

Model 440 Handheld Data Collector

Version 3.0

User Guide



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440 Handheld Data Collector

User Guide

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SECTION

1

Introduction



Getting Started

Power Requirements

The LMI Corporation Model 440 Data Collector can be powered with either two AA- size batteries or with the optional AC to DC power adapter. See Table 1, *Data Power Sources and Rating* for specifications of the types of power sources compatible with the 440, and Table 2, *Battery Usage Time Chart*, for additional information on battery performance.

Table 1: Data Power Sources and Rating

Power Source Type	Parameter	Rating	
AC input (AC/DC converter)	Voltage	110/230 Vac	
	Voltage Fluctuations (permissible)	± 10% of nominal supply rating	
	Power Frequency Range	47 to 63 Hz maximum	
	Outlet Leakage	2 mA maximum allowable	
	Equipment Class	I	
	Installation Category	II	
Battery Powered (Two AA Size Cells)			
	Nickel Metal hydride	Voltage per each cell	1.2 Volts
		Capacity	2100 mAh

Battery Usage

The LMI Corporation Model 440 has been designed and optimized to run on two AA-size NiMh cells. The NiMh cells will provide the optimum cost benefit for operation under any operating conditions.

The following Battery Usage Time Chart provides an idea of expected battery performance. The table is based upon fully charged high capacity NiMh batteries (1300 and 1500 mAh units) and the following use scenario. An operation based upon a five characteristic setup with a subgroup size of one. Each subgroup collected had three readings out of specification, one reading that generated a caution limit violation and one reading that were in specification, and that data was used to represent a typical data collection effort for the purpose of the comparisons. It should be noted that the accompanying buzzer duration and LED status varied dependent on each sample, and the data used to generate the information may be atypical in that it represents a somewhat heavier than normal battery load.

The information provided herein does not imply a commitment on the part of LMI Corporation regarding average battery usage: *your usage time may vary depending upon the setup and other use variables.*

Table 2: Battery Usage Time Chart

Item	Light Use	Medium Use	Heavy Use
Usage Definition:			
LED Duration	0	1 sec.	5 sec.
Backlight Duration	0	10 sec.	15 sec.
Sample Rate	60 sec.	60 sec.	15 sec.
COM Baud Rate	9600	9600	9600
Data Logging	off	off	on
Buzzer Status	off	soft/4	loud/4
Alarms	off	on	on
Lapel Buzzer	no	no	yes
Number of Subgroups	104	91	245
Estimated Collection Time:			
Standard 1300 mAh	8 hr. / 37 min.	7 hr. / 31 min.	5 hr. / 7 min.
Gold 1500 mAh	9 hr. / 40 min.	8 hr. / 25 min.	5 hr. / 37 min.

Charging the Batteries

The 440 Handheld Data Collector uses AA-size batteries, and because a variety of AA batteries technologies are available, batteries are not charged when installed in the unit – even when the AC adapter is plugged in. Discharged NiMh batteries should only be charged in the charging unit designed for that particular style battery. Batteries supplied with the unit have little or no residual charge. Before using the data collector, place the batteries in the charger until they are completely charged. A full charging cycle for a discharged battery takes approximately 3 to 4 hours to complete.

WARNING:

Never place non-rechargeable batteries in the battery charger as this may cause damage to the batteries, the charger, or nearby property, and may be hazardous to individuals near the charging unit.

Steps

1. Open the charging unit cover.
2. Insert the batteries into the charging unit as shown in Figure 1. Be sure to orient the batteries so that the polarity is correct for each cell.
3. Connect the charging unit cord.
4. Plug the charging unit cord into a grounded wall outlet.

The indicators on the charger give the charging status:

- **Red** – charging in progress
- **Green** – charging complete
- **Blinking Yellow** – batteries are discharging. You can discharge the batteries prior to charging by pressing the Reset button near the indicator.

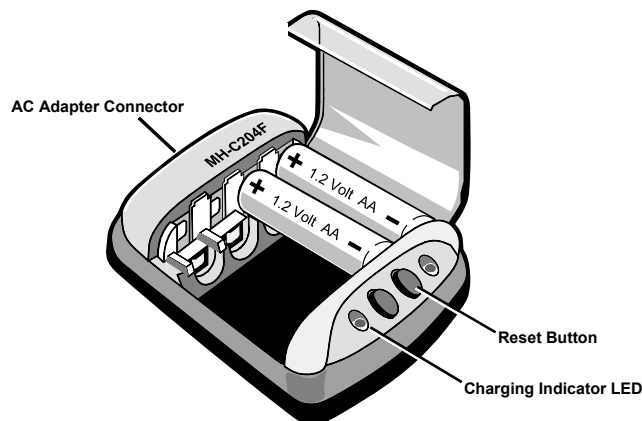
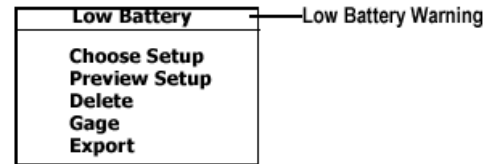


Figure 1. Battery Charging Unit

Replacing the Batteries

When the data collector detects a low battery condition, it will beep three times and display a “Low Battery” message at the top of the display:

The message is repeated every three seconds and the beeps will continue at one minute intervals until either 10 minutes has elapsed (at which point the data collector shuts off) or until the battery charge falls below the shutdown threshold.



WARNING:



Use only batteries approved by LMI Corporation with this data collector. Failure to charge and use batteries as described in this document could result in poor battery performance damage to the charging adapters or batteries or harm to personnel.

Steps

1. Turn the data collector over to access the battery compartment cover as shown in Figure 2.
2. Press down on the tab on the compartment cover and gently lift the cover up.
3. Remove the old batteries from the battery compartment.
4. Install two recently charged batteries in the orientation marked by the polarity indicators inside the battery compartment.
5. Replace the compartment cover by inserting the lower lip of the cover into the ledge on the data collector case. Press the cover into place, the cover should snap snugly into the latch.



Figure 2. Replacing the Battery

Cleaning Instructions

WARNING:

Unplug all power connections before cleaning. Do not use excessive moisture that may seep into openings in the case.

Clean the case of the main unit and accessories using a mild detergent and soft damp cloth to remove any dust and dirt accumulation.

Rub the case dry with a soft cloth to remove moisture. Do not operate the equipment if you suspect that any moisture has entered the unit or accessories.

Product Warnings

Warning Labels

If this equipment is not used in the manner described in this manual; the protection provided as part of the equipment may be impaired causing personal injury and property damage. This label on the product directs the user to important information on the use of this equipment:

WARNING:

Refer to this User Guide for technical specifications and instructions for use.

The technical specifications and instructions for use for safe operation can be found in this user guide:

No Telecommunications Connection

The following symbol is used to indicate that the telephone port on the data collector is not intended to be used for telecommunications devices:



Battery Warnings

WARNING:

Failure to follow any of the following warning statements could result in damage to the Model 440, the batteries, or injury to the operator.

- There is a danger of explosion if batteries are incorrectly replaced.
- Do not short terminals or cause the (+) and (-) ends to contact metal objects either when handling, carrying, or storing the batteries. Shorted terminals can cause the battery to suddenly release all its energy, thereby causing the battery housing to become very hot and may result in burns if touched or handled.
- Do not mix batteries of different cell types, i.e. Alkaline/NiMh, Ni-Cad/NiMh, etc.
- Do not mix old and new batteries or batteries of different charge levels.
- If batteries should leak battery fluid onto skin, eyes, or clothing rinse immediately with water. If the eyes have been involved, contact a doctor immediately.

Battery Cautions

CAUTION:



Failure to follow any of the following cautionary statements could result in damage to the Model 440, the batteries, or injury to the operator.

- Do not expose the battery to fire.
- Do not heat, deform, solder, disassemble or modify any battery.
- Keep the batteries dry.
- Avoid any mechanical shock to the battery that caused dents or damage to the external housing of the battery.
- Do not insert the battery into the unit with the plus (+) minus (-) end reversed.
- If fluid should ever leak from a battery, avoid contact with the fluid. If fluid gets into the eyes rinse with water and consult a doctor immediately.
- Failure to follow the charging instructions provided could result in poor battery performance, damage to the charging adapters or batteries, or even harm to the user/operator.

Battery Charger Warnings

WARNING:



Failure to follow any of the following warning statements could result in damage to the battery charger, the batteries, or injury to the operator.

- Do not overcharge batteries and do not store the cells in the battery charger.

Agency Approvals and Compliance

FCC Compliance

The LMI Corporation 440 Handheld Data Collector complies with the rules of, FCC part 15 - 47 CRF, and is considered a Class A piece of equipment. The data collector generates radio frequency energy that may cause interference with radio and TV reception. Operation of this equipment in a residential area may cause interference. The user bears the expense of all corrective measures required to eliminate this interference.

Canadian RF Transmitter

This device does not exceed the Class A limits for radio noise for digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

European Union Directives

The product described in this documentation complies with the EU directives 73/23/EEC (Low Voltage Directive) and 89/336/EEC (EMC Directive) and bears the CE Mark accordingly. The product has been tested and found to meet the requirements of the harmonized standards, EN 60950 (Safety of Information Technology Equipment, Including Electrical Business Equipment), and also complies with the requirements of EN 61326 for EMC of Scientific and Medical (ISM) Radio Frequency Equipment,” (Group 1, Class A). It meets the Emission requirements of EN 54401 (Class A) and the following Immunity requirements: EN 61000 – 2, 3, 4, 5, 6, 8, and 11.

WARNING:

This is a Class A product. In a domestic or light industrial environment this product may cause radio interference in which case the user may be required to take adequate measures.

RF Energy, Related Devices, and Safe Usage

This equipment generates, uses, and can radiate radio frequency energy and must be installed in accordance with the manufacturer’s instructions. Only devices verified to comply with the limits for FCC Class A or better may be attached to this equipment. It is recommended that LMI Corporation cables be used whenever possible. If LMI Corporation cables are not used, all peripheral devices should be connected to this device via shielded cables with metallized connector hoods. If the product and peripheral devices are not properly installed, this equipment may cause interference with radio and television reception and is likely to violate FCC or European Union rules. If this equipment is not used in the manner described in this manual, the protection provided by the equipment may be impaired causing personal injury and property damage. Compliance with the directives may also be impaired if the equipment is not used as described in the manual, modified, or used with equipment that does not comply with the applicable directives.

Class 1 LED Product Statement

As per EN60825, this device contains light-emitting diodes; therefore it is a class 1 LED product.

