

Tool-Chek® 100

User's Guide



Tool-Chek® 100

User's Guide

Metronics, Inc.
Bedford, New Hampshire, USA



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Safety & Maintenance Considerations

General safety precautions must be followed when operating the system. Failure to observe these precautions could result in damage to the equipment, or injury to personnel. It is understood that safety rules within individual companies vary. If a conflict exists between the material contained in this guide and the rules of a company using this system, the more stringent rules should take precedence.

Although Metronics strongly recommends that you read all parts of this guide, it is essential for reliable and safe operation to read the first portions up to and including Chapter 2: Operation, prior to operating the TC100.

Location & Mounting

The TC100 must be placed or mounted on a stable, reliable surface. If the TC100 should fall, it could become seriously damaged and more importantly could cause injuries to the user. For mounting instructions, refer to the Getting Started section of Chapter 2: Operation, for the mounting bolt hole pattern.

Cleaning

Use only a cloth dampened with water and a mild detergent for cleaning the exterior surfaces. Never use abrasive cleaners, and never use strong detergents or solvents. Only dampen the cloth, do not use a cleaning cloth that is dripping wet.

Electrical

Do not allow the power cord to be located such that it can be walked on or create a tripping hazard.

WARNING

Unplug the TC100 from the electrical outlet before cleaning.

WARNING

The TC100 is equipped with a 3-wire power plug that includes a separate ground connection. Always connect the power plug to a 3-wire grounded outlet. The use of 2-wire power plug adapters or any other connection accessories that remove the third grounded connection create a safety hazard and should not be permitted. If a 3-wire grounded outlet is not available, ask your electrician to provide one.

General Maintenance

Unplug the TC100 from the wall outlet and seek the assistance of a qualified service technician if:

- The power cord is frayed or damaged or the power plug is damaged
- Liquid is spilled or splashed onto the enclosure
- The TC100 has been dropped or the exterior has been damaged
- The TC100 exhibits degraded performance or indicates a need for service some other way

Backup Battery Charging

The TC100 utilizes an internal battery to maintain system configuration settings during power interruptions. A battery circuit charges this backup battery during periods of normal operation.

When the TC100 is used on a daily basis, the backup battery will be adequately charged to maintain configuration settings during power outages. However, over extended periods of nonuse, the battery might lose the charge necessary to maintain configuration settings. To keep the backup battery charged over extended periods of nonuse, apply power to the TC100 and leave it turned on for a minimum of 2 days each month.

FCC Compliance Statement

FCC Rule NP15R Rev. 23, June, 1989

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions in this guide, may cause harmful interference to radio communication. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Shielded cables must be used with this unit to ensure compliance with Class A FCC limits. The connection of a nonshielded equipment interface cable to this equipment will invalidate the FCC Certification of this device and may cause interference levels which exceed the limits established by the FCC for this equipment. It is the responsibility of the user to obtain and use a shielded equipment interface cable with this device. Do not leave cables connected to unused interfaces. Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

For Canadian Users:

This Class "A" digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe "A" respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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Introduction

About this Guide

The material in this guide is divided into 4 chapters. Topics range from basic operating instructions to system configuration. Chapters 1 through 3 contain the essential information to use the TC100. Do not operate the TC100 unless the material in these chapters is thoroughly understood.

Keep this guide in a convenient location. Refer to it any time additional information about the use and operation of the TC100 is needed. Use the index to locate information by subject.

Who Should Read This Guide

This guide is intended for operators, technicians, supervisors, and dealer representatives.

NOTE

System setup and configuration instructions provided are intended for qualified supervisors, dealer representatives and OEMs only. Operators should not attempt to alter the configuration of the TC100.

What This Guide Covers

Chapter 1: Overview

This chapter describes the use and application of the TC100 digital readout and includes an annotated drawing and technical specifications.

Chapter 2: Quick Start

Use this chapter as a basic user tutorial. The quick start demonstration provides TC100 operation instruction with a minimum of details.

Chapter 3: Operation

This chapter includes detailed descriptions of controls and indicators, and instructions for measuring setting gages, tools, circles, and angles.

Chapter 4: Communications

Use this chapter to connect the TC100 to a printer or computer via the RS-232 or parallel port.

Chapter 5: Setup

This chapter contains system configuration instructions for qualified supervisors and dealer representatives.

Conventions & Terms

The terms *Tool-Chek 100*, *TC100* in this guide refer to the Tool-Chek 100 digital readout. *System* refers to the TC100 and the tool presetting device connected to it.

Tool presetter refers to any device intended to measure machine tool offsets in 2 dimensions. *Probing* refers to the process of measuring a tool.

Icons

This guide uses the following icons to highlight information:



Warning

The raised hand icon warns of a situation or condition that can lead to personal injury or death. Do not proceed until the warning is read and thoroughly understood. Warning messages are shown in bold type.



Caution

The exclamation point icon indicates a situation or condition that can lead to equipment malfunction or damage. Do not proceed until the caution message is read and thoroughly understood. Caution messages are shown in bold type.



Note

The note icon indicates additional or supplementary information about an activity or concept. Notes are shown in bold type.

Type Styles

Warnings, cautions, and notes are shown in this typeface.

Italics indicate menu items, front panel keys, input fields, or soft keys.

Measurement Polarity

Instructions in this guide assume that:

- Moving crosshairs to the right causes the X axis counts to increase in a positive direction; 1 to 2 to 3 and so on.
- Moving crosshairs up causes the Z axis counts to increase in a positive direction; 1 to 2 to 3 and so on.
- To reverse the count direction of any axis, see the *encoders* section of *chapter3: setup*.

Display Resolution in this Guide

Generally, the display resolution shown in this guide is one ten-thousandth of an inch (0.0001in) or two microns (0.002mm). Display resolutions in this guide are examples only. User display resolutions are likely to vary according to the specific application.

Accuracy & Precision

Measurement accuracy is determined by the resolution of the encoders on the measuring device. Generally, the display resolution of the TC100 can exceed the encoder resolution. Setting the display resolution to exceed the encoder resolution does not increase measurement accuracy.

System Configuration & Setup

All system setup and configuration must be performed by an authorized Metronics distributor or OEM. Setup includes calibration with the tool presetting device.

Anytime the TC100 is connected to a different tool presetting device, it is necessary to perform configuration and setup again. Qualified supervisory personnel should refer to *chapter 3: setup* or contact their Metronics distributor for assistance.

WARNING

Electrical shock risk: do not open the TC100 enclosure. There are no user-serviceable components or assemblies inside. Contact your Metronics distributor for service and maintenance.

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Overview

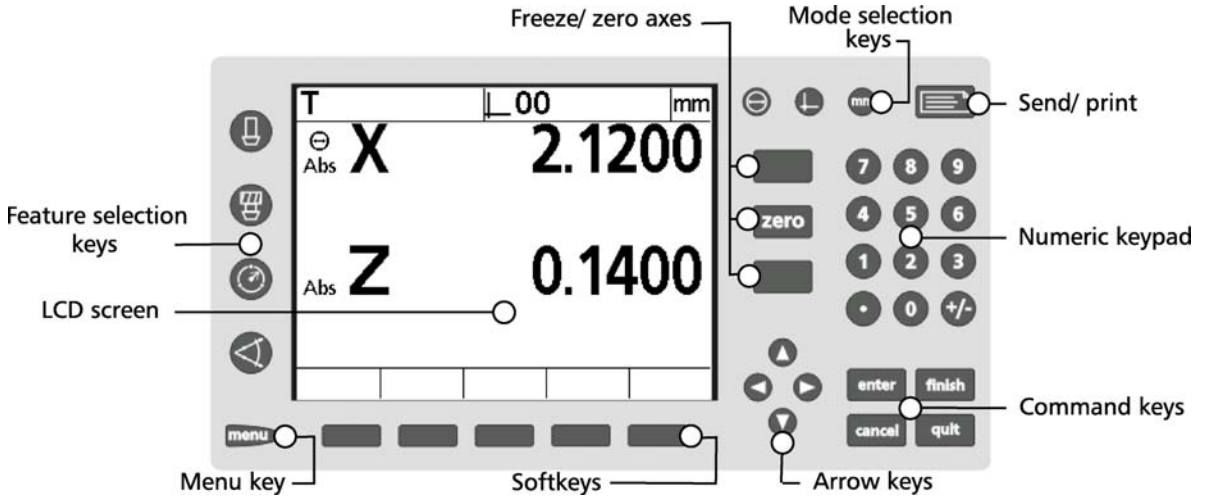
The Tool-Chek 100 is an advanced digital readout system for tool presetters. Use the TC100 to establish datums using a setting gage and measure tool offset relative to nominal dimensions. Measurement results can be viewed on the TC100's LCD display, sent to a printer, or downloaded to a computer. Choose from a variety of printed report formats to suit your application.

The user interface retains many functions and features familiar to users of the Tool-Chek 200® and other Metronics products. In addition, more information is given to the operator via the graphic LCD display. Data is clearly presented on one screen, eliminating the need to page or scroll for information. Front panel keys clearly marked with familiar function and mode symbols.

Use the front panel keys to perform standard presetting tasks. Select presetting functions, change operation and display modes, enter numeric data, zero axes, turn the LCD display on/off, or send data to a printer or computer with the press of a button.

Soft keys execute specific presetting tasks. Depending on the current task, various soft key options are displayed on the bottom of the LCD screen. Press the soft key beneath the displayed option to execute the desired function.

In this guide, users are sometimes instructed to highlight a data field or tool. Use the arrow keys to navigate through lists and menus and highlight data fields on the TC100. Once a data field is highlighted, use the numeric keypad to enter numeric information.



All front panel keys provide tactile sensory feedback. Additionally, supervisors can configure keys to generate audio feedback as well.

The TC100 is equipped with a speaker and external speaker jack. Adjust speaker volume to suit the operating environment or plug a headset into the speaker jack.

Transmit presetting data to a computer over the RS-232 port connection, or to a printer over the parallel or RS-232 port.

An optional foot switch and remote keypad are available for key and numeric data entry. Use these devices when the TC100 is mounted out of the operator's reach.

Specifications

Input voltage range:	85 VAC to 264 VAC. 1.0 Amp maximum (Auto switchable)
Fuse:	1.6 Amp 250V Type T
Input Frequency:	43Hz to 63Hz

CAUTION

For continued protection against fire, use replacement fuse with the specified voltage and current ratings only.

Environmental Conditions

Temperature:	0C to 45C (32F to 113F) non-condensing
Humidity:	90%rh
Altitude:	2000 meters
Installation category:	II

Dimensions

Enclosure(WxHxD):	10" X 5.25" X 4.75"
Enclosure weight:	3.6 lbs.

LCD

Size/color:	6" black and white
Display digit size:	0.5"

Resolution:	0.000004" or 0.0001mm
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ENC tests	EN61326:1998 EMC for electrical equipment for measurement, control, and laboratory use EN61010 Safety requirements for electrical equipment for measurement, control, and laboratory use
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WARNING

Electrical shock risk: do not remove cover or open the enclosure. There are no user serviceable parts inside. Contact your Metronics distributor for service.

Chapter 2

Quick-start

Before You Begin



Use this chapter to learn the basic operation of the Tool-Chek 100. The demonstrations in this chapter help experienced operators start using the TC100 immediately. Less experienced operators may need to read chapter 3: operation to understand some of the material in this chapter. Perform the indicated steps on your TC100 while reading this material for best results.

NOTE

Illustrations are included in this manual to indicate the basic screen displays encountered while operating the TC100. Specific data (i.e. measurements) varies according to user selections. It is not necessary to match your actual measurements to those presented here.

This chapter teaches users to:

- Measure and store a setting gage
- Measure a tool
- Save a tool

See chapter 3: operation for complete operating principles and step-by-step demonstrations.

Illustrations in this chapter show a 2 axis (ZX) system with factory default settings.

Getting Started



Read and understand all safety and operating instructions before operating the TC100. To complete the tasks described in this chapter, users must understand the presetting process, the tool presetter used, and the controls, indicators, and information presented on the TC100 display.

NOTE

Operators are required to understand tool fixturing and probing techniques that apply to the tool presetting device connected to the TC100.

Safety Reminders

Location and mounting

Mount the TC100 on a stable surface. If it falls, serious damage or injury can result.

