S.M.A.R.T. Windows Reset button on the *Statistics Alarm Set-Up* screen recalculates the S.M.A.R.T. limits. Clicking on this button tells the Insight controller to capture the data from the next 25 fastenings and then recalculate the upper and lower control limits. Clicking on the S.M.A.R.T. Windows Settings button brings up the following screen. Click on the screen elements that have red highlights to learn their function.

Screen Element	Description
High Limit	This box displays the calculated value for the S.M.A.R.T. upper control limit.
Low Limit	This box displays the calculated value for the S.M.A.R.T. lower control limit.
Set Limits	Clicking this button sets the monitored limits to the calculated limits shown on this screen.
Sensitivity	Use this drop box to set the S.M.A.R.T. sensitivity to High or Low. These options are described below.
OK	Clicking on this button saves the current S.M.A.R.T. settings and exits this screen.
Cancel	Clicking on this button cancels the settings and exits this screen.

Setting the S.M.A.R.T. sensitivity to high or low (see graphic above) has the following effect. When set to High, Insight uses the S.M.A.R.T. limits calculated for the first 25 fastenings to compare subsequent fastenings. This means that any fastening outside these initial control limits will trigger a Stats Alarm light. When set to Low, Insight calculates the S.M.A.R.T. limits based on the most recent 25 fastenings. This means that any gradual drift in the limits (caused by joint component manufacturing variances for example) will not trigger a Stats Alarm light, rather Insight will only alarm when it detects gross deviations from the constantly adjusting control limits.

S.M.A.R.T. Windows calculations are independent of user entered torque or angle limits. However, the user can set the monitored tightening limits to the

calculated S.M.A.R.T. limit values by navigating to the *Set Limits* button and pressing *Enter*.

Finally, the user must be aware of the following aspects of the S.M.A.R.T. Windows option.

- S.M.A.R.T. alarms will only occur on tightenings that otherwise pass all their fastening criteria. If Insight indicates a high or low torque or angle fault, the user should investigate the fault source, as it takes precedence over a S.M.A.R.T. alarm.
- The user must separately calculate S.M.A.R.T. control limits for each spindle and each configuration.
- In a multi-step strategy, S.M.A.R.T. control limits will only be available if the final step is either torque control or angle control.

Main Window Statistics Alarms Discussion

Using the arrow keys, the user can navigate to the *Statistics Alarm Set-Up* screen's main window and scroll down through the statistics parameters listed under both Torque and Angle. For each parameter, the user can enter an alarm value using the numeric keypad. Use the check box to the right of each parameter to either turn that alarm on or off.

In the main window the user can set alarms for the following statistical parameters for both torque and angle.

Parameter	Explanation
Cp	A statistical parameter used to evaluate tightening performance; for details click here
CpK	A statistical parameter used to evaluate tightening performance; for details click here
6 Sigma	Six times the standard deviation (used for statistical calculations)
Capability	A statistical parameter used to evaluate tightening performance; for details click here
CAM	A statistical parameter used to evaluate tightening performance; for details click here
% Pass	The percentage of tightenings that met the fastening criteria
Meanshift	The difference between the mean value and the control point value
Range	The maximum less the minimum value for the control parameter

This is the end of the *Statistics Menu: Statistics Alarm Set-Up Screen* section and the end of *Menu Screens: The Statistics Menus* topic. To continue your tour click below, or click on another topic at the left.

Menu Screens: The Set-up Menus

The *Set-up* menu and sub-menus are used to program tightening strategies and to set a broad variety of important system parameters. Both basic tightening strategies as well as advanced, customized strategies are created in the *Set-up* menu. In addition to strategies, you can use the *Set-up* menu to set many basic system parameters, such as date and time, display language, measurement units, and communications protocols. The *Set-up* menu is also used to create passwords for controlling access to Insight's software and data records.

Before you can use *Set-up* menus to program the Insight for fastening, you must tell the software what kind of **spindle** is attached to the system in each spindle location. Some Ingersoll-Rand tools have an embedded **Smart Chip** that communicates with the Insight IC controller, telling it what kind of tool is attached. If you do not have a Smart Chip tool, you will have to enter certain basic parameters. In addition, if you want to measure torque in units other than the default value of N-m (Newton-meters), you must specify those units. To perform these preliminary operations go to the [Spindle Initialization Menu Screen](#). If you forget to specify what kind of spindle is attached, you will be prompted by the Insight IC system and directed to the correct screen.

This section has an overview of the *Set-up* menu and a discussion of each of the function's six sub-menu screens. The thumbnails above the links below will help you recognize each screen's layout. To go to a discussion of a *Set-up* screen click on the link, or continue your tour and these topics will be introduced in the sequence shown. The thumbnails above each menu screen link will help you recognize their look and screen layout.

[Set-up Menu Overview](#)

[Quick Set-up Menu Screen](#)

[Advanced Set-up Menu Screen](#)

[System Initialization Menu Screen](#)

[Spindle Initialization Menu Screen](#)

[Password and Powerhead Settings](#)

[Parameter Transfer and Smart Chip](#)

Set-up Menu: Quick Set-up Screen

This menu screen is used to get you up and running quickly. Many simple fastening operations can be set up from this screen. These include single-step torque control, angle control, or yield control fastening strategies. (These and all other Insight fastening strategies are briefly explained under [Fastening Fundamentals](#).) Only basic fastening parameters are displayed with this screen. If a more complex, multi-step strategy is needed, or to get access to all possible programming parameters, proceed to the [Advanced Set-up Menu Screen](#).

The *Quick Set-up* screen allows you to set key parameters (torque, angle, spindle speed, etc.) for your tightening strategy. You may pre-program up to 32 separate tightening operations per spindle (called **Configurations**). The parameters displayed on the screen will vary, depending upon the fastening strategy selected.

The *Quick Set-up* screen is shown below. This is the *Quick Set-up* screen for a torque control tightening strategy. Click on the screen elements that have red highlights to learn their function.

NOTE: If you are not familiar with this screen, the explanations will make more sense if you follow the order indicated by the numbers on the screen elements (1 Select Spindle, 2 Config, 3 Strategy, etc.) Also, notice that near the top of the screen is the **Quick Set-up Wizard Box**. During actual Insight operation, as you navigate to each screen element a brief explanation of that parameter – as well as any special instructions – is displayed in the Wizard Box. Also, as you set various parameters a summary of the strategy and the parameter set points appears in a **Status Box** in the lower half of the screen.

To see the *Quick Set-up* screen for an angle control or a yield control strategy click on the links below, or continue your tour and these topics will be introduced in the sequence shown.

[Quick Set-up Angle Control Screen](#)

[Quick Set-up Yield Control Screen](#)

SETUP
Quick Setup

08/22/2001 13:17:55

Quick Setup Wizard Step 7:
Enter into this entry box the desired high angle limit. NOTE: In angle control a default high angle limit will be calculated of 10% above the angle target value. To edit this value simply type in a new value.

1 Select Spindle Spindle 1	4 Torque Target 10.0	7 Angle Hi Limit 32000.0	10 Free Speed 350
2 Config 3) Config 3	5 Hi Torque Limit 12.0	8 Angle Lo Limit 0.0	11 Shiftdown Point 5.0
Torque Control	6 Lo Torque Limit 8.0	9 Torque Threshold 2.0	12 Shiftdown Speed 200

Torque
Hi
Target
Lo
Shiftdown Pt.
Threshold

TORQUE CONTROL

Lo Hi Angle

Quick Set-up
Advanced Set-up
System Initialization
Spindle Initialization
Password & Powerhead Settings
Parameter Transfer & Smart Chip

Screen Element	Description
Select Spindle	Use this drop box to select the spindle to be programmed (Spindle 1 or Spindle 2). This drop box will not be present if your Insight is a one spindle only model.
Config	Use this drop box to select the configuration you wish to program.
Strategy	Use this drop box to select a torque control, angle control, or yield control strategy. In this graphic, Torque Control is displayed.
Torque Target	<p>The desired final torque for this fastening operation. When the Torque Target value is entered some of the other parameters are automatically calculated. However, the user can edit these values as necessary.</p> <p>Range: Depends upon the tool being used</p> <p>Default Value: none</p>

Torque Hi Limit	The highest permissible final torque. Range: Depends upon the tool being used Default Value: Torque Target + 20%
Torque Lo Limit	The lowest permissible final torque. Range: Depends upon the tool being used Default Value: Torque Target - 20%
Angle Hi Limit	The maximum angle through which the fastener may turn. Range: 0 - 32000 Default Value: 32000
Angle Lo Limit	The minimum angle through which the fastener must turn. Range: 0 - 32000 Default Value: 0
Torque Threshold	The starting point for measuring angle. Range: Depends upon the tool being used Default Value: 20% of Target Torque
Free Speed	The maximum speed the tool will run during tightening. Range: Depends upon the tool being used Default Value: 90% of the tool's full free speed
Shiftdown Point	The point during the final stage of tightening at which the tool shifts to a lower speed to improve accuracy. Range: Depends upon the tool being used Default Value: 50% of Target Torque
Shiftdown Speed	The tool's speed during the shiftdown phase. Range: Depends upon the tool being used Default Value: 30% of the tool's full free speed
Window	The table in the lower part of the window is a summary of the programmed configurations for the spindle selected. The user can scroll through this listing and can also select a configuration.

Below is the *Quick Set-up* screen for an angle control tightening strategy. Click on the screen elements that have red highlights to learn their function.

NOTE: If you are not familiar with this screen, the explanations will make more sense if you follow the order indicated by the numbers on the screen elements (1 Select Spindle, 2 Config, 3 Strategy, etc.) Also, notice that near the top of the screen is the **Quick Set-up Wizard Box**. During actual Insight operation, as you navigate to each screen element a brief explanation of that parameter—as well as any special instructions—is displayed in the Wizard Box. Also, as you set various parameters a summary of the strategy and the parameter set points appears in a **Status Box** in the lower half of the screen.

SETUP

Quick Setup

08/22/2001

15:07:45

Quick Setup Wizard

Enter into this entry box the desired high angle limit. NOTE: In angle control a default high angle limit will be calculated of 10% above the angle target value. To edit this value simply type in a new value.

Step 5:

1 Select Spindle	4 Angle Target	7 Hi Torque Limit	10 Free Speed
Spindle 1	180	60.0	644
2 Config	5 Angle Hi Limit	8 Lo Torque Limit	11 Shiftdown Point
Config 2	216.0	0.0	0.0
Angle Control	6 Angle Lo Limit	9 Torque Threshold	12 Shiftdown Speed
	144.0	0.0	358

Torque

Hi

Lo

Shiftdown Pt.

Threshold

ANGLE CONT

Lo Target Hi Angle

Quick Set-up

Advanced Set-up

System Initialization

Spindle Initialization

Password & Powerhead Settings

Parameter Transfer & Smart Chip

Screen Element	Description
Select Spindle	Use this drop box to select the spindle to be programmed (Spindle 1 or Spindle 2) This drop box will not be present if your Insight is a one spindle only model.
Config	Use this drop box to select the configuration you wish to program.
Strategy	Use this drop box to select a torque control, angle control, or yield control strategy. In this graphic, Angle Control is displayed.
Angle Target	The desired angle (in degrees) through which the fastener should turn for this fastening operation. Range: 0 - 32000 Default Value: none
Angle Hi Limit	The highest permissible degree of rotation. Range: 0 - 32000 Default Value: Angle Target + 10%
Angle Lo Limit	The lowest permissible degree of rotation. Range: 0 - 32000 Default Value: Angle Target - 10%

Torque Hi Limit	The highest permissible final torque. Range: Depends upon the tool being used Default Value: Depends upon the tool being used
Torque Lo Limit	The lowest permissible final torque. Range: Depends upon the tool being used Default Value: 0
Torque Threshold	The starting point for measuring angle. Enter a numerical value, since no default value is assigned. Range: Depends upon the tool being used Default Value: none
Free Speed	The maximum speed the tool will run during tightening. Range: Depends upon the tool being used Default Value: 90% of the tool's full free speed
Shiftdown Point	The point during the final stage of tightening at which the tool shifts to a lower speed to improve accuracy. Range: Depends upon the tool being used Default Value: 0
Shiftdown Speed	The tool's speed during the shiftdown phase. Range: Depends upon the tool being used Default Value: 30% of the tool's full free speed
Window	The table in the lower part of the window is a summary of the programmed configurations for the spindle selected. The user can scroll through this listing and can also select a configuration.

Below is the *Quick Set-up* screen for a yield control tightening strategy. Click on the screen elements that have red highlights to learn their function.

NOTE: If you are not familiar with this screen, the explanations will make more sense if you follow the order indicated by the numbers on the screen elements (1 Select Spindle, 2 Config, 3 Strategy, etc.) Also, notice that near the top of the screen is the **Quick Set-up Wizard Box**. During actual Insight operation, as you navigate to each screen element a brief explanation of that parameter—as well as any special instructions—is displayed in the Wizard Box. Also, as you set various parameters a summary of the strategy and the parameter set points appears in a **Status Box** in the lower half of the screen.

SETUP

Quick Setup

09/04/01
11:44:44

Quick Setup Wizard

Step :

A default Angle Hi limit has been calculated for you. To accept this value move to the next step. To edit this value use the numerical key pad to enter the highest acceptable angle value. See Graphical plot below.

1 Select Spindle Spindle 1	4 Yield Point % 50	7 Torque Lo 0.0	10 Torque Threshold 900
2 Config Config 1	5 Slope Interval 1	8 Angle Hi 32000	11 Free Speed 0
3 Strategy Yield Control	6 Torque Hi 20.0	9 Angle Lo 0	12 Shiftdown Speed 300

Torque

Hi
Lo

Shiftdown Pt.
Threshold

Slope Hi

YIELD CONTI

Slope Lo

Lo Hi Angle

Quick Set-up

Advanced Set-up

System Initialization

Spindle Initialization

Password & Powerhead Settings

Parameter Transfer & Smart Chip



Screen Element	Description
Select Spindle	Use this drop box to select the spindle to be programmed (Spindle 1 or Spindle 2). This drop box will not be present if your Insight is a one spindle only model.
Config	Use this drop box to select the configuration you wish to program.
Strategy	Use this drop box to select a torque control, angle control, or yield control strategy. In this graphic, Yield Control is displayed.
Yield Point %	The percent decrease in the slope value for the torque vs. angle curve that signifies the onset of yield. Range: 20% - 80% Default Value: none
Slope Interval	Sets the interval over which the reference slope will be measured. Range: 0 - 10 Default Value: 0
Torque Hi	The highest permissible torque value. Enter a numerical value, since no default value is assigned. Range: Depends upon the tool being used Default Value: none
Torque Lo	The lowest permissible torque value. Enter a numerical value, since no default value is assigned. Range: Depends upon the tool being used Default Value: none
Angle Hi	The maximum angle through which the fastener may turn. Enter a numerical value, since no default value is assigned. Range: 0 - 32000 Default Value: 0
Angle Lo	The minimum angle through which the fastener must turn. Enter a numerical value, since no default value is assigned. Range: 0 - 32000 Default Value: 0
Torque Threshold	The starting point for measuring angle. Enter a numerical value, since no default value is assigned. Range: Depends upon the tool being used Default Value: 0

Free Speed	The maximum speed the tool will run during tightening. Range: Depends upon the tool being used Default Value: 90% of the tool's full free speed
Shiftdown Point	The point during the final stage of tightening at which the tool shifts to a lower speed to improve accuracy. Range: Depends upon the tool being used Default Value: 0
Window	The table in the lower part of the window is a summary of the programmed configurations for the spindle selected. The user can scroll through this listing and can also select a configuration.

This is the end of the *Set-up Menu: Quick Set-up Screen* section. To continue your tour click below, or click on another topic at the left.

Set-up Menu: Advanced Set-up Screen

Introduction to Advanced Set-up

The *Advanced Set-up* Menu Screen allows you to set a very broad range of tightening parameters. This screen is used if a multi-step fastening strategy is required, one more complex than the simple torque control, angle control, or yield control strategies offered under the [Quick Set-up Menu Screen](#). *Advanced Set-up* may also be used if you want to use one of these three basic strategies, but want to be able to adjust all the possible parameters for the strategy.

Advanced Set-up also gives you access to all of Insight's other, more complex, tightening strategies, as summarized in [Fastening Fundamentals](#). Finally, *Advanced Set-up* allows you to combine these strategies into a series of up to a total of 128 separate and sequential steps, allowing you to create complex and specialized fastening schemes tailored to your unique assembly requirements.

If you are already familiar with *Advanced Set-up* and how to adjust fastening parameters, click on the fastening strategy links below to go to the topics of interest. Otherwise scroll down and we will introduce the basic elements of the *Advanced Set-up* screen.

[Advanced Set-up Strategy Boxes](#)

[Advanced Set-up Tips](#)

[Engage Parameters](#)

[Torque Control Parameters](#)[Angle Control Parameters](#)[Yield Control Parameters](#)[Re-torque Control Parameters](#)[Backout Control Parameters](#)[Delay Control Parameters](#)[Jog Control Parameters](#)[Prevailing Torque Control Parameters](#)[Drag Torque Control Parameters](#)[Bypass Parameters](#)

Advanced Set-up Strategy Boxes

The *Advanced Set-up* screen is shown below. Click on the screen elements that have red highlights to learn their function.

SETUP
Advanced Setup

06/28/01
14:23:50

Select Spindle: **Spindle 1** (highlighted in red)
Config #: Config 1
Copy Configuration

← →

Engage Step	Step #1	Step #2	Step #3
None	None	None	None
Insert After Above Step	Insert After Above Step	Insert After Above Step	Clear All Steps

Quick Set-up
Advanced Set-up (highlighted in red)
System Initialization
Spindle Initialization
Password & Powerhead Settings
Parameter Transfer & Smart Chip

Screen Element	Description
Select Spindle	Use this drop box to select Spindle 1 or Spindle 2. This drop box will not be present if your Insight is a one-spindle model.
Config #	If you setting up a new fastening strategy you can select a new Configuration Number that will distinguish this tightening strategy from all others. If you enter a number that has been previously programmed with a fastening strategy, that strategy's parameters will be displayed. Range: 01 – 32 Default Value: Configuration displayed on the Run Main screen
Config Name	You may assign a convenient name to the Configuration # using the alphanumeric keypad (such as Left Door, Part 81B). If a name already exists it will be shown. The name is limited to 14 characters. Note: You must press the Expand key before entering the name.
Copy Configuration	Often an existing fastening configuration will be reused, either as-is or with slight modifications. Rather than re-entering the entire configuration, you can use the Copy Configuration button. Pressing this button allows you to copy the configuration currently displayed to the spindle and configuration you select.
Arrow Keys	These arrows light up if there are additional steps available before or after the steps displayed. Use the arrow keys on the navigation to scroll left or right.
Step #n Box	You use this drop box to select the strategy desired for each step. More information on the Step #n Boxes is presented below.
Insert After Above Step	When pressed, this button inserts an empty step to the right of the current step, shifting all subsequent steps one step to the right.
Clear All Steps	Pressing this button clears all the steps for the Configuration # listed.

Note in the graphic below that there are four drop boxes, one labeled Engage and the others labeled *Step 1* through *Step 3*. Recall that there are actually 128 possible steps that can be programmed (shared among the 32 possible configurations). By combining various tightening strategies you program into these drop boxes – each of which can be highly customized – you can create complex fastening sequences tailored to your assembly operations. For every *Step #n* drop box, whichever strategy you select for that step will bring up a list of parameters inside the box that you can set and adjust.

Click on the drop boxes in the graphic below to learn about the fastening strategy steps. If you are not familiar with certain strategies they are explained in [Fastening Fundamentals](#).

SETUP
Advanced Setup

06/28/01
14:30:18

Select Spindle: Spindle 1 | Config #: Config 1 | Config Name: | Copy Configuration

← | →

Engage Step	Step #1	Step #2	Step #3
Engage	Torque Control	Backout Control	Torque Control
Tool Motor Direction CW CCW	Free Speed 630	Backout Speed 350	Free Speed 630
Soft Speed 140	Shiftdown Speed 350	Hi Torque Limit 25.00	Shiftdown Speed 350
Reverse Speed 630	Torque Target 10.00	Backout Angle 360	Torque Target 20.00
Insert After Above Step	Insert After Above Step	Insert After Above Step	Clear All Steps

Quick Set-up
Advanced Set-up
System Initialization
Spindle Initialization
Password & Powerhead Settings
Parameter Transfer & Smart Chip

Screen Element	Description
Engage Step	When you open this drop box you can only select Engage parameters. These parameters help you ensure that the tool engages the fastener correctly.
Step #1	When you open this drop box you can select from a series of available strategies. Sometimes the options available for any Step #n depend upon the strategy selected for the previous step.
Step #2	When you open this drop box you can select from a series of available strategies. Sometimes the options available for any Step #n depend upon the strategy selected for the previous step.
Step #3	When you open this drop box you can select from a series of available strategies. Sometimes the options available for any Step #n depend upon the strategy selected for the previous step.
Step Parameter Window	A series of user-adjustable parameters are displayed here. The specific parameters displayed depend upon the strategy selected in this Step.

The first drop box is unique because it always displays the *Engage* parameters. The sections below describe the *Engage* parameter and the parameters for the other tightening strategies. Some of the parameters are required (must be specified) while others are optional. As you navigate to each parameter, Insight displays whether it is required or optional.

In some instances, the strategy you select for one step will dictate the possible strategies that will be displayed in the next step. The Insight software manages all these variables. You do not have to worry about these options; merely select the strategy you need from the list displayed.

This completes the *Advanced Set-up Strategy Boxes* section. To continue your tour click below or click on another topic at the left.

Advanced Set-up Tips

In this section we discuss several topics that are essential to understanding the *Advanced Set-up* function.

Strategy Sequence Rules

The Insight's 128 possible tightening steps and up to 32 separate configurations can be programmed in virtually any sequence. However, there are a few sequence rules dictated by the purpose of certain strategies. Those rules are:

1. A Retorque Control strategy must always be preceded by a step programmed for Torque Control or Angle Control.
2. A Jog Control strategy must always be the first step.
3. The Bypass strategy (which applies only to powerheads) must always be the first step.

Programming Spindles in a Powerhead

You can program the multiple spindles in a **powerhead** in a variety of ways. All of the spindles can be programmed identically, or the spindles can be divided into groups. If divided into groups, all those spindles in a group must be programmed the same. The Insight IC keeps track of the spindles in a powerhead and how they are grouped and programmed. If you attempt to change the programming for a spindle that is part of a powerhead (or a Group within a powerhead), the Insight will bring up a dialogue box for you to confirm the change. If confirmed, the Insight automatically changes the programming for all the spindles in that group, where appropriate.

Programming powerheads and their groups can be complex. However, the process is explained fully in the [Password and Powerhead Settings](#) section.

Clearing a Step

Sometimes in a complex, multiple-step fastening process you may want to revise the sequence of steps. In the section above where we introduced the Advanced Set-up screen, you learned how to insert a step (using the button labeled Insert After Above Step). You can also remove a step from the fastening sequence. You do that by going to the Strategy drop box for the step and selecting None. The system will prompt you to confirm the deletion. If you select Yes the step will be removed and the subsequent steps will be left-adjusted.

Clearing a Configuration

Sometimes you may want to eliminate an entire configuration, that is the entire sequence of steps for a particular fastening sequence (including the Engage step). To do this, simply click on the Clear All Steps button on the *Advanced Set-up* screen. A dialogue box will appear for you to confirm the deletion.

End of Run Data

Remember, the Insight IC controller saves *End of Run* data at the end of each configuration. If you program configurations with multiple steps, you may only want to retain EOR data for the final step. In which case *Record EOR Data* should be set to OFF (which is the default setting) for the intermediate steps.

Note, however, that if a tightening fails for any reason, the Insight IC controller always records the EOR data. (This is done to help you determine why the tightening failed.) So even if you have set *Record EOR Data* to OFF for the intermediate steps in a configuration, if you have a failure you will have the EOR data to review.

This completes the *Advanced Set-up Tips* section. To continue your tour click below, or click on another topic at the left.

Engage Parameters

The first strategy drop box only displays only parameters for the *Engage* strategy. These parameters allow you to specify exactly how the Insight **spindle** will engage the fastener. *Engage* parameters are set only once per configuration and are used throughout the configuration's tightening sequence.

The *Engage* parameters are listed below. Click on any parameter for an explanation, as well as its allowable range and default value. A few of these parameters need some additional explanation and clarification. Scroll down for that information.

[Acceleration](#)

[Tool Motor Direction](#)

[Reverse Speed](#)

[Soft Start Speed](#)

[Torque Filter](#)

[Cycle Timer](#)

[Auto Increment To](#)

[Gang Count](#)

[Final Fault Action](#)

[Final Fault Backout Angle](#)

[Backout Hi Torque Limit](#)

[Retry Backout Angle](#)

[Retry Backout Speed](#)

[Retry Fault Action](#)

[Number of Retries](#)

[Tube Nut Reverse Speed](#)

[Tube Nut Reverse Threshold](#)

[Prevailing Torque Compensation](#)

Auto Increment

Auto Increment, with individual tool trigger pulls, allows the Insight to move through a specific sequence of fastening configurations. For example, if you have programmed six different configurations numbered 1 – 6, you can instruct the Insight to perform fastening in the sequence 1-4-6 and 2-3-5. To do this you set the

Auto Increment To parameter, which is one of the parameters in the *Engage* strategy drop box. This tells the Insight which configuration will be selected upon the next throttle pull. The last configuration in the Auto Increment sequence should have its *Auto Increment To* parameter set to the first configuration in the sequence, to complete the loop. After completing all the configurations in the chain, the system will go to the first programmed configuration. Note that the user still has to activate the tool (for example, pull the trigger on a handheld tool) for each configuration in the Auto Increment sequence.

Auto Increment can be reset by activating the Configuration Reset discrete input signal. When the Configuration Reset input is set, the system automatically goes to the lowest configuration in the Auto Increment sequence. There are two ways to reset the Auto Increment sequence.

1. There is a dedicated reset input on the spindle I/O connector.
2. While on the *Run Main* screen, pressing 0 (zero) three times (000) and then the *Enter* key will reset the Auto Increment for spindle 1. For a two-spindle controller, pressing 0 four times (0000) and then *Enter* will reset spindle 2.

Gang Count

Some assemblies have multiple bolts that must be fastened in sequence (called a "Gang"). For example, if you have a four -bolt assembly you can set the Gang Count to 4. Insight will then keep track of each fastening and when all four fastenings have been completed within specification, a "Gang Complete" message will appear on the display screen.

If the Gang Count is successfully completed, in addition to displaying "Gang Complete" on the screen, the controller provides a gang complete output signal on the spindle's I/O connector. There are two ways to reset the Gang Count.

3. There is a dedicated reset input on the spindle I/O connector.
4. While on the *Run Main* screen, pressing 0 (zero) and then the *Enter* key will reset the Gang Count for spindle 1. For a two-spindle controller, pressing 0 twice (00) and then *Enter* will reset spindle 2.

Fault Retry

The Insight IC allows the user to retry the fastening if a fault occurs during operation in a powerhead. When a tightening results in a fault for one or more bolts, they may be backed out and then retightened. Only those bolts with a fault or all the bolts in a group or powerhead can be retried. The number of retries (up to 10) can also be specified. The retightening always starts with the first step in the configuration.

The following parameters must be set from the *Engage* step to get Fault Retry to operate.

- Backout High Torque Limit
- Retry Backout Angle
- Retry Backout Speed
- Retry Fault Action
- Number of Retries
- Final Fault Backout Angle
- Final Fault Action

Torque Control Parameters

The *Torque Control Strategy* is based on reaching a programmed torque target. For any of the *Step #n* drop boxes, if *Torque Control* is selected as the strategy the parameters listed below are displayed. Click on any parameter for an explanation, as well as its allowable range and default value.

- [Free Speed](#)
- [Shiftdown Point](#)
- [Torque Target](#)
- [Torque Hi Limit](#)
- [Torque Lo Limit](#)
- [Angle Hi Limit](#)
- [Angle Lo Limit](#)
- [Torque Threshold](#)
- [Shiftdown Speed](#)
- [Torque Overshoot](#)
- [EOR Data Select](#)
- [Sync Enable](#)

If you wish to program a *Torque Control with Yield Override* strategy, then you must set the following additional parameters.