Environmental Considerations

The 440 Handheld Data Collector operates at 0° to 45° Celsius up to 6,600 feet without degradation. The data collector may be stored at -20° to 60° C.

SECTION

2

440 Data Collector Overview



Data Collector Features

The 440 Handheld Data Collector is a lightweight, portable data collection device. It has an easy-to-read LCD panel that can be adjusted for various lighting conditions.

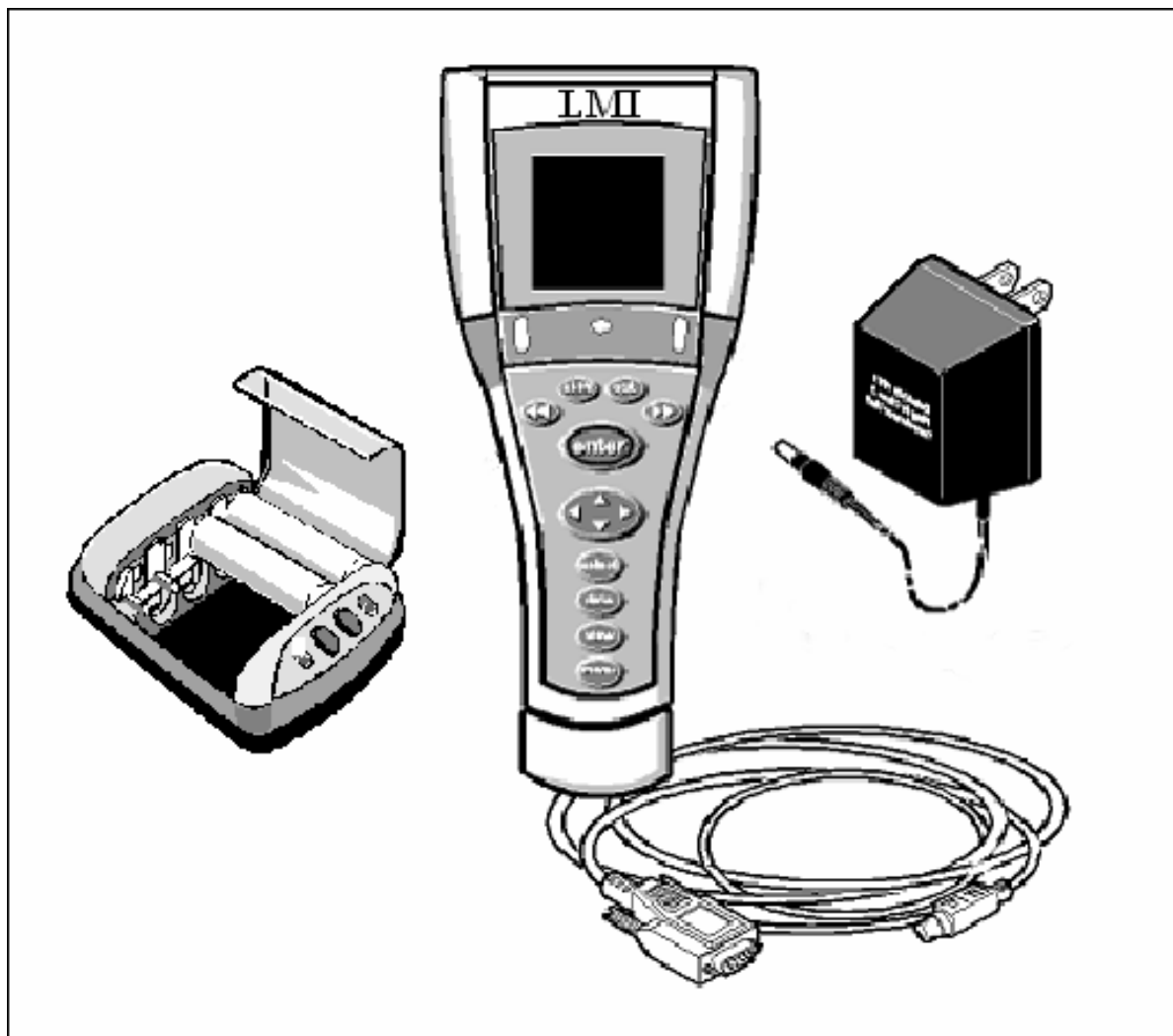


Figure 3. LMI Corporation 440 Handheld Data Collector and Accessories

Hardware Features

- Available with either two megabyte or four megabyte memory.
- 128x128 pixel LCD display providing 14 lines by 21 characters of text.
- Enhanced Key pad – 13 keys for navigating through menus, lists, and setups.
- Visual and Audio Feedback – two LEDs and a built-in speaker (with enhanced lapel buzzer port) supply operator feedback as data is collected.
- Built-in Flash ROM loader for easy software upgrades.
- RS-232 communications for data transfer.
- Runs either on two AA batteries or on an AC adapter. Uses a “Low Battery” warning and user-defined automatic power-off for battery management.

Software Features

- Menu-driven interface for ease of operation.
 - Data collection of variables data with or without labels.
- Supports all LMI analog gages.
- Storage of up to 999 variable part setups, with up to 999 characteristics per setup, and with subgroup sizes of up to 200 (the actual numbers of setups, etc., is constrained by the amount of installed memory). Setups can be created using either support software or ASCII-based text editors.
- Support of programs such as Applied Statistics™, and TranSend™, as well as with third-party software applications such as Microsoft® Excel™.
- Supports the following languages: English, Spanish, French, German, Italian, Portuguese, as well as User-Defined languages.
- Graphical representation of data collection in columnar format.
- Supports data logging to send data collection results to a printer or terminal emulation program.
- Password protection for some data collector functions.
- Label values easily selected from an on-screen choice list.

Hardware Overview

Data Collector Front View

The 440 Handheld Data Collector standard hand grip contains the simple Key pad shown below.

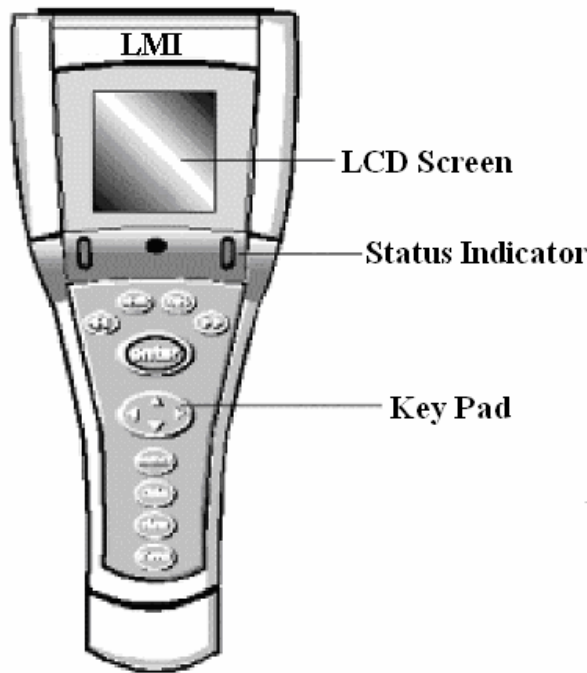


Figure 4. Front View

- **LCD Display** – The user interface for the data collector is displayed using a 128x128 pixel LCD providing 14 lines by 21 characters of text.
- **Key Pad** – 13 keys are used for navigating through menus, lists, and setups.
- **Status Indicators** – Two LED indicators are used to indicate the status of a given reading.



Figure 5. Physical Dimensions

Back View

The back of the 440 Handheld Data Collector provides access to the rechargeable battery compartment.

The 440 Handheld Data Collector accommodates two AA-size batteries. The battery compartment lifts off away from the case by pressing down on the tab on the compartment cover and gently lifting up. See Battery Usage on page 13 for more information about charging and replacing the battery.

The battery charging system in the 440 Handheld Data Collector is different from that of any other LMI Corporation data collector you may have. The 440 Data Collector uses “AA” size batteries, and, because of the variety of AA battery technologies available, any batteries left in the 440 will not be charged—even if an AC adapter is plugged in. Discharged batteries should only be charged in the charging adapters designed for that particular battery.

WARNING:

Do not open the battery, dispose of in fire, put in backwards, or mix with other battery types. Do not mix alkaline and nonalkaline batteries.



Figure 6. Back View

Bottom View

The bottom of the 440 Handheld Data Collector provides connections for a lapel buzzer, serial communications, and for AC power.

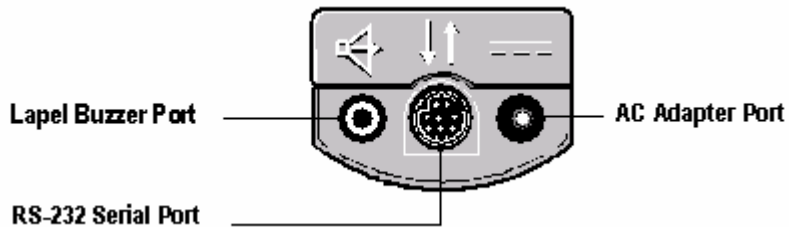


Figure 7. End View

Lapel Buzzer Port

The lapel buzzer port is used to connect the data collector to an audio device. Lapel buzzers are useful in noisy locations to better hear the collector's audio feedback indicator.

Serial Communications Port

The serial communications port is used to connect an LMI Corporation LMI 443 cable from the data collector to a computer running support software.

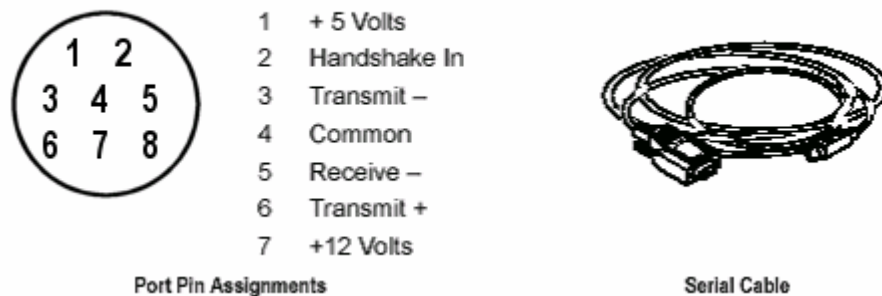


Figure 8. Serial Communications Port

AC Adapter

The AC power port is used to connect the (optional) LMI Corporation AC Adapter to the 440 Handheld Data Collector for non-battery operation.