Checking connections

Perform routine inspections on all connections to the TC100. Keep connections clean and tight. Locate cables away from moving objects. Do not create tripping hazards with the power cord or connection cables.

Use shielded cables to connect to the parallel and serial (RS232) output ports. Make certain cables are properly terminated and firmly connected on both ends.



CAUTION

Never connect the power cable to the TC100 with the power switch in the ON position.

Power cord and plug

Make sure the power cord is not located where it can be walked on or create a tripping hazard. Connect the 3-prong power plug to a 3-prong grounded outlet only. Do not attempt to adapt or remove the 3rd prong to fit the plug in a 2-prong electrical outlet. Modifying or overriding these features creates a safety hazard and should not be permitted.

Power surge suppressor

Use a high-quality power surge suppressor to limit the amplitude of potentially damaging power line transients caused by the operation of heavy electrical machinery or lightning. The surge suppressor found on inexpensive power strips is insufficient to protect the TC100 from damage.

Liquids

Do not spill or splash liquids on the TC100 enclosure.

Configuration and system setup

Only qualified supervisors and dealer representatives should perform system configuration and setup. Operators should not attempt to alter the configuration of the TC100.

Applying Power

Move the power switch located on the back of the TC100 to the *ON* position. The system initializes and displays the power-up screen.

Power-up screen

The power-up screen is displayed each time the TC10 is turned on. Press any key to display the DRO screen.

The DRO screen shows the current positions of encoders on each axis.



NOTE

Some encoders require the user to move each axis across a reference mark before the TC100 displays the DRO screen.

Adjusting LCD contrast

Adjust the LCD contrast for optimum viewing of the DRO screen. Press the *decimal point key* to decrease contrast or the *+/- key* to increase contrast.

Selecting measurement and display modes

Use the mode selection keys located above the numeric keypad to choose measurement units, datums, and display coordinates. These parameters are user defined and depend on the application performed.

Diameter/radius



Select diameter or radius measurement by pressing the Diameter/Radius mode key. This selection can be changed at any time.



NOTE

When the user changes the mode from diameter or radius the value entered remains the same. Be certain to adjust the value entered to obtain accurate presets.

Datum



Use the datum mode selection key to toggle between datum 1 and datum 2. Datum 2 is a temporary datum that is useful for performing incremental measurements. The current datum number is displayed in the upper right corner of the screen.

mm/inch



Use the mm/inch mode selection key to toggle the display units between millimeters and inches. The current unit of measure is displayed in the upper right corner of the screen.

To measure and store a setting gage

Step 1



Press the *setting gage* key to display the *select setting gage* screen.

Select Setting Gage		mm
00	Name	00
	Nominal X	0.00000
	Nominal Z	0.00000
	Label Format	Current
	Swap Axes	No
	Reverse X	No
	Reverse Z	No
	R/D Axis	X
	Cal Date	
New	Edit	Delete

Press the new softkey to display the *new setting gage* screen. Use the numerical keypad to enter a name for the setting gage and then press the *enter* key.



Pressing the *enter* key highlights the next input field on the screen.

New Setting Gage		mm
Name	<input type="text"/>	
Nominal X	<input type="text"/>	Dia
Nominal Z	<input type="text"/>	
Label Format	Current	
Swap Axes	No	
Reverse X	No	
Reverse Z	No	
R/D Axis	X	
Cal Date		
		Cal

Step 2

Enter the value for Nominal X. Nominal X is the diameter or radius of the setting gage. Press enter.



NOTE

The TC100 displays either 'Dia' or 'Rad' next to input field for Nominal X to indicate whether the value is a diameter or radius. This indication can be changed by pressing the Diameter/Radius mode selection key.



NOTE

When the user changes the mode from diameter or radius the value entered remains the same. Be certain to adjust the value entered to obtain accurate presets.

Enter the value for Nominal Z. Nominal Z is the distance from the datum to the tip of the setting gage. Press enter.

Use the softkeys to choose from current, standard, or custom label formats and press enter.

Use the softkeys to choose from current, standard, or custom report formats and press enter.

The swap axes feature allows the user to swap the X and Z axis. Use the softkeys to select yes or no and press enter.

The reverse X feature allows the user to reverse the positive and negative ends of the X axis. Use the softkeys to select yes or no and press enter.

The reverse Z feature allows the user to reverse the positive and negative ends of the Z axis. Use the softkeys to select yes or no and press enter.

The R/D Axis feature allows the user to designate the X or Z axis as the diameter/radius of the setting gage. Use the softkeys to select X or Z.

New Setting Gage		mm
Name	001	
Nominal X	0.12500	Dia
Nominal Z	3.00000	
Label Format	Current	
Swap Axes	No	
Reverse X	No	
Reverse Z	No	
R/D Axis	X	
Cal Date		
X	Z	Cal

Step 3
Press the *finish* key.



Align the setting gage with the crosshairs on the tool presetter and press enter.

New Setting Gage		mm
Name	001	
Press ENTER when the setting gage is aligned.		
La		
Sw		
Reverse X	No	Z
Reverse Z	No	
R/D Axis	X	
Cal Date		X ⊖

The TC100 stores the setting gage in its memory. It is now ready to be recalled by the user.

To measure and store a tool

Step 1



Press the *tool* key to display the *new tool screen*. Use the numeric keypad to enter a number for the tool and press the enter key.

Step 2

Position of tool (POT) refers to a tool's location in a tool changer mechanism. Use the numeric keypad to enter a value between 1 and 99 then press enter.

Nominal X is the diameter or radius of the tool. Use the numeric keypad to enter a value for nominal X and press enter.

Nominal Z is the length of the tool. Use the numeric keypad to enter a value for nominal Z and press enter.

Enter the number of the setting gage to be used with this tool. If the setting gage has not been entered the user is unable to store the tool data. The setting gage must be entered before a tool can be measured with it.

The TC200 allows the user to store the location of tools in the location field.

Location refers to the physical storage location of the tool and not the position of the tool (POT) in the automated tool changer. Entries in this field are optional. Use the numerical keypad to enter the tool location and press enter. To continue without entering a location simply press enter.

The TC200 includes additional inputs for radius and angle for specialized cutting tools. For conventional milling procedures these fields are left blank.

New Tool		mm
Tool	<input type="text" value="001"/>	
Nominal X	<input type="text" value="0.12500"/>	Dia
Nominal Z	<input type="text" value="5.00000"/>	
Setting Gage	<input type="text" value="01"/>	
Location	<input type="text" value=""/>	
Radius	<input type="text" value=""/>	
Angle	<input type="text" value=""/>	
Save	<input type="text" value=""/>	<input type="text" value=""/>

Step 3

Press the save softkey to save the tool. The TC100 displays the tool just created.

Chapter 3

Operation

Using the TC100



Use this chapter to learn the basic operation of the Tool-Chek 100. Perform the indicated steps on your TC100 while reading this material for best results.

NOTE

Illustrations are included in this manual to indicate the basic screen displays encountered while operating the TC100. Specific data (i.e. measurements) varies according to user selections. It is not necessary to match your actual measurements to those presented here.

This chapter teaches the user to:

- Measure and store a setting gage
- Measure and store a tool
- Measure a circle
- Measure an angle

Illustrations in this chapter show a 2 axis (ZX) system with factory default settings.

Getting Started



Read and understand all safety and operating instructions before operating the TC100. To complete the tasks described in this chapter, users must understand the presetting process, the tool presetter used, and the controls, indicators, and information presented on the TC100 display.

NOTE

Operators are required to understand tool fixturing and probing techniques that apply to the tool presetting device connected to the TC100.

Safety Reminders

Location and mounting

Mount the TC100 on a stable surface. If it falls, serious damage or injury can result.

Checking connections

Perform routine inspections on all connections to the TC100. Keep connections clean and tight. Locate cables away from moving objects. Do not create tripping hazards with the power cord or connection cables.

Use shielded cables to connect to the parallel and serial (RS232) output ports. Make certain cables are properly terminated and firmly connected on both ends.



CAUTION

Never connect the power cable to the TC100 with the power switch in the ON position.

Power cord and plug

Make sure the power cord is not located where it can be walked on or create a tripping hazard. Connect the 3-prong power plug to a 3-prong grounded outlet only. Do not attempt to adapt or remove the 3rd prong to fit the plug in a 2-prong electrical outlet. Modifying or overriding these features creates a safety hazard and should not be permitted.

Power surge suppressor

Use a high-quality power surge suppressor to limit the amplitude of potentially damaging power line transients caused by the operation of heavy electrical machinery or lightning. The surge suppressor found on inexpensive power strips is insufficient to protect the TC100 from damage.

Liquids

Do not spill or splash liquids on the TC100 enclosure.

Configuration and system setup

Only qualified supervisors and dealer representatives should perform system configuration and setup. Operators should not attempt to alter the configuration of the TC100.

Applying Power

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Power-up screen

The power-up screen is displayed each time the TC100 is turned on. Press any key to display the DRO screen.

The DRO screen shows the current positions of encoders on each axis.



NOTE

Some encoders require the user to move each axis across a reference mark before the TC100 displays the DRO screen.

Adjusting LCD contrast

Adjust the LCD contrast for optimum viewing of the DRO screen. Press the *decimal point key* to decrease contrast or the *+/- key* to increase contrast.

Selecting measurement and display modes

Use the mode selection keys located above the numeric keypad to choose measurement units, datums, and display coordinates. These parameters are user defined and depend on the application performed.

Diameter/radius



Select diameter or radius measurement by pressing the Diameter/Radius mode key. This selection can be changed at any time.



NOTE

When the user changes the mode from diameter or radius the value entered remains the same. Be certain to adjust the value entered to obtain accurate presets.

Datum



Use the datum mode selection key to toggle between datum 1 and datum 2. Datum 2 is a temporary datum that is useful for performing incremental measurements. The current datum number is displayed in the upper right corner of the screen.

mm/inch



Use the mm/inch mode selection key to toggle the display units between millimeters and inches. The current unit of measure is displayed in the upper right corner of the screen.

Feature selection keys

The feature selection keys initiate TC200 functions that measure and calculate setting gage and tool dimensions, store tool sequencing programs, and initiate other automated features.

Setting gage key



Setting gages are used to establish a datum on the tool presetter. Press this key to bring up the *select setting gage screen*. The user can input new, edit existing, and delete unneeded setting gages with softkey functions on this screen. All tool presetting operations require at least one setting gage.

Tool key



Measure tools by pressing this key to bring up the *new tool screen*. Input information in the required data fields to store a new tool on this screen. New tools can be saved by pressing the *save softkey*. Existing tools are selected by pressing the *select softkey*.

Circle key



Measure circles by targeting between 3 and 100 points around the circumference. Generally, accuracy of the feature is increased as more points are targeted and the targeted points are distributed at more or less equal arc distances around the circle. When more than 3 points are targeted, a best-fit algorithm will be used to create the circle feature and an F (Form) value will be included in the circle feature data.

Angle key



Measure angles by targeting between 2 and 100 points on each of the vertices of the angle. Generally, accuracy of the feature is increased as more points are targeted and the targeted points are distributed at more or less equal distances along the line.

Basic Operation

To measure and store a setting gage

Step 1



Press the *setting gage key* to display the *select setting gage screen*.

Select Setting Gage		mm
00	Name	00
	Nominal X	0.00000
	Nominal Z	0.00000
	Label Format	Current
	Swap Axes	No
	Reverse X	No
	Reverse Z	No
	R/D Axis	X
	Cal Date	
New	Edit	Delete

Press the new softkey to display the *new setting gage screen*. Use the numerical keypad to enter a name for the setting gage and then press the *enter key*.



Pressing the *enter key* highlights the next input field on the screen.

New Setting Gage		mm
Name		
Nominal X	<input type="text"/>	Dia
Nominal Z	<input type="text"/>	
Label Format	Current	
Swap Axes	No	
Reverse X	No	
Reverse Z	No	
R/D Axis	X	
Cal Date		
		Cal

Step 2

Enter the value for Nominal X. Nominal X is the diameter or radius of the setting gage. Press enter.



NOTE

The TC100 displays either 'Dia' or 'Rad' next to input field for Nominal X to indicate whether the value is a diameter or radius. This indication can be changed by pressing the Diameter/Radius mode selection key.