[Yield Point %](#)
[Slope Interval](#)
[Angle Into Yield](#)
[Fail on Yield Override](#)
[Activate Yield Override](#)

Angle Control Parameters

The *Angle Control Strategy* is based on a programmed angle of rotation after the torque threshold is reached. For any of the *Step #n* drop boxes, if *Angle Control* is selected as the strategy the parameters listed below are displayed. Click on any parameter for an explanation, as well as its allowable range and default value.

[Free Speed](#)
[Shiftdown Point](#)
[Angle Target](#)
[Angle Hi Limit](#)
[Angle Lo Limit](#)
[Torque Hi Limit](#)
[Torque Lo Limit](#)
[Torque Threshold](#)
[Shiftdown Speed](#)
[Angle Overshoot](#)
[EOR Data Select](#)
[Sync Enable](#)

If you wish to program a *Angle Control with Yield Override* strategy, then you must set the following additional parameters.

[Yield Point %](#)
[Slope Interval](#)
[Angle Into Yield](#)
[Fail on Yield Override](#)
[Activate Yield Override](#)

Setting Yield Control Parameters

The Yield Control strategy allows the tightening to be based on the onset of bolt yield. For any of the *Step #n Strategy* drop boxes, if *Yield Control* is selected as the strategy the parameters listed below are displayed. Click on any parameter for an explanation, as well as its allowable range and default value.

[Free Speed](#)
[Shiftdown Speed](#)
[Yield Point %](#)
[Slope interval](#)
[Torque Hi Limit](#)
[Torque Lo Limit](#)
[Angle Hi Limit](#)
[Angle Lo Limit](#)
[Torque Threshold](#)
[Shiftdown Point](#)
[Angle into Yield](#)
[EOR Data Select](#)
[Sync Enable](#)

Re-torque Control Parameters

The *Re-torque Control* strategy is used to apply additional torque to a previously tightened joint to overcome relaxation that occurs after tightening. *Re-torque Control* can only be used after either *Torque Control* or *Angle Control* strategies. For any of the *Step #n Strategy* drop boxes, if *Re-torque Control* is selected as the strategy the parameters listed below are displayed. Click on any parameter for an explanation, as well as its allowable range and default value.

[Re-Torque Angle](#)
[Re-Torque Overshoot](#)
[EOR Data Select](#)
[Sync Enable](#)

Backout Control Parameters

The *Backout Control* strategy allows the user to unfasten bolts for a programmed number of degrees and at a programmed speed. If the torque encountered during backout exceeds the Torque Hi Limit setting, the operation is aborted.

For any of the *Step #n Strategy* drop boxes, if *Backout Control* is selected as the strategy the parameters listed below are displayed. Click on any parameter for an explanation, as well as its allowable range and default value.

[Backout Speed](#)

[Backout Angle](#)

[Torque Hi Limit](#)

[EOR Data Select](#)

[Sync Enable](#)

Delay Control Parameters

The *Delay Control* strategy allows the user to insert a time delay into the tightening. For any of the *Step #n Strategy* drop boxes, if *Delay Control* is selected as the strategy the parameters listed below are displayed. Click on either parameter for an explanation, as well as its allowable range and default value.

[Delay](#)

[Sync Enable](#)

Jog Control Parameters

The *Jog Control* strategy allows the user to run the tool at a slow speed (the Soft Speed defined in the *Engage* step) so the tool's socket can easily engage the bolt head. Jog Control must be in the *Step #1 Strategy* drop box. If *Jog Control* is selected, the parameters listed below are displayed. Click on any parameter for an explanation, as well as its allowable range and default value.

[Jog Torque](#)

[Jog Angle](#)

[Sync Enable](#)

Prevailing Torque Control Parameters

The *Prevailing Torque Control* strategy is used with certain specialized fasteners, such as self-tapping types, that require an initial period of high torque even before the fastener applies any clamp load. This strategy allows the Insight IC to apply the correct amount of initial torque to overcome the fastener resistance.

For any of the *Step #n Strategy* drop boxes, if *Prevailing Torque Control* is selected as the strategy the parameters listed below are displayed. Click on any parameter for an explanation, as well as its allowable range and default value.

[Free Speed](#)
[Cut-in Angle](#)
[Cut-in Torque Hi Limit](#)
[Target Prevailing Angle](#)
[Torque Hi](#)
[Torque Lo](#)
[Prevailing Angle Hi](#)
[Prevailing Angle Lo](#)
[Snug Torque](#)
[Chord Length](#)
[Slope Deviation](#)
[EOR Data Select](#)
[Sync Enable](#)

Drag Torque Control Parameters

The *Drag Torque Control* strategy is similar to the *Prevailing Torque Control* strategy, in that there is an initial high torque phase, followed by the actual drag torque phase. However, drag torque mode is not used for tightening. Instead, it is typically used as a quality control step after components are assembled. For example, this strategy can be used to detect binding within a gear mechanism after it is assembled.

For any of the *Step #n Strategy* drop boxes, if *Drag Torque Control* is selected as the strategy, the parameters listed below are displayed. Click on any parameter for an explanation, as well as its allowable range and default value.

[Free Speed](#)
[Target inspection Angle](#)
[Cut-in Angle](#)

[Cut-in Torque Hi Limit](#)
[Torque Hi](#)
[Torque Lo](#)
[Snug Torque](#)
[EOR Data Select](#)
[Sync Enable](#)

Bypass Parameters

The *Bypass* strategy is unique, in that it is either off or on, it has no selectable parameters. The bypass mode applies only to powerheads. It is used to allow a powerhead to operate with different spindles depending upon the tightening configuration selected. When a powerhead is programmed with different configurations, unwanted spindles can be bypassed so only the desired spindles are used. The bypass strategy can only be programmed in the *Step #1 Strategy* drop box.


This is the end of the *Set-up* menu *Advanced Set-up Screen* section. Scroll down to continue your tour or click on another topic at the left.

System Initialization Screen

You can use the *Set-up* menu *System Initialization* screen to set a broad variety of basic Insight IC parameters. These include General parameters (such as plant name and display language), Date/Time parameters (such as time, date format, and enable daylight savings), and Communications parameters (such as baud rate and communications protocols). Below is a typical *System Initialization* screen. Click on the screen elements that have red highlights to learn their function.

SETUP

System Initialization



06/28/01

14:34:23

System Initialization Wizard

General

System Name

Plant Name

MAC Address: AG18FF

Insight: 000.000.000

Language

English

☐ Confirm for configuration change

MCE Version

E.O.R. Filter

Date/Time

Time

Date Format

MM/DD/YY

Spring Forward Date

MM/DD/YY

Date

Daylight Savings

Fall Back Date

MM/DD/YY

Contrast

UP

DOWN

Communications

Data Port

COM 1

Parity

None

Bits Per Character

7

Comm Protocol

None

Baud Rate

1200

of Stop Bits

1

Multi Drop Address

Quick Set-up

Advanced Set-up

System Initialization

Spindle Initialization

Password & Powerhead Settings

Parameter Transfer & Smart Chip

Screen Element	Description
Wizard Box	Displays information or instructions for the screen element that is highlighted.
System Name	Enter a name for your Insight system (maximum of 12 letters). The name will appear at the top of printed reports.
Plant Name	Enter a name for the plant (maximum of 12 letters). The name will appear at the top of printed reports.
MAC Address	Displays the MAC address of the controller
Software Version Box	Displays the software version in use.
MCE Version	Use this button to display the Insight's Motor Control Electronics version.
Language	Select Insight's display language. The choices are English, French, German, Spanish, and Italian.
Configuration Confirm Checkbox	When this box is checked, the user must confirm all changes made to the configuration being run when the configuration is changed from the Run Main screen.
E.O.R. Filter	The End of Run (EOR) Filter determines what data are displayed, in addition to torque and angle, at the end of each tightening cycle. Below is additional information on the EOR filter.

Time	Allows the user to reset the correct time. Press the Expand key then enter the time in 24 hour format.
Date	Allows the user to set the correct date. Press the Expand key then enter the date.
Date Format	Use this drop box to select MM/DD/YY or DD/MM/YY.
Daylight Savings	Use this drop box to enable or disable automatic time adjustment to compensate for daylight savings.
Spring Forward Date	If Daylight Savings is enabled, enter the date at which it begins. (The date clocks are set ahead one hour.)
Fall Back Date	If Daylight Savings is enabled, enter the date at which it ends. (The date clocks are set back one hour.)
Contrast Up	Adjusts screen contrast up.
Contrast Down	Adjusts screen contrast down.
Data Port	Use this drop box to select the communications port setting. The options are: COM 1, COM 2, COM 3, COM 4, Profibus, or Devicenet.
Baud Rate	Use this drop box to set the baud rate at 1200, 2400, 4800, 9600, 19200, or 38400, 57600, or 115,200.
Parity	Use this drop box to set parity to None, Odd, or Even.
# of Stop Bits	Use this drop box to set the number of stop bits to 1 or 2.
Bits Per Character	Use this drop box to set the bits per character to 7 or 8.
Multi Drop Address	Enter the address number for the network port's host Data Out protocol. The allowable range is 00 to 99.
Comm Protocol	Select the communications protocol that will be assigned to the communications port selected in the Data Port drop box. The options are None, Host Data Out, E.O.R. Data Out, PFCS, and Bar Code. See additional explanation of these options below.
Settings Button	This button may or may not be present, and the button's name may change, depending on certain settings. It is present when Bar Code, Profibus, or Devicenet have been selected in the Data Port or Comm Protocol drop boxes. If the button is present, clicking it brings up another screen as discussed below.
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

EOR Filter

The End of Run (EOR) filter determines the data displayed, in addition to torque and angle, at the end of each tightening cycle. Clicking on the E.O.R Filter button on the *System Initialization* screen brings up a screen listing the following parameters. To select a parameter from the list, put a check mark in the adjacent check box. To do this, navigate to the box and press the Enter key. As noted in

the table below, some of the parameters are checked to display by default. For these parameters, navigating to the box and pressing Enter will uncheck the box.

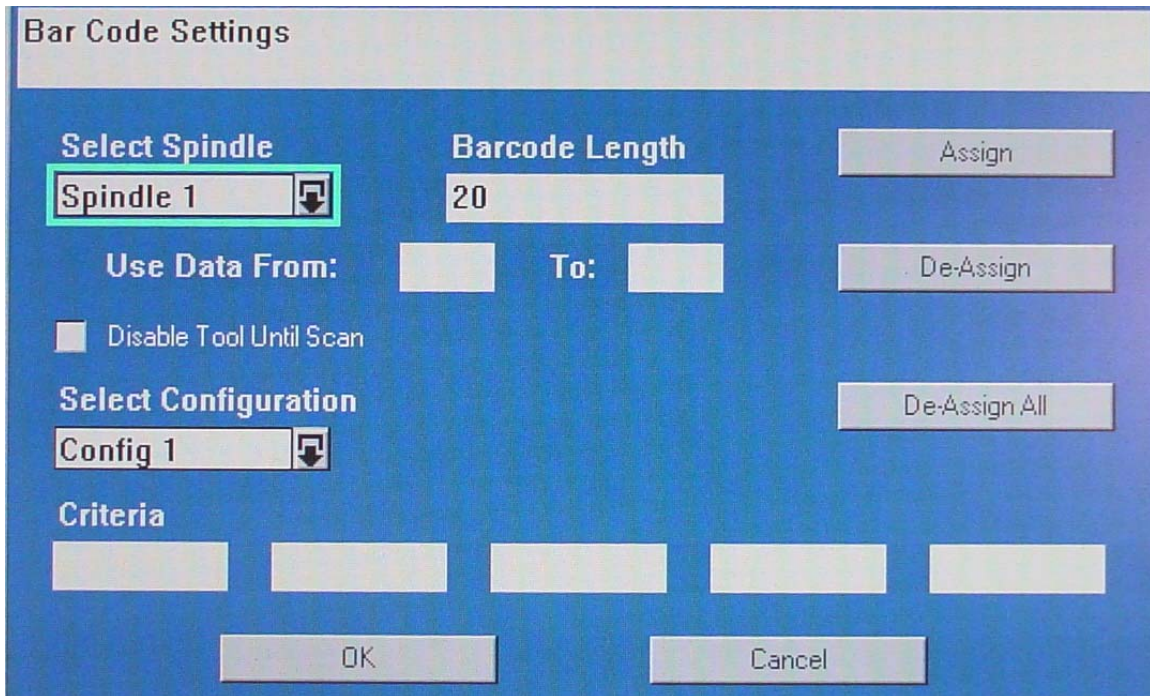
Parameter	Explanation
Shutdown Code	A code created after every cycle; for details click here . By default, this parameter is displayed.
Peak Current	The maximum current draw during the fastening cycle. By default, this parameter is displayed.
Cycle Time	The elapsed time for the fastening cycle. By default, this parameter is displayed.
Peak Slope	Peak slope of the torque vs. angle curve
Final Slope	Final slope of the torque vs. angle curve
Prevailing Torque Slope	The slope of the tightening curve for a prevailing torque strategy
Peak Cut-in Torque	The peak cut-in torque for the prevailing torque and drag torque strategies
Peak Prevailing Torque	The maximum torque measured during the prevailing torque phase of a prevailing torque strategy
Average Prevailing Torque	The average torque measured during the prevailing torque phase of a prevailing torque strategy
Angle at Seat	The degrees of angle rotated when seating torque is reached
Torque at Seat	The measured torque value when seating torque is reached
Peak Drag torque	The maximum torque measured during the drag torque phase of a drag torque strategy
Average Drag Torque	The average torque measured during the drag torque phase of a drag torque strategy
Minimum Drag Torque	The minimum torque measured during the drag torque phase of a drag torque strategy

Communication Protocol Setup

There are four options in the Comm Protocol drop box.

1. None
2. Host Data Out is a handshaking protocol. The host sends a request for data, Insight sends the data, and the host sends a response that the data were received. Click [here](#) to see the data output structure.
3. E.O.R. Data Out sends one line of data after every cycle, without a host request. Click [here](#) to see the data output structure.
4. Bar Code. Select this option if you have a bar code scanner connected to the COM Port. When you select this option a button labeled *Bar Code Settings* appears on the lower right corner of the screen.

If the data port is set to Bar Code, clicking on the *Bar Code Settings* button brings up the screen below. Click on the screen elements that have red highlights to learn their function.



The image shows a software dialog box titled "Bar Code Settings". It has a blue background with white text and buttons. The dialog is organized into several sections. At the top, there's a title bar. Below it, the "Select Spindle" section has a dropdown menu showing "Spindle 1" with a red highlight around it and a small icon to its right. To the right of this is the "Barcode Length" section with a text box containing "20". Further right is an "Assign" button. Below the spindle selection is a "Use Data From:" label followed by an empty text box, and a "To:" label followed by another empty text box. To the right of these is a "De-Assign" button. Below that is a checkbox labeled "Disable Tool Until Scan". The "Select Configuration" section has a dropdown menu showing "Config 1" with a red highlight around it and a small icon to its right. To the right of this is a "De-Assign All" button. At the bottom, there's a "Criteria" section with five empty text boxes. At the very bottom are "OK" and "Cancel" buttons.

Bar Code Settings

Select Spindle
Spindle 1

Barcode Length
20

Assign

Use Data From: To: De-Assign

☐ Disable Tool Until Scan

Select Configuration
Config 1

De-Assign All

Criteria

OK Cancel

Screen Element	Description
Spindle	The spindle number to which the bar code data are attached.
Configuration	The configuration to which the Criteria (see below) are attached.
Length	Enter the size of the bar code. Range is 1-40 characters with a default value of 20.
Use Data From	Defines where in the bar code string the software looks for the starting point of the configuration selection criteria. Range is 1-39, and must be less than the value in the Use Data To box.
Use Data To	Defines where in the bar code string the software looks for the end position of the configuration selection criteria. Range is 1-39, and must be greater than the value in the Use Data From box.
Criteria	The user can enter a bar code value to assign to the configuration. The number of characters must be the same as the range defined in the Use Data From and Use Data to boxes.
Assign	When pressed, this button assigns the displayed spindle and configuration to the criteria entered on the screen.
De-Assign	When pressed, this button de-links the displayed spindle and configuration from the criteria.
De-Assign All	When pressed, all configuration and criteria linked together for the displayed spindle will be de-linked.
Disable Tool Until Scan Check	When checked, the Insight will disable the tool until it receives the bar code scan.
OK	Use this button to save all changes and return to the System Initialization screen.
Cancel	Use this button to cancel all changes and return to the System Initialization screen.

If the data port is set to Profibus, clicking on the *Profibus Settings* button brings up the screen below. Click on the screen elements that have red highlights to learn their function.

Screen Element	Description
Wizard Box	Displays information or instructions for the screen element that is highlighted.
Profibus Operation	Use this drop box to enable or disable Profibus.
Profibus Address	Enter the Profibus address. Range is 2-126, with a default value of 100.
Tool Control	Use this drop box to enable or disable tool control.
EOR Data	Use this drop box to enable or disable EOR data collection.
OK	Use this button to save all changes and return to the System Initialization screen.
Cancel	Use this button to cancel all changes and return to the System Initialization screen.

If the data port is set to Devicenet, clicking on the *Devicenet Settings* button brings up the screen below. Click on the screen elements that have red highlights to learn their function.

Screen Element	Description
Wizard Box	Displays information or instructions for the screen element that is highlighted.
Devicenet Operation	Use this drop box to enable or disable Devicenet.
Devicenet Address	Enter the Devicenet address. Range is 1-63, with a default value of 30.
Baud Rate	Use this drop box to select the baud rate. Selections are 125 kb/sec, 250 kb/sec, and 500 kb/sec. The default is 500 kb/sec.
Tool Control	Use this drop box to enable or disable tool control.
EOR Data	Use this drop box to enable or disable EOR data collection.
OK	Use this button to save all changes and return to the System Initialization screen.
Cancel	Use this button to cancel all changes and return to the System Initialization screen.


This is the end of the *Set-up* menu *System Initialization Screen* section. Scroll down to continue your tour or click on another topic at the left.

Spindle Initialization Screen

You will use this screen to identify which Ingersoll-Rand spindles (tools) are attached to the Insight controller, and to set certain basic spindle operating parameters, such as torque units, start mode, and so on. This screen also has an Auto Calibration button for calibrating the spindles against an external transducer, a Custom Tool button to add a custom tool to the controller's tool list, and a Link Tool button to assign a tool to a particular configuration. Below is the *Spindle Initialization* screen. Click on the screen elements that have red highlights to learn their function.

SETUP
Spindle Setup

06/28/01
14:36:12



Spindle Initialization


Select Spindle
Spindle 1

Tool Parameters

Tool Name NONE	Tube Nut Disabled	Auto Calibration
TR Value 0.00	Angle Constant 0.000	Custom Tool

Spindle Parameters

Torque Units Nm	Spindle Status Disabled	Remote Tool En/Dis Off
Config Select Discrete	Spindle Operation Handheld	Start Mode Throttle



Quick Set-up

Advanced Set-up

System Initialization

Spindle Initialization

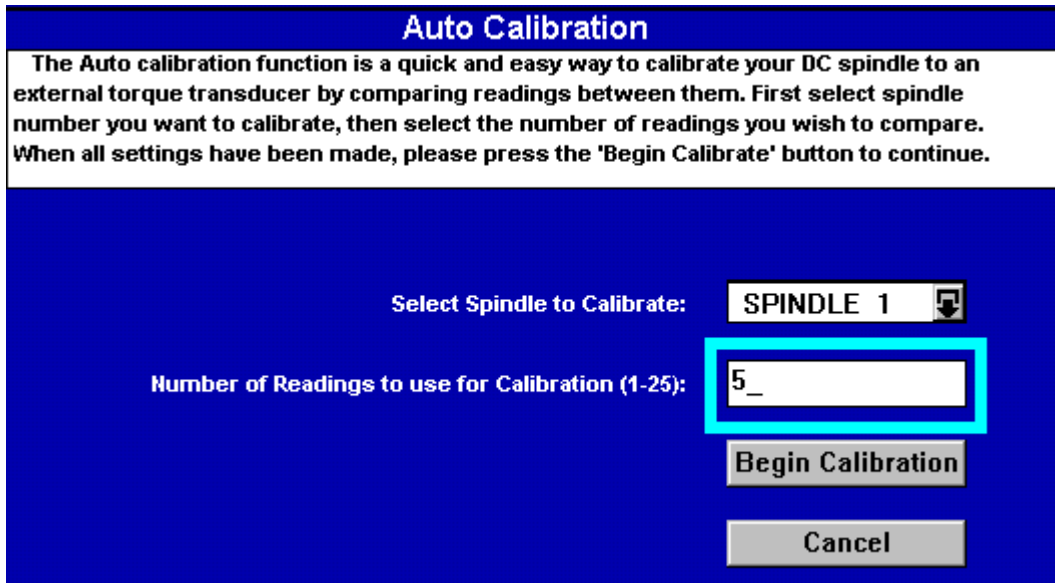
Password & Powerhead Settings

Parameter Transfer & Smart Chip

Screen Element	Description
Wizard Box	Displays information or instructions for the screen element that is highlighted.
Select Spindle	Use this drop box to select either Spindle 1, Spindle 2. This drop box will not be present if your Insight is a one-spindle model.
Tool Name	Use this drop box to select the model number of the I-R tool attached to the selected spindle. If your tool's model number is not listed, see additional instructions below. This box is not selectable (it is grayed out) for Smart Chip tools or if Link Tool is active.
Tube Nut	If you want the Insight controller to operate a tube nut tightening tool, set this drop box to Enable.
Auto Calibration	Pressing this button allows you to calibrate your tool(s) using an external torque transducer, as described below.
TR Value	Use this data entry box to enter the tool's actual Transducer Range value. The value (labeled TR) is on the tool's calibration label. Entering the correct value aids calibration.
Angle Constant	Use this data entry box to enter the tool's actual Angle Constant value. The value is on the tool's calibration label.
Custom Tool	This button brings up a screen that allows you to set-up and program a tool not listed in the Tool Type drop box, as described below.
Torque Units	Use this drop box to select torque units. The options are Nm, Ft-lb, In-lb, Kg-m, or Kg-cm.
Config. Select	Use this drop box to select the method of switching from one configuration to another. The options are Internal, External Binary, and External Discrete. Internal is selected from the Run Main screen. Discrete indicates an external signal (such as from a switch, socket tray, or PLC). Binary indicates an external coded binary signal.
Spindle Status	To operate the tool attached to the spindle, select Enabled. Selecting Disabled prevents tool operation.
Spindle Operation	Use this drop box to identify if the start signal is coming from a hand-operated throttle (Hand Tool) or from an I/O signal (Machine Mounted).
Rem. Tool En./Dis.	This allows the tool to be remotely enabled and disabled through the I/O connector. Options are On and Off.
Start Mode	Use this drop box to select the type of signal indicating tool start. The options are throttle, pulse, or dual. For hand-held tools, select throttle. Pulse indicates a momentary external signal. Dual requires two switch closures (because some tools require the operator to activate two switches simultaneously to ensure his hands are safely away from the machinery).
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

Auto Calibration

Auto calibration allows you to calibrate the Transducer Range for the Insight's tool(s) using an external torque transducer. Clicking on the *Auto Calibration* button on the main *Spindle Initialization* screen brings up the first of three auto-calibration screens, as shown below.



Auto Calibration

The Auto calibration function is a quick and easy way to calibrate your DC spindle to an external torque transducer by comparing readings between them. First select spindle number you want to calibrate, then select the number of readings you wish to compare. When all settings have been made, please press the 'Begin Calibrate' button to continue.

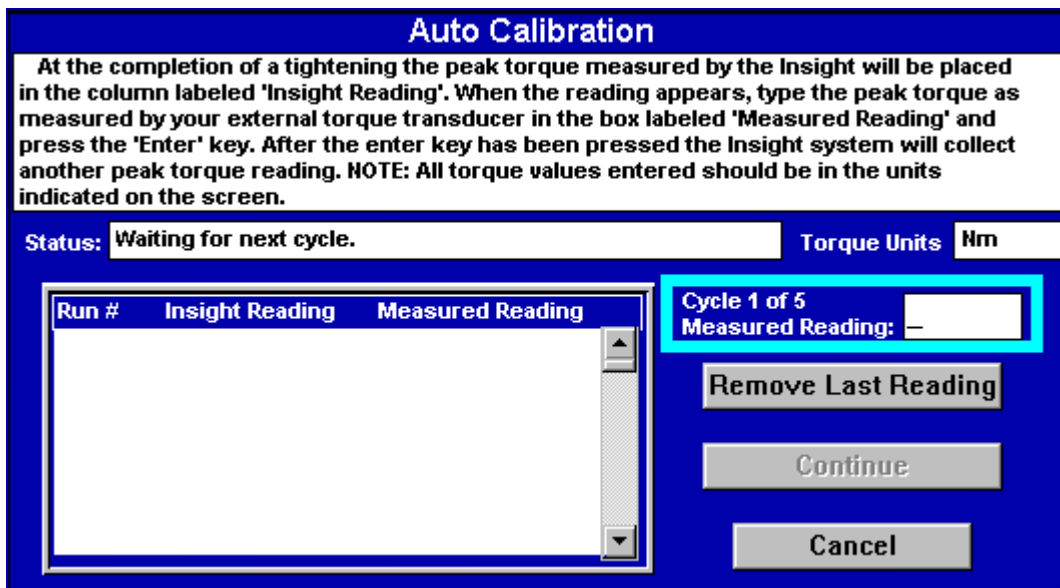
Select Spindle to Calibrate: SPINDLE 1

Number of Readings to use for Calibration (1-25): 5

Begin Calibration

Cancel

Follow the instructions in the wizard box at the top of the screen. When you press the *Begin Calibration* button, the second auto-calibration screen displays, as shown below.



Auto Calibration

At the completion of a tightening the peak torque measured by the Insight will be placed in the column labeled 'Insight Reading'. When the reading appears, type the peak torque as measured by your external torque transducer in the box labeled 'Measured Reading' and press the 'Enter' key. After the enter key has been pressed the Insight system will collect another peak torque reading. NOTE: All torque values entered should be in the units indicated on the screen.

Status: Waiting for next cycle. Torque Units Nm

Run #	Insight Reading	Measured Reading
-------	-----------------	------------------

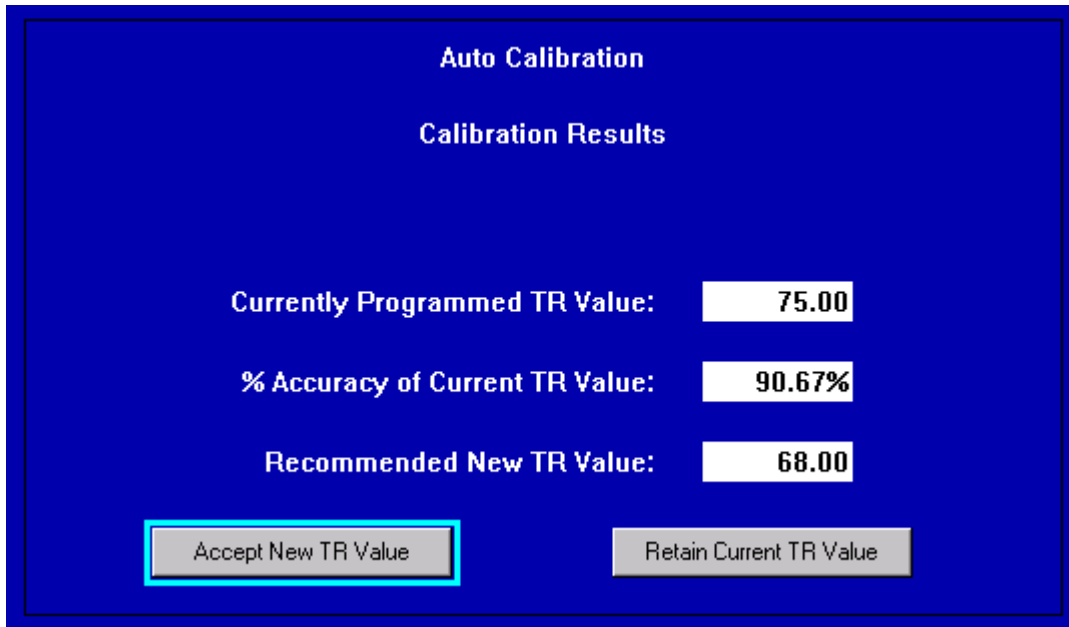
Cycle 1 of 5
Measured Reading:

Remove Last Reading

Continue

Cancel

Follow the instructions in the wizard box to capture each calibration reading. The Status box will remind you where you are in the calibration cycle. Use the Insight's numeric keypad to enter the calibration readings in the Cycle # Measured Reading box. When you have entered readings for the correct number of cycles, the *Continue* button will become active. Pressing the *Continue* button will bring up the final auto-calibration screen, as shown below.