WARNING:



Use only the AC Adapter provided by LMI Corporation. Use of other adapters will damage your 440 Handheld Data Collector.

Top View

The top end of the 440 Handheld Data Collector contains gage input ports.

Analog Gage Inputs

The 440 Data Collector includes analog gage connectors that support four analog gage ports.

- One footswitch/thumb switch port
- One bar code wand port
- One dual channel analog gage port can be used for true position gages or an LMI 2-4-1 gage.
- Two single channel analog gage ports can be configured for and LMI 200 Probe or an LMI 300 series gage.

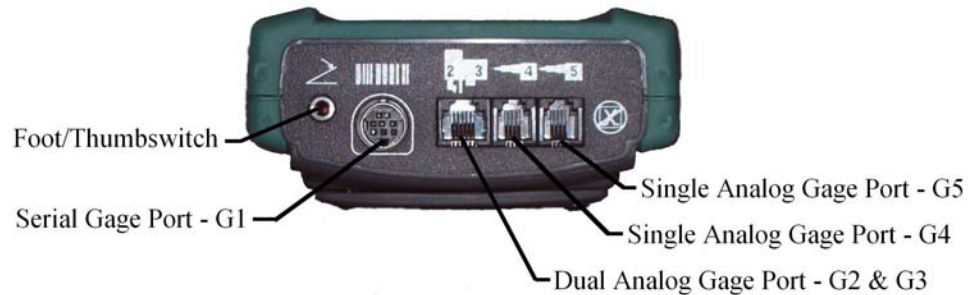


Figure 9. Top View

Footswitch/Thumb switch

An optional footswitch or thumb switch can be used with the data collector. The footswitch or thumb switch emulates pressing the <Enter> key on the 440 Key Pad.

Dual Channel Analog Gages


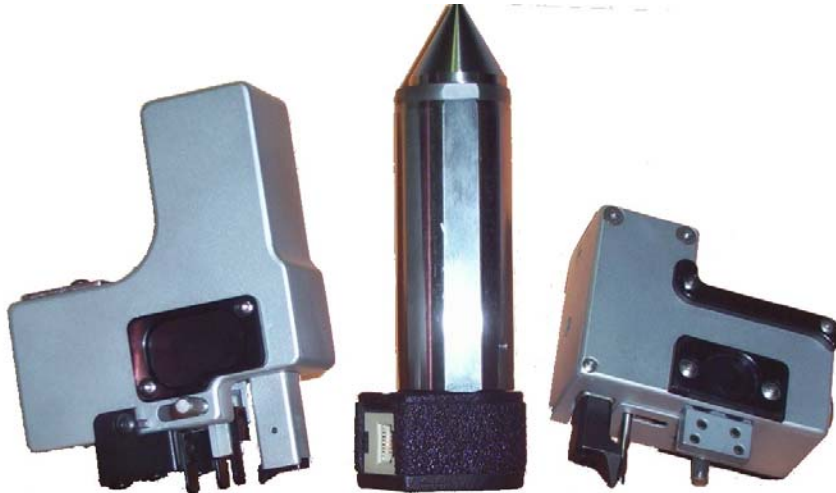
The dual channel analog gage port is indicated by the LMI 241 symbol . The dual channel analog gage port is used for the LMI 241 series, LMI 241-BW series and the TP107.

Figure 10. Dual Analog Gages



Single Channel Analog Gages

Two additional single channel analog gage ports are provided when the analog option is installed. A typical use of a single channel analog gage port is to attach an LMI 200 series, LMI 300 series, and the LMI 770 series as shown in Figure 11.



Figure 11. LMI 200-S Probe, LMI 300 Gap and Flush Gage

Key pad

The 440 Handheld Data Collector’s Key pad uses a number of specialized keys to navigate the data collector interface.

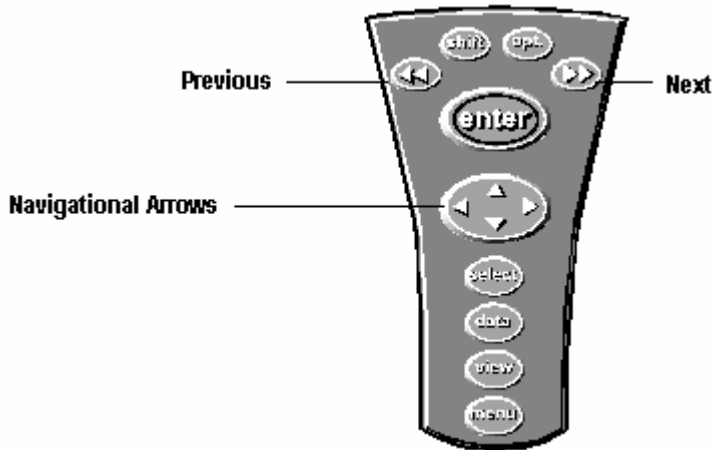


Figure 12. Simple Key pad

Key pad Key Combinations

Many Key pad keys work in combination. Key combinations are indicated by a “+” between the two keys and typically means to press and release the first key before pressing the second key.

Note: *The Shift key can be set to require that it be pressed simultaneously with an action key, rather than consecutively. See Setting User Preferences on page 28.*

Table 3: Key Pad Key Combinations

Key(s)	Function(s)
<Menu>	1) Powers collector ON. 2) Displays the Main Menu.
<Shift>	When entering character string data, changes upper to lower case.
<Shift>+<Menu>	From Data Entry screen, move to previous menu action.
<Shift>+<Select>	Brings up Characteristic Skipping selection menu.
<Option>+<Menu>	Creates demonstration part setups in the data collector, provided no other setups are stored in the data collector.
<View>	Displays the selected report (View 1) from the View Menu.
<Shift>+<View>	Displays the selected report (View 2) from the View Menu.
<Option>+<View>	1) If Printscreen to PCX preference is ON, stores the current LCD image in a PCX format (otherwise, image is sent to COM port).

You can create a demo setup if no setups exist in the data collector



Table 3: Key Pad Key Combinations

Key(s)	Function(s)
<Data>	<ol style="list-style-type: none"> 1) Go to the Data Entry screen for currently selected part. 2) While collecting data, pressing the data key cycles through the characteristic descriptor overlay, engineering limits overlay, or no overlay. The first screen displayed depends on the data preference set. 3) While the Character Input Selection screen is displayed, toggles between alphabetical, symbols, and numeric input characters.
<Shift>+<Data>	Go to the data entry screen for the current piece or characteristic.
<Option>+<Data>	<ol style="list-style-type: none"> 1) When an input box is displayed, opens the Character Input Selection screen. 2) Closes the Character Input Selection screen.
<Select>	Displays the Select Menu, allowing you to select a part setup, characteristic, or subgroup.
<Option>+<Select>	While collecting data, displays a prompt to jump to a specified characteristic for data collection.
<Enter>	<ol style="list-style-type: none"> 1) Selects item from a list or menu 2) Opens or closes an input box 3) Toggles an option 4) Triggers a gage reading in data entry or test 5) Selects and inputs characters
<Shift>+<Enter>	1) When selecting items, selects or deselects all.
<▲>	Moves a selection cursor to the previous field in a menu or list.
<Shift>+<▲>	Page Up screen if all information does not fit on the screen.
<Option>+<▲>	Move forward through a subgroup characteristic-by-characteristic to the lowest numbered null reading. If a characteristic contains two null readings, it stops at the lowest null sample or piece.
<▼>	Moves the selection cursor to the next field in a menu or list.
<Shift>+<▼>	Page Down screen if all information does not fit on one screen.
<Option>+<▼>	Searches backward through a subgroup characteristic-by-characteristic for the next null reading. If a characteristic contains two null readings, it stops at the lowest null sample or piece.
<◀>	<ol style="list-style-type: none"> 1) Move the selection cursor to the left while in a menu; 2) Move the cursor one character to the left in an input box.
<Shift>+<◀>	<ol style="list-style-type: none"> 1) Move the cursor to the start of an input string 2) If the input box is empty or at the end of the input box or the cursor covers input box, then recalls the previous entry (up to 20 previous entries).
<Option>+<◀>	In the Character Input Selection screen, moves the cursor in the input box one character to the left.
<▶>	1) Moves the selection cursor to the right while in a menu.

Table 3: Key Pad Key Combinations

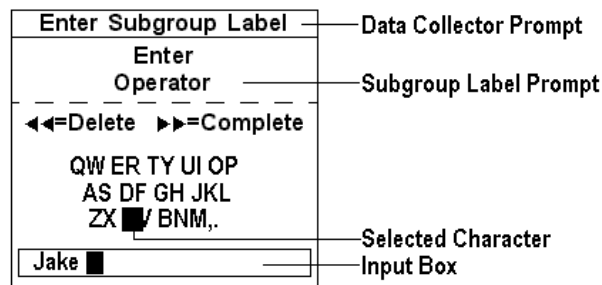
Key(s)	Function(s)
	2) Moves the cursor one character to the right in an input box.
<Shift>+<▶>	1) Move the cursor to the end of an input string. 2) If the input box is empty or at the end of the input box or the cursor covers input box, then recalls the previous entry (up to 20 previous entries).
<Option>+<▶>	In the Character Input Selection screen, move the cursor in the input box one character to the right.
<▶▶>	1) While collecting data, move to the next cell in data collection sequence; 2) When reviewing an item, move to the next operation; 3) When reviewing data or displaying a chart, move to the next characteristic; 4) When an input box is displayed, close and enter the input string; 5) While Main Menu displays, adjust screen contrast.
<Shift>+<▶▶>	While collecting data, move to the next NULL entry.
<Option>+<▶▶>	While collecting data, close the current subgroup and move directly to the next subgroup.
<◀◀>	1) While collecting data, move to the previous cell in data collection sequence; 2) When reviewing an item, move to the previous operation; 3) When reviewing data or displaying a chart, move to the previous characteristic; 4) When an input box is displayed, delete the previous character in the input string; 5) While Main Menu displays, adjust screen contrast.
<Shift>+<◀◀>	While collecting data, move to the previous NULL entry if any.

Character Input Using the Key Pad

If you are not using a barcode wand or gage to enter data, you can enter data directly using the Key pad Character Input Selection screen. You can access this screen when the 440 Handheld Data Collector is prompting for text input.

Steps

1. While the data collector is prompting for text input, press <Option>+<Data>.
2. Use the arrow keys to select the first character that you want to enter.
3. Press <Enter> to input the character into the input box.
4. If the character that you want to enter does not appear in the list, press the <Data> key to view other available characters.
5. Repeat steps 2 through 4 until the required text string is displayed in the input box.
6. Press the ►► key when finished to enter the string.