NOTE

When the user changes the mode from diameter or radius the value entered remains the same. Be certain to adjust the value entered to obtain accurate presets.

Enter the value for Nominal Z. Nominal Z is the distance from the datum to the tip of the setting gage. Press enter.

Use the softkeys to choose from current, standard, or custom label formats and press enter.

Use the softkeys to choose from current, standard, or custom report formats and press enter.

The swap axes feature allows the user to swap the X and Z axis. Use the softkeys to select yes or no and press enter.

The reverse X feature allows the user to reverse the positive and negative ends of the X axis. Use the softkeys to select yes or no and press enter.

The reverse Z feature allows the user to reverse the positive and negative ends of the Z axis. Use the softkeys to select yes or no and press enter.

The R/D Axis feature allows the user to designate the X or Z axis as the diameter/radius of the setting gage. Use the softkeys to select X or Z.

New Setting Gage		mm
Name	001	
Nominal X	0.12500	Dia
Nominal Z	3.00000	
Label Format	Current	
Swap Axes	No	
Reverse X	No	
Reverse Z	No	
R/D Axis	X	
Cal Date		
X	Z	Cal

Step 3
 Press the *finish* key.



Align the setting gage with the crosshairs on the tool presetter and press enter.

New Setting Gage		mm
Name	001	
Press ENTER when the setting gage is aligned.		
La		
Sv		
Reverse X	No	Z
Reverse Z	No	
R/D Axis	X	
Cal Date		X ⊖

The TC100 stores the setting gage in its memory. It is now ready to be recalled by the user.

To measure and store a tool

Step 1



Press the *tool key* to display the *new tool screen*. Use the numeric keypad to enter a number for the tool and press the enter key.

Step 2

Position of tool (POT) refers to a tools location in a tool changer mechanism. Use the numeric keypad to enter a value between 1 and 99 then press enter.

Nominal X is the diameter or radius of the tool. Use the numeric keypad to enter a value for nominal X and press enter.

Nominal Z is the length of the tool. Use the numeric keypad to enter a value for nominal Z and press enter.

Enter the number of the setting gage to be used with this tool. If the setting gage has not been entered the user is unable to the tool data. The setting gage must be entered before a tool can be measured with it.

The TC200 allows the user to store the location of tools in the location field. Location refers to the physical storage location of the tool and not the position of the tool (POT) in the automated tool changer. Entries in this field are optional. Use the numerical keypad to enter the tool location and press enter. To continue without entering a location simply press enter.

The TC200 includes additional inputs for radius and angle for specialized cutting tools. For conventional milling procedures these fields are left blank.

New Tool		mm
Tool	<input type="text" value="001"/>	
Nominal X	<input type="text" value="0.12500"/>	Dia
Nominal Z	<input type="text" value="5.00000"/>	
Setting Gage	<input type="text" value="01"/>	
Location	<input type="text" value=""/>	
Radius	<input type="text" value=""/>	
Angle	<input type="text" value=""/>	
Save	<input type="text" value=""/>	<input type="text" value=""/>

Step 3

Press the save softkey to save the tool. The TC100 displays the tool just created.

To measure a circle

Step 1



Press the *tool key* and select the tool that is to receive the circle data. Press the *circle key* to display the probe circle screen.

Step 2

Align the tool with the crosshairs on the tool presetter and press the enter key. The location of the targeted point is shown on the probe circle screen and the number of points is indicated on the lower left part of the display.

Probe Circle		mm
⊖ Abs	X	5.3050
Abs	Z	6.0600
Pts=1		

Align the tool with the crosshairs on the tool presetter on the next point and press enter. The screen is updated to show the new location and the current number of points will.

Enter the remaining points on the circle in the same way. A minimum of three points are required to measure a circle with the TC100.

Step 3

Press the *finish key* after the last point is entered.

Measuring an angle

Angles can be measured by targeting between 2 and 100 points on each of the vertices of the angle. In general, accuracy increases as more points are entered. Distribute the points along the feature at more or less equal distances for best results.



NOTE

The procedure below assumes that angle data is required for a saved tool. If angle data is required for simple verification or other purposes, press the angle feature selection key and proceed from step 2.

To measure an angle

Step 1

Press the *tool key* and select the tool that is to receive the angle data. Press the *angle key* to display the probe angle screen.

Step 2

Align the first leg of the angle with the crosshairs on the tool presetter and press the *enter key*. The coordinates of the point are displayed on the screen and the total number of points for the line is shown on the lower left part of the display. A minimum of two points is required to measure a line. Press the *finish key* after the last point on the line is entered.

Probe Line 1		mm
⊖ Abs	X	3.5250
Abs	Z	6.4100
Pts=2		

Align the second line of the angle with the crosshairs on the tool presetter and press the *enter* key. Measure the second leg of the angle as you did the first.

Probe Line 2		mm
⊖ Abs	X	5.4850
Abs	Z	6.1600
Pts=1		

Press the *finish* key after the last point is entered.

Zeroing Axes

Press the zero key to zero one or both axes on the TC100. The TC100 displays the following prompt: *press axis to zero, or press zero again to zero both axes*. Press the button next to the desired axis if only one axis is to be zeroed.

Freezing Axes

Occasionally, a tool is too large to fit entirely on the tool presetter. When this happens it is sometimes necessary to measure one axis at a time. The TC200 allows users to freeze axes in order to measure along only one axis at a time. To freeze an axis, press the freeze/zero axis key adjacent to the axis to be frozen. In this example the X axis is frozen. When an axis is frozen it appears in a hollow font.

T 001	L 01	mm
⊖ Vtx	X[⊖]	5.4914
Vtx	Z	6.3961
A 87°36'43"		
Edit	Actual	Dev
	Norm	Incl A

T-Cam

The T-Cam supplies tool measurement data via the RS-232 port of the TC100. A selected tool can be set to display the *actual* (absolute), *deviation* (change in Z and X axis), or *nominal* tool dimensions by pressing the corresponding soft key. In addition, users can obtain angle and radius data from the T-Cam.

To receive angle data from the T-Cam

Step 1

Select the desired tool or create a new tool. Highlight the *angle field* on the new tool or edit tool screen.

Step 2

Align the tool on the T-Cam view screen. Press the soft key that corresponds to the desired angle. Angle 1 (*get A1 soft key*) corresponds to the angle of the tool's Z axis from the machine Z axis. Angle 2 (*get A2 soft key*) corresponds to the angle of the tool's X axis from the z axis.

To receive radius data from the T-Cam

Step 1

Select the desired tool or create a new tool. Highlight the *radius field* on the new tool or edit tool screen.

Step 2

Align the desired radius on the T-Cam view screen. Press the *get R soft key*.

Chapter 4

Communications

Use this chapter to establish a connection between the TC100 and a computer or printer. There are three PC applications used to receive data from the TC100:

- HyperTerminal
- WinWedge®

The TC100 prints to both serial and parallel printers. Parallel printers must support the *text only* mode.



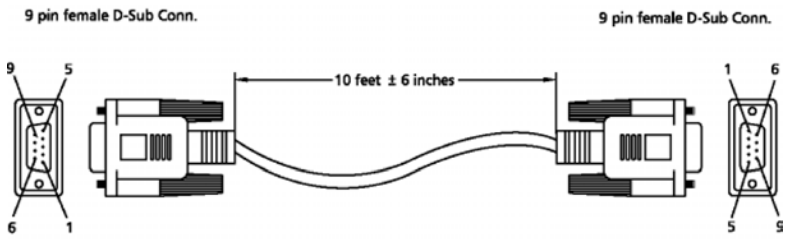
NOTE

Only printers sold by Metronics are tested for compatibility with the TC100. Other printers may work with the TC100 but Metronics has not evaluated their compatibility.

Contact your Metronics distributor to purchase a RS-232 cable if you do not have one. The cable part number is 11B12176.

Connections

Serial Cable 9 Pin Female to 9 Pin Female



Wiring list

PC side	CABLE	TC100 side
9 PIN DSUB (F)	CABLE	9 PIN DSUB (F)
2	RX / TX	2
3	TX / RX	3
4	DTR / NC	4
5	GND / GND	5
7	RTS / CTS	7
8	CTS / RTS	8
CASE	SHIELD	CASE

To connect to a PC using the RS-232 cable



NOTE

Turn off the power to both the PC and the TC100 before connecting the RS-232 cable.

Step 1

Connect the RS-232 cable to *com 1* or *com 2* port on the PC.

Step 2

Connect the RS-232 cable to the RS-232 port on the TC100.

Step 3

Restore power to the PC and the TC100.

Using HyperTerminal

Use HyperTerminal to connect a computer to the TC100 and transfer data to the computer. HyperTerminal uses the RS-232 ports on the computer and the TC100 and is included on most Windows® PCs.

To connect to a computer using HyperTerminal

Steps 1 through 7 describe how to set up HyperTerminal to receive data from the TC100.



NOTE

Pre-configured Hyperterminal sessions are available for download at <http://www.metronics.com/help.html>. Skip to step 15 if using a pre-configured session.

Step 1

Double-click on the *HyperTerminal icon*.



Hypertrm.exe



NOTE

Use the *Windows® start menu* to open HyperTerminal if there is no shortcut icon on the desktop. Click on the *start button*, followed by *programs*, then *accessories*.

Step 2

Type a file name and highlight an icon. Click *OK*.

Step 3

Select the desired port (*direct to com1* or *direct to com2*) from the connect using list box. Click *OK*.

Step 4

Enter the port settings as shown.

Port settings:

Bits per second:	9600
Data bits:	8
Parity:	None
Stop bits:	2
Flow control:	Hardware

**NOTE**

Use the same port settings on the TC100. See steps 8 through 11.

Click *OK*.

Step 5

Click on the *file menu* and select *properties*. Click on the *settings tab* and match the following settings:

- *Terminal keys*
- Set *emulation* to *auto detect*
- Set *backscroll buffer lines* to *100*

Leave the remaining settings as is. Click the *ASCII setup button* when finished.

Step 6

Match the following settings:

- Check *echo typed characters locally*
- Enter 0 milliseconds for *line delay*
- Enter 0 milliseconds for *character delay*
- Check *append line feeds to incoming line ends*
- Check *wrap lines that exceed terminal width*

Click *OK*.

Step 7

Click *OK*. Click on the *file menu* and select *save as...* in the HyperTerminal application. Type the desired file name and click *save*.

Chapter 4 Communications

Steps 8 through 11 describe how to set up the TC100 to send data to HyperTerminal.

Step 8

Press the *menu key*. Press the *setup soft key*. Use the arrow keys to highlight *ports* in the list as shown.

Step 9

Enter the following RS-232 port settings.

Ports		mm
About	RS232	
Display	Baud	9600
Encoders	Word Len	8
Print	Stop Bits	2
Form Chars	Parity	None
Ports	Handshake	Hard.
Supervisor	Data	Label
Squareness	EOC Delay	330
LEC	EOL Delay	0
SLEC	Parallel	
	Data	None

Port settings:

Baud:	9600
Word length:	8
Stop bits:	2
Parity:	None
Handshake:	Hardware

Step 10

Set the RS-232 data field to either *label*, *report*, or *both*. Highlight the *parallel data field* and press the *none soft key*.

Step 11

Press the *finish key* twice.

To send data from the TC100 to HyperTerminal

Step 1

Press the *send/print key*. The TC100 data appears in HyperTerminal as shown.



NOTE

If no data appears in HyperTerminal when the send/print key is pressed, verify that the RS-232 cable is connected to the correct port (com1 or com2) of the computer. Check that the port settings on the TC100 match the settings for the HyperTerminal session.

Using WinWedge®

Use WinWedge® to connect a computer to the TC100 and transfer data to the computer. WinWedge® uses the RS-232 ports on the computer and the TC100 to send data to a spreadsheet or other applications. Contact your Metronics distributor to purchase WinWedge® for your computer.



NOTE

Pre-configured WinWedge connections are available for download at <http://www.metronics.com/help.html>. Skip to step 8 if using a pre-configured connection.

To connect to a computer using WinWedge®



NOTE

WinWedge® sends data to a user defined application. For example, this example uses WinWedge® to send data to Microsoft® Excel.