The image shows a screenshot of a software interface titled "Auto Calibration" with a subtitle "Calibration Results". The background is dark blue. It displays three rows of data, each with a label on the left and a value in a white box on the right. The first row shows "Currently Programmed TR Value:" followed by "75.00". The second row shows "% Accuracy of Current TR Value:" followed by "90.67%". The third row shows "Recommended New TR Value:" followed by "68.00". At the bottom, there are two buttons: "Accept New TR Value" on the left and "Retain Current TR Value" on the right. The "Accept New TR Value" button is highlighted with a red rectangular border.

Auto Calibration	
Calibration Results	
Currently Programmed TR Value:	75.00
% Accuracy of Current TR Value:	90.67%
Recommended New TR Value:	68.00
<input type="button" value="Accept New TR Value"/> <input type="button" value="Retain Current TR Value"/>	

This third screen displays the calibration results. You can either accept or reject the new calibration factor. If you reject it, the existing Transducer Range value is retained. After making the selection you are asked if you wish to print an Auto Calibration report. Finally, you will be returned to the main *Spindle Initialization* screen.

Custom Tool

This button allows you to set-up and calibrate a tool not listed in the *Tool Type* drop box. Clicking on the *Custom Tool* button on the main *Spindle Initialization* screen brings up the screen shown below. Click on the screen elements that have red highlights to learn their function.

Custom Tool
Select the custom tool you would like to edit.

Custom Tool <input type="text" value="Custom Tool 1"/>	Tool Name <input type="text"/>	Motor Type <input type="text" value="40 Series"/>
Transducer Range <input type="text" value="10.00"/> Current Units: Nm	Angle Constant <input type="text" value="5.000"/>	

OK Cancel

Screen Element	Description
Wizard Box	Displays information or instructions for the screen element that is highlighted.
Custom Tool	Select either Custom 1 or Custom 2.
Tool Name	Use this data entry box to assign a tool name.
Motor Type	Select the motor type by selecting the series number of the I-R tool you are using. The options are 120 series, 40 series, and 30 Series.
Transducer Range	Use this data entry box to enter the tool's Transducer Range value. The value (labeled TR) is on the tool's calibration label. Entering the correct value aids calibration.
Angle Constant	Use this data entry box to enter the tool's Angle Constant value. The value is on the tool's calibration label.
OK	Use this button to save all changes and return to the Spindle Initialization screen.
Cancel	Use this button to cancel all changes and return to the Spindle Initialization screen.

This is the end of the *Set-up menu Spindle Initialization Screen* section. Scroll down to continue your tour or click on another topic at the left.

Password and Powerhead Settings Screen

This screen is used to set the Insight's four levels of user passwords, and to set-up certain **powerhead** functions. Below is the *Password and Powerhead Settings* screen. Click on the screen elements that have red highlights to learn their function. Scroll down for additional information on the password and powerhead functions.

SETUP
Password and Parameter Tran

07/02/01
13:23:25

Password Setup

Password Password Logout View Password Access Lockout Time
Timer is off

Powerhead Settings

Powerhead Operation
ON

Powerhead Name

☐ Stop All Spindles on Reject

Spindle	Group
1	1
2	2

Quick Set-up
Advanced Set-up
System Initialization
Spindle Initialization
Password & Powerhead Settings
Parameter Transfer & Smart Chip

Screen Element	Description
Password / Password Logout	Pressing this button brings up a box for entering the four digit password or to log out of passwords and relock the Insight system.
Change Password	Pressing this button brings up a box that allows the user to change the password.
View Password	Pressing this button allows a level 3 or higher user to see a list of current passwords.
Access Lockout Time	If a user has logged into Insight with a password and no additional actions occur within the lockout time, Insight returns to the Run Main screen. With this drop box, the user can set the logout time to intervals ranging from 30 seconds to 60 minutes. A 10-second countdown timer activates to alert the user to the logout. The lockout time may also be set to OFF. This disables the password function, allowing unrestricted access to all Insight operations.
Powerhead Operation	Use this drop box to select a powerhead operation to be on or off.
Powerhead Name	Use this data entry box to assign a name to the powerhead
Stop All Spindles on Reject	When this box is checked, all spindles in a powerhead will stop as soon as any spindle in the powerhead fails a fastening.
Spindle / Group	Using these buttons and drop boxes, the user can assign tightening groups within a powerhead operation.
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

The Password Function

Access to Insight IC screens is password controlled. A few screens require no passwords, but most require a certain level of password authorization to make changes to the screen settings. In addition to a no-password option (called Level 0) the Insight has four owner-controlled access levels each requiring a unique four-digit password. Level 1 allows the least access to Insight's functions, while Level 4 allows complete access. The password levels have been designed to accommodate typical industrial job functions. Those job functions, and the factory set password default settings, are shown in the table below.

Password Level	Typical Job Functions	Factory Set Default Password
Level 0	No password protection	None
Level 1	Operator, Electrical or Mechanical Maintenance	1111
Level 2	Insight IC Programmer	2222
Level 3	Quality Control Engineer	3333
Level 4	Factory or Line Supervisor	4444

If you do not wish to use any passwords (that is, allow all users access to every screen), you must sign in at Level 4 and set the *Access Lockout Time* drop box to OFF.

If a user attempts to access or change a screen to which he or she is not authorized, a dialogue box will appear requesting the necessary password level. To change a password, the user must sign in on that particular level. The table below shows the password level required to access the Insight IC Menu and Sub Menu screens.

Menu	Sub Menu	Password Level Required
Run	Main	0
	Tightening Curves	0
	Stats Summary	0
	Cycle Log	2, 3, 4
	View Parameters	0
Statistics	Summary	2, 3, 4
	Export	2, 3, 4
	Tightening Curves	2, 3, 4
	Cycle Log	0
	Stats Alarm	2, 3, 4
Set-up	Quick Set-up	2, 4
	Advanced Set-up	2, 4
	System Initialization	2, 4
	Spindle Initialization	2, 4
	Password and Powerhead	All passwords can change their value

	Settings	
	Parameter Transfer and Smart Chip	2, 4
Diagnostics	System test	1, 2, 4
	Discrete Inputs	1, 2, 4
	Discrete Outputs	1, 4
	Event Log	1, 2, 4
	Tool Test	1, 4
Print	All Screens	0
Help	All Screens	0

The Powerhead Function

The powerhead function offers the user powerful control over tightening operations. The first step in understanding this function is to understand the function's terminology. A *Powerhead* is two or more spindles that all start with a common start signal and have a common configuration. A *Group* is one or more spindles in a powerhead that have an identical number of fastening steps. A *Step* is one fastening operation (strategy), such as torque control, angle control, etc. A *Configuration* is a step or sequence of steps that define a distinct tightening operation. For the Insight IC each spindle or powerhead can have up to 32 configurations. A *sync* (synchronization) point is a parameter that can be set to require all spindles in a group to complete the step before starting the next step.

To perform various powerhead operations, follow the steps below.

Assigning a Powerhead

1. Select On from the *Powerhead Operation* drop box.
2. If desired, enter a name in the *Powerhead Name* data entry box.
3. Select the group number for each spindle.

To edit a powerhead follow the above steps, changing the group numbers as desired.

Deleting a Powerhead

1. Select Off from the *Powerhead Operation* drop box.
2. When the warning box appears, select Yes

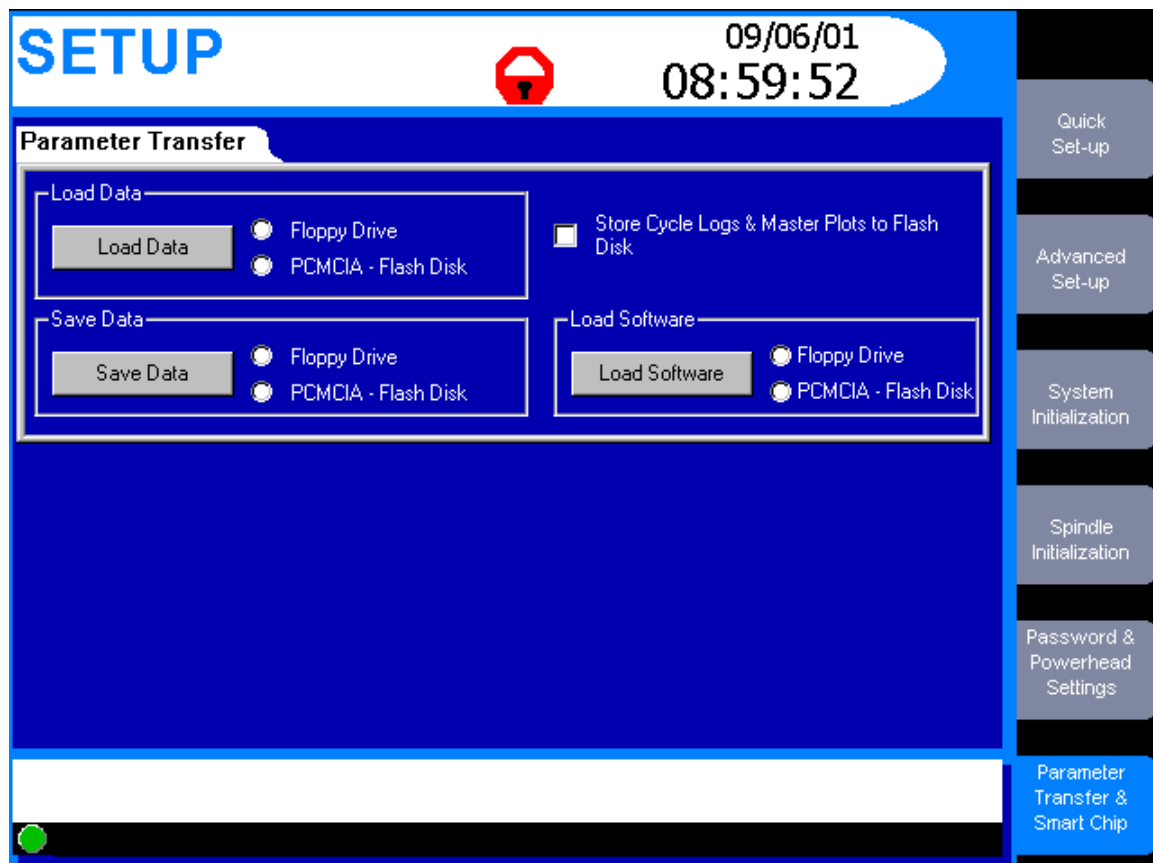
This is the end of the *Set-up* menu *Password and Powerhead Settings Screen* section. Scroll down to continue your tour or click on another topic at the left.

Parameter Transfer and Smart Chip Screen

The parameter transfer function is used to download or save Insight IC parameters or new versions of the Insight software from or to removable media

Some Ingersoll-Rand tools are equipped with a Smart Chip. These chips store parameters that are specific to each tool and read or displayed on the Insight IC. This capability will be in a future release of the Insight IC.

Below is the *Parameter Transfer and Smart Chip* screen. Click on the screen elements that have red highlights to learn their function.



Screen Element	Description
Load Data	To load parameter data set click on this button after first checking the adjacent box to specify whether the upload is from a disk inserted in the floppy disk drive or a flash disk inserted in the PCMCIA slot.
Save Data	To save parameter data set click on this button after first checking the adjacent box to specify whether the data is to be stored on a floppy disk inserted in the disk drive or a flash disk inserted in the PCMCIA slot. You will be prompted to name the saved file.
Store ... to Flash Disk	Checking this box saves the Master Plots and Cycle Log data to a flash disk inserted in the PCMCIA slot.
Load Software	To upload new software click on this button after first checking the adjacent box to specify whether the upload is graphics software or Motor Controller software.
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

This is the end of the *Set-up* menu *Parameter Transfer and Smart Chip Screen* section and the end of *The Set-up Menus* topic. To go to the next section of this manual click on the arrow below, or click on another topic at the left.

The Diagnostics Menus

The *Diagnostics* menu allows the user to check the overall system health of the Insight IC Fastening System with Graphics Display. This function also diagnoses system problems. The user can view diagnostic test results and store them for future reference. The *Diagnostics* menu has five sub-menu screens. Click on the links below to go to the discussion of those screens, or continue your tour and these topics will be introduced in the sequence shown. The thumbnails above each menu screen link will help you recognize their look and screen layout.

[System Test Screen](#)

[Discrete Input Screen](#)

[Discrete Outputs Screen](#)

[Event Log Screen](#)

[Tools Test Screen](#)

System Test Screen

With this screen the user can request and display diagnostics test results on the tightening tools (**spindles**) and on the **Motor Controllers** (MCs). Below is a typical *System Test* screen graphic. Click on the screen elements that have red highlights to learn their function.

DIAGNOSTICS 09/19/2001
System Test 4 10:36:27

Diagnostic Wizard:
Press this button to initiate the diagnostic tests.

Expected Range:

Recommended Action on Failure:

Select Spindle **Spindle 1**

Start Test **Save Results**

New Test			Time/Date Stamp		
Tool	Value	Result	Tool	Value	Result
Motor temperature			Motor temperature	0.00	PASS
Motor test			Motor test		
Amplifier offset			Amplifier offset	0.00 % Shunt C	PASS
Bridge offset			Bridge offset	0.00 % Shunt C	PASS
Shunt calibration			Shunt calibration	0.00 % Ideal	FAIL
Excitation V. +ve			Excitation V. +ve	0.00 Volts	FAIL
Excitation V. -ve			Excitation V. -ve	0.00 Volts	FAIL
Hall Signal Test			Hall Signal Test	0.00	FAIL
MCE MCE Temperature			MCE MCE Temperature	0.00 deg. C	FAIL
Battery Voltage			Battery Voltage	0.00 Volts	PASS
A/D Ref. Voltage			A/D Ref. Voltage	0.00 Volts	

System Test
Discrete Inputs
Discrete Outputs
Event Log
Tool Test

Screen Element	Description
Wizard Box	Displays information or instructions for the screen element that is highlighted.
Select Spindle	Use this drop box to select either Spindle 1 or Spindle 2 for testing. This drop box will not be present if your Insight is a one-spindle model.
Start Test	This button initiates the system diagnostics test. The test results are then displayed on the left-hand side of the screen's main window.
Save Results	This button stores the system diagnostics test results and displays them on the right-hand side of the screen's main window.
Main Window	When the user performs a systems test, the results are displayed as a table on the left-hand side of this window (the side labeled NEW). If there are test results already displayed there, they are overwritten. If the Save Results button is pressed, the test results displayed on the left-hand side of the window are moved to the right-hand side and stored, overwriting any stored test results previously displayed there. Below is additional information on the specific test results displayed in this window.
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

The following system test data are displayed in the main window. When the Insight IC displays these data, it will show the value measured during the test and also whether that value is within allowable parameters (PASS) or not (FAIL).

Test Data Element	Explanation
TOOL	
Motor temperature	Checks motor temperature
Motor test	Motor's Kt value (Peak Torque/Peak Motor Torque)
Amplifier offset	MC's offset voltage (as % of Shunt Cal voltage)
Bridge offset	Torque transducer's offset voltage (as % of Shunt Cal voltage)
Shunt calibration	Front-end electronics gain (as % of ideal Shunt Cal voltage)
Excitation voltage +ve	Transducer's positive excitation voltage
Excitation voltage -ve	Transducer's negative excitation voltage
Hall signal test	Checks if Hall sensors are operating correctly
MOTOR CONTROLLER	
MC temperature	Displays MC's internal temperature
A/D reference voltage	Measures A/D converter's reference voltage

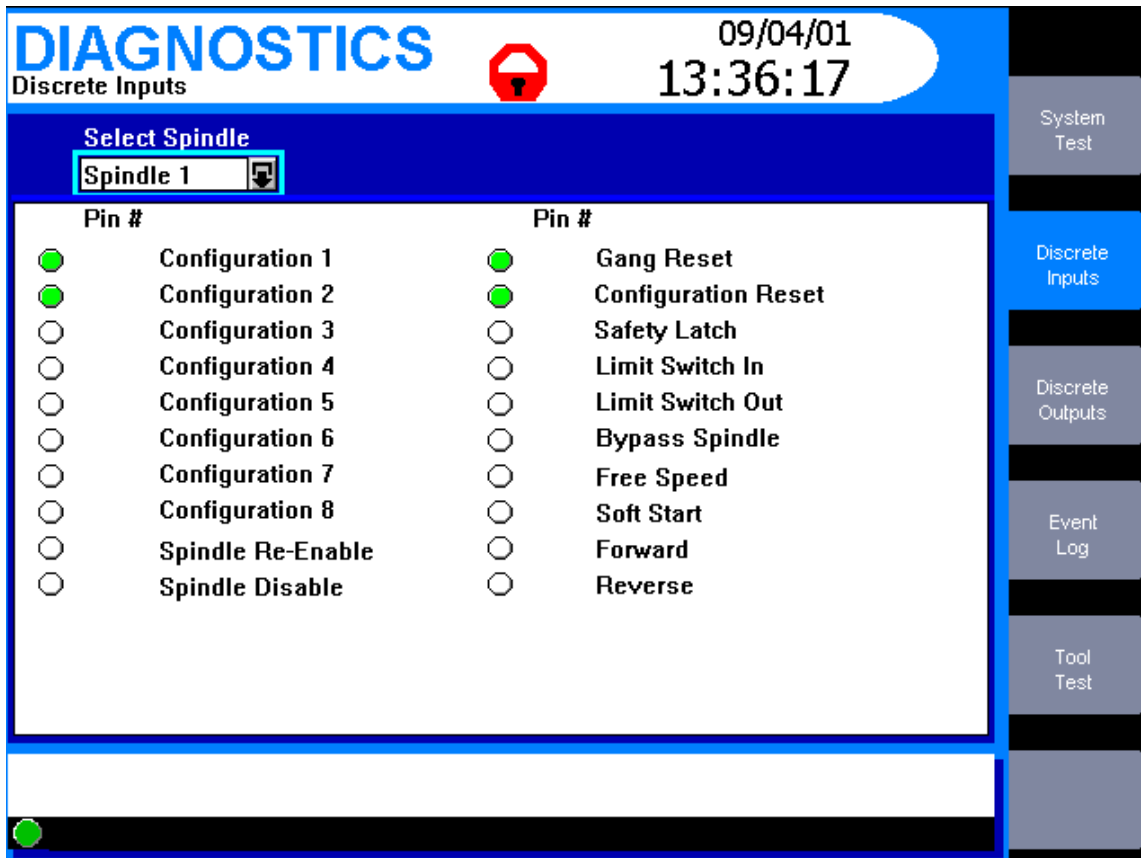
Note that the *System Test* window is a display box. The user can enter this box simply by navigating to the window with the arrow keys, and using the arrow keys to scroll through the table.

As the user scrolls through the *System Test* parameters, information on each parameter displays in the wizard box. This includes an explanation of the parameter, the expected range (if applicable), and guidance on what to do if the parameter test failed.

This is the end of the *Diagnostics* menu *System Test Screen* section. Scroll down to continue your tour, or click on another topic at the left.

Discrete Inputs Screen

On the left side panel of the Insight controller are Spindle I/O (Input/Output) connectors. (For an illustration of where these connectors are located, click [here](#).) With this screen, the user can determine whether any of the required input signals are present. Below is a typical *Discrete Inputs* screen graphic. Click on the screen elements that have red highlights to learn their function. See below for additional explanation of this function.



Screen Element	Description
Select Spindle	Use this drop box to select either Spindle 1 or Spindle 2 for testing. This drop box will not be present if your Insight is a one-spindle model.
Main Window	The spindle input signals are listed on the screen. If the input signal is present, the circle to the left of the signal will be filled-in. If no signal is present, the circle will be white. Below is additional information on the input signals displayed in this window.
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

The Insight IC can be delivered in three versions. A one- or two-spindle Base System with 8 input signals per spindle, a one- or two-spindle Expanded System with 24 input signals per spindle, and a one-spindle Ultra Expanded System with 40 input signals. When energized, the circle to the left of the input signal name in the main screen window will be filled in.

The input signals and their connector pin designations are shown in the tables below.

	Insight IC Base System			
	Spindle 1		Spindle 2	
	Block #	Pin #	Block #	Pin #
Inputs	Block #	Pin #	Block #	Pin #
Configuration 1	2	I-1	4	I-1
Configuration 2	2	I-2	4	I-2
Spindle #n Disable	2	I-3	4	I-3
Spindle #n Enable	2	I-4	4	I-4
Free Speed	2	I-5	4	I-5
Soft Start	2	I-6	4	I-6
Forward	2	I-7	4	I-7
Reverse	2	I-8	4	I-8

	Insight IC Expanded System				Insight IC Ultra System	
	Spindle 1		Spindle 2		Spindle 1	
	Block #	Pin #	Block #	Pin #	Block #	Pin #
Inputs	Block #	Pin #	Block #	Pin #	Block #	Pin #
Configuration 1	2	I-1	4	I-1	2	I-1
Configuration 2	2	I-2	4	I-2	2	I-2
Configuration 3	2	I-3	4	I-3	2	I-3
Configuration 4	2	I-4	4	I-4	2	I-4
Configuration 5	2	I-5	4	I-5	2	I-5
Configuration 6	2	I-6	4	I-6	2	I-6
Configuration 7	2	I-7	4	I-7	2	I-7
Configuration 8	2	I-8	4	I-8	2	I-8
Spindle #n Enable	6	I-1	10	I-1	6	I-1
Spindle #n Disable	6	I-2	10	I-2	6	I-2
Gang Reset	6	I-3	10	I-3	6	I-3
Config Reset	6	I-4	10	I-4	6	I-4
Safety Latch	6	I-5	10	I-5	6	I-5

Limit Switch In	6	I-6	10	I-6	6	I-6
Limit Switch Out	6	I-7	10	I-7	6	I-7
Bypass Spindle	6	I-8	10	I-8	6	I-8
Free Speed	8	I-1	12	I-1	8	I-1
Soft Start	8	I-2	12	I-2	8	I-2
Forward	8	I-3	12	I-3	8	I-3
Reverse	8	I-4	12	I-4	8	I-4
Not Available	8	I-5	12	I-5	8	I-5
Not Available	8	I-6	12	I-6	8	I-6
Not Available	8	I-7	12	I-7	8	I-7
Not Available	8	I-8	12	I-8	8	I-8
						The Ultra System has additional inputs reserved for future expansion on: Block 10 Pins I-1 thru I-8 AND Block 12 Pins I-9 thru I-16

This is the end of the *Diagnostics* menu *Discrete Inputs Screen* section. Scroll down to continue your tour or click on another topic at the left.

Discrete Outputs Screen

On the left side panel of the Insight controller are Spindle I/O (Input/Output) connectors. (For an illustration of where these connectors are located, click [here](#).) With this screen, the user can artificially activate an output signal. This function is typically used for troubleshooting; for example to send a signal to an external device (such as a PLC) to verify the device is operating correctly.

Below is a typical *Discrete Outputs* screen graphic. Click on the screen elements that have red highlights to learn their function. See below for additional explanation of this function.

DIAGNOSTICS
Discrete Outputs

08/24/2001 08:27:36

Select Spindle **Spindle 1**

☐ 1:0-1 Accept ☐ 1:0-6 Low Angle
☐ 1:0-2 Reject Buzzer ☐ 1:0-7 Gang Complete
☐ 1:0-3 High Torque ☐ 1:0-8 Cycle Complete
☐ 1:0-4 High Angle ☐ 5:0-1 Reject
☐ 1:0-5 Low Torque ☐ 5:0-2 Stats Alarm

Spare #	Status	Output Function
5:0-3	<input type="checkbox"/>	Not Active
5:0-4	<input type="checkbox"/>	Not Active
5:0-5	<input type="checkbox"/>	Not Active
5:0-6	<input type="checkbox"/>	Not Active

System Test
Discrete Inputs
Discrete Outputs
Event Log
Tool Test

Screen Element	Description
Select Spindle	Use this drop box to select either Spindle 1 or Spindle 2 for testing. This drop box will not be present if your Insight is a one-spindle model.
Output Signals Window	The spindle output signals are listed on the screen. If the check box to the left of the output signal is checked, that output signal will be sent. Below is additional information on the input signals displayed in this window.
Output Function	Additional output signals can be selected using these drop boxes.
Status	A series of checkboxes to make output signals active.
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

The Insight IC can be delivered in three versions. A one- or two-spindle Base System with 8 output signals per spindle, a one- or two-spindle Expanded System with 24 output signals per spindle, and a one-spindle Ultra Expanded System with 40 output signals. To manually activate an output, check the checkbox next to the output name.

The output signals and their connector pin designations are shown in the tables below.

Insight IC Base System				
Outputs	Spindle 1		Spindle 2	
	Block #	Pin #	Block #	Pin #
Accept	1	O-1	3	O-1
Reject	1	O-2	3	O-2
Cycle Complete	1	O-3	3	O-3
High Torque	1	O-4	3	O-4
Low Torque	1	O-5	3	O-5
High Angle	1	O-6	3	O-6
Low Angle	1	O-7	3	O-7
Programmable	1	O-8	3	O-8

Outputs	Insight IC Expanded System				Insight IC Ultra System	
	Spindle 1		Spindle 2		Spindle 1	
	Block #	Pin #	Block #	Pin #	Block #	Pin #
Accept	1	O-1	3	O-1	1	O-1
Reject Buzzer	1	O-2	3	O-2	1	O-2
High Torque	1	O-3	3	O-3	1	O-3
High Angle	1	O-4	3	O-4	1	O-4
Low Torque	1	O-5	3	O-5	1	O-5
Low Angle	1	O-6	3	O-6	1	O-6
Gang Complete	1	O-7	3	O-7	1	O-7
Cycle Complete	1	O-8	3	O-8	1	O-8
Reject	5	O-1	9	O-1	5	O-1
Stats Alarm	5	O-2	9	O-2	5	O-2
Programmable	5	O-3	9	O-3	5	O-3

Programmable	5	O-4	9	O-4	5	O-4
Programmable	5	O-5	9	O-5	5	O-5
Programmable	5	O-6	9	O-6	5	O-6
Programmable	5	O-7	9	O-7	5	O-7
Programmable	5	O-8	9	O-8	5	O-8
Programmable	7	O-1	11	O-1	7	O-1
Programmable	7	O-2	11	O-2	7	O-2
Programmable	7	O-3	11	O-3	7	O-3
Programmable	7	O-4	11	O-4	7	O-4
Programmable	7	O-5	11	O-5	7	O-5
Programmable	7	O-6	11	O-6	7	O-6
Programmable	7	O-7	11	O-7	7	O-7
Programmable	7	O-8	11	O-8	7	O-8
					The Ultra System has additional programmable inputs on: Block 9 Pins O-1 thru O-8 AND Block 11 Pins O-1 thru O-8	

This is the end of the *Diagnostics* menu *Discrete Outputs Screen* section. Scroll down to continue your tour or click on another topic at the left.

Event Log Screen

The *Event Log* screen is a large scrollable window that logs the date and time that certain important Insight events occur. The events recorded include hardware and software faults (such as a tool over-temperature event), and significant user actions (such as changes to a tool's transducer range or angle constant). This record of significant events can help users investigate and troubleshoot problems.