Interface Basics

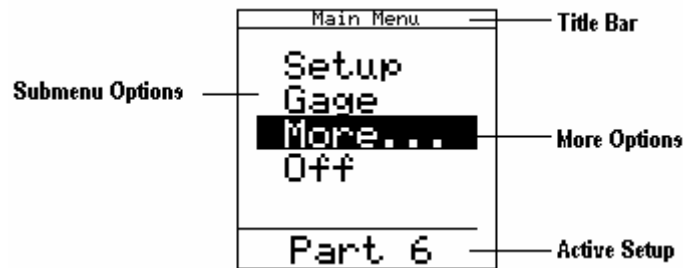
Before starting up the data collector, make sure that either the batteries are installed or the AC adapter is connected to the data collector and to the wall outlet.

Powering the Data Collector On

Steps

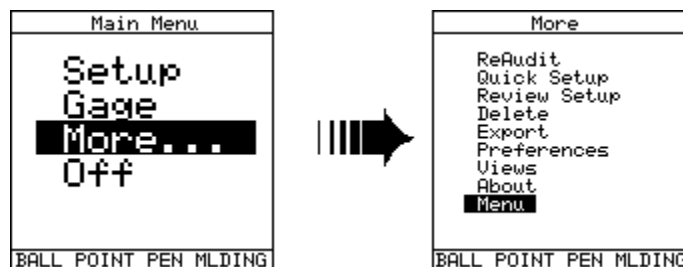
1. Press the <Menu> key.

In a moment, the 440 Main Menu appears.



- **Title Bar** - The Title Bar appears at the top of the display and tells you where you are in the data collector program. The Title Bar sometimes prompts you for the next action to perform.
- **Submenu Options** - Submenu Options list the procedures you can perform. The currently selected option is highlighted. Use the arrow keys (▲ or ▼) to select an option. Some submenu options may be "grayed out," which means that the option is not available at this time.
- **Active Setup** - The Active Setup line refers to the part setup currently active in the data collector.
- **More Option** - The More option opens a second screen that contains additional Main Menu options.

When you press the <Menu> key from any other menu on the data collector, you return to the More screen. To return to the Main Menu, press the <Menu> key a second time, or select Menu from the More screen and press <Enter>.



Powering the 440 Data Collector OFF

Steps

1. If the Main menu is not displayed, press the <Menu> key.
2. From the Main menu, press ▲ or ▼ to select Off.
3. Press <Enter>.

The About Screen

The About screen shows the following information about your 440 Handheld Data Collector:

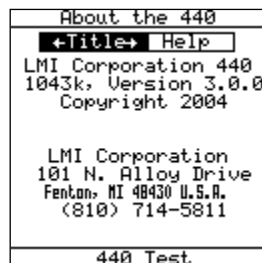
- The data collector model number
- The amount of installed memory in megabytes
- The data collector software version number
- LMI Corporation's address and technical support telephone number

To display the About screen, perform the following.

Steps

1. Power the 440 Data Collector on.
2. From the Main Menu, press ▲ or ▼ to select More and press <Enter>.
3. Press ▲ or ▼ to select About and press <Enter>.
4. Press ◀ or ▶ to select Title.

The About the 440 screen appears:



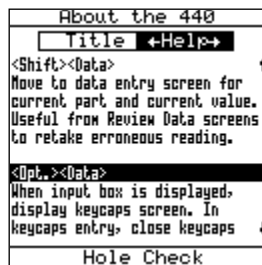
Accessing On-Line Help

The 440 Handheld Data Collector has an on-line help system that provides information about using Key pad functions. Perform the following steps to access the Help System.

Steps

1. From the Main Menu, press ▲ or ▼ to select More and press <Enter>.
2. Press ▲ or ▼ to select About and press <Enter>.
3. Press ◀ or ▶ to select Help.

The Help Screen opens.



4. Use ▼ or <Shift>+▼ to move down through the Help contents.
5. Use <Shift>+▲ to page back through the Help contents.
6. Press <Menu> when finished.

Naming the 440 Data Collector

A Collector ID is a user-defined name created to distinguish one data collector from another. The Collector ID appears during communications and in some reports.

To change the Collector ID, perform the following steps.

Steps

1. Press <Menu> to turn on the data collector and display the Main Menu.
2. Press ▼ to select More...
3. Press <Enter>.
4. Press ▼ to select Preferences.
5. On the Preferences menu, press u to select Comm.
6. Press ▼ to select Collector ID.
7. Press <Enter> to display the Character Input Selection Screen.

The Enter Collector ID prompt appears in the Preferences window.

8. Use the arrow keys to select the first character from the list (i.e., M) and press <Enter> to input the character into the input box.
 - Use ◀ as a backspace key to delete an incorrectly entered character.
 - Use <Shift> to toggle a selected character's case.
 - Enter a space by selecting an empty space in the character list and pressing <Enter>.
9. Press the ▶▶ key when finished.
10. Press <Menu> to return to the Main menu More screen.

SECTION

3

Configuring the Data Collector



Introduction

This section contains procedures for configuring preferences and for configuring views for the 440 Handheld Data Collector. Preferences allow you to customize your data collector with default settings for features such as key click sound, LCD contrast, language, baud rate, and data collection preferences. View settings determine what the display shows when you press the View key.

Preferences are grouped into three categories:

- **User**– Configuration selections that affect the 440 Handheld Data Collector User Interface.
- **Communications** – Configuration selections that affect how the 440 Handheld Data Collector communicates over its ports.
- **Data Collection** – Configuration selections that affect the data collection sequence.

Setting User Preferences

1. From the Main menu, press ▲ or ▼ to select **More** and press <Enter>.
2. Press ▲ or ▼ to select **Preferences** and press <Enter>.
3. Press ◀ or ▶ to select **User**.
4. Press ▲ or ▼ to select the user preference to change, and press <Enter> to either toggle the parameter value or display a data input prompt. See Table 7 on the following page for a description of each option.



Setting User Preferences

Table 7: User Preferences

Preference	Description	Settings
Keyclick	Clicking sound when Key pad key is pressed.	(On) or (Off)
Key Repeat	Auto-repeat when key is pressed.	(On) or (Off)
Keycase	Determines default case of letter.	(Upper) or (Lower)
Shift Keys	Select (Normal) to press both <Shift> and other keys simultaneously; Select (Sticky) to press <Shift> and then, as a separate keystroke, press another key to effect a <Shift>+key- combination. Note: This choice is only available for the simple Key pad.	(Normal) or (Sticky)
Buzzer Volume	Determines the loudness of the speaker.	(Loud), (Soft), or (Off)
Buzzer Tone	Determines the pitch of the speaker.	(1)–(15) (lower to higher)
Power Off Time	Automatic shut-off after a specified idle interval (no Key pad/gage input).	disabled, 5, 10, 20, 30, 40 and 60 minutes
Contrast	Adjust LCD screen contrast.	(1)– (16)
LED Duration	Length of time the LED status indicator lights remains turned on.	(0)–(99) seconds
Backlight Time	Length of time backlight remains on if unit is idle. Note: The Backlight Option is not supported if the LCD backlight option is not installed.	(0)–(999) seconds
Printscreen to PCX	Simple Key pad: press <Option>+<View> to store the current screen image in .pcx file format. Alphanumeric Key pad: press <Symbol>, <View> to store the current screen image in .pcx file format. See Appendix E–PCX Screen Captures on page 147.	(On) or (Off) When (Off) the keypress sequence will send the image to be sent to the serial port in Epson Graphic Format.

Setting Communication Preferences

Steps

1. From the Main menu, press ▲ or ▼ to select **More** and press <Enter>.
2. Press ▲ or ▼ to select **Preferences** and press <Enter>.
3. Press ◀ or ▶ to select **Comm.**
4. Press ▲ or ▼ to select the communications preference to change, and press <Enter> to either toggle the parameter value or display a data input prompt.

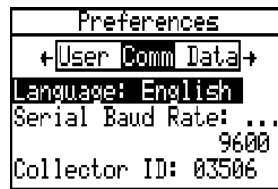


Table 8: Communications Preferences

Preference	Description	Settings
Language	The default language used with the data collector.	English, French, German, Italian, Castellano, Portuguese, or user-defined (if installed)
Serial Baud Rate	Default baud rate for serial communications (measured in Bits Per Second).	300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200 BPS
Collector ID	User-defined name for data collector.	String up to 24 characters long

Setting Data Preferences

1. From the Main menu, press ▲ or ▼ to select **More** and press <Enter>.
2. Press ▲ or ▼ to select **Preferences** and press <Enter>.
3. Press ◀ or ▶ to select **Data**.
4. Press ▲ or ▼ to select the preference to change. Press <Enter> to either toggle the parameter value or display a data input prompt.



Table 9: Data Preferences

Preference	Description	Settings
Data Logging	Sends data to a printer as it is collected. You must have a printer connected to the data collector serial port.	(On) or (Off)
Subgroup Rolloff	Determines the disposition of a subgroup when memory space is full. (Prompted) causes the 440 to warn the operator that untransferred subgroup data will be lost if the user continues; (Automatic) issues no warning. See About Subgroup Rolloff on page 45.	(Prompted) or (Automatic)
Rolloff at...	Sets Rolloff threshold. When 'Reserved Size' is selected, subgroups will be rolled off at the reserved subgroup size instead of when memory is Full.	(Full) or (Reserved Size)
Unreasonable Reading Action	Determines the 440's response to an obviously erroneous reading. If Reasonable Limits are used, (Stop) does not accept the reading and forces the operator to retake the reading; (Advance) accepts the reading but assigns it a NULL value.	(Stop) or (Advance)
Null Reading Action	Determines the response to NULL data readings, such as skipping a data entry: (Stop) does not accept the reading and forces the operator to retake the reading; (Advance) stores a NULL value for the entry. The result of an arithmetic calculation that includes a NULL data entry is NULL.	(Stop) or (Advance)

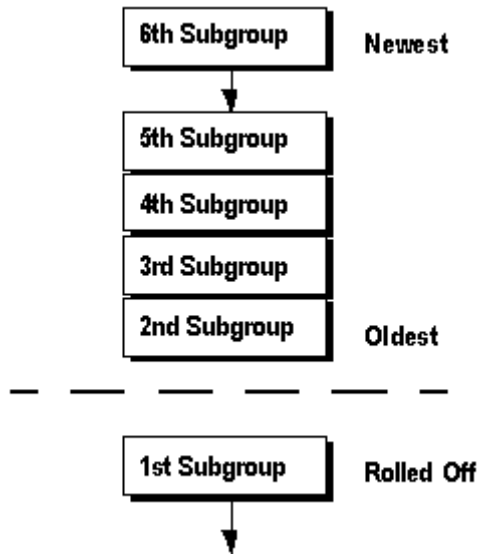
Table 9: Data Preferences

Preference	Description	Settings
Retake Prompting	Determines whether a prompt asking the operator to retake an out-of-spec reading appears during data collection.	(On) or (Off)
Auto Data Info	Determines the default display during data collection mode: the characteristic descriptor overlay, the limits overlay, or no overlay.	(None) or (Characteristic Descriptors) or (Limits)
Time	Sets the time and date in the data collector.	
Part List	Determines the order in which part setups appear when the <Select> key is pressed.	(Alphabetic) or (Unsorted, i.e., chronological)
Select Part	Enables the loading of a part setup using serial input (i.e., barcode wand) while in the Select Part screen.	(On) or (Off)

About Subgroup Rolloff

As data is collected, each new subgroup of data is added to memory. When the memory is full and there is no more room left in the data collector's total memory, the oldest subgroup is “rolled off.”