Step 1

Double-click on the WinWedge® icon.



NOTE

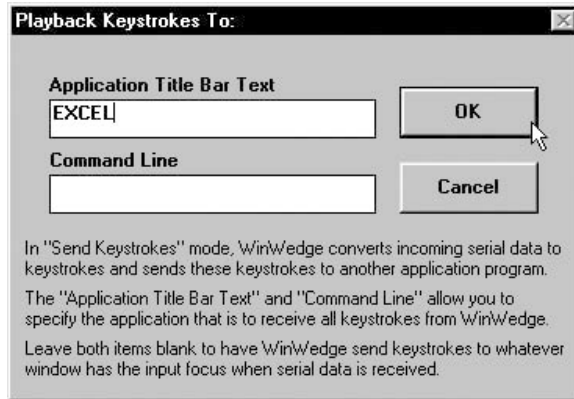
Use the *Windows® start menu* to open WinWedge® if there is no shortcut icon on the desktop.

Step 2

Click on *mode menu...* and choose *send keystrokes to...* Type *EXCEL* in the *application title bar text box* as shown.

**NOTE**

Type the name of the application that will receive the TC100 data. This example uses Microsoft® Excel spreadsheet. Type the application name in all capitals as shown .

**NOTE**

Leave the Command Line Box blank

Click *OK*.

Step 3

Click on the *port menu...* and choose *settings...* Enter the following settings:

- Connector: COM 1 or COM2 (as connected)
- Baud rate: 9600
- Parity: None
- Data bits: 8
- Stop bits: 2
- Flow control: Hardware
- Buffer size: 512

Click *OK*.

Step 4

Click on the *define menu...* and choose *input data record structure*. Select Carriage Return or CrLf Received Click on *continue*.

Step 5

Select *single field data records*. Click on *continue*.

Step 6

Select *numeric* from the *filter list* as shown. Type *{DOWN}* in the *field postamble keystrokes text box*.



NOTE

Leave the *record preamble keystrokes field blank*.

Click *OK*.

Step 7

Click on the *activate menu* and choose *test mode*. The WinWedge® connection window appears.

Steps 8 through 9 describe how to set up the TC100 to send data to WinWedge®.

Step 8

Press the *menu key*. Press the *setup soft key*. Highlight *ports* in the list as shown.

Step 9

Enter the following RS-232 port settings.

Ports		mm
About	RS232	
Display	Baud	9600
Encoders	Word Len	8
Print	Stop Bits	2
Form Chars	Parity	None
Ports	Handshake	Hard.
Supervisor	Data	Label
Squareness	EOC Delay	330
LEC	EOL Delay	0
SLEC	Parallel	
	Data	None

Port settings:

Baud: 9600
 Word length: 8
 Stop bits: 2
 Parity: None
 Handshake: Hardware

Set the RS-232 data field to either *label*, *report*, or *both*. Highlight the *parallel data field* and press the *none soft key*. Press the *finish key* twice.

The TC100 is now set up to send data to the WinWedge® application.

To send data to WinWedge®

Step 1

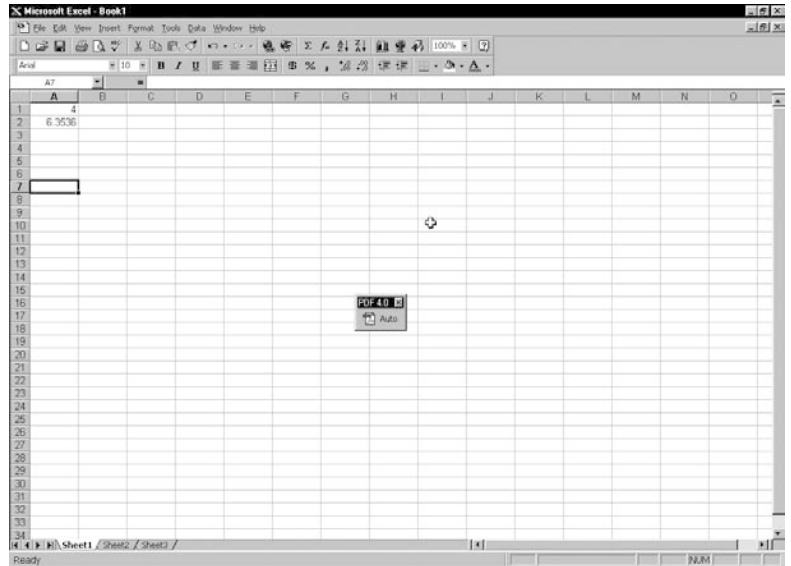
Press the *send/print key*.



NOTE

Users can also select print options from the *extra menu*. Press the *menu key*, followed by the *extra soft key*, and use the arrow keys to highlight the desired print option. For example, highlight *send D* to print the diameter of a circle. See chapter 3: operation for more information about the extra menu print options.

The data is displayed in the WinWedge window as shown.



NOTE

If no data appears in WinWedge® when the send/print key is pressed, verify that the RS-232 cable is connected to the correct port (com1 or com2) of the computer. Check that the port settings on the TC100 match the settings in the WinWedge® application.

Ascii codes

Use *ascii character codes* to adjust the format of printed reports. Insert the desired ascii character codes in the preline, post line, and post form fields of the print setup screen. For example, use ascii character codes to insert a line feed and carriage return command as shown here.



NOTE

Insert pre-form characters on the *form characters (form chars) screen.*

In the example above, ascii character codes 10 (line feed) and 13 (carriage return) are included in the post line field. This instructs the printer to perform a line feed and carriage return after each line of print.

Use the decimal key on the numeric keypad to space ascii character codes in the fields. The TC100 does not recognize multiple unspaced ascii codes.

ASCII Codes

8	backspace	46	.	84	T
9	horizontal tab	47	/	85	U
10	line feed	48	0	86	V
11	vertical tab	49	1	87	W
12	form feed	50	2	88	X
13	carriage return	51	3	89	Y
14	so	52	4	90	Z
15	si	53	5	91	[
16	dle	54	6	92	\
17	dcl	55	7	93]
18	dc2	56	8	94	^
19	dc3	57	9	95	~
20	dc4	58	:	96	
21	nak	59	;	97	a
22	syn	60	<	98	b
23	etb	61	=	99	c
24	can	62	>	100	d
25	em	63	?	101	e
26	sub	64	@	102	f
27	esc	65	A	103	g
28	fs	66	B	104	h
29	gs	67	C	105	i
30	rs	68	D	106	j
31	us	69	E	107	k
32	space	70	F	108	l
33	!	71	G	109	m
34	"	72	H	110	n
35	#	73	I	111	o
36	\$	74	J	112	p
37	%	75	K	113	q
38	&	76	L	114	r
39	'	77	M	115	s
40	(78	N	116	t
41)	79	O	117	u
42	*	80	P	118	v
43	+	81	Q	119	w
44	comma (,)	82	R	120	x
45	-	83	S	121	y
				122	z

Printer connections

Connect the TC100 to a printer via the printer port or the RS-232 port. Use the printer port to connect to a parallel printer and use the RS-232 port to connect to a serial printer. See the illustration at the beginning of this chapter to locate the printer and RS-232 ports.

To connect to a parallel printer



NOTE

Shut off power to the printer and the TC100 while connecting the printer cable.

Step 1

Connect the printer cable to the printer port located on the rear of the TC100.

Step 2

Connect the printer cable to the parallel printer.

Step 3

Restore power to the printer and TC100.

Step 4

Press the *menu key*.

Step 5

Press the *setup soft key*.

Step 6

Highlight the *ports field* as shown.

Step 7

Enter the following RS-232 port settings.

Port settings:

RS-232 data: None

Parallel data: Display, report, or tolerance (tol rpt) report

Step 8

Press the *finish key* twice.

The parallel printer is connected to the TC100. Press the send/print key to print reports.

To connect to a serial printer



NOTE

Shut off power to the printer and the TC100 while connecting the printer cable.

Step 1

Connect the RS-232 cable to the RS-232 port located on the rear of the TC100.

Step 2

Connect the RS-232 cable to the serial printer.

Step 3

Restore power to the printer and the TC100.

Step 4

Press the *menu key*.

Step 5

Press the *setup soft key*.

Step 7

Highlight the *ports field* as shown.



NOTE

Use the arrow keys to highlight the desired field.

Step 8

Enter the following RS-232 port settings.

Port settings:

Bits per second:	9600
Word length:	8
Parity:	None
Stop bits:	1
Flow control:	Hardware
EOL delay:	125,000
EOC delay:	10,000
Parallel data:	None

Step 9

Highlight the *print field* as shown.

Step 10

Enter the following print settings.

Print settings:

Form feed:	No
Post line:	10 13



NOTE

Use ascii character codes **10 (line feed)** and **13 (carriage return)** to instruct the printer to perform a line feed and carriage return at the end of each line. Press the decimal key on the numeric keypad to put a space between the ascii codes.

Step 11

Press the *finish key* twice.

The serial printer is connected to the TC100. Press the *send/print key* to print labels or reports.



NOTE

Some additional configuration may be required for serial printers. Consult the printer manufacturer's literature for more information.

Keyboard Commands

Use keyboard commands to operate the TC100 via a computer connection. Keyboard commands can perform the task of any button on the front of the TC100. For example, typing keyboard command *KEY 33* in HyperTerminal is the same as pressing the *enter key*.



NOTE

TC100 readouts recognize the following keyboard command format: *@Id*. For example, typing *@33* is the same as pressing the *enter key*.

TC100 Keyboard Commands

Id	Key Name	Id	Key Name
1	Left fast track key	23	2
2	Right fast track key	24	3
3	Zero X axis	25	4
4	Zero Y axis	26	5
5	Zero Q axis	27	6
7	Left arrow	28	7
8	Up arrow	29	8
9	Right arrow	30	9
10	Down arrow	31	.
11	Soft key 1	32	+/-
12	Soft key 2	33	Enter
13	Soft key 3	34	Finish
14	Soft key 4	35	Cancel
15	Soft key 5	36	Quit
16	Print	37	Point
17	mm/inch	38	Line
18	Datum	39	Circle
19	Polar/cartesian	40	Distance
20	Help	41	Angle
21	0	42	Skew
22	1	43	Measure magic
		44	Power (display only)

Chapter 5

Setup

Before You Begin

Day to day use of the TC100 does not require re-configuration of system settings. Most of the procedures in this chapter are performed during initial installation and are rarely changed. Understand that changes made on any of the setup screens affect the operation of the TC100. Only properly trained supervisory personnel should alter the TC100 setup. To prevent unintended or unauthorized changes to the system setup, many setup fields are password restricted. For example, the encoder setup screen is displayed on the left with password restriction. Only the axis field can be accessed. The encoder setup screen shown on the right is how the screen is displayed once the supervisor password is entered. All the fields can now be accessed.

Encoders		mm
About	Axis	X
Display	Res	0.00100000
Encoders		
Print		
Form Chars	Type	TTL
Ports	Ref Marks	None
Supervisor	M.Z. Cnts	0
Squareness	Reversed	No
LEC	Interpolation	X1
SLEC	Units	MM

Encoders		mm
About	Axis	X
Display	Res	0.00100000
Encoders		
Print		
Form Chars	Type	TTL
Ports	Ref Marks	None
Supervisor	M.Z. Cnts	0
Squareness	Reversed	No
LEC	Interpolation	X1
SLEC	Units	MM



CAUTION

Do not change any TC100 setup screens or fields unless you are certain what the change will do. Attempting to correct a problem by changing setup fields at random will worsen any existing problem. Contact your Metronics distributor before proceeding.

Supervisor password

Enter the supervisor password on the supervisor setup screen to access password restricted setup fields. Contact your Metronics distributor to receive your password. Limit password use to operators or supervisors properly trained to change the TC100 setup.

To enter the supervisor password



NOTE

Contact your Metronics distributor to receive your password.

Step 1

Press the *menu key*. Press the *setup soft key* and highlight *supervisor* in the list.



NOTE

Use the arrow keys to highlight the desired field.

Step 2

Highlight the *password field* as shown. Enter the *supervisor password* as shown.