Screen Element	Description
Select Spindle	Use this drop box to select the spindle to be tested.
Lamp Test	Check one of the radio buttons (circles) to turn the lamp test on or off. If the lamp test is on the Insight cycles through all the lights on the tool so the user can see if they are working properly. A lamp output signal will also be sent if there is an external light box attached to the Insight so the user can also verify that it is working correctly.
Speed	This box displays the tool's dynamic speed.
Torque	This box displays the dynamic torque, which can indicate the drag torque in the tool's gearbox.
Angle	This box displays a continuous readout of the tool's angle count. The display continues until the Angle reset button on the screen is pressed.
Message Box	The Message Box summarizes system status and provides warnings and alarms.
Insight Controller Software Status Box	This bar shows the status of the Insight Controller Software (ICS), the optional software that allows the Insight to communicate over a network. If the light in the box is green, the ICS is connected and operational. Depending on the ICS's communication status, the box may display additional information

This is the end of the *Tool Test Screen* section and the end of *The Diagnostics Menus* topic. To go to the next section of this manual click on the arrow below, or click on another topic at the left.

Print Menus

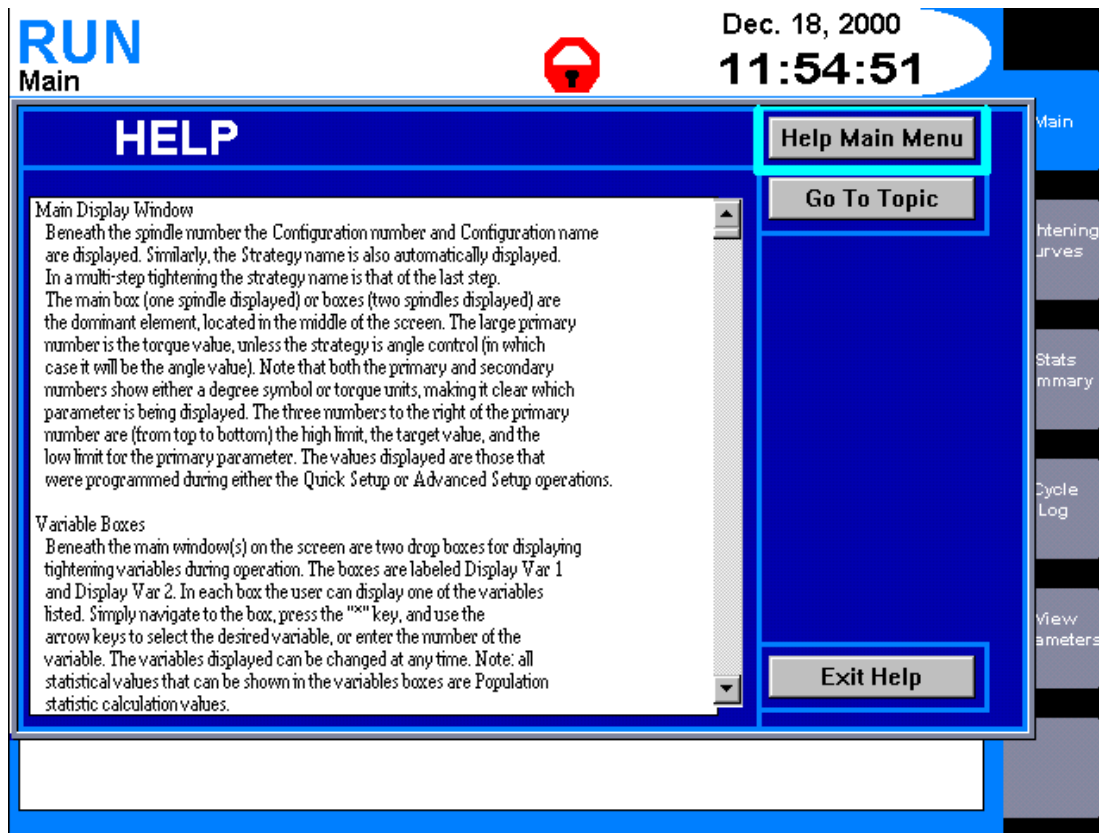
The Insight IC Fastening System with Graphics Display can print a large number of standard reports on fastening data, statistics, system settings and parameters, and many other topics. From within any of the controller's menus or sub-menus, the user can press the *Print Main Menu Key* on the Insight front panel, and a print menu displays. The display is context sensitive. That is, Insight recognizes what menu it is in (Run, Statistics, Set-up, or Diagnostics) when the user presses the *Print* key, and displays the appropriate report printing options.

While Insight offers many printed report options, each one is self-explanatory, and it is not necessary to explain each print screen. Simply use the arrow keys and the *Enter* key to navigate through and select the option you want. Occasionally, you may be asked to mark a checkbox (use the *Enter* key to check or uncheck the box) or enter a number in a data entry box (use the *numeric keypad*).

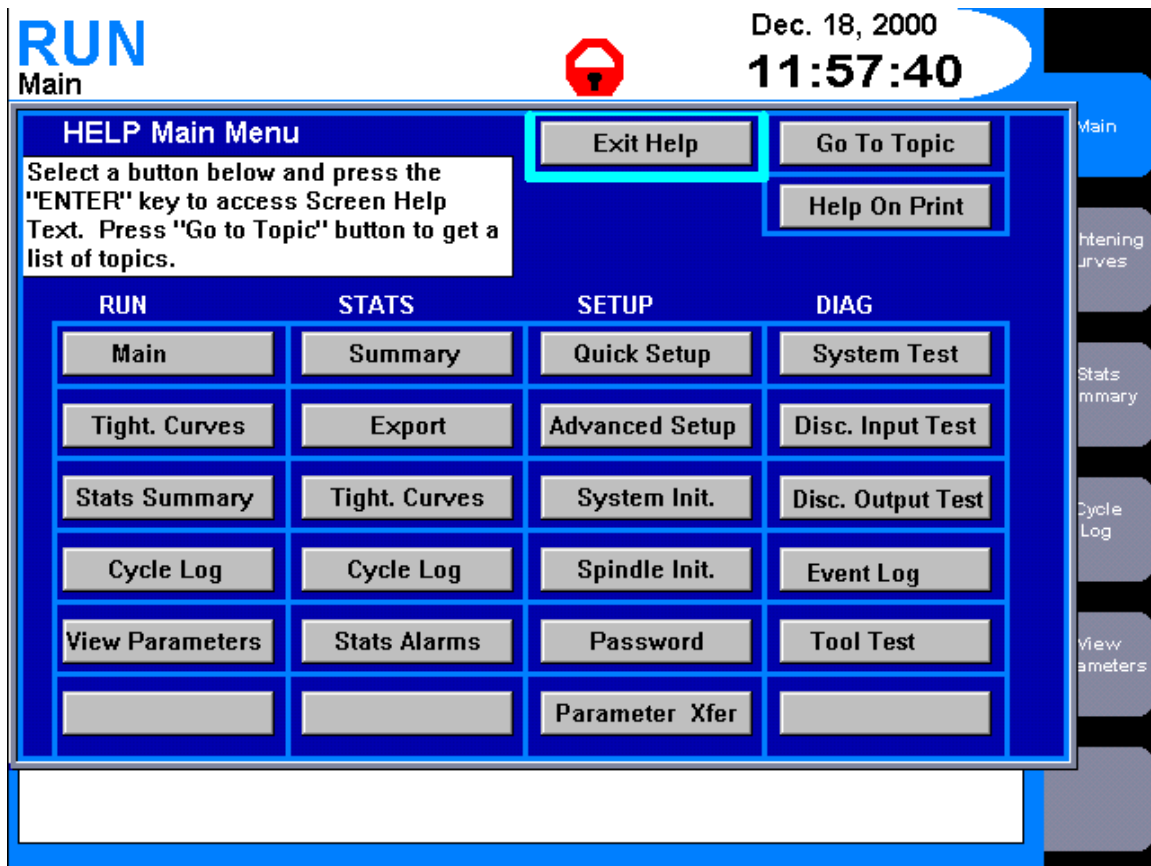
To go to the next section of this manual click on the arrow below, or click on another topic at the left.

Help Menus

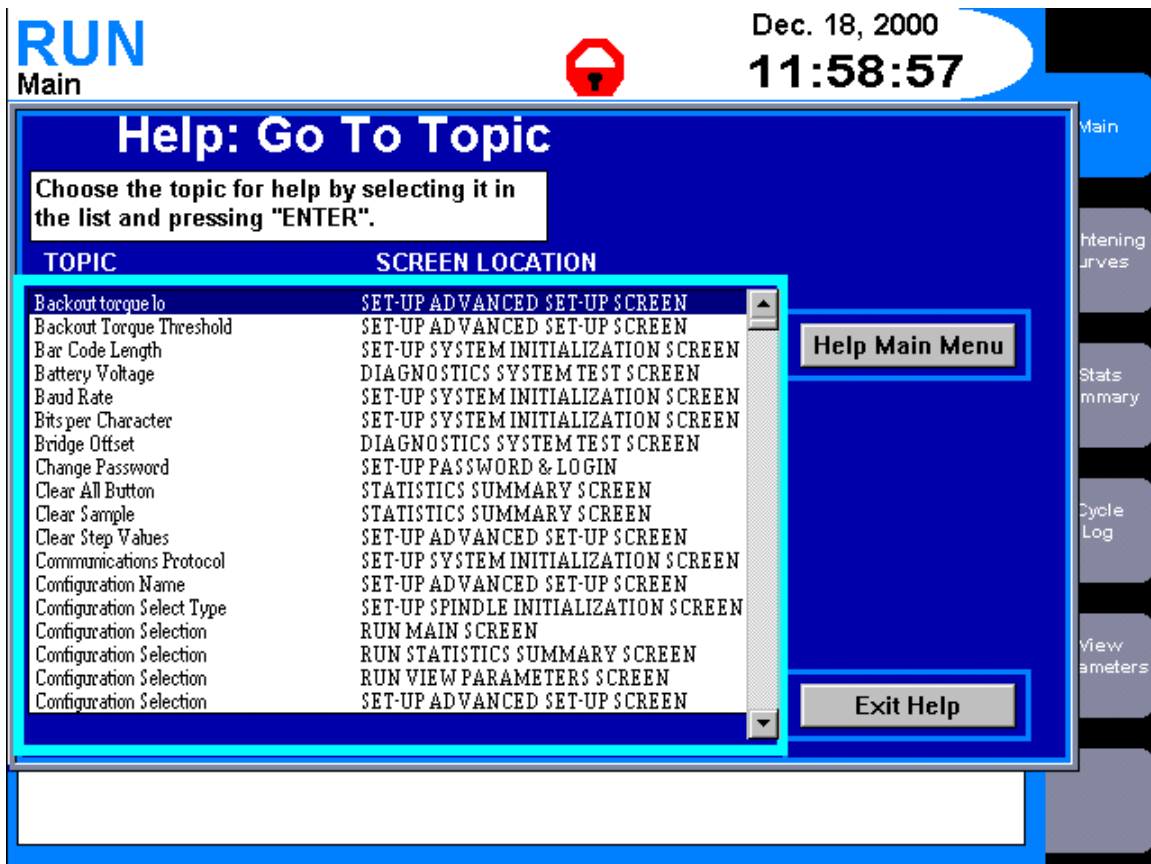
The Insight IC Fastening System with Graphics Display has built-in *Help* functions that the user can access at any time, simply by pressing the *Help Main Menu Key* on the front panel. The Help is context sensitive. That is, when the user presses the Help key the Insight recognizes what main menu and sub-menu it is in, and it also recognizes the current (highlighted) screen element, and displays the appropriate information for the highlighted item. Below is a typical *Help* screen. (It is for the *Run Menu, Main* screen sub-menu). Click your mouse on screen elements that have red highlights to learn their function.



Pressing the *Help Main Menu* button on the main menu screen brings up the *Help* screen shown below. Note that Insight's four main functions are listed, and there is a button for every sub-menu under each function. Pressing any of the sub-menu buttons brings up a *Help* file on that topic.



Pressing the *Go To Topic* button on the first Help screen brings up the Help screen shown below. There is an alphabetical list of Insight topics in the drop box on the left of the screen. Also shown is the principal screen location where each topic is addressed, entered, set, selected, and so on. To display the Help file for a topic, navigate to the drop box with the arrow keys and press the *Expand* key. Then use the arrow keys to bring that topic to the top of the list, and press *Enter*.



This is the end of the *Help Menus* topic, and the end of the entire section devoted to *Menus and Sub-Menus*. To go to the next section of this manual click on the arrow below, or click on another topic at the left.

Parameters

This section describes every parameter used by the Insight IC Fastening System with Graphics Display. If you are looking for information on a specific parameter, click [here](#) to go to the alphabetic list of all the Insight parameters. Otherwise scroll down through this brief section to learn how the section is organized and the kinds of parameter information it provides.

Earlier in this document you learned to work with all of the Insight's main menu and sub-menu screens. You learned that for all of these menus and sub-menus there are many individual parameters that can be selected, set, specified, adjusted, and so on. Some of the parameters are unique, only applying to one specific menu screen. Others are common and appear in many different menu screens.

If you encounter a parameter with which you are unfamiliar, this section is designed to be a quick way for you to learn everything about that parameter, regardless of where it appears within any of the Insight's menus. To learn how we have presented the parameter information click on the example below, then roll your mouse over each screen element in the graphic.

Angle Lo Limit

Angle Lo Limit	The minimum angle (in degrees) through which the fastener must turn. (User-entered)
-----------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Quick Set-up	Data entry box #8 under Torque Control strategy	0 - 32000	0
Set-up	Quick Set-up	Data entry box #6 under Angle Control strategy	0 - 32000	Angle Target - 10%
Set-up	Advanced Set-up	In Parameter List when strategy is Torque Control	0 - 32000	0
Set-up	Advanced Set-up	In Parameter List when strategy is Angle Control	0 - 32000	Angle Target - 10%

Screen Element	Description
Angle Lo Limit	The parameter's name.
Box to right of name	The parameter's definition, and whether the parameter is entered by the user or is automatically calculated by the Insight system.
Make the first three columns one roll-over	For user-entered parameters, these columns tell you all the locations from which the parameter can be programmed. For system-calculated parameters, these columns tell you where the parameter is displayed.
Make the last two columns one roll-over	For each parameter location, these columns give the parameter's allowable range and default value, if applicable.

Below is a complete alphabetical list of all the parameters used by the Insight IC Fastening System with Graphics Display. Click on any parameter to display its information.

# for Sigma	The number of fastenings used to calculate sigma. (System-calculated)
--------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Stats Summary	Population and Sample Statistics Tables	NA	NA
Stats	Summary	Population and Sample Statistics Tables	NA	NA

# Hi Rejects	The number of fastenings rejected because the target parameter's final value exceeded the acceptable maximum value. (System-calculated)
--------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Stats Summary	Population Statistics Table	NA	NA
Stats	Summary	Population Statistics Table	NA	NA

# Lo Rejects	The number of fastenings rejected because the target parameter's final value did not reach the acceptable minimum value. (System-calculated)
--------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Stats Summary	Population Statistics Table	NA	NA
Stats	Summary	Population Statistics Table	NA	NA

# of Chords	The number of slope calculations that must exceed the Deviation Limit (see parameter) to define the end of the Prevailing Torque Zone. (User-entered)
-------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	Prevailing Torque Strategy	1 - 10	1

# of Stop Bits	The number of stop bits sent in the communications string when Insight communicates with an external RS-232 serial device. (User-entered)
----------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Drop box under Communications	1 or 2	1

# Rejects %	Number and % of fastenings that did not meet the tightening limits. (System-calculated)
-------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Main	Under the Var. 1 and Var. 2 drop boxes	NA	NA
Run	Stats Summary	Population Statistics Table	NA	NA
Stats	Summary	Population Statistics Table	NA	NA

# Rejects Hi\Lo	The number of fastenings that were rejected because they above \ below the tightening limits. (System-calculated)
-----------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Main	Under the Var. 1 and Var. 2 drop boxes	NA	NA
Run	Stats Summary	Population Statistics Table	NA	NA
Stats	Summary	Population Statistics Table	NA	NA

# OK	The number of fastenings that met the tightening parameters. (System-calculated)
------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Main	Under the Var. 1 and Var. 2 drop boxes	NA	NA
Run	Stats Summary	Population Statistics Table	NA	NA
Stats	Summary	Population Statistics Table	NA	NA

6 Sigma	Six times the value of sigma (σ). (System-calculated) (See Sigma in Parameters listing.)
---------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Main	Under the Var. 1 and Var. 2 drop boxes	NA	NA
Run	Stats Summary	Under the Population Statistics and Sample Statistics drop boxes	NA	NA
Stats	Summary	Under the Population Statistics and Sample Statistics drop boxes	NA	NA

A/D Reference Voltage	A voltage measurement used to test the analog to digital reference voltage. Insight measures the voltage and assigns either PASS or FAIL. (System-calculated)
------------------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Diagnostics	System Test	Within the main window	NA	NA

Acceleration	The rate at which a tool accelerates up to its free speed, where 100% is its maximum acceleration. (User-entered)
---------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List for the Engage step	30 - 100%	90%

Access Lockout Time	If a user has logged into Insight with a password and no additional actions occur within the lockout time, the Insight locks the software. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Password and Powerhead Settings	Access Lockout Time drop box	OFF - 60 min. in specific increments	5 minutes

Activate Yield Override	When checked activates the yield override function torque control and angle control strategies. . (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	When Torque Control or Angle Control is selected as the strategy	Checked or Unchecked	Unchecked

Amplifier Offset	The signal offset voltage generated by the Motor Controller's front end electronics (expressed as % of Shunt Cal voltage). Insight measures the voltage and assigns either PASS or FAIL. (System-calculated)
-------------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Diagnostics	System Test	Within the main window	NA	NA

Angle at Seat	The degrees of angle rotated when seating torque is reached (applies to a prevailing torque strategy). (System-calculated)
----------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Main	Under the Var. 1 and Var. 2 drop boxes	NA	NA
Set-up	System Initialization	Under the EOR (End of Run) Filter button	NA	NA

Angle Cnt at Drag TQ	For a drag torque strategy, the degrees of angle rotated when the drag torque step is complete. (System-calculated)
-----------------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Main	Under the Var. 1 and Var. 2 drop boxes	NA	NA

Angle Constant	A value used by the Insight to translate motor Hall pulses into spindle degrees of rotation. Enter the Angle Constant value found on the tool's calibration label in the Angle Constant data entry box. (User-entered)
-----------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Spindle Initialization	A data entry box within the main window	Depends on tool selected	Depends on tool selected

Angle for Backout	The number of degrees the tool will reverse to achieve backout. (User-entered)
--------------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List when strategy is Backout	0 - 32000	0

Angle for Backout Retry	Number of degrees the tool will automatically reverse on a tightening fault, before a retry is started. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up (in Engage step)	In Parameter List when strategy is Fault Backout	0 - 32000	0

Angle for Fault Backout	Number of degrees the tool will automatically reverse on a tightening fault, when all retries have failed. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up (in Engage step)	In Parameter List when strategy is Fault Backout	0 - 32000	0

Angle Hi Limit	The maximum allowable angle through which the fastener may turn. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Quick Set-up	Data entry box #7 under Torque Control strategy	0 - 32000	32000
Set-up	Quick Set-up	Data entry box #5 under Angle Control strategy	0 - 32000	Angle Target + 10%
Set-up	Quick Set-up	Data entry box #8 under Yield Control strategy	0 - 32000	32000
Set-up	Advanced Set-up	In Parameter List when strategy is Torque Control	0 - 32000	32000
Set-up	Advanced Set-up	In Parameter List when strategy is Angle Control	0 - 32000	Angle Target + 10%
Set-up	Advanced Set-up	In Parameter List when strategy is Yield Control	0 - 32000	32000
Set-up	Advanced Set-up	In Parameter List when strategy is Fault Backout	0 - 32000	Backout Angle + 10%

Angle Into Yield	The number of degrees the tool rotates beyond the onset of yield to constitute complete tightening. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Quick Set-up	Data entry box #5 under Yield Control strategy	0 - 32000	0
Set-up	Advanced Set-up	In Parameter List when Torque, Angle, or Yield Control strategy is selected	0 - 32000	0

Angle Into Yield Overshoot	If tightenings are routinely overshooting the Angle Into Yield, the tool will be shut off this many degrees before Angle Into Yield. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List when strategy is Yield Control	0 - Angle Into Yield	

Angle Lo Limit	The minimum angle through which the fastener must turn. (User-entered)
-----------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Quick Set-up	Data entry box #8 under Torque Control strategy	0 - 32000	0
Set-up	Quick Set-up	Data entry box #6 under Angle Control strategy	0 - 32000	Angle Target - 10%
Set-up	Quick Set-up	Data entry box #9 under Yield Control strategy	0 - 32000	0
Set-up	Advanced Set-up	In Parameter List when strategy is Torque Control	0 - 32000	0
Set-up	Advanced Set-up	In Parameter List when strategy is Angle Control	0 - 32000	Angle Target - 10%
Set-up	Advanced Set-up	In Parameter List when strategy is Yield Control	0 - 32000	0

Angle Overshoot	If tightenings are consistently overshooting the Angle Target, the tool will be shut off this many degrees before the Angle Target. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List when strategy is Angle Control	0 - Angle Target	0

Angle Target	The desired angle through which the fastener should turn. (User-entered)
---------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Quick Set-up	Data entry box #4 under Angle Control strategy	0 - 32000	None
Set-up	Advanced Set-up	In Parameter List when strategy is Angle Control	0 - 32000	None

Auto Increment To	This tells the Insight which configuration will be selected upon the next throttle pull. (User-entered)
--------------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Quick Set-up	In the Engage step	0 - 32	0

Avg Prevailing Torque	The average prevailing torque calculated from the last 360° of torque data points prior to the seating torque. (System-calculated)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Behind the E.O.R Filter button	Parameter may be checked or unchecked	Unchecked

Backout Angle Hi	The maximum angle through which the fastener will turn during the backout step. (User-entered)
-------------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List when strategy is Backout	0 - 32000	0

Backout Angle Lo	The minimum angle through which the fastener will turn during the backout step. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List when strategy is Backout	0 - 32000	0

Backout Hi Torque Limit	The maximum permissible torque value for the backout phase. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List when strategy is Backout	Depends on tool selected	Maximum of tool

Backout Speed	The tool's speed during the backout phase. One of the parameters listed in the Engage step. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List for every fastening strategy	20-100% of the tool's full free speed	90% of the tool's full free speed

Baud Rate	The data transfer rate Insight uses to communicate with an external RS-232 serial device. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	In the main window, under Communications	1200, 2400, 4800, 9600, 19200, 38400, 56,600, 115,200	115,200

Bits Per Character	The number of data bits per character used for external serial RS-232 communications. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	In the main window, under Communications	7 or 8	7

Bridge Offset	The offset voltage generated by the torque transducer (expressed as % of Shunt Cal voltage). Insight measures the voltage and assigns either PASS or FAIL. (System-calculated)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Diagnostics	System Test	Within the main window	NA	NA

CAM	A statistical parameter used to measure system performance. (System-calculated)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Main	Var. 1 and Var. 2 drop boxes	NA	NA
Run	Stats Summary	In Parameter List in main window	NA	NA
Stats	Summary	In Parameter List in main window	NA	NA
Stats	Stats Alarm Set-up	In the two Parameter Lists in the main window	0 - 99	Alarm Off

Capability	A statistical parameter used to measure system performance. (System-calculated)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Main	Var. 1 and Var. 2 drop boxes	NA	NA
Run	Stats Summary	In Parameter List in main window	NA	NA
Stats	Summary	In Parameter List in main window	NA	NA
Stats	Stats Alarm Set-up	In the two Parameter Lists in the main window	0 - 99	Off

Change Password	Pressing this button brings up a box with the levels and the current passwords. The level 4 user can then change the passwords by entering a new value and then reentering it to confirm the change. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Password and Powerhead Settings	This button is only available if the Insight is unlocked at any password level	NA	NA

Chord Length	The number of degrees over which the slope is calculated. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	Prevailing Torque Strategy	0 - 100	8

Config # Config	Insight can be programmed with up to 32 separate fastening operations, called configurations. Each has a unique Configuration Number from 01 through 32, and may also have a name assigned. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Main	Select Configuration to be Run	01 - 32	Last selected configuration
All other screens	All other screens	Select Configuration to view	01 - 32	Configuration selected on Run Main screen

Config Name	A suitable alphanumeric name can be assigned to any of Insight's 32 available configurations. Note: User must press the Expand key to change this parameter. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	Config Name data entry box	Any alphanumeric name (12 characters max.)	None

Config. Select	Use this drop box to select whether the configuration is selected internally (through the Run Main screen) or externally through the Insight's I/O connector. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Spindle Initialization	Config. Select drop box	Internal, External Binary, or External Discrete	Internal

Configuration Confirm	When this box is checked, the user must confirm all changes made to the configuration being run when the configuration is changed from the Run Main screen. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	A checkbox in the General parameters window labeled "Confirm for configuration change"	Checked or Unchecked	Unchecked

Cp	A statistical parameter used to measure system capability. (System-calculated)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Main	Var. 1 and Var. 2 drop boxes	NA	NA
Run	Stats Summary	In Parameter List in main window	NA	NA
Stats	Summary	In Parameter List in main window	NA	NA
Stats	Stats Alarm Set-up	In the two Parameter Lists in the main window	0 - 9.9	Alarm Off

CpK	A statistical parameter used to measure system capability. (System-calculated)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Main	Var. 1 and Var. 2 drop boxes	NA	NA
Run	Stats Summary	In Parameter List in main window	NA	NA
Stats	Summary	In Parameter List in main window	NA	NA
Stats	Stats Alarm Set-up	In the two Parameter Lists in the main window	0 - 9.9	Alarm Off

Cut-In Angle	The angle from the start of cut-in (snug torque) to the successful completion of the cut-in phase; applies to prevailing torque and drag torque strategies. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List when strategy is Prevailing Torque Control	0 - 32000	0
Set-up	Advanced Set-up	In Parameter List when strategy is Drag Control	0 - 32000	0

Cut-In Torque HI Limit	The maximum permissible torque during the cut-in phase (the initial high-torque phase) of the prevailing torque and drag torque strategies. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List when strategy is Prevailing Torque Control	0 to max. torque of tool	0
Set-up	Advanced Set-up	In Parameter List when strategy is Drag Control	0 to max. torque of tool	0

Cycle #	Each fastening is one cycle, and is incremented by one to give it a unique number. (System-calculated)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Main	Under the Var. 1 and Var. 2 drop boxes	NA	NA
Run	Cycle Log	In Cycle Log table	NA	NA
Stats	Cycle Log	In Cycle Log table	NA	NA

Cycle # Measured Reading	A data entry box for entering the measured torque when calibrating a spindle against an external torque transducer. (User-entered)
---------------------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Spindle Initialization	A data entry box on a screen behind the Auto Calibration button	NA	NA

Cycle Time	The elapsed time for a fastening cycle. (System-calculated)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Behind the E.O.R Filter button	Parameter may be checked or unchecked	Unchecked
Run	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA
Stats	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA
Run	Main	Under the Var. 1 and Var. 2 drop boxes	NA	NA

Cycle Time Out	Specifies the maximum time (in seconds) in which the tightening must be completed before the tool will stop upon a tightening error. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In the Parameter List for the Engage step	1 - 1,000 seconds	15 seconds

Data Port	The port for Insight's external communications. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
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Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Drop box in the Communications window	COM1, COM2, COM3, COM4, Profibus (optional) Devicenet (optional)	COM1
Stats	Export	Drop box	COM1, COM2, COM3, COM4, Floppy disk, Flash disk	COM1

Data to Transmit	Defines what fastening data will be exported when the communications protocol is set to P.F.C.S. (Plant Floor Communications System). (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Under the P.F.C.S. Settings button when the Data Port drop box is set to P.F.C.S.	OK Only or All Cycles	OK Only

Date	Data entry box to enter today's date. Note: User must press the Expand key to change this parameter. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Data entry box in the Date/Time window	NA	NA

Date Format	Data entry box to select the date format. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Data entry box in the Date/Time window	MM/DD/YY or DD/MM/YY	MM/DD/YY

Daylight Savings	Drop box to allow the Insight to automatically adjust the time for the start and end of daylight savings. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Data entry box in the Date/Time window	Enabled or Disabled	Disabled

Delay	The amount of time (in seconds) that can be programmed in between any two fastening steps. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In the Parameter List for the Delay Control strategy	0.1 - 200	0.1