For example, if five subgroups are collected which fills the memory and a sixth subgroup is added, the memory in the data collector looks like the following.



The Subgroup Rolloff option affects the way the data collector handles Subgroup Data that has not been transferred when its memory is full.

- If set to **(Prompted)**, the operator is alerted that sufficient memory for the data has run out and that if the user continues, the earliest subgroup will be “rolled off” from the memory.
- If set to **(Automatic)**, the operator is not alerted and the earliest subgroup data is deleted from memory. Transferred subgroups roll off automatically without prompting.

WARNING:



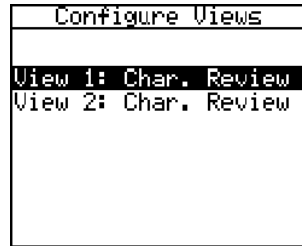
Subgroup Rolloff should be set to (Prompted) unless rolling off transferred subgroups is acceptable for your use of the data collector. When 'Reserved Size' is selected, subgroups will be rolled off at the reserved subgroup size instead of when memory is Full.

Configuring Views

You can view collected data for an active part setup at any time by pressing the <View> key. By default, the <View> key shows View 1. To see View 2, press <Shift>+<View>.

Steps

1. From the Main menu, press ▲ or ▼ to select **More** and press <Enter>.
2. Press ▲ or ▼ to select **View** and press <Enter>.
3. 440 SPC users, press ► to select **Views**.

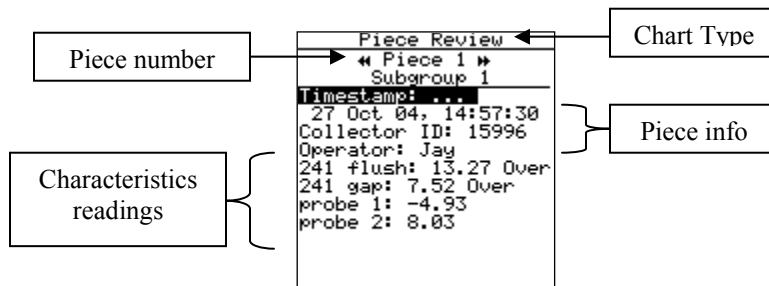


Common Views

The Char Review, Piece Review, Label Review are common to the LMI Corporation 440 data collector.

Char Review

The Piece Review screen displays the data collected for a given piece in a part setup.

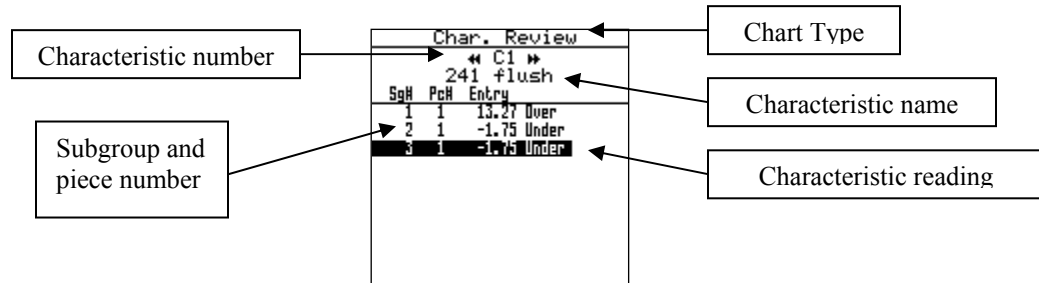


Steps

- Use ◀◀ or ▶▶ to move between pieces.
- Select a line and press <Shift>+<Data> to jump to the selected place in the data collection sequence.

Piece Review

The Characteristic Review screen displays the data collected for a given characteristic in a part setup.

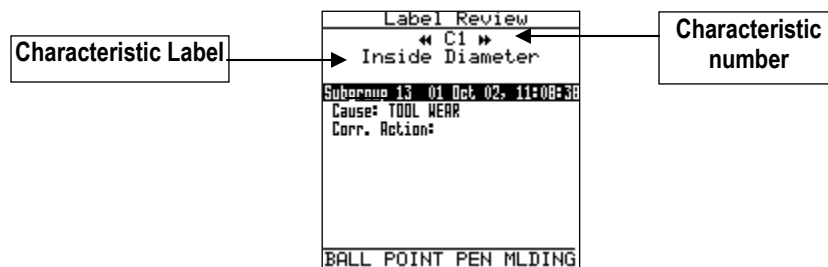


Steps

- Use << or >> to move between characteristics.
- Select a line and press <Shift>+<Data> to jump to the selected place in the data collection sequence.

Label Review

The Label Review screen displays the current characteristic and the name and value of each characteristic label associated with it.



Steps

- Press << or >> to move between characteristics.
- Press ▲ or ▼ to scroll through the label list.

SECTION

4

Configuring LMI Gages



Introduction

This section includes procedures for configuring, mastering and testing analog gages. Analog gages may be dual or single analog gages. The data collector software requires different configuration information depending on the type of gages. For detailed information about analog gage applications see Section 7.

Configuration Checklist

- Have your gage documentation at hand while configuring the gage.
- Have the correct gage cabling in place. The cable that runs from the gage to the data collector is vendor-specific. If you do not know what cable to use, contact LMI Corporation Technical Support.

Supported Gage Types

The data collector can accept input from the following types of gages:

- **Serial –Bar Code Wands.** Communication parameters (i.e., data bits, stop bits, parity, baud rate, Inquiry/Response strings, etc.) must be known during configuration.
- **Single Channel Analog –** Single Channel Analog gages use only one port on the data collector.
- **Dual Channel Analog –** Dual Channel Analog gages require two ports with one connector on the 440 Handheld Data Collector.

Gage List

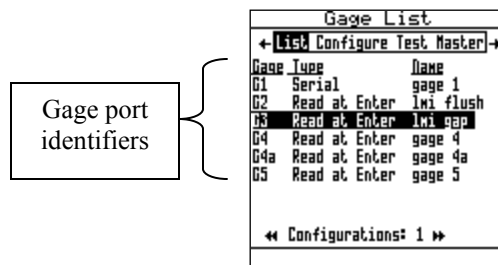
Many different LMI gages can be attached to the 440 Handheld Data Collector to gather statistical information. Each gage used with the data collector is defined in the Gage List. Only configured gage ports are displayed. The Gage List is used to:

- Provide a List of Gage Input Ports used by the data collector.
- Change the number of displayed configurations.
- Indicate how a particular Gage Input Port is presently configured.
- Provide a means for naming gages.

Perform the following steps to access the Gage List.

Steps

1. From the Main menu, press ▲ or ▼ to select **Gage** and press <Enter>. The Gage List window opens.



2. Press ▲ or ▼ to scroll through the list of configured gage input ports.
3. Press ◀ or ▶ to configure, test, or master a port and/or gage (see pages 46 through 47).
4. Use ▶▶ to increase the number of gage configurations *displayed* on the gage list.
5. Use ◀◀ to decrease the number of gage configurations *displayed* on the list.

Note: The number of gage configurations for a given port is constant: Only the number of configurations displayed on the list may be changed. Configurations not shown may still be used to collect data. The number of configurations is usually reduced to that number actually in use to avoid clutter.

Gage Interface Port Identification

The gage ports on the data collector are assigned the following identifiers:

Note: *Gage port assignments for G2 through G5 depend on whether the Analog Module or Torque Module is installed.*

- G1 – Serial port
- G2 – Analog port (dual)
- G3 – Analog port (dual)
- G4 – Analog port (single)
- G5 – Analog port (single)

Each gage input port identifier can contain multiple configurations.

- Port G1 can have four sub-configurations, referred to as G1x, where x refers to one of four sub-configurations (a-d). This provides a total of five discrete gage configurations.
- Analog Ports G2 through G5 can have 9 sub-configurations (a-i) available. These additional sub-configurations provide a total of 10 discrete gage configurations for these ports.

All configurations of a port are available for data collection - even the ports not currently displayed on the gage list. The physical ports available depend on the configuration of your data collector.

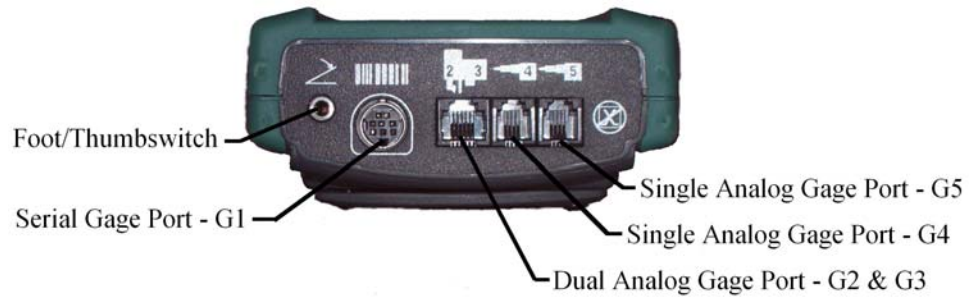


Figure 13. Gage Interface Ports

Naming a Gage Input Port

Each Gage Input Port can be assigned a user-defined name up to 12 characters long. Though not required, the gage name appears during data collection to identify the gage to the operator.