About		mm
About	English	Yes
Display	Français	No
Encoders	Deutsch	No
Print	Italiano	No
Form Chars		
Ports		
Supervisor	Version 1.00	
Squareness	XZ	
LEC		
SLEC		
▼		

Step 3

Press the *finish key*.

All password restricted setup fields can now be accessed.

Setup Screens

Press the *menu key* and then the *setup soft key* to view setup screens. Use the list on the left-hand side of the screen to select the desired setup screen. Setup screens on the TC100 are as follows:

- About
- Display
- Encoders
- Print
- Form (form chars) characters
- Ports
- Supervisor
- Squareness
- LEC
- SLEC
- Miscellaneous (misc)
- Libraries
- Clock

About

Highlight the *about field* in the list as shown.

About		mm
About	English	<u>Yes</u>
Display	Français	<u>No</u>
Encoders	Deutsch	<u>No</u>
Print	Italiano	<u>No</u>
Form Chars		
Ports		
Supervisor	Version 1.00	
Squareness	XZ	
LEC		
SLEC		
▼		

Use the *about setup screen* to change the language on the TC100 display. Software version information and factory options are displayed on the bottom of the screen.

Display

Highlight the *display field* as shown.

Display		mm
About	MM Disp Res	0.0001
Display	Inch Disp Res	0.0001
Encoders	DMS Disp Res	0.00.01
Print	DD Disp Res	0.001
Form Chars	Startup Linear	MM
Ports	Startup Angular	DMS
Supervisor	Radix	Decimal
Squareness	Current Angular	DMS
LEC		
SLEC		

Use the display setup screen to enter measurement resolution and display parameters.

Set display resolution fields to match encoder resolution.

Display		mm
About	MM Disp Res	0.0001
Display	Inch Disp Res	0.0001
Encoders	DMS Disp Res	0.00.01
Print	DD Disp Res	0.001
Form Chars	Startup Linear	MM
Ports	Startup Angular	DMS
Supervisor	Radix	Decimal
Squareness	Current Angular	DMS
LEC		
SLEC		

Set the *startup linear* and *startup angular fields* to define the default display of linear and angular measurements. For example, set *startup linear* to mm (millimeters) to display linear measurements in metric units each time the TC100 is started.

Display		mm
About	MM Disp Res	0.0001
Display	Inch Disp Res	0.0001
Encoders	DMS Disp Res	0.00.01
Print	DD Disp Res	0.001
Form Chars	Startup Linear	MM
Ports	Startup Angular	DMS
Supervisor	Radix	Decimal
Squareness	Current Angular	DMS
LEC		
SLEC		
MM	Inch	Last

Set the *radix field* to *decimal* or *comma*. There is no difference between measurements displayed with a decimal radix or a comma radix. Select the radix appropriate for your reporting needs.

Display			mm
About	MM Disp Res	0.0001	
Display	Inch Disp Res	0.0001	
Encoders	DMS Disp Res	0.00.01	
Print	DD Disp Res	0.001	
Form Chars	Startup Linear	MM	
Ports	Startup Angular	DMS	
Supervisor	Radix	Decimal	
Squareness	Current Angular	DMS	
LEC			
SLEC			
<input type="button" value="Decimal"/> <input type="button" value="Comma"/>			

Set the *current angular field* to define the angular units of measure for the current session. If the *current angular field* is different from the *startup angular field*, the units shown in the *startup angular field* are displayed when power is cycled off and on.

Display			mm
About	MM Disp Res	0.0001	
Display	Inch Disp Res	0.0001	
Encoders	DMS Disp Res	0.00.01	
Print	DD Disp Res	0.001	
Form Chars	Startup Linear	MM	
Ports	Startup Angular	DMS	
Supervisor	Radix	Decimal	
Squareness	Current Angular	DMS	
LEC			
SLEC			
<input type="button" value="DD"/> <input type="button" value="DMS"/>			

Encoders

Highlight the encoder field as shown.

Encoders		mm
About	Axis	X
Display	Res	0.00100000
Encoders		
Print	Type	TTL
Form Chars	Ref Marks	None
Ports	M.Z. Cnts	0
Supervisor	Reversed	No
Squareness	Interpolation	X1
LEC	Units	MM
SLEC		
▼		

Use the encoder setup screen to define encoder parameters for each axis.

Set the resolution field to match the resolution of the encoder. For example, enter 0.001 for 1 micron encoders.

Encoders		mm
About	Axis	X
Display	Res	0.00100000
Encoders		
Print	Type	TTL
Form Chars	Ref Marks	None
Ports	M.Z. Cnts	0
Supervisor	Reversed	No
Squareness	Interpolation	X1
LEC	Units	MM
SLEC		
▼		

Highlight the type field and select the desired encoder type.

Encoders		mm
About	Axis	X
Display	Res	0.00100000
Encoders		
Print	Type	TTL
Form Chars	Ref Marks	None
Ports	M.Z. Cnts	0
Supervisor	Reversed	No
Squareness	Interpolation	X1
LEC	Units	MM
SLEC		
▼		
TTL	Analog	Serial

There are four types of encoder interfaces supported by the TC100:

- TTL
- Analog
- Mitutoyo (MTISer) serial
- Mitutoyo (MTI 2) 2



NOTE

Use Mitutoyo (MTISer) serial for Mitutoyo products that use 10 pin rectangular connectors. Choose Mitutoyo (MTI2) 2 when there is an EXE box between the TC100 and the actual encoder device.

Highlight the *reference (ref marks) field* and select the desired reference marks.

Encoders		mm
About	Axis	X
Display	Res	0.00100000
Encoders	Type	TTL
Print	Ref Marks	None
Form Chars	M.Z. Cnts	0
Ports	Reversed	No
Supervisor	Interpolation	X1
Squareness	Units	MM
LEC		
SLEC		
	None	Ref
	Abs AC	Abs HH
	Manual	

Reference marks are used for *segmented linear error correction (SLEC)* or *non-linear error correction (NLEC)*. There are four types of reference marks recognized by the TC100:

- Reference (ref)
- Absolute (Abs AC) acu-rite
- Absolute (Abs HH) Heidenhain
- Manual

Press the *none soft key* if your system does not use reference marks.

Highlight the *machine zero (MZ Cnts) counts field*. Use the *machine zero (MZ Cnts) counts field* to define the machine zero position of an (Acu-Rite Absolute) encoder.

Encoders				mm
About	Axis	X		
Display	Res	0.00100000		
Encoders	Type	TTL		
Print	Ref Marks	None		
Form Chars	M.Z. Cnts	0		
Ports	Reversed	No		
Supervisor	Interpolation	X1		
Squareness	Units	MM		
LEC				
SLEC				

Enter *zero (0)* to record the current encoder position as the machine zero for the next system startup. Machine zero does not change during power cycles unless this field is reset to zero.

Highlight the *reversed field*. Reverse the direction of the selected axis by pressing the *yes soft key*. Press the *no soft key* to maintain the current direction of the axis.

Encoders				mm
About	Axis	X		
Display	Res	0.00100000		
Encoders	Type	TTL		
Print	Ref Marks	None		
Form Chars	M.Z. Cnts	0		
Ports	Reversed	No		
Supervisor	Interpolation	X1		
Squareness	Units	MM		
LEC		No	Yes	
SLEC				

Highlight the interpolation field. Press the soft key that corresponds to the desired interpolation value.

Encoders				mm
About	Axis	X		
Display	Res	0.00100000		
Encoders	Type	TTL		
Print	Ref Marks	None		
Form Chars	M.Z. Cnts	0		
Ports	Reversed	No		
Supervisor	Interpolation	X1		
Squareness	Units	MM		
LEC		X1	X2	X5
SLEC		X10		

Highlight the units field. Press the soft key for the desired units of measure (millimeters or inches) that correspond to the encoder used.

Encoders			mm
About	Axis	X	
Display	Res	0.00100000	
Encoders			
Print			
Form Chars	Type	ITL	
Ports	Ref Marks	None	
Supervisor	M.Z. Cnts	0	
Squareness	Reversed	No	
LEC	Interpolation	X1	
SLEC	Units	MM	
	In	MM	Deg



NOTE
Perform the above encoder setup functions for each axis.

Print

Highlight the print field as shown.

Print				mm
About	Auto Label	Yes		
Display	Auto Report	No		
Encoders	Label Format	Metronics1		
Print	Pre Line			
Form Chars	Post Line	10 13		
Ports	Pre Form			
Supervisor	Label Lines	5		
Squareness	Skip Lines	0		
LEC	Label Indent	0		
SLEC				
▼				

Use the *print setup* screen to format printed labels.

Highlight the *auto label field* as shown.

Print				mm
About	Auto Label	Yes		
Display	Auto Report	No		
Encoders	Label Format	Metronics1		
Print	Pre Line			
Form Chars	Post Line	10 13		
Ports	Pre Form			
Supervisor	Label Lines	5		
Squareness	Skip Lines	0		
LEC	Label Indent	0		
SLEC				
▼				
No	Yes			

Press the *yes soft key* to print labels automatically after the user presses the *finish key* when the *new tool* or *edit tool screens* are displayed. Press the *no soft key* to print labels only when the *send/print key* is pressed.

Highlight the *auto report field* as shown.

Print				mm
About	Auto Label	Yes		
Display	Auto Report	No		
Encoders	Label Format	Metronics1		
Print	Pre Line			
Form Chars	Post Line	10 13		
Ports	Pre Form			
Supervisor	Label Lines	5		
Squareness	Skip Lines	0		
LEC	Label Indent	0		
SLEC				
▼				
No	Yes			

Press the *yes soft key* to print a tool report automatically after the user presses the *finish key* when the *new tool* or *edit tool screens* are displayed. Press the *no soft key* to print tool reports only when the *send/print key* is pressed.

Highlight the *label format field* as shown.

Print				mm
About	Auto Label	Yes		
Display	Auto Report	No		
Encoders	Label Format	Metronics1		
Print	Pre Line			
Form Chars	Post Line	10 13		
Ports	Pre Form			
Supervisor	Label Lines	5		
Squareness	Skip Lines	0		
LEC	Label Indent	0		
SLEC				
List				

Print				mm
About	Auto Label	Yes		
Display	Auto Report	No		
Encoders	Label Format	Metronics1		
Print	Pre Line			
Form Chars	Post Line	10 13		
Ports	Pre Form			
Supervisor	Label Lines	5		
Squareness	Skip Lines	0		
LEC	Label Indent	0		
SLEC				
List				

Press the *list soft key* to access the label formats list. Use the up or down arrow keys to highlight the desired label format. Press the *finish key* to return to the print setup screen.

Highlight the *pre line field* as shown.

Print				mm
About	Auto Label	Yes		
Display	Auto Report	No		
Encoders	Label Format	Metronics1		
Print	Pre Line			
Form Chars	Post Line	10 13		
Ports	Pre Form			
Supervisor	Label Lines	5		
Squareness	Skip Lines	0		
LEC	Label Indent	0		
SLEC				

Use the numeric keypad to enter up to four ascii key codes. Ascii key codes entered in the *pre line field* occur before each line of print on a report. For example, enter *ascii key code 32* to insert a space before each line of print. See *chapter 6: communications* for more information on the use of ascii key codes.

Highlight the *post line field* as shown.

Print				mm
About	Auto Label	Yes		
Display	Auto Report	No		
Encoders	Label Format	Metronics1		
Print	Pre Line			
Form Chars	Post Line	10 13		
Ports	Pre Form			
Supervisor	Label Lines	5		
Squareness	Skip Lines	0		
LEC	Label Indent	0		
SLEC				

Use the numeric keypad to enter up to four ascii key codes. Ascii key codes entered in the *post line field* occur after each line of print on a report. For example, enter *ascii key code 10 and 13* to insert a line feed and carriage return after each line of print. See *chapter 6: communications* for more information on the use of ascii key codes.



NOTE

Enter *ascii key codes 10 and 13* as shown for best results when printing reports.

Highlight the *post form field* as shown.

Print				mm
About	Auto Label	Yes		
Display	Auto Report	No		
Encoders	Label Format	Metronics1		
Print	Pre Line			
Form Chars	Post Line	10 13		
Ports	Pre Form			
Supervisor	Label Lines	5		
Squareness	Skip Lines	0		
LEC	Label Indent	0		
SLEC				

Use the numeric keypad to enter up to four ascii key codes. Ascii key codes entered in the *post form field* occur after each report form. For example, enter *ascii key code 13* to insert a carriage return after each report form. See *chapter 6: communications* for more information on the use of ascii key codes.