Deviation Limit	If the prevailing angle is set to zero, then the Insight will define the end of the Prevailing Torque Zone by the slope value entered here. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List when strategy is Prevailing Torque Control	0 - 9.9	0

Direction	Sets the forward direction the Insight spindle turns; clockwise (CW) or counter clockwise (CCW). (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	Text box in the Engage step	CW or CCW	CW

Drag Torque Hi Limit	Maximum permissible torque in the Drag Torque Zone of the drag torque fastening strategy (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List when strategy is Drag Torque Control	Depends on tool	Tool's maximum rating

Drag Torque Lo Limit	Minimum required torque in the Drag Torque Zone of the drag torque fastening strategy (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List when strategy is Drag Torque Control	Depends on tool	0

EOR Data Select	This parameter determines if EOR data are collected on intermediate fastening steps. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List for all fastening strategies except Engage	NA	Unchecked

EOR Filter	The E.O.R. (End of Run) Filter selects what parameters, in addition to torque and angle, will be recorded for each fastening. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Under the E.O.R. Filter button in the General window	Numerous parameters can be checked	Shutdown Code, Peak Current, and Cycle Time are checked

Excitation Voltage	During self-testing, the Insight measures the spindle transducer's positive excitation voltage (+ve) and negative excitation voltage (-ve). (System-calculated)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Diagnostics	System Test	In table under Tool parameters	Measured voltage; also assigned either PASS or FAIL	NA

Fail On Yield Override	If a fastening is set to be terminated if the onset of yield is detected, this parameter allows that fastening to either be accepted (PASS) or rejected (FAIL). (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value

Set-up	Advanced Set-up	In the Parameter List for the Torque Control with Yield Override strategy and the Angle Control with Yield Override strategy	Checked or Unchecked	Unchecked
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Fall Back Date	The date for the end of daylight savings. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Data entry box in the Date/Time window; only active if Daylight Savings is Enabled	NA	NA

Final Fault Action	If a fault occurs during the last retry of a fault backout operation, this parameter determines the action to be taken with the faulted bolt(s). (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In the Parameter List for the Engage step	Stop (0), Backout faulted bolts (1), Backout all bolts in Group (2), Backout all bolts in Powerhead (3)	Stop

Final Fault Backout Angle	If a fault occurs during the tightening, and the Final Fault Action parameter is set to backout the fastener, this parameter sets the number of degrees for the backout. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In the Parameter List for the Engage step	0 - 32000	3,200

Final Yield Calculation	The yield point calculated at shutdown; only calculated if this parameter is checked under the E.O.R. (End of Run) Filter. (System-calculated)
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Where the Parameter is Found and Its Range and Default Values				
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Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Behind the E.O.R Filter button	Parameter may be checked or unchecked	Unchecked
Run	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA
Stats	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA

Free Speed	The maximum speed the tool will turn during fastening. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Quick Set-up	Data entry box under Torque Control strategy	Depends on tool selected	90% of the tool's full free speed
Set-up	Quick Set-up	Data entry box under Angle Control strategy	Depends on tool selected	90% of the tool's full free speed
Set-up	Advanced Set-up	Every step has its own free speed	Depends on tool selected	90% of the tool's full free speed

Gang Count	Some assemblies have multiple bolts that must be fastened in sequence (called a "Gang"). Setting the Gang Count tells the Insight how many tightenings are required to complete the gang assembly. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up (in Engage step)	In the Engage step	1 - 99	1

Group	A Group is one or more spindles in a powerhead that have identical fastening steps. Groups can be selected in the Passwords and Powerhead Settings screen. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Password and Powerhead Settings	Drop boxes in the Powerhead Settings portion of the main screen	1 or 2	1

Hall Signal Test	During self-testing, the Insight determines if the Hall sensor is operating correctly. (System-calculated)
-------------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Diagnostics	System Test	In table under Tool parameters	PASS or FAIL	NA

Jog Angle	The number of degrees the tool will turn before exiting the jog step. The tool runs at the softstart speed. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In the Parameter List for the Jog Control strategy	1 - 3200	90

Jog Torque	If the limit is reached the tool will exit the jog step. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In the Parameter List for the Jog Control strategy	0.1 - 9999	0.1

Lamp Test	Check boxes to turn the lamp test on or off. This test is used to check the operation of the lights on the tool, the controller cabinet, and on any external light box. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Diagnostics	Tool test	Radio button in the main window	NA	NA

Language	Specifies the language the Insight uses. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	A drop box in the General window	English, French, German, Italian, and Spanish	English

Last Slope	The final value of the slope of the torque vs. angle curve. (System-calculated)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Behind the E.O.R Filter button	Parameter may be	Unchecked

			checked or unchecked	
Run	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA
Stats	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA

Load Data	A button used to upload parameters into the Insight from removable media. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Parameter Transfer and Smart Chip	In the Parameter Transfer portion of the main screen	NA	NA

Load Software	A button used to upload new graphics or motor controller software to the Insight. (User-entered)
----------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Parameter Transfer and Smart Chip	In the Parameter Transfer portion of the main screen	NA	NA

Max Value	The maximum value of the control parameter for the selected configuration. (System-calculated)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Stats Summary	In Parameter List in main window	NA	NA
Stats	Summary	In Parameter List in main window	NA	NA

Meanshift	The difference between the mean value and the control point value. (System-calculated)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Main	Under the Var. 1 and Var. 2 drop boxes	NA	NA
Run	Stats Summary	In the Parameters List in the	NA	NA

		main window		
Stats	Summary	In the Parameters List in the main window	NA	NA
Stats	Stats Alarm Set-up	In the Parameter Lists under Torque and Angle in the main window	0 - 99	0

MC Temperature	Displays the temperature of the Motor Controller. (System-calculated)
-----------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Diagnostics	System Test	In table under MC parameters	Measured value; also assigned either PASS or FAIL	NA

Minimum Drag Torque	The minimum drag torque reached for a drag torque fastening strategy. (System-calculated)
----------------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Behind the E.O.R Filter button	Parameter may be checked or unchecked	Unchecked
Run	Main	Under the Var. 1 and Var. 2 drop boxes	NA	NA
Run	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA
Stats	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA

Motor Temperature	The Insight spindle's motor temperature. (System-calculated)
--------------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Diagnostics	System Test	In table under Tool parameters	PASS or FAIL	NA

Motor Test	The spindle motor's Kt value (Peak Torque/Peak Motor Current). (System-calculated)
-------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Diagnostics	System Test	In table under Tool parameters	Measured value; also assigned either PASS or	NA

			FAIL	
--	--	--	------	--

Motor Type	When specifying a custom tool, this parameter tells the Insight what type of motor the tool has. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	The Custom Tool screen under Spindle Initialization	Drop box on the Custom Tool screen	None 30 Series 40 Series 120 Series	None

Multi Drop Address	The address number for the network port's host Data Out protocol. (User-entered)
---------------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	A drop box in the Communications window	0 - 99	0

Number of Retries	The number of times the Insight attempts to communicate if the first try is unsuccessful, when the communications protocol is set to P.F.C.S. (Plant Floor Communications System). (User-entered)
--------------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Under the P.F.C.S. Settings button when the Data Port drop box is set to P.F.C.S.	1 - 10	5

Numbering Format	The numbering format when the communications protocol is set to P.F.C.S. (Plant Floor Communications System). (User-entered)
-------------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Under the P.F.C.S. Settings button when the Data Port drop box is set to P.F.C.S.	Integer or Real Type	Integer

Output Function	The Insight IC has programmable outputs. This parameter allows the function of each output to be selected. (User-entered)
------------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Diagnostics	Discrete Outputs	Drop boxes in the main window	Numerous options, click here for list	None

P.F.C.S. Enable/Disable	Determines whether the P.F.C.S. (Plant Floor Communications System) is enabled or disabled. (User-entered)
--------------------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Under the P.F.C.S. Settings button when the Data Port drop box is set to P.F.C.S.	Disabled or Enabled	Disabled

Parity	Sets the communications port parity for an external RS-232 serial device. (User-entered)
---------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	A drop box in the Communications window	None, Odd, or Even	None

Password	A button and a data entry box to enter a previously stored password to gain access to Insight's functions. (User-entered)
-----------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Password and Powerhead Settings	A button on the Password Set-up screen	4 digit number	None

Password Logout	A button and a confirmation box to log out of the password screen and relock the Insight system. (User-entered)
------------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Password and Powerhead Settings	A button on the Password Set-up screen	NA	NA

Peak Current	The maximum current the tool drew during the fastening cycle. (System-calculated)
---------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Behind the E.O.R Filter button	Parameter may be checked or unchecked	Unchecked
Run	Main	Var. 1 and Var. 2 drop boxes	NA	NA
Run	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA
Stats	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA

Peak Cut-In Torque	The maximum torque measured during the cut-in phase (the initial high-torque phase) of the prevailing torque and drag torque strategies. (System-calculated)
---------------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Behind the E.O.R Filter button	Parameter may be checked or unchecked	Unchecked
Run	Main	Var. 1 and Var. 2 drop boxes	NA	NA
Run	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA
Stats	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA

Peak Drag Torque	The maximum torque measured during the drag torque phase of a drag torque strategy. (System-calculated)
-------------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Behind the E.O.R Filter button	Parameter may be checked or unchecked	Unchecked
Run	Main	Var. 1 and Var. 2 drop boxes	NA	NA
Run	Cycle Log	If checked (see above)	NA	NA

		parameter appears in the Cycle Log table		
Stats	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA

Peak Prevailing Torque	The maximum torque measured during the prevailing torque phase of a prevailing torque strategy. (System-calculated)
-------------------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Behind the E.O.R Filter button	Parameter may be checked or unchecked	Unchecked
Run	Main	Var. 1 and Var. 2 drop boxes	NA	NA
Run	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA
Stats	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA

Peak Slope	The maximum value of the slope of the torque vs. angle curve. (System-calculated)
-------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Behind the E.O.R Filter button	Parameter may be checked or unchecked	Unchecked
Run	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA
Stats	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA

Plant Name	A data entry box for assigning a plant name or other plant identifier. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Data entry box in the General window.	Any alphanumeric entry (12 characters max.)	None

Powerhead Name	Assigns a name to a powerhead. (User-entered)
-----------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Password and Powerhead Settings	Data entry box in the Powerhead Settings portion of the main screen	Any alphanumeric name (12 characters max.)	NA

Powerhead Operation	Turns the powerhead function on or off. (User-entered)
----------------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Password and Powerhead Settings	Drop box in the Powerhead Settings portion of the main screen	On or Off	Off

Prevailing Torq. Compensation	If set to 0, then the torque of the next step will be offset by an amount equal to the average prevailing torque. If set to 1, no offset. (User-entered)
--------------------------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List when strategy is Prevailing Torque Control	0 or 1	0

Prevailing Angle Hi Limit	The maximum allowable angle of rotation for the prevailing torque phase of a Prevailing Torque fastening strategy. (User-entered)
----------------------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List when strategy is Prevailing Torque Control	0 - 32000	32000

Prevailing Angle Lo Limit	The minimum acceptable angle of rotation for the prevailing torque phase of a Prevailing Torque fastening strategy. (User-entered)
----------------------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List when strategy is Prevailing Torque Control	0 - 32000	0

Prevailing Torque Hi Limit	The maximum permissible torque for the prevailing torque phase of a Prevailing Torque fastening strategy. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List when strategy is Prevailing Torque Control	0 to maximum rating of tool	Depends upon tool

Prevailing Torque Lo Limit	The minimum acceptable torque for the prevailing torque phase of a Prevailing Torque fastening strategy. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List when strategy is Prevailing Torque Control	0 to Prevailing Torque Hi value	0

Range	The maximum value less the minimum value for a parameter. (System-calculated)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Main	Var. 1 and Var. 2 drop boxes	NA	NA
Run	Stats Summary	In Parameter List in main window	NA	NA
Stats	Summary	In Parameter List in main window	NA	NA

Record E.O.R. Data	When programming a multi-step tightening, this parameter determines whether or not cycle data is saved for the step. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List for all the strategies	Enabled or Disabled	Disabled

Rem. Tool En / Dis.	This parameter allows the tool to be remotely enabled and disabled through the I/O connector; options are On and Off. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Spindle Initialization	A drop box in the main screen	On or Off	Off

Re-Torque Angle	In Re-torque Mode, the re-torque step will be complete if the angle measured during a re-torque is less than or equal to the value for the re-torque angle. (User-entered)
------------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In the Parameter List for the Re-torque Control strategy	0 - 32000	5

Re-Torque Overshoot	This parameter is used to adjust the amount of overshoot in the torque value allowed when a previously tightened bolt is re-torqued. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In the Parameter List for the Re-torque Control strategy	0 - 9999 torque units	0

Retry Backout Angle	If a fault occurs during the tightening, and the Insight is set to retry the fastening, this parameter sets the number of degrees of backout before the retry. (User-entered)
----------------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In the Parameter List for the Engage step	0 - 32000	90

Retry Backout Speed	If a fault occurs during the tightening, and the Insight is set to retry the fastening, this parameter sets the speed of the backout before the retry. (User-entered)
----------------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In the Parameter List for the Engage step	20 - 100% of the tool's Free Speed	50%

Retry Interval	Applies when the Insight is in P.F.C.S. (Plant Floor Communications System) mode. If the Insight is unable to communicate with external devices, this parameter specifies the duration (in seconds) between retries. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Under the P.F.C.S. Settings button when the Data Port drop box is set to P.F.C.S.	5 – 60	10

Retry Fault Action	If a fault occurs during a operation, this parameter determines the action to be taken with the faulted bolt(s). (User-entered)
---------------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In the Parameter List for the Engage step	Stop (0), Backout faulted bolts (1), Backout all bolts in Group (2), Backout all bolts in Powerhead (3)	Stop

Save Data	A button used to download parameters from the Insight to removable media. (User-entered)
------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Parameter Transfer and Smart Chip	In the Parameter Transfer portion of the main screen	NA	NA

Shiftdown Point	The point during the final stage of tightening at which the tool shifts to a lower speed to improve accuracy. (User-entered)
------------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Quick Set-up	Data entry box # 11 in the main screen when strategy is Torque or Angle control	0 - Maximum torque of tool	50% of Target Torque for Torque Control or 0 (zero) for Angle Control
Set-up	Advanced Set-up	In Parameters List under the Step #n Strategy drop box when the strategy is Torque, Angle, or Yield Control	Depends on tool selected	50% of Torque Target

Shiftdown Speed	The tool's speed during the shiftdown phase. (User-entered)
------------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Quick Set-up	Data entry box # 12 in the main screen when strategy is Torque, Angle, or Yield control	Depends on tool selected	30% of tool's full free speed
Set-up	Advanced Set-up	One of the parameters under the Step #n Strategy drop box	Depends on tool selected	30% of tool's full free speed

Shunt Calibration	A system test that measures the front-end electronics gain (as % of ideal shunt calibration voltage). (System-calculated)
--------------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Diagnostics	System Test	In table under Tool parameters	Measured value; also assigned either PASS or FAIL	NA

Slope Interval	Defines the interval over which the reference slope will be measured. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List when strategy is Yield Control	0 - 10	0

Sigma	The standard deviation (σ); used for statistical calculations. (System-calculated)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Main	Under the Var. 1 and Var. 2 drop boxes	NA	NA
Run	Stats Summary	Under the Population Statistics and Sample Statistics drop boxes	NA	NA
Stats	Summary	Under the Population Statistics and Sample Statistics drop boxes	NA	NA

Snug Torque also called Torque Threshold	The torque required to seat components in the joint; also the torque point at which angle begins to be measured. (User-entered)
---	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Quick Set-up	Data entry box # 9 in the main screen when strategy is Torque or Angle control, and drop box #10 for Yield Control	0 – maximum of tool	For Torque Control, 20% of Torque Target For all other strategies default = 0
Set-up	Advanced Set-up	In the Parameters List under the Step #n Strategy drop box when strategy is Torque, Angle, Yield, Prevailing Torque, or Drag Control	0 – maximum of tool	For Torque Control, 20% of Torque Target For all other strategies default = 0

Softstart Speed	Most handheld tools have two throttle settings. The first (the slower softstart speed) makes it easier for the tool's socket to engage. (User-entered)
------------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In the Engage step under the Step #n Strategy drop box	20 – 100% of the tool's full free speed	20% of tool's full free speed

Spindle Operation	This parameter indicates if the start signal is coming from a hand-operated throttle or from an I/O signal (machine mounted). (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Spindle Initialization	A drop box in the main window	Handheld or Machine Mounted	Handheld

Spindle Status	Controls spindle operation. Selecting Enabled allows the tool attached to the spindle to operate, selecting Disabled prevents tool operation. (User-entered)
-----------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Spindle Initialization	A drop box in the main window	Enabled, or Disabled	Enabled

Spring Forward Date	The date for the start of daylight savings. (User-entered)
----------------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Data entry box in the	NA	NA

		Date/Time window; only active if Daylight Savings is Enabled		
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Start Mode	Defines the type of signal initiating tool start. For continuous signal select throttle. Pulse indicates a momentary external signal. Dual requires two switch closures (because some tools require the operator to activate two switches simultaneously to ensure his hands are safely away from the machinery). (User-entered)			
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Spindle Initialization	A drop box in the main window	Throttle, Pulse, or Dual	Throttle

Stats From	A drop box to select whether the fastening statistics will be displayed for the entire fastening population or for a sample of that population. (User-entered)			
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Statistics	Summary	A drop box in the main window	Population or Sample	

Status	A series of Status check boxes that allow the user to make a particular output signal active. (User-entered)			
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Diagnostics	Discrete Outputs	Check boxes in the main window	NA	Unchecked

Stop All Spindles on Reject	When this box is checked, all spindles in a powerhead will stop as soon as any spindle in the powerhead fails a fastening.. (User-entered)			
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Password and Powerhead Settings	Check box in the Powerhead Settings portion of the main screen	NA	Unchecked

Store Cycle Logs and Master Plots to Flash Disk	A check box to enable cycle logs and master plots to be automatically stored on a flash disk in the PCMCIA slot. (User-entered)			
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Where the Parameter is Found and Its Range and Default Values				
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Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Parameter Transfer and Smart Chip	Check box in the Parameter Transfer portion of the main screen	NA	Unchecked

Sync Enable	If this parameter is enabled, the spindles will be synchronized. (User-entered)
--------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List for all the strategies except the Engage step.	NA	Unchecked

System Name	A data entry box for assigning a system name or other system identifier; maximum of 12 letters and numbers. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Data entry box in the General window.	Any alphanumeric entry (12 characters max.)	None

Target Inspection Angle	The number of degrees of rotation required to complete the drag torque phase. (User-entered)
--------------------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In the Parameters List under the Step #n Strategy drop box when strategy is Drag control	0 - 32000	32000

Target Prevailing Angle	The number of degrees of rotation required to complete the prevailing torque phase. (User-entered)
--------------------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In the Parameters List under	0 - 32000	32000

		the Step #n Strategy drop box when strategy is prevailing Torque control		
--	--	--	--	--

Time	Data entry box to enter the current time. Note: User must press the Expand key to change this parameter. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Data entry box in the Date/Time window	Enter hour and minutes in 24 hour format	NA

Tool Name	Drop box to select the specific I-R tool attached to the Insight's spindle. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Spindle Initialization	Drop box in the main window	None plus a large number of I-R tool model numbers	None

Torque at Seat	Peak torque value when joint is seated for prevailing torque. (User-entered)
-----------------------	--

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Behind the E.O.R Filter button	Parameter may be checked or unchecked	Unchecked
Run	Main	Var. 1 and Var. 2 drop boxes	NA	NA
Run	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA
Stats	Cycle Log	If checked (see above) parameter appears in the Cycle Log table	NA	NA

Torque Filter	Removes high frequency noise (ripple) from the torque signal to improve measurement accuracy. This parameter is used primarily for soft (gasketed) joints. For hard joints, select 500 Hz. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	Drop box in the Engage step	75 - 750 Hz	150 Hz

Torque Hi Limit	The maximum permissible torque value for a fastening. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Quick Set-up	Data entry box #5 under Torque Control strategy	Depends on tool selected	Torque Target +20%
Set-up	Quick Set-up	Data entry box #7 under Angle Control strategy	Depends on tool selected	Maximum of tool
Set-up	Quick Set-up	Data entry box #6 under Yield Control strategy	Depends on tool selected	Maximum of tool
Set-up	Advanced Set-up	In Parameter List when strategy is Torque Control	Depends on tool selected	Torque Target +20%
Set-up	Advanced Set-up	In Parameter List when strategy is Angle Control	Depends on tool selected	Maximum of tool
Set-up	Advanced Set-up	In Parameter List when strategy is Yield Control	Depends on tool selected	Maximum of tool
Set-up	Advanced Set-up	In Parameter List when strategy is Pretorque Control	Depends on tool selected	Pretorque Target + 20%
Set-up	Advanced Set-up	In Parameter List when strategy is Backout Control	Depends on tool selected	Maximum of tool

Torque Lo Limit	The minimum acceptable torque value for a fastening. (User-entered)
------------------------	---

Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Quick Set-up	Data entry box #6 under Torque Control strategy	Depends on tool selected	Torque Target -20%
Set-up	Quick Set-up	Data entry box #6 under Angle Control strategy	Depends on tool selected	0
Set-up	Quick Set-up	Data entry box #7 under Yield Control strategy	Depends on tool selected	0
Set-up	Advanced Set-up	In Parameter List when strategy is Torque Control	Depends on tool selected	Torque Target -20%
Set-up	Advanced Set-up	In Parameter List when strategy is Angle Control	Depends on tool selected	0
Set-up	Advanced Set-up	In Parameter List when strategy is Yield Control	Depends on tool selected	0
Set-up	Advanced Set-up	In Parameter List when	Depends on	Pretorque Target -

		strategy is Pretorque Control	tool selected	20%
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Torque Overshoot	If tightenings are consistently overshooting the Torque Target, the tool will be shut off this many torque units before the Torque Target. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	In Parameter List when strategy is Torque Control	0 – Torque Target	0

Torque Target	The desired final torque for the Torque Control fastening operation. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Quick Set-up	Data entry box #4 under Torque Control strategy	Depends on tool selected	None
Set-up	Advanced Set-up	In Parameter List when strategy is Torque Control	Depends on tool selected	None

Torque Threshold also called Snug Torque	The torque required to seat components in the joint; also the torque point at which angle begins to be measured. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Quick Set-up	Data entry box # 9 in the main screen when strategy is Torque or Angle control, and data entry box #10 for Yield control	0 – maximum of tool	For Torque Control, 20% of Torque Target For all other strategies default = 0
Set-up	Advanced Set-up	In the Parameters List under the Step #n Strategy drop box when strategy is Torque, Angle, Yield, Prevailing Torque, or Drag control	0 – maximum of tool	For Torque Control, 20% of Torque Target For all other strategies default = 0

Torque Units	Use this drop box to select the units the Insight uses to measure torque. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Spindle Initialization	Drop box in the main window	Nm, Ft-lb, In-lb, Kg-cm, or Kg-m	Nm

Transducer Range	Every I-R tool has a generic Transducer Range and (as part of the tool's final calibration) a specific, measured Transducer Range. The Insight has an internal database so that when you select the I-R tool attached to the spindle, Insight inserts the generic value into the Transducer Range data entry box. You may overwrite this Transducer Range value and insert the tool's actual measured Transducer Range (located on the tool's label). (System-calculated AND User-entered)			
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Spindle Initialization	Data entry box in the main window	NA	Depends on tool selected

Transmission Mode	Defines how data are exported when the communications protocol is set to P.F.C.S. (Plant Floor Communications System). Options are: Complete Tool Button (data not sent until the operator pushes the tool button), Individual (data sent at the end of each cycle), or Gang Count (data sent at the end of the Gang Count). (User-entered)			
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	System Initialization	Under the P.F.C.S. Settings button when the Data Port drop box is set to P.F.C.S.	Complete Tool Button, Individual, or Gang Count	Complete Tool Button

Tube Nut	When enabled, the Insight controller will correctly operate a tube nut tightening tool. (User-entered)			
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Spindle Initialization	Drop box in the main window	Enabled or Disabled	Disabled

Tube Nut Rev. Speed	The reversing speed when the Insight is operating a tube nut tightening tool. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	One of the Engage Parameters under the Step #n Strategy drop box	10 – 30% of tool's full free speed	10% of tool's full free speed

Tube Nut Rev. Threshold	Torque value that a tool will shut off in the reverse direction when in Tube Nut Mode. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Advanced Set-up	One of the Engage Parameters under the Step #n Strategy drop box	10 – 30% of tool's maximum torque	10% of tool's maximum torque

Use Factory Set Angle Constant Value Use Custom Angle Constant Value	These drop boxes select whether the tool's angle constant value is the factory default value or a user-entered value. This only applies to I-R tools equipped with a Smart Chip. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Parameter Transfer and Smart Chip	Check boxes in the Smart Chip portion of the main screen	NA	NA

Use Factory Set Transducer Value Use Custom Transducer Value	These drop boxes select whether the tool's Transducer Range value is the factory default value or a user-entered value. This only applies to I-R tools equipped with a Smart Chip. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Parameter Transfer and Smart Chip	Check boxes in the Smart Chip portion of the main screen	NA	NA

View Password	A button that allows a Level 4 user (the highest level of access to the Insight's functions) to view all the current passwords. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Password and Powerhead Settings	Button on the Password Set-Up screen	NA	NA

Warn When New Tool Type Required	A checkbox used with tool linking, in which a specific tool is assigned to a configuration. If checked, the Insight will bring up a warning message when a configuration has been selected that has a different tool type than the one previously selected. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	The Link Tool screen under Spindle Initialization	Check box on the Link Tool screen	NA	NA

X-Bar	The mean (average) value for the control parameter. (System-calculated)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Run	Stats Summary	In Parameter List in main window	NA	NA
Stats	Summary	In Parameter List in main window	NA	NA

Yield Point %	The average decrease in the slope of the torque vs. angle curve that signifies onset of yield. (User-entered)
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Where the Parameter is Found and Its Range and Default Values				
Main Menu	Sub-Menu	Location within Sub-Menu	Range	Default Value
Set-up	Quick Set-up	Data entry box #4 in the main screen when strategy is Yield Control	20 – 80%	NA
Set-up	Advanced Set-up	In the Parameter List under the Step #n Strategy drop box when strategy is Torque Control	20 – 80%	50%
Set-up	Advanced Set-up	In the Parameter List under the Step #n Strategy drop box when strategy is Angle Control	20 – 80%	50%
Set-up	Advanced Set-up	In the Parameter List under the Step #n Strategy drop box	20 – 80%	NA

		when strategy is Yield Control		
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This is the end of the *Parameters* topic. Scroll down to continue your tour or click on another topic at the left.

How Do I ...?

In this section we list a series of commonly asked questions about programming and operating the Insight IC Fastening System with Graphics Display. For each of these questions we provide step-by-step explanations of how to perform the operation.

If you have a question about using the Insight, it is probably in this list. You can navigate to specific questions in two ways. First, we have organized the questions into subject headings. Second, we have provided a complete list of questions you can scroll through.

To go to the "How do I ...?" questions organized by subject, simply scroll down. To go to the complete question list click [here](#).

Click on a link below to bring up questions on that subject.

- Questions on how to [Program Fastening Strategies](#)
- Questions related to [Spindles \(Tools\)](#)
- Questions related to [Basic Settings \(Dates, Times, Torque Units, Passwords, etc.\)](#)
- Questions related to [Programming Advanced Tightening Functions](#)
- Questions related to [Communications and Attaching Printers and Peripherals](#)
- Questions related to [Troubleshooting \(Installation, Diagnostics, Maintenance, and Repairs\)](#)
- Questions related to [Software Versions and Upgrades](#)

FAQ: Program Fastening Strategies

How do I program the Insight for the first time?

Click on the link below for basic programming instructions.

[Quick Start: Be Operational in Minutes](#)

How do I program a Torque Control strategy in Quick Set-up?