Simple Key pad

Steps

1. Press ◀ or ▶ to select **List** in the Gage List submenu.
2. Press <Enter>.

The Enter Name prompt appears.

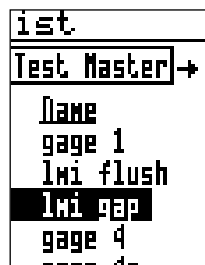


3. Use the arrow keys to select the first character for the name.

Note: Press <Shift> to toggle a character's case.

4. Press <Enter> to input the character into the input box.
5. Repeat steps 3-4 until the gage name is displayed in the input box.
6. Press the ▶▶ key when finished to accept the entered name.

The Gage Name appears in the Gage List.



7. Repeat the previous procedure to name a gage input port for each gage sub configuration.

Standard Parameters

Depending on the gage selected, the exact parameters listed will vary. Refer to the documentation for your gage to determine the specific settings recommended by the manufacturer.


Serial Gages


Note: *The Barcode Wand should be set up as a serial gage using Text as its data type and leaving all other values at their default settings.*

- **Data Type** – How the gage output string should be interpreted by the 440 Handheld Data Collection System. Choices include:
 - Numeric With Decimal – Interpret the output string as a floating point number.
 - Numeric Without Decimal – Interpret the output string as an integer value.
 - Any Numeric – Interpret the output string as either a floating point number or integer value.
 - Text – Interpret the output string as an ASCII string (not available for Continuous Serial Gage Configurations).
- **Baud Rate** – The measurement of data transmission speed expressed in bits per second. Valid baud rates include: 300, 600, 1200, 2400, 4800, 9600, 19200, and 38400. The default baud rate is 9600.
- **Stop Bits** – The number of bits transmitted after each character of data is transmitted (in asynchronous communications). Options are either 1 or 2 stop bits.
- **Data Bits** – The number of bits used to represent one character of data. Options include 7 or 8 data bits.
- **Parity** – The presence (or absence) of an extra bit attached to character data that is used to detect errors in data transmission. Options include None, Even, or Odd.

Configuring Analog Gage Interface Ports

The 440 Handheld Data Collector with the analog gage option has four analog ports with three connectors. Analog gages are configured using ports 2 through 5.

The symbol  marks the dual channel connector on the 440 Handheld Data Collector.

The symbol  marks the single channel connector on the 440 Handheld Data Collector.

- Port 2 and port 3 are configured for dual channel gages.
- Port 4 or Port 5 is configured for single channel gages.

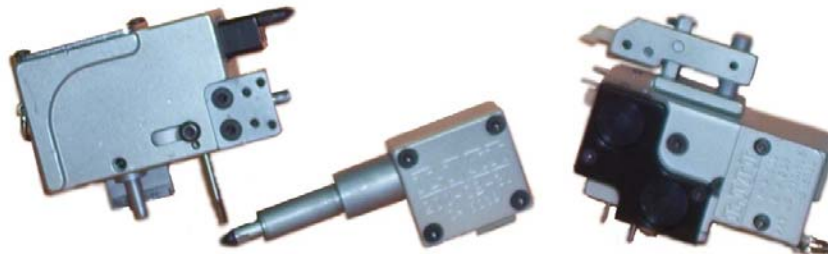
The following table lists analog gages that are commonly used with the 440 Handheld Data Collector and whether they are typically configured as single channel or dual channel gages.

Table 15: Analog Gages

Gage	Single or Dual Channel
LMI 200 Series Probe	Single Channel (1 configuration required)
LMI 300/700 Series Flush and Gap	Single Channel (2 configurations required - one for gap and one for flush)
LMI True Position Gage with 2 single channel cables	Single Channel (uses both ports 4 and 5) or, with Y cable, attach to the Dual Channel connector and configure ports 2 and 3.
Any other LMI analog gage with a four-pin cable	Single Channel
True Position Gage	Dual Channel
LMI 241 or 241BWV2 simultaneous gap and flush gage	Dual Channel
Any other LMI analog gage with a six-pin cable	Dual Channel

Single Channel Analog Gage

Single channel analog gages contain one analog sensor and have a single four pin cable. For single channel analog gages that have more than one reference, one configuration is required for each reference.



- LMI 200 Series Probe – One configuration on a single channel port is required. For example, G4a.
- LMI 300 or 700 Series Gap and Flush Gages – Two configurations on a single channel port are required. For example, G5b and G5c - one for gap and one for flush.

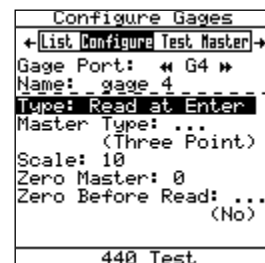
Complete the following steps to configure a single channel analog gage.

Steps

1. Connect the gage with the appropriate cable to the applicable gage input port.
2. Power the gage ON.
3. On the Main menu, select **Gage** and press <Enter>.
4. Select gage port G4x or G5x from the Gage List screen.
5. Press ◀ or ▶ to select **Configure** in the Gage List submenu.

The Configure Gages screen opens for the selected Gage Input Port.

6. Complete the required fields in the Configure Gages screen. See Table 16, “Single Analog Gage Configuration Options,” on the next page for details about options for each parameter. Make sure that you set the gage type and the master type.



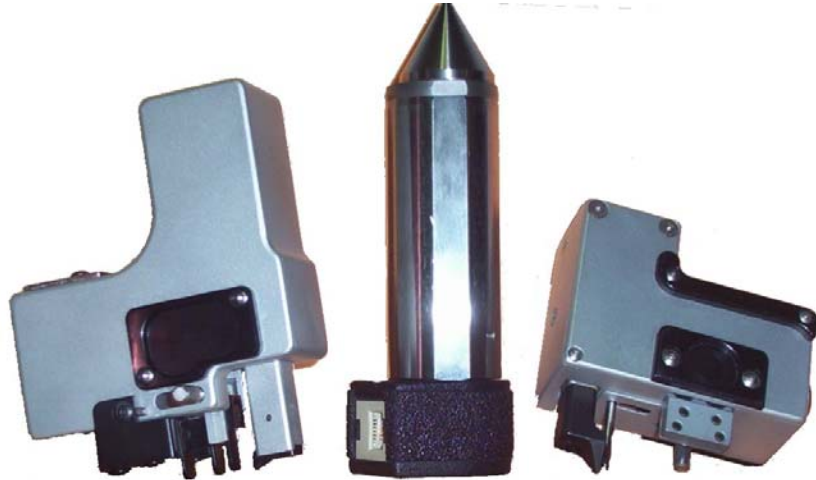
7. When you have set all of the configuration options, either press the <Menu> key or any arrow key.
8. The “Save Gage Configuration?” prompt appears.
9. Select **Save...** to save your changes to this port or **Cancel** to close the window without saving your changes

Table 16: Single Analog Gage Configuration Options

Field	Description	Default	Mastering Type
Type	Select Read at Enter to apply the gage to the work piece and initiate a reading by using the <Enter> key, an attached footswitch, or a thumbswitch. This is the default value. Select Time at Level to apply the gage to the work piece and have the collector automatically take the reading when the gage has come to a steady state at the point of measurement.	Read at Enter	
Master Type	Every gage must be mastered. Select Three Point mastering if your gage uses two mechanical references to establish a scale distance and a third point as a zero reference. Select Two Point mastering if your analog gage uses two mechanical masters with known values.	Three Point	
Scale	Enter the difference between the high master and the low master of your three point master.	10	Three-point
High Scale	Enter the value of your High Master.	2.5	Two-point
Low Scale	Enter the value of your Low Master.	- 2.5	Two-point
Zero Master	Enter the value that you want your gage to read at the zero position.	0	Three-Point
Zero Before Read	In data entry mode, you are prompted to Zero Master the gage prior to each data entry. This feature is useful for taking measurements relative to a work piece rather than relative to the master. Toggle between Yes and No by pressing <Enter>.	No	
Options for Time At Level Configuration			
Level Time	The time duration that the value from the gage must be level in order to initiate a reading.	0.1 second	
Level Zone	Measurement tolerance in engineering units that the value from the gage must remain within for a duration of level time to initiate a reading	0.01	
At Rest A/D	Set to Low if the A/D value from the gage is lowest when the gage is at rest. Set to High if the A/D value is highest when the gage is at rest. (On the Master Screen, observe the A/D value at rest, then move the gage to the opposite extreme. If the A/D value at the opposite extreme is higher than the rest value, set the value to Low.)	Low	
Sample Time	The sample rate in milliseconds.	20 ms	
Start Threshold	The minimum analog value necessary for a valid reading.	5	

Dual Channel Analog Gage

The following list provides configuration guidelines for some typical dual channel analog gages.



- True Position Gage – Two configurations on the dual channel ports are required. For example, G2c and G3c. Simultaneous mastering is not supported. Choose “Alone” in the “Master” field.
- LMI 241 and 241-BWV2 series flush and gap gage – Two configurations on the dual channel ports are required. For example, G2b and G3b. One of the ports is for flush and one of the ports is for gap. Simultaneous mastering is supported.

Complete the following steps to configure a single channel analog gage.

Steps

1. Connect the gage with the appropriate cable to port 2/3 on the collector.
2. Power the LMI 440 on.
3. On the Main menu, select **Gage** and press <Enter>.
4. Select gage port G2x and G3x from the Gage List screen.

5. Press ◀ or ▶ to select **Configure** in the Gage List submenu.

The Configure Gages screen opens for the selected Gage Input Port.



6. Verify that **Read at Enter** is selected in the **Type** field.
7. Complete the required fields in the Configure Gages screen. See Table 17, “Dual Analog Gage Configuration Options,” on the next page for details about the options for each parameter.
8. When you have set all of the configuration options, either press the <Menu> key or any arrow key.
9. At the confirmation prompt, select **Save...** to save your changes to this port or **Cancel** to close the window without saving your changes.