Highlight the *label lines* field as shown.

Print				mm
About Display Encoders Print Form Chars Ports Supervisor Squareness LEC SLEC ▼	Auto Label	Yes		
	Auto Report	No		
	Label Format	Metronics1		
	Pre Line			
	Post Line	10 13		
	Pre Form			
	Label Lines	5		
	Skip Lines	0		
	Label Indent	0		

Use the numeric keypad to enter the desired number of print lines for a label.

Highlight the *skip lines* field as shown.

Print				mm
About Display Encoders Print Form Chars Ports Supervisor Squareness LEC SLEC ▼	Auto Label	Yes		
	Auto Report	No		
	Label Format	Metronics1		
	Pre Line			
	Post Line	10 13		
	Pre Form			
	Label Lines	5		
	Skip Lines	0		
	Label Indent	0		

Use the numeric keypad to enter the desired number of skipped lines between printed lines.

Highlight the *label indent* field as shown.

Print				mm
About Display Encoders Print Form Chars Ports Supervisor Squareness LEC SLEC ▼	Auto Label	Yes		
	Auto Report	No		
	Label Format	Metronics1		
	Pre Line			
	Post Line	10 13		
	Pre Form			
	Label Lines	5		
	Skip Lines	0		
	Label Indent	0		

Use the numeric keypad to enter the number of spaces each printed line is to be indented.

Form characters (form chars)

Highlight the form characters (form chars) field as shown.

Form Chars		mm
About	Pre Form	
Display		
Encoders		
Print		
Form Chars		
Ports		
Supervisor		
Squareness		
LEC		
SLEC		

Use the form characters setup screen to enter pre form ascii key codes. See chapter 6: communications for more information on the use of ascii key codes.

Ports

Highlight the ports field as shown.

Ports		mm
About	RS232	
Display	Baud	9600
Encoders	Word Len	8
Print	Stop Bits	2
Form Chars	Parity	None
Ports	Handshake	Hard.
Supervisor	Data	Label
Squareness	EOC Delay	330
LEC	EOL Delay	0
SLEC	Parallel	
	Data	None

Use the ports setup screen to establish RS-232 and parallel port settings for communication with a computer. See chapter 6: communications for more information about using the TC100 with a computer.

The ports setup screen is divided into two section: RS-232 and parallel. RS-232 fields include Baud, word length (word len), stop bits, parity, handshake, data, EOC (end-of-character) delay, and EOL (end-of-line) delay. There is one parallel field: data.



NOTE

The *handshake* field is fixed and cannot be changed by the user.

Highlight the *baud field* as shown.

Ports		mm
About	RS232	
Display	Baud	9600
Encoders	Word Len	8
Print	Stop Bits	2
Form Chars	Parity	None
Ports	Handshake	Hard.
Supervisor	Data	Label
Squareness	EOC Delay	330
LEC	EOL Delay	0
SLEC	Parallel	
	Data	None
Dec	Inc	

Use the baud field to set the baud rate. Press the decrease (dec) soft key to decrease the baud rate. Press the increase (inc) soft key to increase the baud rate.

Highlight the *word length (word len) field* as shown.

Ports		mm
About	RS232	
Display	Baud	9600
Encoders	Word Len	8
Print	Stop Bits	2
Form Chars	Parity	None
Ports	Handshake	Hard.
Supervisor	Data	Label
Squareness	EOC Delay	330
LEC	EOL Delay	0
SLEC	Parallel	
	Data	None
7	8	

Press the *7 soft key* to set word length to 7? Press the *8 soft key* to set word length to 8?

Highlight the *stop bits field* as shown.

Ports		mm
About	RS232	
Display	Baud	9600
Encoders	Word Len	8
Print	Stop Bits	2
Form Chars	Parity	None
Ports	Handshake	Hard.
Supervisor	Data	Label
Squareness	EOC Delay	330
LEC	EOL Delay	0
SLEC	Parallel	
	Data	None
1	2	

Press the *1 soft key* to set one stop bit. Press the *2 soft key* to set two stop bits.

Highlight the *parity field* as shown.

Ports		mm
About	RS232	
Display	Baud	9600
Encoders	Word Len	8
Print	Stop Bits	2
Form Chars	Parity	None
Ports	Handshake	Hard.
Supervisor	Data	Label
Squareness	EOC Delay	330
LEC	EOL Delay	0
SLEC	Parallel	
	Data	None
None		Odd
		Even

Press the *none soft key* to select no parity. Press the *odd soft key* to select odd parity. Press the *even soft key* to select even parity.



NOTE

The *handshake field* is fixed and cannot be changed by the user.

Highlight the *data field* as shown.

Ports		mm
About	RS232	
Display	Baud	9600
Encoders	Word Len	8
Print	Stop Bits	2
Form Chars	Parity	None
Ports	Handshake	Hard.
Supervisor	Data	Label
Squareness	EOC Delay	330
LEC	EOL Delay	0
SLEC	Parallel	
	Data	None
None		Label
		Report
		Both

Use the data field to select the data output from the TC100. There are four data output options:

- *None*: no data output
- *Label*: prints label only
- *Report*: prints tool report only
- *Both*: prints tool report and label

Press the *none soft key* to select no data output. Press the *display soft key* to output the DRO display. Press the *report soft key* to print a standard results report. Press the *tolerance report (tol rpt) soft key* to print a tolerance report.

Highlight the *EOC (end-of-character) delay field* as shown.

Ports		mm
About	RS232	
Display	Baud	9600
Encoders	Word Len	8
Print	Stop Bits	2
Form Chars	Parity	None
Ports	Handshake	Hard.
Supervisor	Data	Label
Squareness	EOC Delay	330
LEC	EOL Delay	0
SLEC	Parallel	
	Data	None

EOC delay is a chronological delay following each character sent. Use the numeric keypad to enter a delay value from 0 to 99,999.

Highlight the *EOL (end-of-line) delay field* as shown.

Ports		mm
About	RS232	
Display	Baud	9600
Encoders	Word Len	8
Print	Stop Bits	2
Form Chars	Parity	None
Ports	Handshake	Hard.
Supervisor	Data	Label
Squareness	EOC Delay	330
LEC	EOL Delay	0
SLEC	Parallel	
	Data	None

EOL delay is a chronological delay following each line sent. Use the numeric keypad to enter a delay value from 0 to 9,999,999.

Highlight the *parallel data field* as shown.

Ports		mm
About	RS232	
Display	Baud	9600
Encoders	Word Len	8
Print	Stop Bits	2
Form Chars	Parity	None
Ports	Handshake	Hard.
Supervisor	Data	Label
Squareness	EOC Delay	330
LEC	EOL Delay	0
SLEC	Parallel	
	Data	None
	None	
	Label	
	Report	
	Both	

Use the parallel data field to select the parallel data output from the TC100. There are four parallel data output options:

- *None*: no data output
- *Label*: prints label only
- *Report*: prints tool report only
- *Both*: prints tool report and label

Press the *none soft key* to select no data output. Press the *display soft key* to output the DRO display. Press the *report soft key* to print a standard results report. Press the *tolerance report (tol rpt) soft key* to print a tolerance report.

Supervisor

Highlight the *supervisor field* as shown.

Supervisor		mm
About	Password	XXXXXX
Display		
Encoders		
Print		
Form Chars		
Ports		
Supervisor		
Squareness		
LEC		
SLEC		

Use the *supervisor setup screen* to enter the supervisor password lock/unlock programs.

See the beginning of this chapter for more information on the *password field*.

Squareness

Highlight the *squareness field* as shown.

Squareness				mm
About	Angle	90°00'00"		
Display	Master Axis	X		
Encoders				
Print				
Form Chars				
Ports				
Supervisor				
Squareness				
LEC				
SLEC				
▼				

Use the *squareness setup screen* to compensate for small machine errors between the X and Y axes.

Highlight the *angle field* as shown.

Squareness				mm
About	Angle	90°00'00"		
Display	Master Axis	X		
Encoders				
Print				
Form Chars				
Ports				
Supervisor				
Squareness				
LEC				
SLEC				
▼				
Teach				

Use a standard imprinted with a perfect right angle to obtain the measurement for the angle field. Enter the result of the angle measurement in the *angle field* using the numeric keypad or press the *teach key* and measure the angle.

Highlight the *master axis field* as shown.

Squareness				mm
Angle				90°00'00"
About	Master	Axis		X
Display				
Encoders				
Print				
Form Chars				
Ports				
Supervisor				
Squareness				
LEC				
SLEC				
	X	Z		

The master axis is the machine reference for angular measurements. Press the *X soft key* to designate the X axis as the master axis. Press the *Y soft key* to designate the Y axis as the master axis.

LEC & SLEC

See the *error correction* section of this chapter for a detailed discussion of these setup screens.

Miscellaneous (misc)

Highlight the *miscellaneous (misc) field* as shown.

Misc.				mm
↑	Key Delay			6
Print				
Form Chars				
Ports	Volume			10
Supervisor	Only Pos Nom			No
Squareness	Scr Saver Min			10
LEC				
SLEC				
Misc.				
Libraries				
Clock				

Use the miscellaneous setup screen to set/adjust the following functions:

- Key delay
- Volume
- Only positive nominals (Only pos nom)
- Screen saver minutes

Highlight the *key delay field* as shown.

Misc.				mm
Print	Key Delay			6
Form Chars				
Ports	Volume			10
Supervisor	Only Pos Norm			No
Squareness	Scr Saver Min			10
LEC				
SLEC				
Misc.				
Libraries				
Clock				

Use the *key delay field* to set the *auto-repeat delay* for front panel keys. *Auto-repeat* repeats the key function if it is held down longer than the delay interval. For example, press and hold the down arrow key. Notice the cursor block scrolls repeatedly until the key is released. Use the numeric keypad to enter a key delay value between 0 and 99. Enter small values for fast repetition or large values for slow repetition.

Highlight the *volume field* as shown.

Misc.				mm
Print	Key Delay			6
Form Chars				
Ports	Volume			10
Supervisor	Only Pos Norm			No
Squareness	Scr Saver Min			10
LEC				
SLEC				
Misc.				
Libraries				
Clock				

Increase or decrease the volume of TC100 sounds using this field. Valid volume inputs are 1 through 10.

Highlight the *only positive nominals field* as shown.

Misc.				mm
Print	Key Delay	6		
Form Chars				
Ports	Volume	10		
Supervisor	Only Pos Nom	No		
Squareness	Scr Saver Min	10		
LEC				
SLEC				
Misc.				
Libraries				
Clock				
No	Yes			

Press the *yes soft key* to allow nominal values that are positive to be entered on the *new tool* and *edit tool screens*. Press the *no soft key* to allow positive or negative nominal values.

Highlight the *screen saver minutes (scr saver min) field* as shown.

Misc.				mm
Print	Key Delay	6		
Form Chars				
Ports	Volume	10		
Supervisor	Only Pos Nom	No		
Squareness	Scr Saver Min	10		
LEC				
SLEC				
Misc.				
Libraries				
Clock				

Use the numeric keypad to enter a number between 1 and 9999. Screen saver minutes define the number of minutes before the DRO screen saver is displayed.

Libraries

The libraries setup screen contains six functions:

- use locations
- tool button
- leave selected
- SG 00 master
- edit lock
- cal lock

Libraries		mm
↑	Tools	
Print	Use Locations	<u>Yes</u>
Form Chars	Tool Button	<u>Select</u>
Ports	Leave Selected	<u>No</u>
Supervisor	Setting Gages	
Squareness	SG 00 master	<u>No</u>
LEC	Edit Lock	<u>No</u>
SLEC	Cal Lock	<u>No</u>
Misc.		
Libraries		
Clock		

Highlight the *use locations field* as shown.

Libraries		mm
↑	Tools	
Print	Use Locations	Yes
Form Chars	Tool Button	<u>Select</u>
Ports	Leave Selected	<u>No</u>
Supervisor	Setting Gages	
Squareness	SG 00 master	<u>No</u>
LEC	Edit Lock	<u>No</u>
SLEC	Cal Lock	<u>No</u>
Misc.		
Libraries		
Clock		
No	Yes	

Press the *yes soft key* to enable the tool location field on the new tool screen. Press the *no soft key* to disable it.