Prerequisites

1. You must have a spindle (tool) attached.
2. You must have told the software which Ingersoll-Rand spindle is attached, or have a Smart Chip tool connected.
3. You know how to use the directional keys, the *Expand* key, and the *Enter* key to navigate on the screen, open a drop box, and select a parameter.
4. You know how to use the numeric keypad to enter data.

Steps

1. Press the *Set-up* Main Menu key. The *Quick Set-up* screen will be displayed.
2. Go to the *Select Spindle* drop box. Spindle 1 is the default value. If you want to use Spindle 1 go to Step 3. If you want to use Spindle 2, open the drop box and select Spindle 2.
3. Go to the *Configuration* drop box, open it, and select the configuration number you wish to program.
4. The *Strategy* drop box will display Torque (since this is the default strategy).
5. If you wish to use the learn function to automatically calculate shiftdown point, shiftdown speed and angle limits then select Yes for the learn function. If you wish to enter these values manually then select No.
6. Using the numeric keypad, enter the desired torque value for your fastening operation into the *Torque Target* data entry box. (Make sure the torque units displayed are the units you want to use. If not, press the *Spindle Initialization* Sub-Menu key and change the units in the *Torque Units* drop box.)
7. The Insight software automatically assigns values to the other torque control parameters displayed in the main menu screen. If you want to edit any of these values, navigate to the data entry box and enter a new value using the numeric keypad.

How do I program a Torque Control strategy in Advanced Set-up?

Prerequisites

1. You must have a spindle (tool) attached.
2. You must have told the software which Ingersoll-Rand spindle is attached, or have a Smart Chip tool connected.

3. You know how to use the directional keys, the *Expand* key, and the *Enter* key to navigate on the screen, open a drop box, and select a parameter.
4. You know how to use the numeric keypad to enter data.

Steps

1. Press the *Set-up* Main Menu key and then the *Advanced Set-up* Sub-Menu key.
2. In the *Select Spindle* drop box select the spindle you want to program.
3. In the *Config #* drop box select the configuration you want to program.
4. Go to the *Engage* step drop box and select Engage. (If the Engage parameter default values are acceptable, you can skip to step 6.)
5. Go to the list of parameters just below the *Engage* step drop box and navigate down through the parameter list. You must enter values (or accept the default values) for the Required Parameters. As appropriate, you may also enter values or accept the default values for the Optional Parameters.
6. Go to the *Step #1 Strategy* drop box and select Torque.
7. Go to the list of parameters just below the *Step #1 Strategy* drop box and navigate down through the parameter list. You must enter values (or accept the default values) for the Required Parameters. As appropriate, you may also enter values or accept the default values for the Optional Parameters.
8. If you want to program additional tightening steps, repeat Steps 6 and 7 as appropriate for the desired step.

How do I program an Angle Control strategy in Quick Set-up?

Prerequisites

1. You must have a spindle (tool) attached.
2. You must have told the software which Ingersoll-Rand spindle is attached, or have a Smart Chip tool connected.
3. You know how to use the directional keys, the *Expand* key, and the *Enter* key to navigate on the screen, open a drop box, and select a parameter.
4. You know how to use the numeric keypad to enter data.

Steps

1. Press the *Set-up* Main Menu key. The *Quick Set-up* screen will be displayed.

2. Go to the *Select Spindle* drop box. Spindle 1 is the default value. If you want to use Spindle 1 go to Step 3. If you want to use Spindle 2, open the drop box and select Spindle 2.
3. Go to the *Configuration* drop box, open it, and select the configuration number you wish to program.
4. Go to the *Strategy* drop box and select the Angle strategy.
5. Using the numeric keypad, enter the desired angle value for your fastening operation into the *Angle Target* data entry box.
6. The Insight software automatically assigns values to the other torque control parameters displayed in the main menu screen. If you want to edit any of these values, navigate to the data entry box and enter a new value using the numeric keypad.

How do I program an Angle Control strategy in Advanced Set-up?

Prerequisites

1. You must have a spindle (tool) attached.
2. You must have told the software which Ingersoll-Rand spindle is attached, or have a Smart Chip tool connected.
3. You know how to use the directional keys, the *Expand* key, and the *Enter* key to navigate on the screen, open a drop box, and select a parameter.
4. You know how to use the numeric keypad to enter data.

Steps

1. Press the *Set-up* Main Menu key and then the *Advanced Set-up* Sub-Menu key.
2. In the *Select Spindle* drop box select the spindle you want to program.
3. In the *Config #* drop box select the configuration you want to program.
4. Go to the *Engage* step drop box and select Engage. (If the Engage parameter default values are acceptable, you can skip to step 6.)
5. Go to the list of parameters just below the *Engage* step drop box and navigate down through the parameter list. You must enter values (or accept the default values) for the Required Parameters. As appropriate, you may also enter values or accept the default values for the Optional Parameters.
6. Go to the *Step #1 Strategy* drop box and select Angle.

7. Go to the list of parameters just below the *Step #1 Strategy* drop box and navigate down through the parameter list. You must enter values (or accept the default values) for the Required Parameters. As appropriate, you may also enter values or accept the default values for the Optional Parameters.
8. If you want to program additional tightening steps, repeat Steps 6 and 7 as appropriate for the desired step.

How do I program a Yield Control strategy in Quick Set-up?

Prerequisites

1. You must have a spindle (tool) attached.
2. You must have told the software which Ingersoll-Rand spindle is attached, or have a Smart Chip tool connected.
3. You know how to use the directional keys, the *Expand* key, and the *Enter* key to navigate on the screen, open a drop box, and select a parameter.
4. You know how to use the numeric keypad to enter data.

Steps

1. Press the *Set-up* Main Menu key. The *Quick Set-up* screen will be displayed.
2. Go to the *Select Spindle* drop box. Spindle 1 is the default value. If you want to use Spindle 1 go to Step 3. If you want to use Spindle 2, open the drop box and select Spindle 2.
3. Go to the *Configuration* drop box, open it, and select the configuration number you wish to program.
4. Go to the *Strategy* drop box and select the Yield strategy.
5. Using the numeric keypad, enter the desired yield point for your fastening operation into the *Yield Point %* data entry box (50% recommended).
6. The Insight software automatically assigns values to the parameters displayed in the main menu screen. If you want to edit any of these values, navigate to the data entry box and enter a new value using the numeric keypad.

Note: For Yield Control, I-R recommends setting the torque threshold value to 30 to 60% of the expected yield torque.

How do I program a Yield Control strategy in Advanced Set-up?

Prerequisites

1. You must have a spindle (tool) attached.
2. You must have told the software which Ingersoll-Rand spindle is attached, or have a Smart Chip tool connected.
3. You know how to use the directional keys, the *Expand* key, and the *Enter* key to navigate on the screen, open a drop box, and select a parameter.
4. You know how to use the numeric keypad to enter data.

Steps

1. Press the *Set-up* Main Menu key and then the *Advanced Set-up* Sub-Menu key.
2. In the *Select Spindle* drop box select the spindle you want to program.
3. In the *Config #* drop box select the configuration you want to program.
4. Go to the *Engage* step drop box and select Engage. (If the Engage parameter default values are acceptable, you can skip to step 6.)
5. Go to the list of parameters just below the *Engage* step drop box and navigate down through the parameter list. You must enter values (or accept the default values) for the Required Parameters. As appropriate, you may also enter values or accept the default values for the Optional Parameters.
6. Go to the *Step #1 Strategy* drop box and select Yield.
7. Go to the list of parameters just below the *Step #1 Strategy* drop box and navigate down through the parameter list. You must enter values (or accept the default values) for the Required Parameters. As appropriate, you may also enter values or accept the default values for the Optional Parameters.
8. If you want to program additional tightening steps, repeat Steps 6 and 7 as appropriate for the desired step.

How do I program a Backout strategy?

Prerequisites

1. You must have a spindle (tool) attached.
2. You must have told the software which Ingersoll-Rand spindle is attached, or have a Smart Chip tool connected.
3. You know how to use the directional keys, the *Expand* key, and the *Enter* key to navigate on the screen, open a drop box, and select a parameter.
4. You know how to use the numeric keypad to enter data.

Steps

1. Press the *Set-up* Main Menu key and then the *Advanced Set-up* Sub-Menu key.
2. In the *Select Spindle* drop box select the spindle you want to program.
3. In the *Config #* drop box select the configuration you want to program.
4. At the appropriate *Step #n Strategy* drop box select Fault Backout.
5. Go to the list of parameters just below the *Step #n Strategy* drop box and navigate down through the parameter list. You must enter values (or accept the default values) for the Required Parameters. As appropriate, you may also enter values or accept the default values for the Optional Parameters.

How do I program a Fault Backout strategy?

Prerequisites

1. You must have a **fixtured** (machine tool) spindle attached.
2. You must have told the software which Ingersoll-Rand spindle is attached, or have a Smart Chip tool connected.
3. You know how to use the directional keys, the *Expand* key, and the *Enter* key to navigate on the screen, open a drop box, and select a parameter.
4. You know how to use the numeric keypad to enter data.

Steps

1. Press the *Set-up* Main Menu key and then the *Advanced Set-up* Sub-Menu key.
2. In the *Select Spindle* drop box select the spindle you want to program.
3. In the *Config #* drop box select the configuration you want to program.
4. Go to the list of parameters just below the *Engage Strategy* drop box and navigate down through the parameter list. You must enter values for the following parameters: Backout Angle Hi Limit, Final Fault Action, and Final Fault Backout Angle. If you wish to automatically retry the tightening after a fault you will have to program the following parameters: Retry Backout Angle, Retry Backout Speed, Number of Retries, and Retry Action. Note: At least one step must be programmed for fault backout to function.

How do I program a Prevailing Torque Control strategy?

Prerequisites

1. You must have a spindle (tool) attached.
2. You must have told the software which Ingersoll-Rand spindle is attached, or have a Smart Chip tool connected.
3. You know how to use the directional keys, the *Expand* key, and the *Enter* key to navigate on the screen, open a drop box, and select a parameter.
4. You know how to use the numeric keypad to enter data.

Steps

1. Press the *Set-up* Main Menu key and then the *Advanced Set-up* Sub-Menu key.
2. In the *Select Spindle* drop box select the spindle you want to program.
3. In the *Config #* drop box select the configuration you want to program.
4. Go to the *Step #1 Strategy* drop box and select Prevailing Torque.
5. Go to the list of parameters just below the *Step #1 Strategy* drop box and navigate down through the parameter list. You must enter values (or accept the default values) for the Required Parameters. As appropriate, you may also enter values or accept the default values for the Optional Parameters.
6. If you want to program additional tightening steps, repeat Steps 4 and 5 as appropriate for the desired step.

How do I program a Drag Torque Control strategy?**Prerequisites**

1. You must have a spindle (tool) attached.
2. You must have told the software which Ingersoll-Rand spindle is attached, or have a Smart Chip tool connected.
3. You know how to use the directional keys, the *Expand* key, and the *Enter* key to navigate on the screen, open a drop box, and select a parameter.
4. You know how to use the numeric keypad to enter data.

Steps

1. Press the *Set-up* Main Menu key and then the *Advanced Set-up* Sub-Menu key.
2. In the *Select Spindle* drop box select the spindle you want to program.
3. In the *Config #* drop box select the configuration you want to program.
4. Go to the *Step #1 Strategy* drop box and select Drag Torque.

5. Go to the list of parameters just below the *Step #1 Strategy* drop box and navigate down through the parameter list. You must enter values (or accept the default values) for the Required Parameters. As appropriate, you may also enter values or accept the default values for the Optional Parameters.
6. If you want to program additional tightening steps, repeat Steps 4 and 5 as appropriate for the desired step.

FAQ: Spindles (Tools)

How do I select a tool?

Prerequisites

1. You must have a spindle (tool) attached.
2. You do not have a Smart Chip tool connected.
3. You know how to use the directional keys, the *Expand* key, and the *Enter* key to navigate on the screen, open a drop box, and select a parameter.

Steps

1. Press the *Set-up Main Menu* key and then the *Spindle Initialization Sub-Menu* key.
2. Go to the *Tool* drop box and select the model number of the I-R tool that is attached to the Insight spindle.
3. If the tool you are using is not in the tool list, select the closest model number. Then go to the *TR Value* data entry box and enter the actual Transducer Range value for your tool (shown as TR on the tool's label). Then go to the *Angle Constant* data entry box and enter the actual Angle Constant value for your tool (shown as ASC on the tool's label).

How do I link a tool to a configuration?

Click on the link below for instructions.

[Link Tool](#)

How do I Clear a step in a configuration?

1. Press the *Set-up* Main Menu key and then the *Advanced Setup* Sub-Menu key.
2. Go to the Strategy box of the step you wish to clear and select *None*.

How do I Clear a configuration?

1. Press the *Set-up* Main Menu key and then the *Advanced Setup* Sub-Menu key.
2. Navigate to the button in the lower right hand corner of the screen labeled *Clear All Steps* and press *Enter*.

How do I program a custom tool?

Click on the link below for instructions.

[Custom Tool](#)

How do I program and use a tube nut tool?

A tube nut tool is a tool that has a special attachment that allows it to tighten tube nuts, such as those used in brake line applications. The tube nut attachment has an opening at one end and a socket that is U shaped. To properly use a tube nut tool, the Insight must be programmed specifically for tube nut tool operation.

1. Press the *Set-up* Main Menu key and then the *Spindle Initialization* Sub-Menu key.
2. Select the desired spindle from the *Spindle* drop box.
3. Go to the *Tool* drop box and select the model number of the I-R tool that is attached to the Insight spindle.
4. Enter the TR value shown on the tool's calibration label in the *Transducer Range* data entry box.
5. Enter the ASC value shown on the tool's calibration label in the *Angle Constant* data entry box.
6. Select Enabled from the drop box labeled Tube Nut.

You are now programmed to use the tube nut tool. To change the reverse speed of the tube nut tool, change the value in the Tube Nut Rev. Speed parameter data entry box in the *Engage* step of the *Advanced Set-up* Sub-Menu. To change the torque threshold at which the tube nut tool reverse motion is stopped, change the

value in the Tube Nut Rev. Threshold parameter data entry box in the *Engage* step of the *Advanced Set-up* Sub-Menu.

How do I change from a handheld to a fixtured tool (or vice versa)?

A fixtured tool (or machine tool) is one that receives the start or throttle signal remotely through the Insight's I/O connector on the left-side of the controller. To change from a handheld tool to a fixtured tool, select *Machine Mounted* from the Spindle Operation drop box on the *Spindle Initialization* screen. To switch back to handheld mode select *Handheld Tool* from this drop box.

How do I calibrate a tool to an external transducer?

Click on the link below for calibration instructions.

[Auto Calibration](#)

How do I remotely enable/disable a tool using a PLC?

1. Press the *Set-up* Main Menu key and then the *Spindle Initialization* Sub-Menu key.
2. Select the desired spindle from the *Spindle* drop box.
3. Go to the *Remote Tool En/Dis.* drop box and select Enable.

To Disable the Tool

Use the PLC to activate the Spindle Disable input on the left side on the controller.

To Enable the Tool

Use the PLC to activate the Spindle Enable input on the left side on the controller.

NOTE: Only one of these signals can be present at any time

FAQ: Basic Settings (Dates, Times, Torque Units, Passwords, etc.)

How do I set the system date and time?

1. Press the *Set-up* Main Menu key and then the *System Initialization* Sub-Menu key.
2. Go to the *Date* or *Time* data entry box then press the *Expand* key. (To prevent inadvertent changes, these data entry boxes require the *Expand* key for access.) If entering the date, make sure the date format is as specified in the *Date Format* drop box.
3. Enter the correct values using the numeric keypad then press *Enter*.

How do I change the viewable parameters on the Cycle Log screen?

Certain fastening parameters are always displayed on the Cycle Log screen, while others are optional. The optional parameters are those the user chooses to record using the End of Run (E.O.R.) Filter. To select the E.O.R. parameters, follow the steps below.

1. Press the *Set-up* Main Menu key and then the *System Initialization* Sub-Menu key.
2. Go to the *E.O.R. Filter* button and press *Enter*.
3. Using the *Enter* key, select the tightening parameters you wish to capture. These parameters will now be displayed on the *Cycle Log* screen.

How do I change the torque units?

1. Press the *Set-up* Main Menu key and then the *Spindle Initialization* Sub-Menu key.
2. Go to the *Torque Units* drop box then press the *Expand* key.
3. Select the desired torque units then press *Enter*.

How do I turn off passwords?

Turning off the password protection allows unrestricted access to all of the Insight's functions.

1. Press the *Set-up* Main Menu key and then the *Password and Powerhead Settings* Sub-Menu key.
2. Go to the *Password* button, press the *Enter* key, and enter the Insight's Level 4 password.
3. Go to *Access Lockout Time* drop box and press the *Expand* key.
4. Select OFF then press *Enter*.

How do I change a password?

1. Press the *Set-up* Main Menu key and then the *Password and Powerhead Settings* Sub-Menu key.
2. Go to the *Change Password* button and press *Enter*. You will be prompted to enter your password. To change a Level 1, 2, 3, or 4 password you must enter a password of that same level.
3. Enter the new password using the numeric keypad. The password must be a four-digit number.
4. You will be prompted to re-enter the new password.
5. The password is changed. Press any Main Menu key to exit this screen.

How do I Setup Statistical Alarms?

1. Press the *Stats* Main Menu key and then the *Stats Alarm Set-Up* Sub-Menu key.
2. Go to the lists of alarm parameters shown in the main window. Scroll through this list, entering the desired values in the parameter drop boxes.
3. Go to the *Alarm* check box adjacent to the parameter and check the box to turn the alarm parameter on.

How do I use the on-screen Help function?

Click on the link below for instructions.

[Help Menus](#)

FAQ: Programming Advanced Tightening Functions**How do I program and use the Gang Count function?**

Some assemblies have multiple bolts that must be fastened in sequence; this is called a "Gang." For example, if you have a four-bolt assembly you will set the Gang Count to 4. Insight will then keep track of each fastening and when all four fastenings have been completed within specification, a "Gang Complete" message will appear on the display screen.

To Set the Gang Count

1. Press the *Set-up* Main Menu key and then the *Advanced Set-up* Sub-Menu key.
2. Select the desired spindle and configuration.
3. Go to the list of parameters just below the Engage step drop box, navigate down through the parameter list, and enter the gang count value into the parameter *Gang Count*.

To Display the Gang Count

To display the current status of the Gang Count during a fastening select Gang Count from the Var. 1 and/or Var. 2 drop box on the *Run Main* screen.

To Reset the Gang Count

During a Gang Count fastening operation, if one of the tightenings fails the count must be reset to one. There are two ways to reset the Gang Count.

1. From the *Run Main* screen, pressing 0 (zero) then *Enter* resets the count for Spindle 1. Pressing 00 and *Enter* resets the count for Spindle 2.
2. The Gang Count can be reset externally by activating the Gang Reset input on the left side on the controller.

Gang Count Complete

The Insight provides two indications when the Gang Count is successfully completed.

1. "Gang Complete" displays on the *Run Main* screen.
2. Gang Complete output becomes active to provide an external signal.

How do I program and use the Auto Increment function?

Auto Increment (often used in conjunction with the Gang Count function) is one of the options in the *Engage step* box in the *Advanced Setup* screen. To program this function go to the *Engage Step* of the first configuration in the sequence desired and enter the configuration number you wish this configuration to go to in the parameter *Auto Increment*. For example, to make Configuration 1 auto increment to Configuration 5, enter 5 into Configuration 1's *Auto Increment* parameter. Then go to Configuration 5 and enter into its *Auto Increment* the next configuration in the sequence, and so on and so on. The last configuration in the

sequence should have the first configuration number's value in its auto increment parameter, so that a loop is created.

If you select this option, when the Insight begins a fastening sequence the controller will start from the programmed configuration with the lowest configuration number. Upon completing that configuration, it will move to the next programmed configuration in ascending order. The system will continue to step through all programmed configurations until it reaches the configuration with the highest configuration number. After completing that configuration the system will return to the first programmed configuration for the next cycle. Note that it is possible to have multiple auto increments in one system. To select between different auto increment chains, select a configuration in that chain.

Auto Increment Reset

During an Auto Increment fastening sequence, if one of the fastenings fails and the part is rejected, the Auto Increment must be reset to the lowest configuration number. There are two ways to reset the Auto Increment.

1. From the *Run Main* screen, pressing 000 (zero three times) then *Enter* resets the count for Spindle 1. Pressing 0000 and *Enter* resets the count for Spindle 2.
3. The Auto Increment can be reset externally by activating the *Config Reset* input on the left side on the controller.

How do I assign a name to a configuration?

It is often useful to assign a meaningful name to a fastening configuration number so that it is easier to recall the purpose of the configuration. (Such as: RIGHT DOOR, PRELIM ASSY, ACCESS PANEL, etc.)

1. Press the *Set-up Main Menu* key and then the *Advanced Set-up Sub-Menu* key.
2. Go to the *Select Spindle* drop box and select the spindle whose configuration you are naming.
3. Go to the *Config #* drop box and select the configuration you want to name.
4. Go to the *Config Name* data entry box and enter the configuration name (up to 12 alphanumeric characters) using the numeric keypad.

How do I use the S.M.A.R.T Windows function to calculate limits?

S.M.A.R.T. stands for Self Moving Automatic Range Test. Click on the link below for instructions.

[S.M.A.R.T. Windows Discussion](#)

FAQ: Questions related to Communications and Attaching Printers and Peripherals**How do I send End of Run data via the serial port at the end of each cycle?**

1. Press the *Set-up* Main Menu key and then the *System Initialization* Sub-Menu key.
2. Go to the *Data Port* drop box and select COM1.
3. Go to the *Comm Protocol* drop box and select E.O.R Data Out.
4. Make sure the Baud Rate, Parity, # of Stop Bits, and Bits per Character are at the desired settings.

You will now get one line of tightening data out of the serial port labeled "Auxiliary Serial" for each cycle run. The format of the data sent can be modified by using the Edit Data Format function under the *Stats* Main Menu and *Export* Sub-Menu, and checking the box labeled Make E.O.R. Data Out Same Format.

How do I connect and use a socket tray?

Click on the link below for Insight installation instructions.

[Socket Tray Connection and Setup](#)

How do I switch configurations using a PLC?

1. Press the *Set-up* Main Menu key and then the *Spindle Initialization* Sub-Menu key.
2. If your PLC is switching only the first eight configurations, go to Step 4 below. If your PLC is switching configurations beyond configuration eight, go to Step 3 below.
3. Go to the *Config. Select. Type* drop box and select *External Binary*, then go to Step 5.
4. Go to the *Config. Select. Type* drop box and select *External Discrete*, then go to Step 5.
5. Insight programming for PLC operation is now complete. See information below on how to connect your PLC.

If you selected *External Binary* in the *Config. Select.* drop box then you will use configuration inputs 1 through 5 (on the I/O connector) as a binary number to switch all 32 configurations. If you selected *External Discrete* operation, then you will use the inputs 1 through 8 to directly select the desired configuration.

How do I connect the Insight IC to a bar code scanner?

The Insight is compatible with bar code readers that have a serial output and send ASCII text characters.

1. Connect your bar code scanner via a standard 9-pin serial cable to a communications (comm.) port located on the left-hand side of the Insight controller (the ports are labeled "10101").
2. Press the *Set-up* Main Menu key and then the *System Initialization* Sub-Menu key.
3. Go to the *Data Port* drop box and select the communications port you wish to connect the bar code scanner too.
4. Go to the *Comm. Protocol* drop box and select *Bar Code*.
5. As necessary, adjust the settings for Baud Rate, Parity, # of Stop Bits, and Bits Per Character to match those settings on the Bar code reader.
6. Go the button labeled *Settings* and press the *Enter* key
7. Select the spindle to attach the bar code scans to.
8. Go to the *Bar Code Length* data entry box and enter the number of characters in the bar code using the numeric keypad.

9. If you wish to select configurations using the data from the Bar code scan, enter values in the *Data From* and *To* entry boxes along with *Criteria* for each configuration.
10. Press the *Assign* then the *OK* button to save your changes.
11. Press the *Run Main Menu* key. Go to the appropriate variable box (Var. 1 or Var. 2) and select Bar Code.
12. Use the bar code scanner to scan a code and then run a cycle with the tool. The scan data should appear in the variable box on the *Run Main* screen as well as in the Cycle Log.

How do I attach a serial printer?

Click on the link below for instructions.

[Serial Printer Connection and Setup](#)

How do I attach a parallel printer?

Click on the link below for instructions.

[Parallel Printer Connection and Setup](#)

How do I attach a PC?

Click on the link below for instructions.

[Computer Connection and Setup via the Serial Port](#)

How do I check the status of inputs from the I/O connector?

1. Press the *Diagnostics Main Menu* key and then the *Discrete Inputs Sub-Menu* key.
2. Each input that is active is shown in real time during the fastening cycle.

How do I save program parameters to a floppy disk?

1. Press the *Set-up Main Menu* key and then the *Parameter Transfer and Smart Chip Sub-Menu* key.
2. Ensure that a formatted floppy disk is in the floppy drive.
3. Select *Floppy Disk* from the Save Data section of the Parameter Transfer portion of the screen.

4. Navigate to the *Save Data* button, press *Enter*, and enter in a file name using the numeric keypad.

How do I load program parameters from a floppy disk?

1. Press the *Set-up* Main Menu key and then the *Parameter Transfer and Smart Chip* Sub-Menu key.
2. Ensure that a floppy disk containing program sets is in the floppy drive.
3. Select *Floppy Disk* from the Load Data section of the Parameter transfer portion of the screen.
4. Navigate to the *Load Data* button, press *Enter*, and enter in a file name using the numeric keypad.

FAQ: Questions related to Troubleshooting (Installation, Diagnostics, Maintenance, and Repairs)

How do I install the Insight controller in the workspace?

Click on the link below for Insight installation instructions.

[Mounting the Insight Enclosure](#)

How do I replace a Motor Controller?

This process is easier if the Insight IC controller is placed on its back on a flat level surface before beginning this procedure.

1. Turn off the system using the rotary Main Power Switch on the right-hand side of the controller.
2. Unplug the power cord then unlock and open the front door.
3. Disconnect the five connectors on the Motor Controller.
4. Unfasten the four screws securing the Motor Controller to the heat sink (one screw in each corner).
5. Use a screwdriver to pry the Motor Controller from the heat sink.
6. Place the new Motor Controller over the heat sink and fasten the four screws.
7. Re-connect the five connectors.

How do I conduct diagnostics on a connected tool?

1. Press the *Diagnostics* Main Menu key and the *System Test* Sub-Menu is displayed.
2. Go to the *Start Test* button and press *Enter*. The Insight will test the tool and display the results on the left-hand side of the main screen.
3. To save the test results go to the *Save Results* button and press *Enter*. The Insight will save the test results on the right-hand side of the main screen.

FAQ: Questions related to Software Versions and Upgrades**How do I check the application software version I am using?**

1. Press the *Set-up* Main Menu key and then the *System Initialization* Sub-Menu key.
2. The version number is displayed in the General window next to the words "Version Insight."

How do I check the Motor Controller Electronics (MCE) software version I am using?

1. Press the *Set-up* Main Menu key and then the *System Initialization* Sub-Menu key.
2. Navigate to the *MCE Version* button and press *Enter*.