Table 17: Dual Analog Gage Configuration Options

Field	Description	Default	Mastering Type
Type	Must be set to Read at Enter.		
Master Type	Every gage must be mastered. Select Three Point mastering if your gage uses two mechanical references to establish a scale distance and a third point as a zero reference. Select Two Point mastering if your analog gage uses two mechanical masters with known values. Either type of mastering can be done alone or with the partner gage port.	Three Point	
Master	Select Alone to master the gage independently from the partner gage. Select With Gnx to master the gage with its partner port. For example, G2i with G3i, or G2a with G3a. Toggle between the options by pressing <Enter>	Alone	
Scale	Enter the difference between the high master and the low master of your three point master.	10	Three-point
Zero Master	Enter the value that you want your gage to read at the zero position.	0	Three-Point
Zero Before Read	In data entry mode, you are prompted to Zero Master the gage prior to each data entry. This feature is useful for taking measurements relative to a work piece rather than relative to the master. Toggle between Yes and No by pressing <Enter>.	No	

SECTION

5

Mastering LMI Gages



Introduction

Mastering is the process which calibrates a gage with the 440 Handheld Data Collector to known mechanical references (masters). Mastering type for all LMI analog gages is “Three-Point Mastering” –Master Lo starts the scale range, Master Hi ends the scale range, Master Zero establishes the nominal.

- Always master an analog gage whenever it is to be used in a new configuration. If an LMI 241 flush and gap gage is configured with port G2a for flush and port G3a for gap, both configurations must be mastered before initial use.
- Although the 440 Handheld Data Collector retains the mastering in memory, even when the power is turned off, it is recommended that analog gages be remastered periodically. It is strongly recommended to remaster before the start of a shift. Always remaster whenever a gage is replaced, even if the same type of gage is to be used for measurement.
 - ◆ Example, assume that an LMI 241 flush and gap gage with Serial Number 1234 was mastered and used on gage port G2 and gage port G3. If you change the gage to an LMI 241 flush and gap gage Serial Number 6789, you must remaster both the flush and gap configurations before using the new gage.

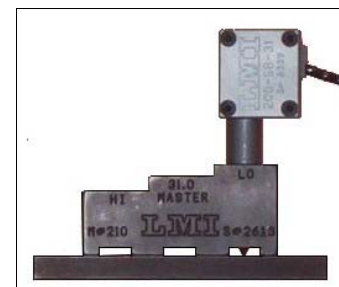
Note: *If an analog gage is mastered in “reverse,” the readings taken will be incorrect. To help prevent this condition, the collector provides a warning if high and low masters are reversed from their previous mastering.*

Mastering the LMI 200-S and 200-SB Series

Assumes the LMI 200 series is configured for G4. If G5 is configured follow same steps using G5 instead of G4.

1. Connect the LMI 200-S or 200-SB probe to the LMI 440 at port 4 using the LMI 6009.
2. Turn on the LMI 440.
3. Press ▼ to highlight “Gage” and press <enter> on the key pad.
4. Press ▼ in the “List” screen to highlight G4.
5. Press ◀ to the “Master” screen.

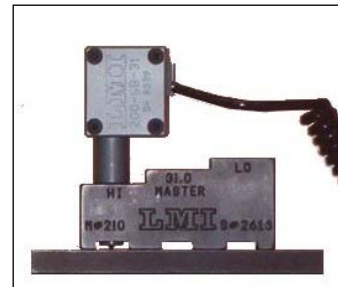
6. Insert the LMI 200-S or 200-SB into the tallest step or the step labeled “Lo” on the LMI 210.



“Master Lo”

7. Verify “Master Lo” is highlighted on the collector screen and press <enter>.

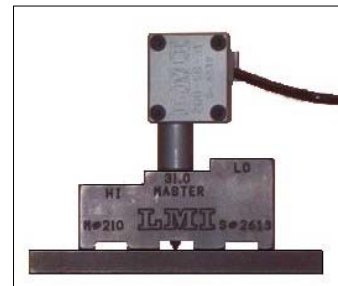
8. Insert the LMI 200-S or 200-SB into the shortest step or the step labeled “Hi” on the LMI 210.



"Master Hi"

9. Verify “Master Hi” is highlighted on the collector screen and press <enter>.

10. Insert the LMI 200-S or 200-SB into the middle step or the step labeled “Master” on the LMI 210.



"Master Zero"

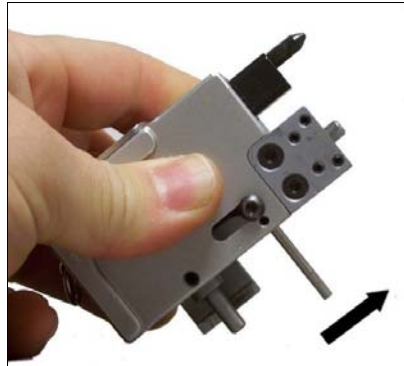
11. Verify “Master Zero” is highlighted on the collector screen and press <enter>.

Mastering the LMI 770 or LMI 300 Series

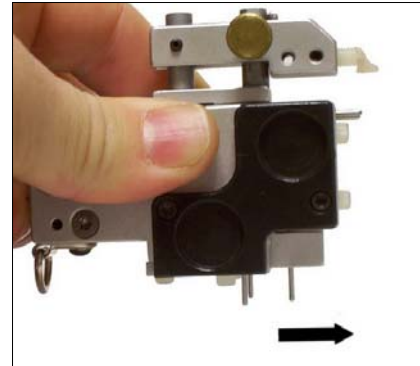
Assumes the LMI 770 or LMI 300 is configured for G4 and G4a. If a different gage is already configured in G4 use G5 and G5a, or a different pair of subfiles for G4 like G4b and G4c follow same steps using your configured ports instead of G4 and G4a.

1. Connect the LMI 770 or LMI 300 probe to the LMI 440 at port 4 using the LMI 6009.
2. Turn on the LMI 440.
3. Press ▼ to highlight “Gage” and press <enter> on the key pad.
4. Press ▼ in the “List” screen to highlight G4.
5. Press ◀ to the “Master” screen.

- 6. Fully extend the LMI 770 or LMI 300.

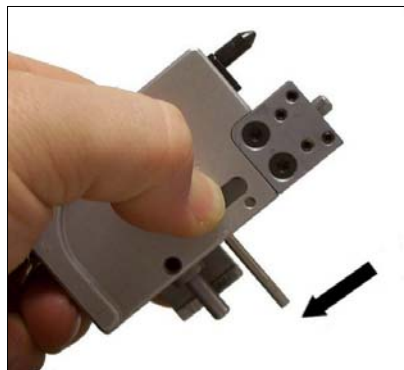


LMI 770 Flush “Master Lo”

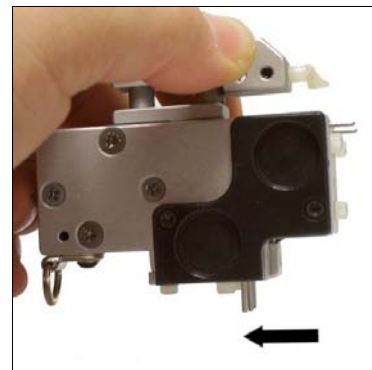


LMI 300 Flush “Master Lo”

- 7. Verify “Master Lo” is highlighted on the collector screen and press <enter>.
- 8. Fully retract the LMI 770 or LMI 300



LMI 770 Flush “Master Hi”

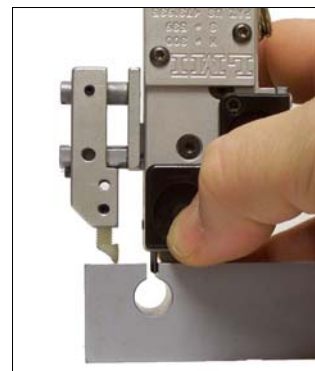


LMI 300 Flush “Master Hi”

- 9. Verify “Master Hi” is highlighted on the collector screen and press <enter>.
- 10. Insert the LMI 770 or LMI 300 into its master block in the flush position.

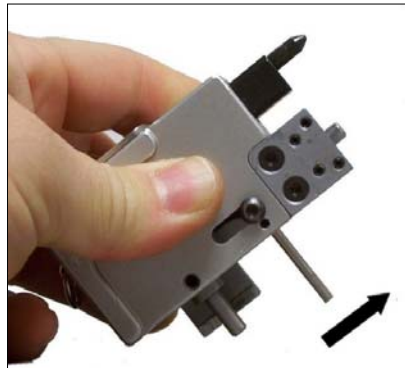


LMI 770 “Flush Master”

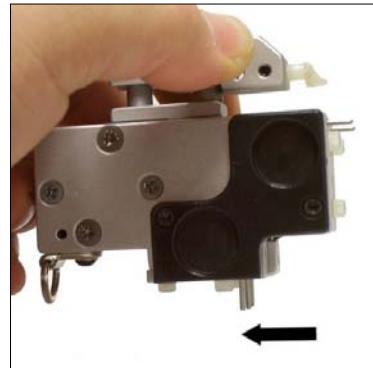


LMI 300 “Flush Master”

11. Verify “Master Zero” is highlighted on the collector screen and press <enter>.
12. Press the ►► on the LMI 440 to advance to the gap configuration.
13. Fully extend the LMI 770; fully retract the LMI 300.

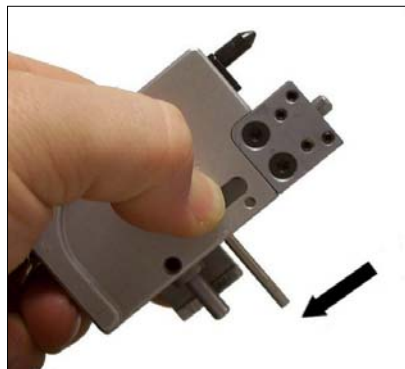


LMI 770 Gap “Master Lo”

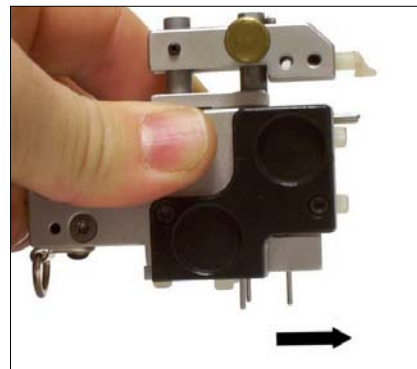


LMI 300 Gap “Master Lo”

14. Verify “Master Lo” is highlighted on the collector screen and press <enter>.
15. Fully retract the LMI 770; fully extend the LMI 300.