Highlight the *tool button field* as shown.

Libraries				mm
Print	Tools	Use Locations	Yes	
Form Chars		Tool Button	Select	
Ports		Leave Selected	No	
Supervisor	Setting Gages	SG 00 master	No	
Squareness		Edit Lock	No	
LEC		Cal Lock	No	
SLEC				
Misc.				
Libraries				
Clock				
New	Select			

This field determines the navigation result when the tool key is pressed. Press the *new soft key* to bring up the *new tool screen* when the *tool key* is pressed. Press the *select soft key* to bring up the *select tool screen* when the *tool key* is pressed.

Highlight the *leave selected field* as shown.

Libraries				mm
Print	Tools	Use Locations	Yes	
Form Chars		Tool Button	Select	
Ports		Leave Selected	No	
Supervisor	Setting Gages	SG 00 master	No	
Squareness		Edit Lock	No	
LEC		Cal Lock	No	
SLEC				
Misc.				
Libraries				
Clock				
No	Yes			

This field allows the current tool to remain selected after the *send/print key* is pressed. Press the *yes soft key* to leave the current tool selected. Press the *no soft key* to deselect the tool after pressing *send/print*.

Highlight the *SG 00 field* as shown.

Libraries				mm
Print	Tools	Use Locations	Yes	
Form Chars		Tool Button	Select	
Ports		Leave Selected	No	
Supervisor	Setting Gages	SG 00 master	No	
Squareness		Edit Lock	No	
LEC		Cal Lock	No	
SLEC				
Misc.				
Libraries				
Clock				
No	Yes			

This field assigns all calibrations relative to a master setting gage rather than

absolute or machine zero. Press the *yes soft key* to enable this function. Press the *no soft key* to calibrate each setting individually against absolute/machine zero.

Highlight the *edit lock field* as shown.

Libraries				mm
Print	Tools	Use Locations	Yes	
Form Chars		Tool Button	Select	
Ports		Leave Selected	No	
Supervisor	Setting Gages	SG 00 master	No	
Squareness		Edit Lock	No	
LEC		Cal Lock	No	
SLEC				
Misc.				
Libraries				
Clock				
No	Yes			

This field enables or disables edit options related to setting gages. Press the *yes soft key* to enable edits to settings gages. Press the *no soft key* to disable edits to setting gages.

Highlight the *cal lock field* as shown.

Libraries				mm
Print	Tools	Use Locations	Yes	
Form Chars		Tool Button	Select	
Ports		Leave Selected	No	
Supervisor	Setting Gages	SG 00 master	No	
Squareness		Edit Lock	No	
LEC		Cal Lock	No	
SLEC				
Misc.				
Libraries				
Clock				
No	Yes			

This field password protects the setting gage calibration to prevent users from inadvertently altering calibrations. Press the *yes soft key* to require the supervisor password before changing calibration data. Press the *no soft key* permit alteration without entering the supervisor password.

Clock

Highlight the *clock field* as shown.

Clock		mm
Print	Year	0
Form Chars	Month	0
Ports	Day	0
Supervisor	Hours	0
Squareness	Minutes	0
LEC	Seconds	0
SLEC	Date Format	M/D/Y
Misc.	Time Format	12
Libraries		
Clock		

Use the *clock setup screen* to set and format date/time information.

Highlight the *year field* to enter the four digit year.

Highlight the *month field* to enter the month (1 to 12; January to December respectively).

Highlight the *day field* to enter the calendar day of the month.

Highlight the *hours field* to enter the hour.

NOTE

Use the appropriate hours for the desired time format. For example, enter 1 for 1 pm when using the 12 hour time format. Enter 13 for 1 pm when using the 24 hour time format.

Highlight the *minutes field* to enter the minutes.

Highlight the *seconds field* to enter the seconds.

Highlight the *date format field* as shown.

Clock				mm
▲	Year		0	
Print	Month		0	
Form Chars	Day		0	
Ports	Hours		0	
Supervisor	Minutes		0	
Squareness	Seconds		0	
LEC	Date Format		M/D/Y	
SLEC	Time Format		12	
Misc .				
Libraries				
Clock				
M/D/Y	D/M/Y			

Press the *M/D/Y soft key* to select month/day/year format. Press the *D/M/Y soft key* to select day/month/year format.

Highlight the *time format field* as shown.

Clock				mm
▲	Year		0	
Print	Month		0	
Form Chars	Day		0	
Ports	Hours		0	
Supervisor	Minutes		0	
Squareness	Seconds		0	
LEC	Date Format		M/D/Y	
SLEC	Time Format		12	
Misc .				
Libraries				
Clock				
12	24			

Press the *12 soft key* to select 12 hour time format. Press the *24 soft key* to select 24 hour time format.

Error Correction

There are two error correction methods used with the TC100:

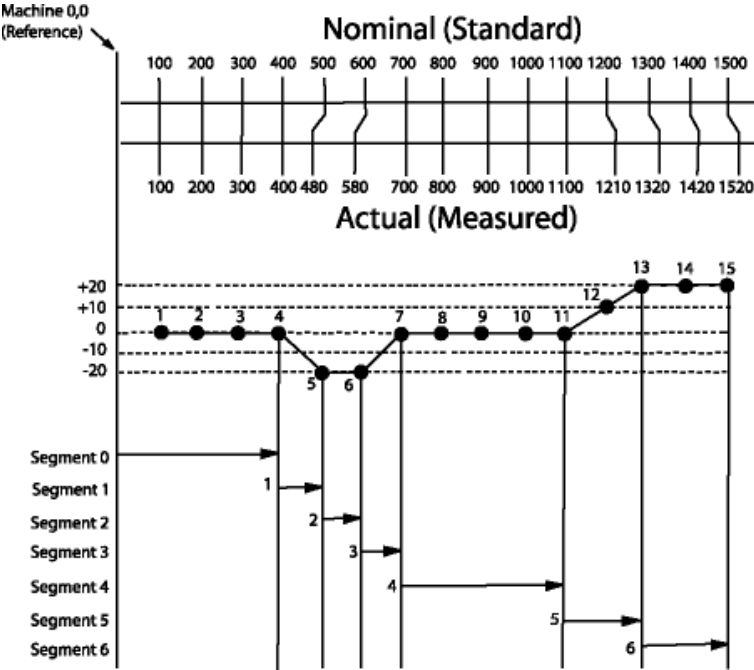
- Linear error correction (LEC)
- Segmented linear error correction (SLEC)

All TC100 models are equipped with LEC and SLEC. Each method compensates for encoder and machine travel variations with error correction coefficients. Coefficients are determined by comparing actual measurements of a standard to the nominal values imprinted on the standard.

Linear error correction (LEC) compensates for variations along the axes using one correction coefficient for each axis. For example, a LEC coefficient of 0.0002 per inch applied to a 6 inch measurement along an axis produces a result of 6.0012 inches.

LEC			mm
Print	X Standard	1.000	
Form Chars	X Observed	1.000	
Ports	Z Standard	1.000	
Supervisor	Z Observed	1.000	
Squareness			
LEC			
SLEC			
Misc.			
Libraries			
Clock			

Segmented linear error correction (SLEC) divides each axis into a number of user-defined segments.



Each segment has one error correction coefficient to compensate for variation within the segment. Each axis is also offset (MZ reference) to account for the variation between the standard datum and machine zero. Apply the nominal (standard) and measured (observed) segment values from the standard during the setup process. Specify the machine zero offset during setup as well. Move the each axis to cross a reference mark/hard-stop during startup to initialize SLEC.

SLEC		mm
Print	SLEC Axis	X
Form Chars	Enabled	Off
Ports	Station	0
Supervisor	Standard	
Squareness	Observed	
LEC		
SLEC	MZ Offset	0.00000
Misc		
Libraries		
Clock		

Linear error correction (LEC)

Highlight the LEC field as shown.

LEC			mm
▲	Linear Error	Correction	
Print	X Standard	1.000	
Form Chars	X Observed	1.000	
Ports	Z Standard	1.000	
Supervisor	Z Observed	1.000	
Squareness			
LEC			
SLEC			
Misc.			
Libraries			
Clock			

Use LEC to compensate for encoder and machine travel variations.

Highlight the *X standard* field as shown.

LEC			mm
▲	Linear Error	Correction	
Print	X Standard	1.000	
Form Chars	X Observed	1.000	
Ports	Z Standard	1.000	
Supervisor	Z Observed	1.000	
Squareness			
LEC			
SLEC			
Misc.			
Libraries			
Clock			

Use the numeric keypad to enter the nominal value of a point on the X axis of the standard. For example, if the scale on the standard indicates 1 inch, enter 1 inch in the *X standard* field.

Highlight the *X observed* field as shown.

LEC			mm
▲	Linear Error	Correction	
Print	X Standard	1.000	
Form Chars	X Observed	1.000	
Ports	Z Standard	1.000	
Supervisor	Z Observed	1.000	
Squareness			
LEC			
SLEC			
Misc.			
Libraries			
Clock			

Use the numeric keypad to enter the actual value of the point as shown on the X axis DRO display.

Highlight the *Y standard field* as shown.

LEC				mm
▲	Linear Error Correction			
Print	X Standard		1.000	
Form Chars	X Observed		1.000	
Ports	Z Standard		1.000	
Supervisor	Z Observed		1.000	
Squareness				
LEC				
SLEC				
Misc.				
Libraries				
Clock				

Use the numeric keypad to enter the nominal value of a point on the Y axis of the standard. For example, if the scale on the standard indicates 1 inch, enter 1 inch in the *Y standard field*.

Highlight the *Y observed field* as shown.

LEC				mm
▲	Linear Error Correction			
Print	X Standard		1.000	
Form Chars	X Observed		1.000	
Ports	Z Standard		1.000	
Supervisor	Z Observed		1.000	
Squareness				
LEC				
SLEC				
Misc.				
Libraries				
Clock				

Use the numeric keypad to enter the actual value of the point as shown on the Y axis DRO display.

To setup linear error correction

- Step 1
Place a glass standard on the measuring device.
- Step 2
Zero the X and Y axes on the standard's datum.
- Step 3
Move the crosshair to the desired point on the X axis.
- Step 4
Record the X axis result on a piece of paper.
- Step 5
Move the crosshair to the desired point on the Y axis.
- Step 6
Record the Y axis result on a piece of paper.
- Step 7
Press the *menu key*.
- Step 8
Press the *setup soft key*.
- Step 9
Highlight the *LEC field* as shown.

LEC			mm
Print	Linear Error Correction		
Form Chars	X Standard	1.000	
Ports	X Observed	1.000	
Supervisor	Z Standard	1.000	
Squareness	Z Observed	1.000	
LEC			
SLEC			
Misc.			
Libraries			
Clock			



NOTE
Use the arrow keys to highlight the desired field.

Step 10

Highlight the *X standard field* as shown and enter the nominal value of the point on the X axis of the standard.

LEC			mm
↑	Linear Error	Correction	
Print	X Standard	1.000	
Form Chars	X Observed	1.000	
Ports	Z Standard	1.000	
Supervisor	Z Observed	1.000	
Squareness			
LEC			
SLEC			
Misc.			
Libraries			
Clock			

Step 11

Highlight the *X observed field* as shown.

LEC			mm
↑	Linear Error	Correction	
Print	X Standard	1.000	
Form Chars	X Observed	1.000	
Ports	Z Standard	1.000	
Supervisor	Z Observed	1.000	
Squareness			
LEC			
SLEC			
Misc.			
Libraries			
Clock			

Step 12

Enter the actual value of the point as recorded from the X axis DRO display.

LEC			mm
↑	Linear Error	Correction	
Print	X Standard	1.000	
Form Chars	X Observed	0.9	
Ports	Z Standard	1.000	
Supervisor	Z Observed	1.000	
Squareness			
LEC			
SLEC			
Misc.			
Libraries			
Clock			

Step 13

Highlight the *Y standard field* as shown and enter the nominal value of the point on the Y axis of the standard.