The Complete List of "How do I ...?" Questions**How do I ...?**

1. [Program the Insight for the first time?](#)
2. [Program a Torque Control strategy in Quick Set-up?](#)
3. [Program a Torque Control strategy in Advanced Set-up?](#)
4. [Program an Angle Control strategy in Quick Set-up?](#)

5. [Program an Angle Control strategy in Advanced Set-up?](#)
6. [Program a Yield Control strategy in Quick Set-up?](#)
7. [Program a Yield Control strategy in Advanced Set-up?](#)
8. [Program a Backout strategy?](#)
9. [Program a Fault Backout strategy?](#)
10. [Program a Prevailing Torque Control strategy?](#)
11. [Program a Drag Torque Control strategy?](#)
12. [Select a tool?](#)
13. [Link a tool to a configuration?](#)
14. [Clear a step in a configuration?](#)
15. [Clear a configuration?](#)
16. [Program a custom tool?](#)
17. [Program and use a tube nut tool?](#)
18. [Change from a handheld to a fixtured tool \(or vise versa\)?](#)
19. [Calibrate a tool to an external transducer?](#)
20. [Remotely enable/disable a tool using a PLC?](#)
21. [Set the system date and time?](#)
22. [Change the viewable parameters on the Cycle Log screen?](#)
23. [Change the torque units?](#)
24. [Turn off passwords?](#)
25. [Change a password?](#)
26. [Setup Statistical Alarms?](#)
27. [Use the on-screen Help function?](#)
28. [Program and use the Gang Count function?](#)
29. [Program and use the Auto Increment function?](#)
30. [Assign a name to a configuration?](#)
31. [Use the S.M.A.R.T Windows function to calculate limits?](#)
32. [Send End of Run data via the serial port at the end of each cycle?](#)
33. [Connect and use a socket tray?](#)
34. [Switch configurations using a PLC?](#)
35. [Connect the Insight to a bar code scanner?](#)

- 36. [Attach a serial printer?](#)
- 37. [Attach a parallel printer?](#)
- 38. [Attach a PC?](#)
- 39. [Check the status of inputs from the I/O connector?](#)
- 40. [Save program parameters to a floppy disk?](#)
- 41. [Load program parameters to a floppy disk?](#)
- 42. [Install the Insight controller in the workspace?](#)
- 43. [Replace a Motor Controller?](#)
- 44. [Conduct diagnostics on a connected tool?](#)
- 45. [Check the application software version I am using?](#)
- 46. [Check the Motor Controller Electronics \(MCE\) software version I am using?](#)

This is the end of *How Do I ...?* section. To go to the next section of this manual click on the arrow below, or click on another topic at the left.

Fastening Fundamentals

Precision fastening is the process of applying energy to a fastener via a DC electric torque wrench (called a [spindle](#)) in a highly controlled fashion, in order to achieve an optimum clamp load. The Insight Fastening Control System is the device that controls the spindle.

When a bolt is tightened most of the energy input (typically over 90%) is needed to overcome friction in the threads and elsewhere. Only about 10% is actually used to achieve the clamp load. The amount of friction that must be overcome before proper clamping is achieved can be highly variable. Since friction in the system is both large and variable, it takes a very sophisticated system like Insight to monitor all the tightening parameters and achieve accurate and reproducible fastening.

There are a variety of ways to control fastening, all involve measuring the torque applied to the fastener and the fastener's angular rotation. Insight comes ready to operate in 13 modes or fastening strategies. To go to a brief explanation of a particular strategy click on the link below, or continue your tour and these strategies will be introduced in the sequence shown.

[Engage step](#)

[Torque Control strategy](#)

[Torque Control with Yield Override strategy](#)

[Angle Control strategy](#)

[Angle Control with Yield Override strategy](#)

[Yield Control strategy](#)

[Re-torque Control strategy](#)

[Backout Control strategy](#)

[Delay Control strategy](#)

[log Control strategy](#)

[Prevailing Torque Control strategy](#)

[Drag Torque Control strategy](#)

[Bypass strategy](#)

By controlling a very large number of spindle variables, Insight can achieve highly accurate fastening regardless of the tightening mode used. In addition, by using Insight's advanced programming features you can readily combine these modes to create many specialized tightening strategies.

Following is a brief explanation of each of these tightening strategies. The torque vs. angle curve (called the **tightening curve** or **signature**) is also shown, where appropriate. These signatures call attention to the important parameters or control points for each strategy.

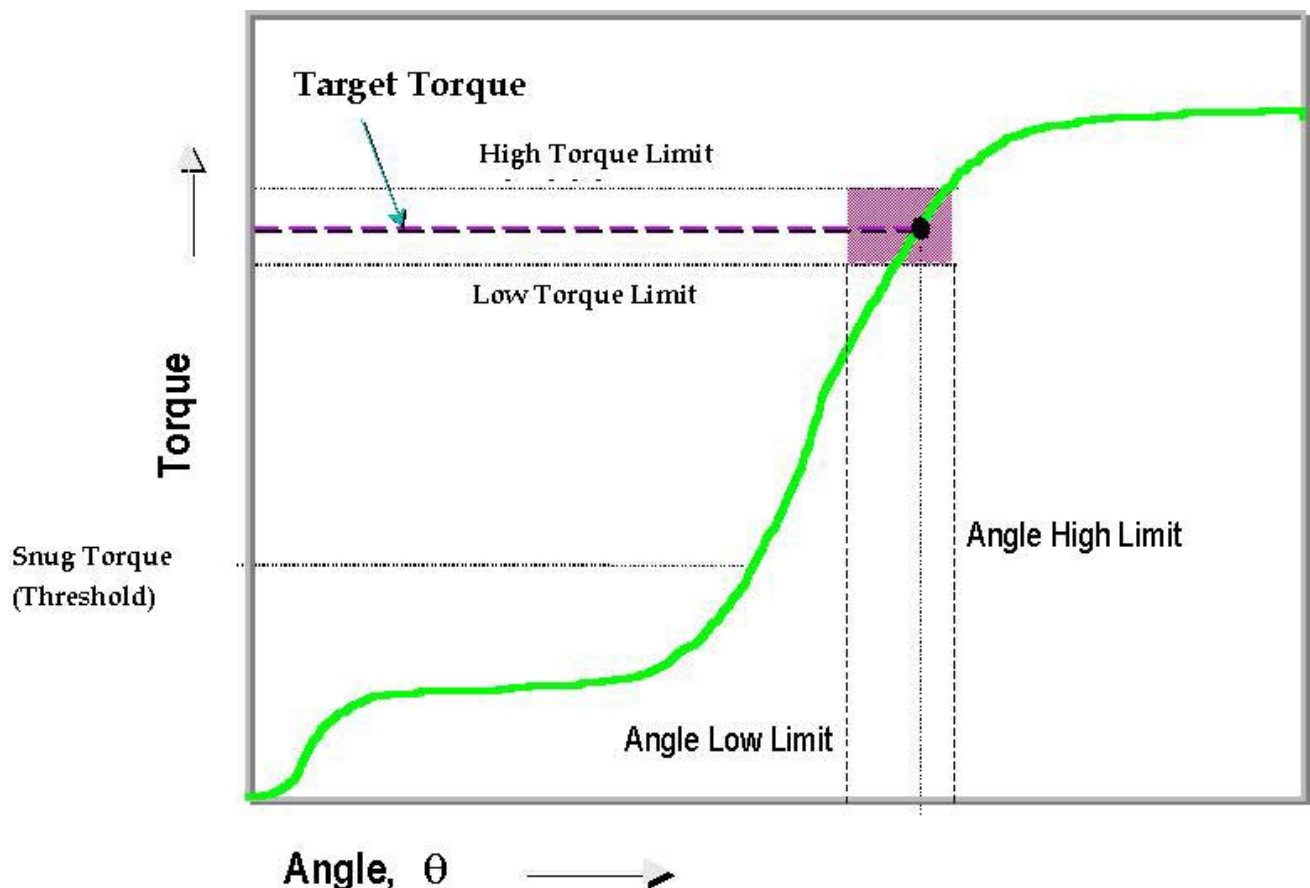
Engage Step

Strictly speaking, the Engage step is not a tightening strategy. Rather it is a step that precedes the tightening strategy and allows the user to specify exactly how the tool will engage the fastener. For example, in the Engage step the user can set the direction the tool turns to tighten (does the fastener have right-hand or left-hand threads?), the speed at which the tool runs down the fastener prior to tightening, the speed at which the tools backs-out if a fault occurs, and so on.

There are about 20 separate Engage parameters, some of which are quite complex. The parameters are explained them in detail in the [Engage Parameters](#) topic in the *Advanced Setup* section.

Torque Control Strategy

Torque is a measure of force (in units of pounds or Newtons) applied over a distance (in units of inches, feet, or meters). Thus, in the Torque Control mode the fastener is tightened to a predetermined torque value as measured by the torque transducer in the [spindle](#). A check on the final angle of fastener rotation is also provided to detect bad tightenings, such as crossed or stripped threads. The tightening curve for torque control strategy is shown below. Click on each parameter with a red highlight to learn its function.

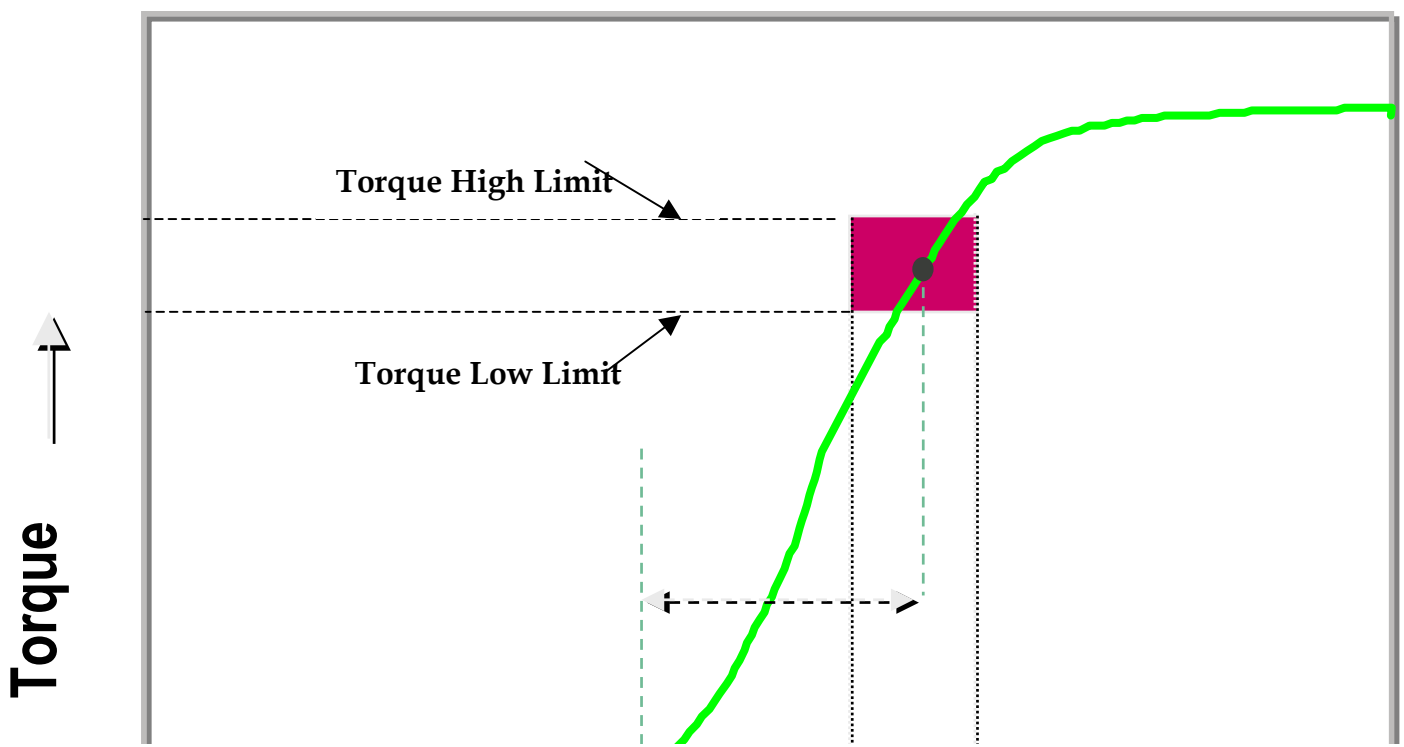


Torque Control with Yield Override Strategy

This is part of the Torque Control mode described immediately above, but in this case an additional check is made during tightening to detect the onset of fastener yield. (Yield is plastic deformation of the fastener, and is described below in [Yield Control Strategy](#).) In this mode, tightening is complete when the controller either reaches the predetermined torque value or detects fastener or joint yield. If yield is reached, the user can program whether this tightening is considered a pass or a fail.

Angle Control Strategy

Angle Control mode works by turning the fastener through a pre-determined angle. Actually this is a two-step process. First a torque is applied to consolidate ("snug") the fastener. Then the fastener is turned through the specified angle. Determining the snug (torque threshold) and final angle parameters requires application testing in order to develop a thorough knowledge of the variations in fastener properties. The tightening curve for angle control strategy is shown below. Click on each parameter with a red highlight to learn its function.



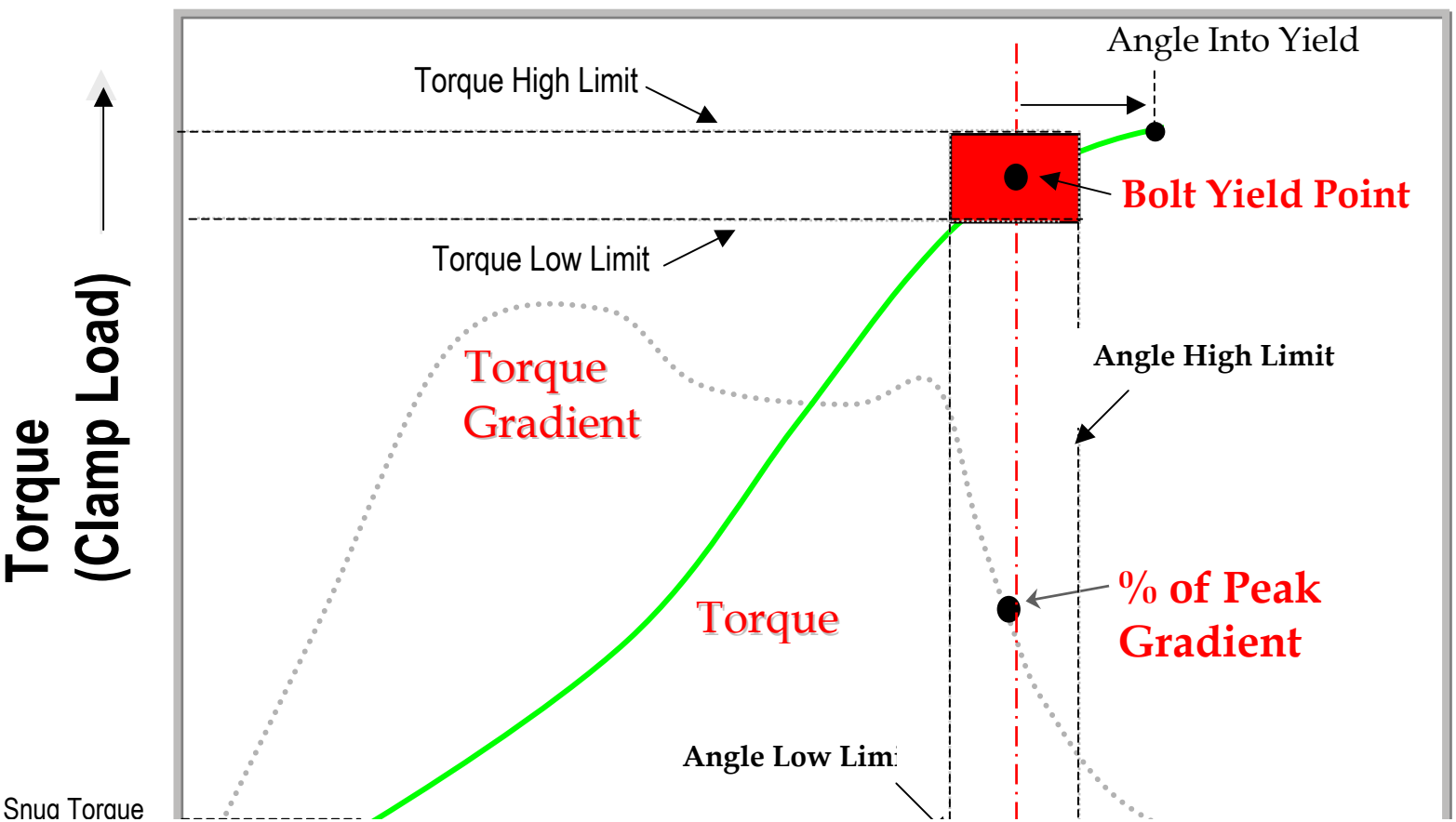
Angle Control with Yield Override Strategy

This is the part of the Angle Control mode described immediately above, but in this case an additional check is made during tightening to detect the onset of fastener yield. (Yield is plastic deformation of the fastener, and is described below in [Yield Control Strategy](#).) In this mode, tightening is complete when the controller either reaches the predetermined angular rotation or detects fastener or joint yield. If yield is reached, the user can program whether this tightening is considered a pass or a fail.

Yield Control Strategy

In Yield Control mode the fastener is tightened until there is actual yield (**plastic deformation**) of the fastener, as measured by monitoring torque and angle tightening parameters. Yield control tightening provides the maximum clamp load for the joint. Also, yield control permits very consistent clamp loads, making it appropriate for critical fastening, such as engine connecting rod and head bolts. The tightening curve for yield control mode is shown below. Click on each parameter with a red highlight to learn its function.

Note: Application testing is required to ensure the joint is suitable for yield control.



Re-torque Control Strategy

Sometimes a fastener will relax after it is tightened. In the Re-torque Control mode the Insight controller reapplies torque to take up relaxation in the joint. This mode can only be used following a Torque Control or Angle Control strategy. The re-torque set point is automatically set at either the Torque Control strategy's target torque value, or the peak torque attained if this step follows an Angle Control strategy. In this mode, the Insight re-tightens the fastener to the same torque value, subject to certain limiting parameters.

Backout Control Strategy

In many instances a fastener is first tightened, then untightened (backed out), then retightened. This process is often used with fasteners that have a compressible gasket. The initial tightening helps deform and consolidate the gasket. The final tightening step is then used to both fully seat the gasket as well as achieve the correct clamp load. This strategy can also be used to pre-condition (clean/chase) the internal threads prior to final tightening.

Backout Control strategy is simply the backout step in the process described above. There is no tightening curve for backout mode, since it is only the untightening portion of a larger fastening strategy.

Delay Control Strategy

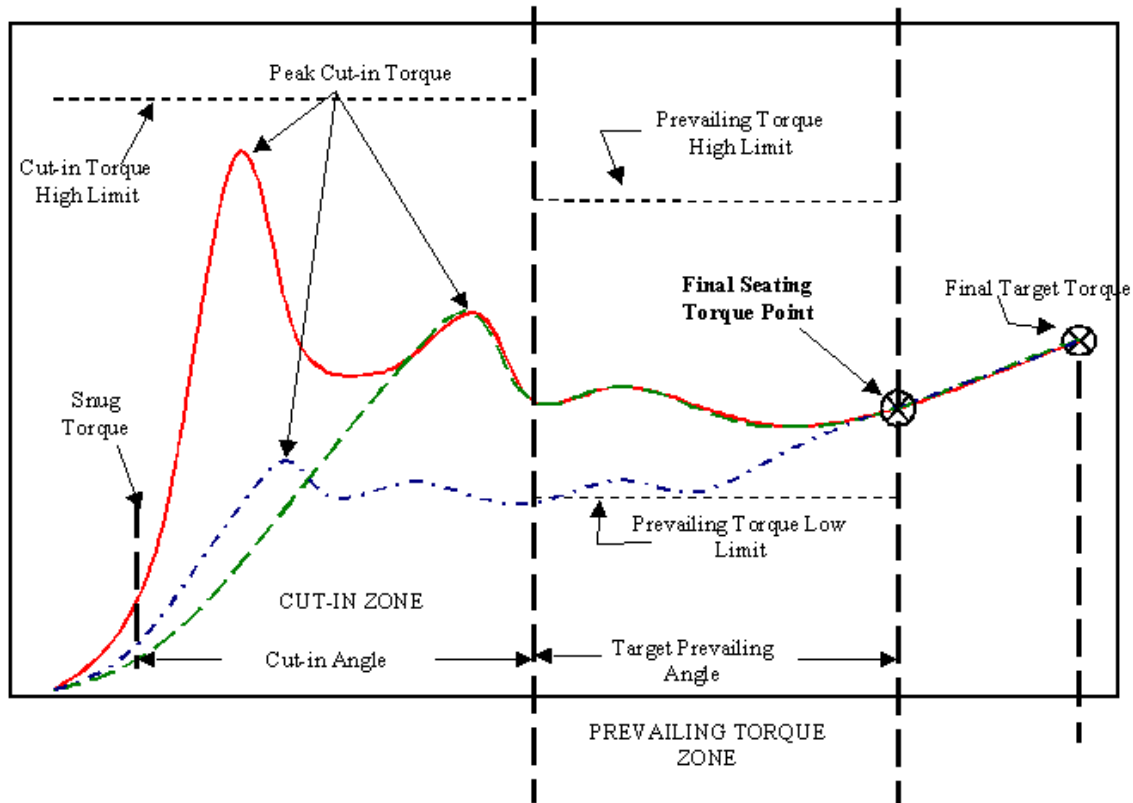
Delay strategy simply allows a time delay to be programmed into the fastening sequence.

Jog Control Strategy

Jog Control mode allows the user to run the Insight at a slow speed for a predetermined maximum angle so that the tool's socket can easily find and engage the fastener. The jog speed is actually set during the [Engage](#) step, but the angle is set here. The jog step continues until either the jog angle or jog torque is reached.

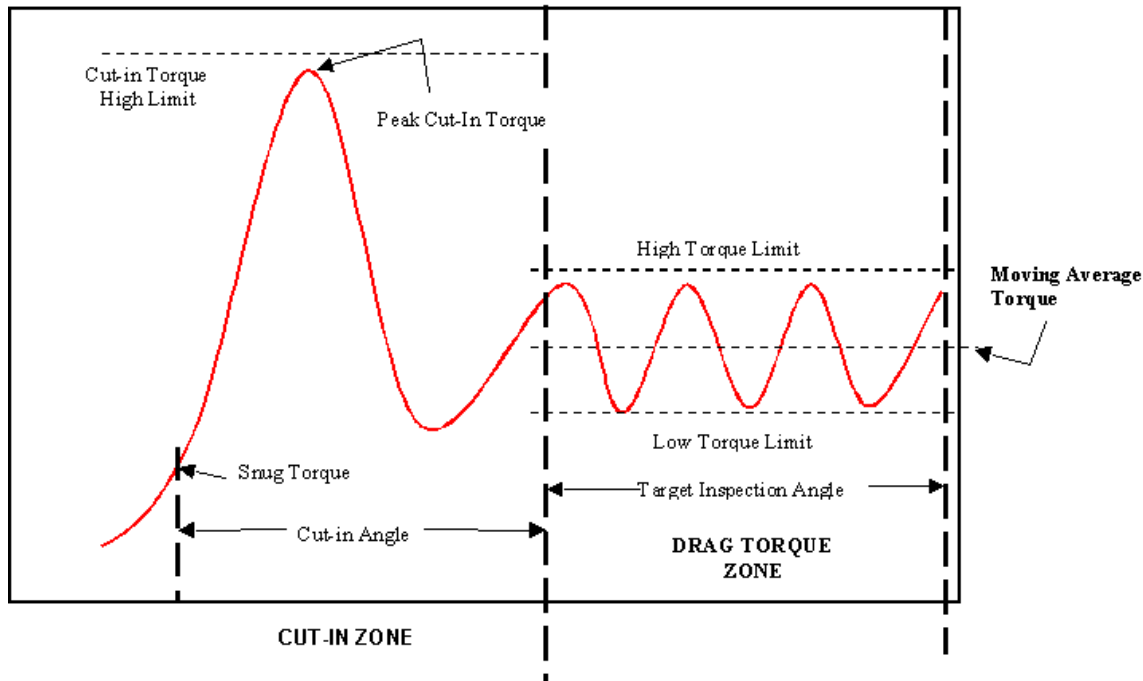
Prevailing Torque Control Strategy

Prevailing Torque Control mode is used with certain specialized fasteners, such as those with nylon locking inserts or [tri-lobular](#) fasteners that are self-tapping or thread-forming. When these fasteners are tightened they encounter an initial period of high torque even before the fastener applies any clamp load. Insight can be programmed to apply the correct amount of initial torque to overcome the fastener resistance, and then continue to apply torque to achieve the proper clamp load. Prevailing torque mode refers only to the strategy required to overcome the fastener resistance; another strategy must always follow prevailing torque to perform the final tightening. The tightening curve for prevailing torque mode is shown below. Click on each parameter with a red highlight to learn its function.



Drag Torque Control Strategy

The Drag Torque Control mode is similar to the prevailing torque mode, in that there is an initial high torque phase, followed by the actual drag torque phase. However, drag torque mode is not used for tightening. Instead, it is typically used as a quality control step after components are assembled. For example, if you produce a gear assembly (such as a transmission), after the transmission is assembled you will want to verify that the gears work properly and do not bind. In these cases the Insight is often used as a dedicated quality control device to turn the transmission and verify the rotational torque required is within specifications. The tightening curve for drag torque mode is shown below. Click on each parameter with a red highlight to learn its function.



Bypass Strategy

The Bypass strategy is unique, in that it is either off or on, it has no selectable parameters. The bypass mode applies only to powerheads. It is used to allow a powerhead to operate with different spindles depending upon the tightening configuration selected. When a powerhead is programmed with different configurations, unwanted spindles can be bypassed so only the desired spindles are used.

This is the end of *Fastening Fundamentals*. To go to the next section of this manual click on the arrow below, or click on another topic at the left.

Contact Ingersoll-Rand

The Fastener Tightening Systems group of Ingersoll-Rand wants you to achieve excellence in fastening and component assembly, and we are ready to help you in any way we can. Contact us for any type of assistance, including

- technical support
- fastening training programs
- [warranty](#) service

- [spare parts](#) or repair services
- application testing.

Our web site (www.irtools.com/fts) is a comprehensive source of information, and you can also e-mail your questions or comments to us via the web site or at insight@irco.com. In addition, you can reach us by mail, telephone, or fax at our [USA](#), [Latin America](#), [Europe](#), and [Asia Pacific](#) offices:

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Register Your Insight System

To get the most from your Ingersoll-Rand Insight fastening control system you should register the product. As a registered user, you and your company will receive notification of enhancements and software upgrades, maintenance bulletins, safety announcements, etc.

You will need the following information when you register:

- Product Model Number
- Product Serial Number (also called Date Code)

This information is located on the label on the right side of the Insight controller, next to the rotary power switch.

To register your system mail in the Registration Card that was included in the shipping carton.

Product Warranty Information

In general, Ingersoll-Rand Insight Fastening Control Systems are warranted for 12 months after installation or 15 months from the date of purchase, whichever occurs first. Since warranty terms are subject to change, refer to the specific warranty that came with your system. If you have questions about your warranty, or need warranty service, [contact Ingersoll-Rand](#) and we will promptly pursue corrective action.

This is the end of the *Contact Ingersoll-Rand* section. To go to the next section of this manual click [here](#), or click on another topic at the left.

Services: System Specifications

Insight Technical Specifications

The specifications for the Insight IC Tightening System are shown below.