LEC			mm
▲	Linear Error Correction		
Print	X Standard	1.000	
Form Chars	X Observed	0.90000	
Ports	Z Standard	1.000	
Supervisor	Z Observed	1.000	
Squareness			
LEC			
SLEC			
Misc.			
Libraries			
Clock			

Step 14

Highlight the *Y observed field* as shown and enter the actual value of the point as recorded from the Y axis DRO display. .

LEC			mm
▲	Linear Error Correction		
Print	X Standard	1.000	
Form Chars	X Observed	0.90000	
Ports	Z Standard	1.000	
Supervisor	Z Observed	1.000	
Squareness			
LEC			
SLEC			
Misc.			
Libraries			
Clock			

Step 15

Press the *finish key* twice.

Linear error correction (LEC) setup is complete. The LEC correction coefficient is applied to all subsequent measurements.

Segmented linear error correction (SLEC)

Highlight the *SLEC field* as shown. Use the *SLEC setup screen* to define error correction coefficients for segments on the X and Y axes. Segments are comprised of the axial distance from one SLEC station to the next. There is no specified minimum or maximum distance between stations. Position stations to compensate for the known variation of each axis. For example, if the midsection of an axis has more variation than the ends, position several stations close together through the midsection. Use fewer stations toward the ends and space them further apart.

Keep in mind that *station 0* should not have a correction value assigned to it. Generally, *station 0* can be any point on the axis where the standard and observed values are the same. Sometimes there is no point on the axis without error. In this case, *station 0* is located at the zero point of the axis. All other stations follow sequentially from *station 0*. For example, *station 0* is followed by *station 1* followed by *station 2* and so on. Up to 30 stations can be defined per axis.

Keep in mind that SLEC stations are always relative to machine zero. It is important to select a repeatable location for machine zero. If the location of machine zero changes so do the locations of all SLEC stations.

There are three ways to establish machine zero at startup. Each method depends on the type of encoder used. Use the *ref marks field* on the *encoder setup screen* to define the machine zero method.

Select *manual* when using encoders with no reference marks. Users are prompted at startup to move the axis to the zero point manually.

Encoders		mm
Encoders	Axis	X
Print	Res	0.00100000
Form Chars	Type	TTL
Ports	Ref Marks	Ref
Supervisor	M.Z. Cnts	0
Squareness	Reversed	No
LEC	Interpolation	X1
SLEC	Units	MM
Misc		
Libraries		
		None Ref Abs AC Abs HH Manual

Select *ref* when using encoders with a single reference mark. Users are prompted at startup to move the axis until a reference mark is crossed.

Encoders		mm
Encoders	Axis	X
Print	Res	0.00100000
Form Chars		
Ports		
Supervisor	Type	TTL
Squareness	Ref Marks	Abs AC
LEC	M.Z. Cnts	0
SLEC	Reversed	No
Misc.	Interpolation	X1
Libraries	Units	MM
None	Ref	Abs AC
		Abs HH
		Manual

There are two types of absolute reference marks supported by the TC100: absolute Acu-Rite and absolute Heidenhain. Select *abs AC* when using Acu-Rite encoders and *abs HH* when using Heidenhain encoders. Users are prompted at startup to move the axis until two reference marks are crossed.

Encoders		mm
Encoders	Axis	X
Print	Res	0.00100000
Form Chars		
Ports		
Supervisor	Type	TTL
Squareness	Ref Marks	Abs AC
LEC	M.Z. Cnts	0
SLEC	Reversed	No
Misc.	Interpolation	X1
Libraries	Units	MM
None	Ref	Abs AC
		Abs HH
		Manual

Encoders		mm
Encoders	Axis	X
Print	Res	0.00100000
Form Chars		
Ports		
Supervisor	Type	TTL
Squareness	Ref Marks	Abs HH
LEC	M.Z. Cnts	0
SLEC	Reversed	No
Misc.	Interpolation	X1
Libraries	Units	MM
None	Ref	Abs AC
		Abs HH
		Manual

To setup SLEC

Steps 1 through 3 identify the type of reference marks used on the measuring device's encoders. The method of establishing machine zero depends on the encoders used and the type of reference mark.

Step 1

Use the arrow keys to highlight the *ref marks field* on the *encoder setup screen* as shown.

Encoders		mm
About	Axis	X
Display	Res	0.00100000
Encoders	Type	TTL
Print	Ref Marks	None
Form Chars	M.Z. Cnts	0
Ports	Reversed	No
Supervisor	Interpolation	X1
Squareness	Units	MM
LEC		
SLEC		
	None	Ref
	Abs	AC
	Abs	HH
	Manual	

Step 2

Press the soft key that corresponds to the type of reference marks used on the measuring device's encoders. This example uses *absolute Acu-Rite* (abs AC) reference marks. Select the appropriate reference marks for your encoders.

Encoders		mm
About	Axis	X
Display	Res	0.00100000
Encoders	Type	TTL
Print	Ref Marks	Abs AC
Form Chars	M.Z. Cnts	0
Ports	Reversed	No
Supervisor	Interpolation	X1
Squareness	Units	MM
LEC		
SLEC		
	None	Ref
	Abs	AC
	Abs	HH
	Manual	

Step 3

Press the *finish key* twice.

Steps 4 through 9 establish the offset between machine zero and the standard zero.

Step 4

Place the crosshair on the standard zero.

Step 5

Use the arrow keys to highlight the *MZ offset field* on the *SLEC setup screen*.

SLEC				mm
About	SLEC Axis	X		
Display	Enabled	Off		
Encoders	Station	0		
Print	Standard			
Form Chars	Observed			
Ports				
Supervisor	MZ Offset	0.2444		
Squareness				
LEC				
SLEC				
Teach				

Step 6

Press the *teach soft key*.

Step 7

Press the *enter key*.

Step 8

Press the *finish key* twice.

Step 9

Press the *zero axis key* next to the desired axis. This example uses the X axis.

Steps 10 through 21 describe how to define *station 0* as the last known point with no variation between standard and observed values. If no point on the axis has the same standard and observed values, enter *0* for both the standard and observed fields.

Step 10

Use the arrow keys to highlight the *SLEC axis field*.

SLEC		mm	
About	SLEC Axis	X	
Display	Enabled	Off	
Encoders	Station	0	
Print	Standard		
Form Chars	Observed		
Ports			
Supervisor	MZ Offset	0.05560	
Squareness			
LEC			
SLEC			

Step 11

Press the desired *axis soft key*.

SLEC		mm	
About	SLEC Axis	X	
Display	Enabled	Off	
Encoders	Station	0	
Print	Standard		
Form Chars	Observed		
Ports			
Supervisor	MZ Offset	0.05560	
Squareness			
LEC			
SLEC			
X	Z		



NOTE

This example uses the X axis soft key. Press the Z axis soft key to define a station on the Z axis.

Step 12

Highlight the *enabled field* as shown.

SLEC				mm
About	SLEC Axis	X		
Display	Enabled	Off		
Encoders	Station	0		
Print	Standard			
Form Chars	Observed			
Ports				
Supervisor	MZ Offset	0.05560		
Squareness				
LEC				
SLEC				
Off	On			

Step 13
Press the *off* soft key.



NOTE

Use the *on* and *off* soft keys to toggle the station on and off. Turn off stations when no error correction is desired and during error correction setup.

Step 14
Use the arrow keys to highlight the *station* field as shown. Make sure *station 0* is entered for this step.

SLEC				mm
About	SLEC Axis	X		
Display	Enabled	Off		
Encoders	Station	0		
Print	Standard			
Form Chars	Observed			
Ports				
Supervisor	MZ Offset	0.05560		
Squareness				
LEC				
SLEC				
Dec	Inc	Remove		

Step 15
Use the numeric keypad to enter the nominal value printed on the standard.

SLEC				mm
About	SLEC Axis	X		
Display	Enabled	Off		
Encoders	Station	0		
Print	Standard	0		
Form Chars	Observed			
Ports				
Supervisor	MZ Offset	0.05560		
Squareness				
LEC				
SLEC				

Step 16
 Highlight the *observed field* as shown.

SLEC			mm
About	SLEC Axis	X	
Display	Enabled	Off	
Encoders	Station	0	
Print	Standard	0	
Form Chars	Observed		
Ports			
Supervisor	MZ Offset	0.05560	
Squareness			
LEC			
SLEC			

Step 17
 Use the numeric keypad to enter the same value entered in the *standard field* in the *observed field*.

SLEC			mm
About	SLEC Axis	X	
Display	Enabled	Off	
Encoders	Station	0	
Print	Standard	0.00000	
Form Chars	Observed	0	
Ports			
Supervisor	MZ Offset	0.05560	
Squareness			
LEC			
SLEC			
Teach			



NOTE
 This example assumes that the last known point with no variation is 0.

Step 18
 Highlight the *machine zero offset (MZ offset) field* as shown.

SLEC			mm
About	SLEC Axis	X	
Display	Enabled	Off	
Encoders	Station	0	
Print	Standard	0.00000	
Form Chars	Observed	0.00000	
Ports			
Supervisor	MZ Offset	0.05560	
Squareness			
LEC			
SLEC			
Teach			

Step 19

Place the crosshair on the standard's datum.

Step 20

Press the *teach soft key*.

The MZ offset value is automatically entered in the *MZ offset field*.

SLEC				mm
About	SLEC Axis	X		
Display	Enabled	Off		
Encoders	Station	0		
Print	Standard	0.00000		
Form Chars	Observed	0.00000		
Ports	MZ Offset	0.0556		
Supervisor				
Squareness				
LEC				
SLEC				
Teach				

Step 21

Press the *finish key*.

Station 0 is now defined as the last known point on the X axis with no variation between standard and observed values. All subsequent stations should show some variation between standard and observed values.

Steps 22 through 30 define station 1. Station 1 is the first station with variation between standard and observed values.

Step 22

Use the arrow keys to highlight the station field as shown.

SLEC				mm
About	SLEC Axis	X		
Display	Enabled	Off		
Encoders	Station	0		
Print	Standard	0.00000		
Form Chars	Observed	0.00000		
Ports	MZ Offset	0.05560		
Supervisor				
Squareness				
LEC				
SLEC				
Dec	Inc	Remove		

Step 23

Use the *increase soft key* to enter the desired station number.

Step 24

Highlight the *standard field* as shown.

SLEC			mm
About Display Encoders	SLEC Axis Enabled	X Off	
Print Form Chars	Station Standard	1	
Ports	Observed		
Supervisor Squareness	MZ Offset	0.05560	
LEC			
SLEC			

Step 25

Use the numeric keypad to enter the nominal value printed on the standard.

SLEC			mm
About Display Encoders	SLEC Axis Enabled	X Off	
Print Form Chars	Station Standard	1	
Ports	Observed		
Supervisor Squareness	MZ Offset	0.05560	
LEC			
SLEC			

Step 26

Highlight the *observed field* as shown.

SLEC			mm
About Display Encoders	SLEC Axis Enabled	X Off	
Print Form Chars	Station Standard	1.00000	
Ports	Observed		
Supervisor Squareness	MZ Offset	0.05560	
LEC			
SLEC			
Teach			

Step 27

Press the *teach soft key*.

Step 28

Move the crosshairs to the desired point on the standard. This is the same point entered as the nominal value in step 37.

SLEC			mm
About	SLEC	Axis	X
Display	Enabled		Off
Encoders	Station		1
Print	Standard		1.00000
Form Chars	Observed		0.86666
Ports			
Supervisor	MZ Offset		0.05560
Squareness			
LEC			
SLEC			
Teach			

Step 29

Press the *enter key*.



NOTE

Do not enter a new value in the *MZ offset field*. MZ offset is entered only for station 0. All subsequent stations should show the same MZ offset value as station 0.

Step 30

Press the *finish key*.

Station is now defined.

SLEC			mm
About	SLEC	Axis	X
Display	Enabled		Off
Encoders	Station		1
Print	Standard		1.00000
Form Chars	Observed		0.80000
Ports			
Supervisor	MZ Offset		0.05560
Squareness			
LEC			
SLEC			
Teach			

Use steps 22 through 30 to define the remaining SLEC stations. Up to 29 additional stations can be entered on each axis. Do not turn on SLEC until all the desired stations are defined. The SLEC correction coefficients are applied to all subsequent measurements when turned on.

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