Property	Value
Measurement Accuracy	$\pm 0.2\%$ of torque full scale ± 1 count of angle
Measurement Resolution	$\pm 0.025\%$ of torque full scale
Torque Transducer Bridge Excitation	$\pm 5\text{V}$ DC standard
Torque Transducer Zero Offset/Drift Compensation	$\pm 0.4\%$ of full scale
Input Signal Sensitivity	2.0 mV/V

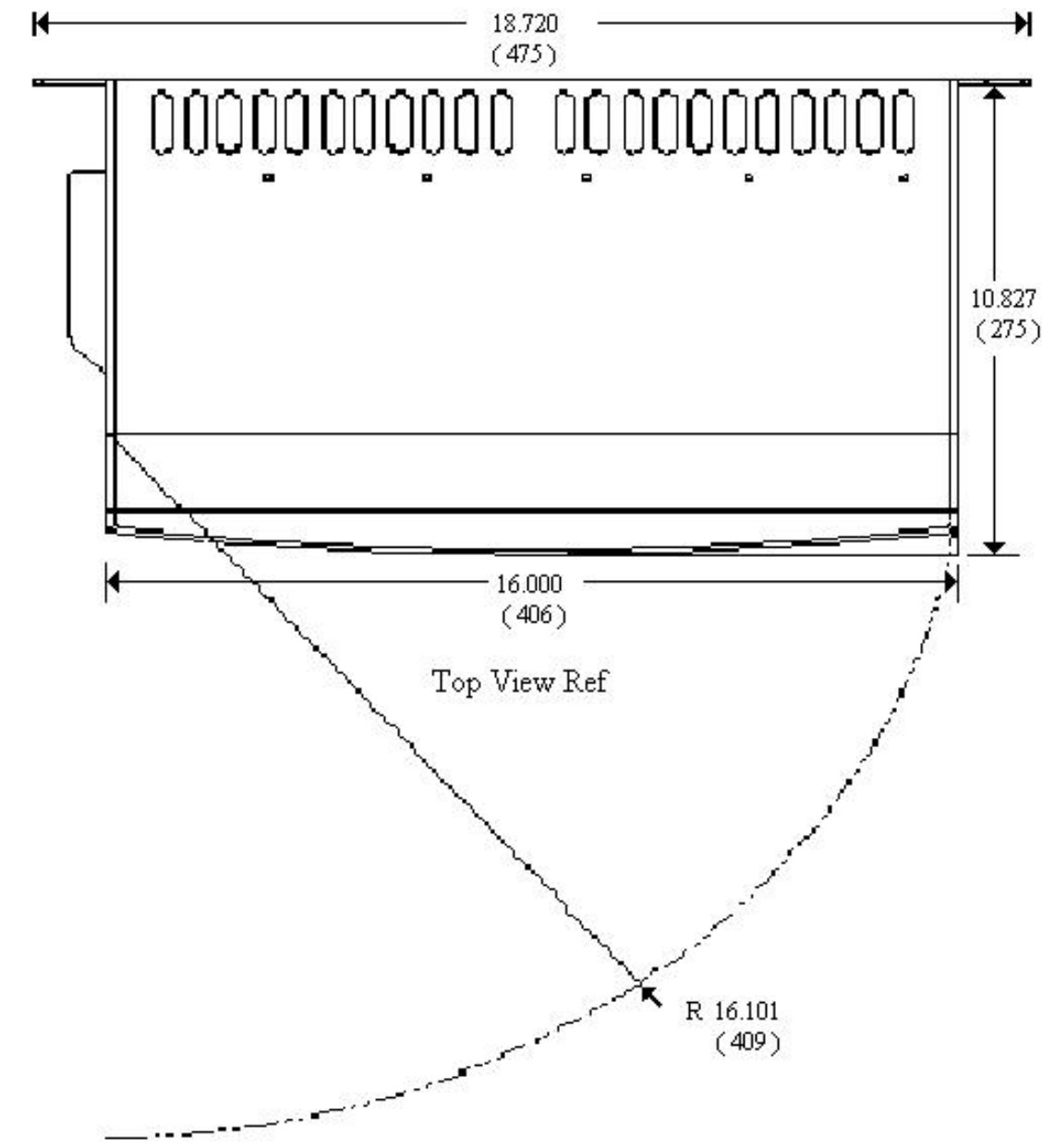
Calibration	Values entered from front panel, tool table or Smart Chip. Automatic digital correction
Frequency Response	Selectable 75 Hz, 150 Hz, 350 Hz, 500 Hz, 750 Hz
Keypad	Membrane keypad containing six hot keys, six function keys, numerical keypad and directional keypad
Display	10.4 inches, 256 color, 640 x 480 pixels, 50° viewing angle
Parameter Sets	32 per spindle
Number of Cycles Stored in Memory	5,000 per spindle, 50,000 per spindle with optional PCMCIA flash card
Statistics Data Memory	100,000 per spindle
Communications	4 Serial RS-232, Ethernet, Parallel printer, optional Profibus and Devicenet Modem port
Control Inputs	STANDARD Free Speed, Soft Start, Forward, Reverse, Tool Disable, Tool Enable, Configuration 1, Configuration 2 OPTIONAL Configuration 3-8, Gang Reset, Configuration Reset, Safety Latch, Limit Switch In, Limit Switch Out, Bypass Spindle
Control Outputs	Accept, Reject, Reject Buzzer, Gang Complete, Cycle Complete, High Torque, High Angle, Low Torque, Low Angle, In Cycle, Statistics Alarm, Spindle in Bypass, Paint Marker Powerhead Accept, Powerhead Reject, Powerhead Cycle Complete, Powerhead In Cycle, Powerhead Paint Marker
Indicators	High-intensity LED indicators for Torque High, Torque Low, Angle High, Angle Low and OK. Incandescent lamps for Spindle Power and Statistics Alarm
Optional Devices	PCMCIA Modem, PCMCIA Flash Card, Floppy Drive, Devicenet Card, Profibus Card, Additional I/O card(s)
Input Voltage	PD1G & PD2G Single Phase 120 Volts, 50/60 Hz, 20 Amp PD1G3 & PD2G3 1 Single Phase 230 Volts, 50/60 Hz, 10 Amp
Ambient Operating Conditions	0-50° C, 20/90% non-condensing humidity
Enclosure	NEMA-12 type
System Weight	PD1G 60 pounds (27kg) PD2G 70 pounds (32 kg)

	PD1G3 80 pounds (36 kg) PD2G3 90 pounds (41 kg)
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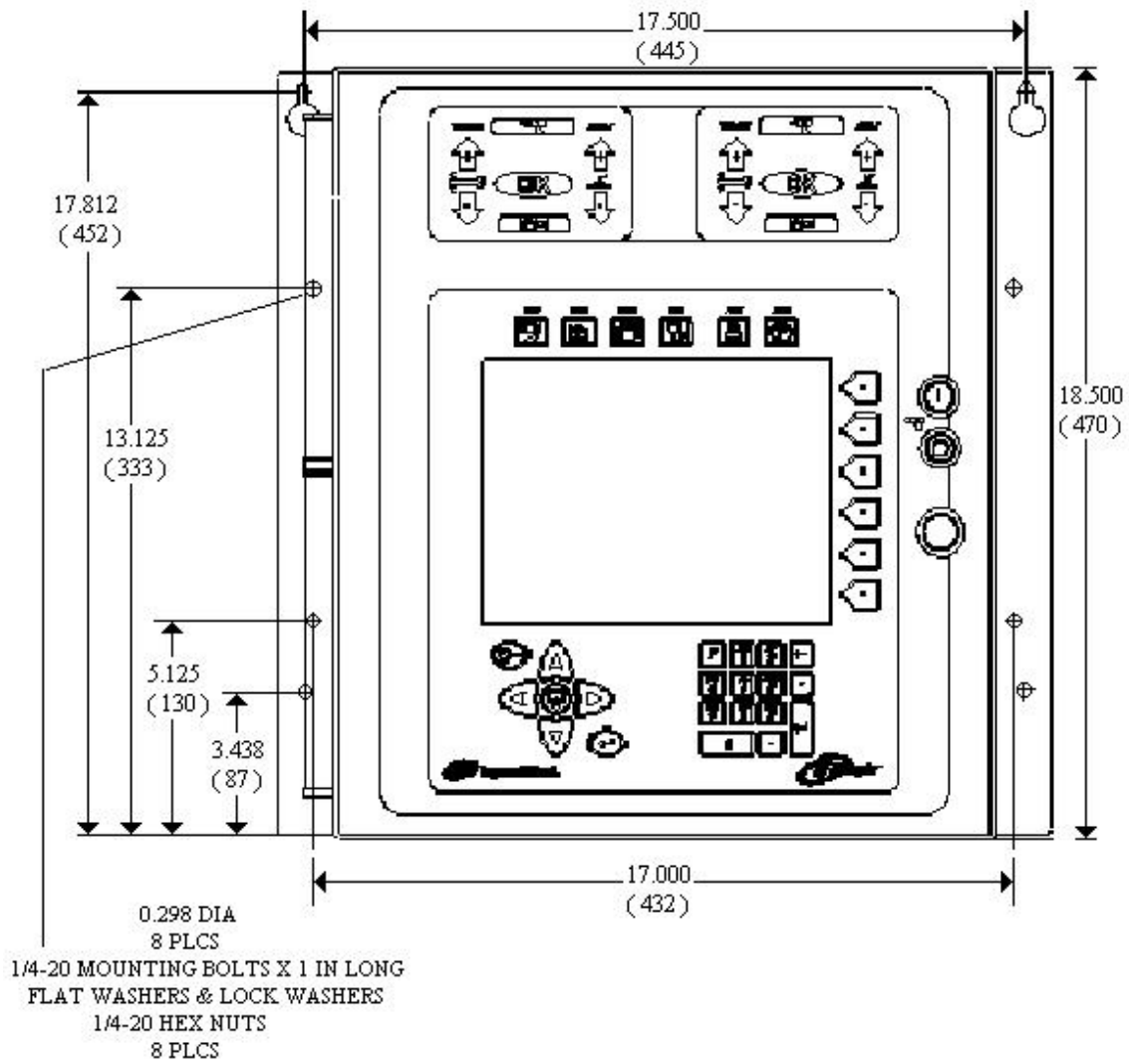
Insight Dimensional Drawings

Below are the dimensional drawings for the Insight one and two spindle controllers. Information on recommended mounting hardware is also provided on the drawings.

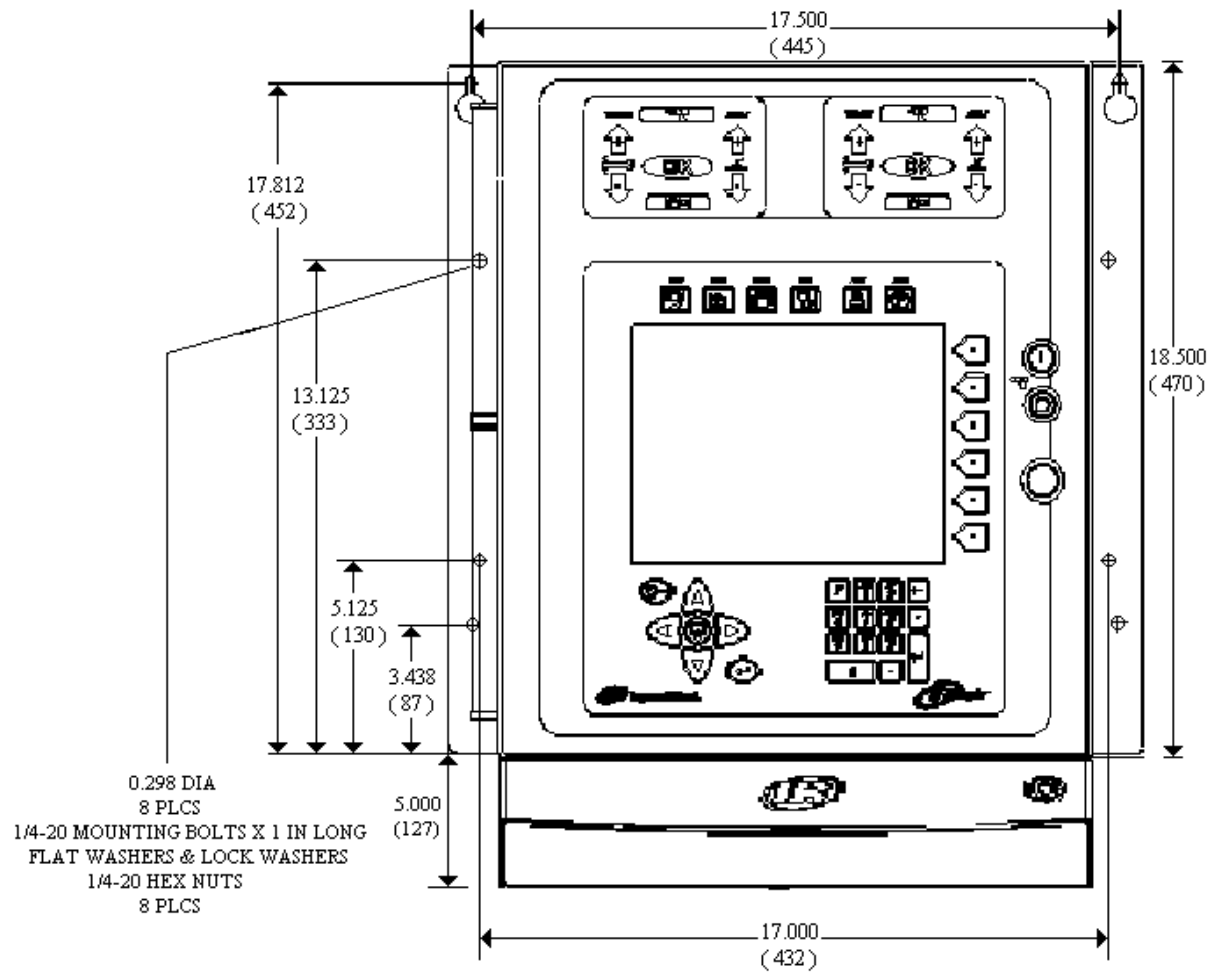
PD1G, PD2G, PD1G3 and PD2G3 Top View



PD1G and PD2G Front View



PD1G3 and PD2G3 Front View



Pinout for Input/Output Connectors

Below is the Pinout for an Insight IC one or two spindle system with no optional I/O boards.

Inputs

Insight IC Base System				
		Spindle 1		Spindle 2
Inputs	Block #	Pin #	Block #	Pin #
Configuration 1	2	I-1	4	I-1
Configuration 2	2	I-2	4	I-2
Spindle #n Disable	2	I-3	4	I-3
Spindle #n Enable	2	I-4	4	I-4
Free Speed	2	I-5	4	I-5
Soft Start	2	I-6	4	I-6
Forward	2	I-7	4	I-7
Reverse	2	I-8	4	I-8

Outputs

Insight IC Base System				
		Spindle 1		Spindle 2
Outputs	Block #	Pin #	Block #	Pin #
Accept	1	O-1	3	O-1
Reject	1	O-2	3	O-2
Cycle Complete	1	O-3	3	O-3
High Torque	1	O-4	3	O-4
Low Torque	1	O-5	3	O-5
High Angle	1	O-6	3	O-6
Low Angle	1	O-7	3	O-7
Programmable	1	O-8	3	O-8

Below is the Pinout for an Insight IC one or two spindle expanded system with one optional I/O board per spindle.

Inputs

Inputs	Insight IC Expanded System			
	Spindle 1		Spindle 2	
	Block #	Pin #	Block #	Pin #
Configuration 1	2	I-1	4	I-1
Configuration 2	2	I-2	4	I-2
Configuration 3	2	I-3	4	I-3
Configuration 4	2	I-4	4	I-4
Configuration 5	2	I-5	4	I-5
Configuration 6	2	I-6	4	I-6
Configuration 7	2	I-7	4	I-7
Configuration 8	2	I-8	4	I-8
Spindle #n Enable	6	I-1	10	I-1
Spindle #n Disable	6	I-2	10	I-2
Gang Reset	6	I-3	10	I-3
Config Reset	6	I-4	10	I-4
Safety Latch	6	I-5	10	I-5
Limit Switch In	6	I-6	10	I-6
Limit Switch Out	6	I-7	10	I-7
Bypass Spindle	6	I-8	10	I-8
Free Speed	8	I-1	12	I-1
Soft Start	8	I-2	12	I-2
Forward	8	I-3	12	I-3
Reverse	8	I-4	12	I-4
Not Available	8	I-5	12	I-5
Not Available	8	I-6	12	I-6
Not Available	8	I-7	12	I-7
Not Available	8	I-8	12	I-8

Outputs

Insight IC Expanded System

	Spindle 1		Spindle 2	
Outputs	Block #	Pin #	Block #	Pin #
Accept	1	O-1	3	O-1
Reject Buzzer	1	O-2	3	O-2
High Torque	1	O-3	3	O-3
High Angle	1	O-4	3	O-4
Low Torque	1	O-5	3	O-5
Low Angle	1	O-6	3	O-6
Gang Complete	1	O-7	3	O-7
Cycle Complete	1	O-8	3	O-8
Reject	5	O-1	9	O-1
Stats Alarm	5	O-2	9	O-2
Programmable	5	O-3	9	O-3
Programmable	5	O-4	9	O-4
Programmable	5	O-5	9	O-5
Programmable	5	O-6	9	O-6
Programmable	5	O-7	9	O-7
Programmable	5	O-8	9	O-8
Programmable	7	O-1	11	O-3
Programmable	7	O-2	11	O-3
Programmable	7	O-3	11	O-3
Programmable	7	O-4	11	O-3
Programmable	7	O-5	11	O-3
Programmable	7	O-6	11	O-3
Programmable	7	O-7	11	O-3
Programmable	7	O-8	11	O-3

Below is the Pinout for an Insight IC one spindle expanded system with two optional I/O boards.

Inputs

Insight IC Ultra System		
Spindle 1		
Inputs	Block #	Pin #
Configuration 1	2	I-1
Configuration 2	2	I-2
Configuration 3	2	I-3
Configuration 4	2	I-4
Configuration 5	2	I-5
Configuration 6	2	I-6
Configuration 7	2	I-7
Configuration 8	2	I-8
Spindle #n Enable	6	I-1
Spindle #n Disable	6	I-2
Gang Reset	6	I-3
Config Reset	6	I-4
Safety Latch	6	I-5
Limit Switch In	6	I-6
Limit Switch Out	6	I-7
Bypass Spindle	6	I-8
Free Speed	8	I-1
Soft Start	8	I-2
Forward	8	I-3
Reverse	8	I-4
Not Available	8	I-5
Not Available	8	I-6
Not Available	8	I-7
Not Available	8	I-8

	The Ultra System has additional inputs reserved for future expansion on: Block 10 Pins I-1 thru I-8 AND Block 12 Pins I-9 thru I-16
--	---

Outputs

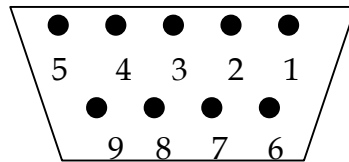
Insight IC Ultra System		
Spindle 1		
Outputs	Block #	Pin #
Accept	1	O-1
Reject Buzzer	1	O-2
High Torque	1	O-3
High Angle	1	O-4
Low Torque	1	O-5
Low Angle	1	O-6
Gang Complete	1	O-7
Cycle Complete	1	O-8
Reject	5	O-1
Stats Alarm	5	O-2
Programmable	5	O-3
Programmable	5	O-4
Programmable	5	O-5
Programmable	5	O-6
Programmable	5	O-7
Programmable	5	O-8
Programmable	7	O-1
Programmable	7	O-2
Programmable	7	O-3
Programmable	7	O-4
Programmable	7	O-5
Programmable	7	O-6

Programmable	7	O-7
Programmable	7	O-8
The Ultra System has additional programmable outputs on: Block 9 Pins O-1 thru O-8 AND Block 11 Pins O-1 thru O-8		

Pinout for Serial Port

Pin-Out for Auxiliary Serial port

DB9 Female



Pin #	Signal
1	Receive Line Signal
2	Receive
3	Transmit
4	Data Terminal Ready
5	Ground
6	Data Set Ready
7	Request to Send
8	Clear to Send
9	Ring Indicator

Serial Protocols

Host Data Out Serial Protocol

The following is the output structure for the Insight's serial port when "Host Data out" has been selected in the Set-Up System Initialization screen. One line of data will be produced for every request sent by the host. The data is in the following format. After a request has been sent by the host and it receives the data, it must send the address number along with an ACK to the controller, to acknowledge that it has received the data.

eeSSCCMMDDYYhhmmhhhhjjkkkkklmmnn<CR><LF>

ee Address Address No. of Insight sent in "Multi Drop Address" entry box
SS Spindle Number
CC Configuration Number
MMDDYY Month, Day, Year
hhmm Hour, Minutes (24 hr time)
hhhhh Torque Four digits plus decimal point
j Torque status space=OK, H=High, L=Low,
kkkkk Angle Five digits
l Angle status space=OK, H=High, L=Low,
mmCycle Last two digits of the cycle count
nn Check sum Two digits Mod 256

To request data Host sends message

AASSCC<CR><LF>

Where AA is Insight Address Number, SS is Spindle number and CC in the configuration number. System responds with data stream above if there is data. If there is no data, then the controller will respond with "AA@@@@" where AA is the address No.

To clear the Host buffer for a configuration send the command

AASSCC01<CR><LF>

To clear the Host buffer for a all configuration of a spindle, send the command

AASSCC02<CR><LF>

E.O.R. (End of Run) Data Out Protocol

The following is the output structure for the Insight's serial port when "E.O.R. Data out" has been selected in the Set-Up System Initialization screen. One line of data will be produced for every valid cycle detected by the Insight. The data will appear on the serial line the moment the cycle has ended.

MM/DD/YY^hh:mm:ss^S^CC^cccccc^TTTTTF^aaaafnn<CR><LF>

Where

^ is a Space

MM is the month the cycle occurred

DD is the day the cycle occurred

YY is the day the cycle occurred

hh:mm:ss is the hours minutes and seconds that the cycle occurred

S is the spindle number of the cycle

CC is the configuration number of the cycle

cccccc is the cycle number

TTTTT is the torque reading (4 digits with a decimal place) of the cycle

F is the status flag for the torque reading: space = ok, H = high, L = low

aaaa is the angle reading of the cycle

f is the status flag for the angle reading: space = ok, H = high, L = low

nn Two digit Check sum (Mod 256)

Definition of Statistical Parameters

INSIGHT IC's statistics functions allow you to acquire meaningful information about your fastening and assembly operations. Most often you will use these functions to analyze empirical data that is "real world" data from your fastening production line to verify that you are meeting existing specifications. However, these statistics functions can also be useful in developing specifications. In these situations you would conduct controlled experiments to systematically vary tightening parameters, and use the statistics functions to help understand the results.

This section briefly defines and explains Insight's statistics functions. You may want to consult statistics reference books for additional information on what these functions mean and how they are used for data analysis. In addition, Ingersoll-Rand's applications engineers are available to help you make full use of not only statistics, but also all of the Insight IC Tightening System's capabilities. Remember that statistics are calculated independently for each spindle and for each spindle configuration. Remember also that you can calculate statistics for a population (all values in memory for that spindle and configuration) or for a sample of that population. Clearing the statistics stored in memory will reset the population and sample counters for the statistics only, the raw torque and angle values are retained in Insight's memory.

The mean, also called the average, is a measure of central tendency.

$$\text{Mean} = \bar{X} = \text{Sum of readings} / \text{Number of readings}$$

Sigma (σ) is the symbol for Standard Deviation, which is defined as the square root of the Variance. Variance is a measure of the degree to which the numbers in a list are spread out, that is whether they are close to or far from the Mean. The units of Variance are the square of the units of the data (for example foot-pounds squared), which makes them less intuitive and sometimes harder to interpret. Since σ is the square root of Variance, it has the advantage of having the same units as the original data.

$$\sigma = \text{square root} \left(\sum_{i=1, n} (\bar{X}_i - \bar{X})^2 / n - 1 \right)$$

Six Sigma (6σ) is six times the standard deviation, as calculated above. While that is the simple definition of six sigma, its significance is that it is an important performance measure for a recent movement within the quality control community to achieve significantly fewer manufacturing defects. For a normal bell-shaped distribution, the mathematical properties of the distribution mean that there is a 68% chance that a value (such as the final torque for a fastening) will be within one standard deviation (1σ) of the mean. Achieving six sigma quality means that you have improved your process and it no longer follows a normal distribution. With six sigma there is a 99.9997% chance of a value being within one standard deviation of the mean. Expressed another way, six sigma quality means that there are <4 defects per 1,000,000 operations.

The Insight IC also uses several other less conventional statistical measures. These are summarized below.

$$C_p = (USL - LSL) / 6\sigma$$

Where USL = the upper set limit (or high limit) for a parameter, and
LSL = the lower set limit (low limit)

$$C_{pk} = \text{the lesser of } \frac{(\bar{X} - LSL)}{3\sigma} \quad \text{or} \quad \frac{(USL - \bar{X})}{3\sigma}$$

$$\text{Capability} = (6\sigma / \bar{X}) * 100 \quad (\text{expressed as a percent})$$

CAM is a statistical parameter that is calculated for a series of fastenings. A total of 30 readings (six sample groups of five readings each) are usually used. Sample group #1 consists of five consecutive fastening values, sample group #2 consists of the next five consecutive fastening values, and so on up to sample group #6. For each sample group subtract the lowest reading from the highest reading. This value is called x_1 for sample group #1, x_2 for sample group #2, and so on. These results are used to define a term called W, Average dispersion, where:

$$W = (x_1 + x_2 + x_3 + \dots + x_n) / (\text{number of sample groups (usually 6)})$$

A constant is also used in the CAM calculation. That constant (called dS) varies with the number of sample groups, but for the usual six sample groups, dS = 1.746. Finally, CAM requires the torque or angle high limit and low limit (see USL and LSL defined above). Using these various values, CAM is calculated as follows:

$$\text{CAM} = (\text{USL} - \text{LSL}) / (6 * (\text{W} / \text{dS}))$$

Recommended Spare Parts

Recommended Spare Parts List

Part Number	Description
PC89944185	Insight Operations Manual - CD ROM
PC89944326	Label, I/O Configuration A
PC89944334	Label, I/O Configuration B
PC89944342	Label, I/O Configuration C
PC89944359	Door assembly, 1 Spindle
PC89944367	Door assembly, 2 Spindle
PC89944375	Display,
PC89944375	Display, Color 10.4" LCD
PC89944383	Inverter, LCD Backlight
PC89944391	PCB Assembly, RISC Processor
PC89944409	PCB Assembly, 5V Power Supply
PC89944417	Power Supply, 12V DC - 60W
PC89944425	PCB Assembly, I/O
PC89944433	PCB Assembly, Cycle Status
PC89944466	Motor Controller Assembly
PC89944565	Connector, Terminal Block - 10 Pin
PC89944573	Power Supply, 24V DC - 100W

PC89944581	GFI/Circuit Breaker
PC89944599	Floppy Drive Kit
PC89944672	Cord, Power 120V-20A
PC89944680	Battery, Processor
PC89944748	Shipping Carton
PC89945331	Label, Operation Manual CD-ROM
PC89945349	Label, ICS Utility CD-ROM
PC89945455	Cover, Safety
PC89945497	ProfiBus Kit
PC89945505	DeviceNet Kit
PC89945521	PFCS Software
PC89945851	Modem Kit, PCMCIA
PC89945869	Modem, PCMCIA Card
PC89946669	Flash Memory, PCMCIA Card
PC89947618	115V Standard Cord Kit
PC89947626	115V Pigtail Kit
PC89947634	230V Pigtail Kit
PC89947642	Option, Standard I/O
PC89947659	Option, Single I/O Board
PC89947667	Option, 2 I/O Boards
PC89947675	Option, No Floppy Drive
PC89947683	Floppy Drive
PC89947691	Option, Standard Communications
PC89947840	Interface Card, ProfiBus
PC89947857	Interface Card, DeviceNet
PC89947865	Cord, Power - 230V 16A Pigtail
PC89947873	Cord, Power - 120V 20A Pigtail

Insight Shutdown Codes

At the end of every cycle, the Insight IC logs a shutdown code to the cycle that indicates under what conditions the tool stopped. This shutdown code can be viewed in the cycle log by selecting *Shutdown Code* in the *E.O.R. Filter* screen of the *Set-Up System Initialization* menu screen. Below is a list of the Shutdown Codes.

Shutdown Code #	Description
0	Normal Completion of Cycle
1	Trigger released before system shutdown
2	Tool stop on torque high
3	Tool stop on Angle high
4	Tool stop on yield override
5	Prevailing torque seating torque fail
6	Prevailing torque seating angle fail
7	Prevailing torque too high (next step target + prevailing > next step limit)
8	Prevailing torque sync shutdown (forced to shutdown because sync flag was set)
9	Min drag torque fail
10	Motor stalled (I2t limit reached)
11	Hall transition error (Hall fault)
12	Motor controller IGBT driver fault (bootstrap cap under voltage or IGBT short)
13	Over current (detected by software current loop)
14	Low bus voltage
15	Cycle timeout (cycle timeout time reached before end of cycle)
16	Display processor issued a STOP command to Motor controller
17	Tool was disconnected
18	Communication was lost (unable to send EOR or other asynchronous "event")
19	Bad torque reference (the torque step reference + tare-overshoot was greater than the step limit)

This is the end of the *Services: System Specifications* section and the end of the Insight IC Fastening System with Graphics Display manual. If you want additional information on this Insight system, click on another topic at the left.

END OF DOCUMENT