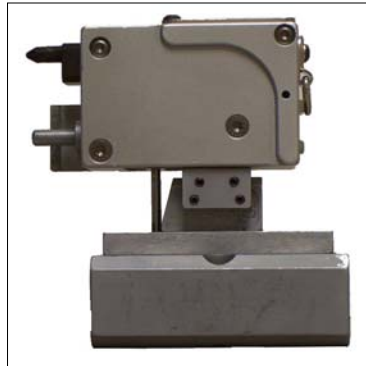
LMI 770 Gap “Master Hi”



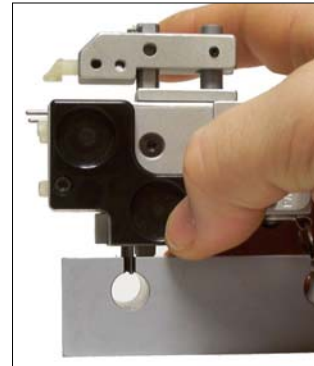
LMI 300 Gap “Master Hi”

16. Verify “Master Hi” is highlighted on the collector screen and press <enter>.

17. Insert the LMI 770 or LMI 300 into its master block in the Gap position.



LMI 770 “Gap Master”



LMI 300 “Gap Master”

18. Verify “Master Zero” is highlighted on the collector screen and press <enter>.

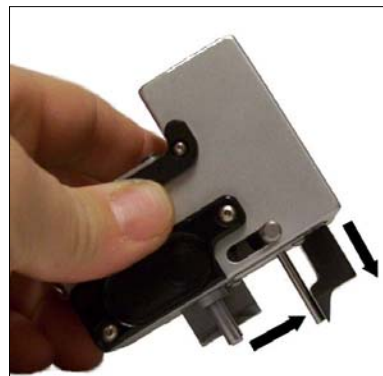
Mastering the LMI 241-BW series or LMI 241 Series

Assumes the LMI 241BW series and LMI 241 series are configured in ports G2 and G3. If G2a and G3a are configured, follow same steps using G2a and G3a instead of G2 and G3.

1. Connect the LMI 241BW series or LMI 241 series into the LMI 440 at port 2/3 using the LMI 6025.
2. Turn on the LMI 440.
3. Press ▼ to highlight “Gage” and press <enter> on the key pad.
4. Press ▼ in the “List” screen to highlight G2.
5. Press ◀ to the “Master” screen.
6. On the LMI 241 BW series fully extend the flush and fully retract the gap. On the LMI 241 series fully extend both the flush and gap.



LMI 241-BWV2 “Master Lo”



LMI 241 “Master Lo”

7. Verify “Master Lo” is highlighted on the collector screen and press <enter>.
8. On the LMI 241 BW series fully retract the flush and fully extend the gap.

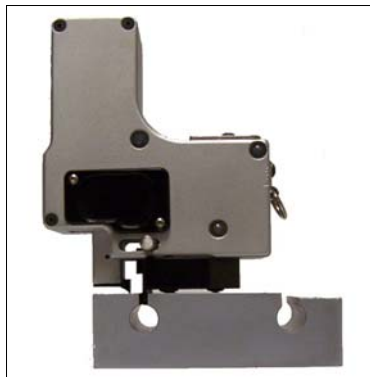


LMI 241-BWV2 “Master Hi”



LMI 241 “Master Hi”

9. Verify “Master Hi” is highlighted on the collector screen and press <enter>.
10. Insert the LMI 241-BW and LMI 241 series into the master block.



LMI 241-BWV2 “Master Zero”



LMI 241 “Master Hi”

11. Verify “Master Zero” is highlighted on the collector screen and press <enter>.

Mastering LMI Gages not shown

Contact LMI Corporation for documentation either at our:
 website www.lmicorporation.com,
 email techsupport@lmicorporation.com,
 or phone 1-810-714-5811

Testing Gages

After mastering a gage, test the gage to make sure that it is configured properly and is sending readings to the data collector.

Steps

1. Connect the analog gage with the appropriate cable to the applicable analog gage input port.
2. Power the gage ON.
3. On the Main menu, select **Gage** and press <Enter>.
4. Select the gage port to test from the Gage List screen.
5. Press ◀ or ▶ to select **Test** in the Gage List submenu. This area allows the user to view sampled readings without adding unwanted data to a part file. This data is not stored.

If the gage is configured for Read at Enter, take a gage reading and press the <Enter> key.

If your analog gage is configured for Time at Level, achieve a Time at Level reading and press the <Enter> key.

SECTION

6

Working With Part Setups



Overview

A part setup is a group of part characteristics, labels, and data collector options specifically packaged for use with the LMI Corporation 440 Data Collector. You create part setups using TranSend software and then transfer the setup to the data collector. Figure 21 shows a typical process for working with part setups. You can also use the Quick Setup feature to create a part setup on the data collector. Quick Setup is described on page 67.

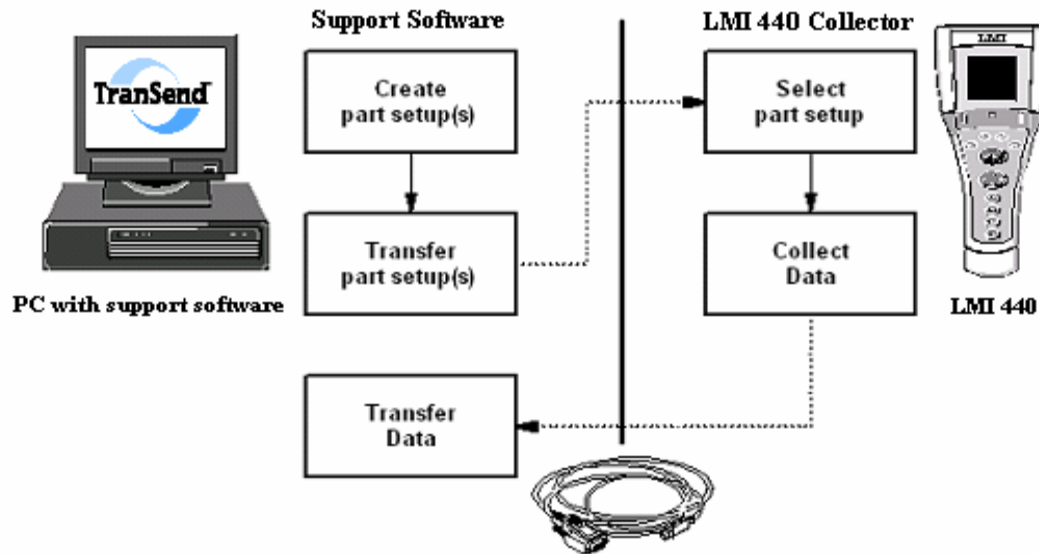


Figure 14. Working with Part Setups

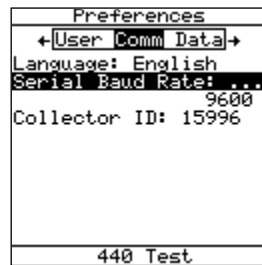
1. **Create Part Setup(s)** – Before data can be collected a part setup must be created using any of the following:
 - TranSend™
 - Quick Setup on the data collector
 - Standard text editor (such as Microsoft® Windows™ Notepad)
2. **Transfer Part Setup(s)** – After a part setup is created, it must be *transferred* to the 440 collector. You will need the LMI 443 serial cable to connect the data collector to the computer running the support software.
3. **Select Part Setup** – Once the part setup is transferred to the collector, it can be selected for data collection by 440 Handheld Data Collector.
4. **Collect Data** – Collect data for the part setup using an LMI gage and the 440 Handheld Data Collector.
5. **Transfer Data** – Once data has been collected for any part setup, it may be transferred back to the support software for analysis and long term storage.

Transferring Part Setups Using TranSend

Details about transferring part setups to the 440 Handheld Data Collector vary with each software package. For information about using a text editor for creating a part setup and how to transfer it to the data collector, see *Creating Setups Using a Text Editor* in Section 9, Open Communications.

440 Steps

1. Power the data collector on.
2. From the Main menu, press ▲ or ▼ to select **More** and press <Enter>.
3. Press ▲ or ▼ to select **Preferences** and press <Enter>.
4. At the Preferences menu press ◀ or ▶ to select **Comm**.



5. Press ▲ or ▼ to select **Serial Baud Rate** and press <Enter>.
6. On the overlay, press ▲ or ▼ to select the baud rate to match the baud rate set in the support software package.

Note: *In order for the data collector and the computer to communicate, the baud rates must be set to the same rate.*

7. Press <Enter>.

WARNING:



Resending a part setup without deleting the old setup causes ALL DATA associated with that part setup to be lost. Transfer any data you have not already imported prior to resending the revised setup. If you are using Open Communications to resend your part setup, the data collector does not allow the part setup to be overwritten. However, TurboSPC, DataMyte Setup Editor and TranSend users can overwrite part setups stored in the 440 Handheld Data Collector.

TranSend Steps

1. Start TranSend software on the support pc.
2. Connect the LMI 443 communication cable to the 440 and the comm. port on the pc
3. Select "Send" from the TranSend "Setups" menu
4. Mouse click the part setup to transfer to the LMI 440
5. Mouse click "Send"
6. Wait for the transfer dialog to state the transfer is complete
7. Disconnect the LMI 443 cable from the LMI 440.

Reviewing and Editing Setups Within the 440

You can use the data collector to edit certain fields in a part setup. Some fields in the part setup cannot be changed, such as elements that define the size of the setup in memory and element names. Most characteristic options can be changed in a part setup.

If a field cannot be edited, pressing <Enter> has no effect on the setting. To change any of the non-editable items, you must either recreate the part setup on the data collector, or edit the part setup using the support software.

Editable Fields

Part Options

- Reserved Subgroups
- Char Label Source
- Char Label Data Logging
- Char Label Ditto

Characteristic Options

- Process
- Characteristic Descriptor Values
- Resolution
- Source
- Keyboard Ditto
- Auto Scan
- Boundary
- Alarms
- Limit Choice
- Caution Limit%
- Reasonable Limits
- Data Logging
- Label List Name
- Label Ditto
- Label Auto Enter

Non-editable Fields

- Part Setup Name
- Date Modified
- Part Descriptors
- Variables Count
- Char Label Names
- Labels Count
- Creator
- Largest Subgroup Size

- Characteristic Names
- Label Names
- Subgroup Size

Use the **Review Setup** menu to review or edit a part setup:

Steps

1. From the Main menu, press ▲ or ▼ to select **More** and press <Enter>.
2. Press ▲ or ▼ to select **Review Setup** and press <Enter>.

The Review Setup screen appears:



Review Part Setup Menu



Review Characteristic Menu

Navigate the Review Setup menu as follows:

- Use ◀ or ▶ to select either **Part** or **Char**.
- On the Part setup menu, use ◀◀ or ▶▶ to select a different part setup.
- On the Char menu, use ◀◀ or ▶▶ to select a different characteristic.
- Press ▲ or ▼ to select a field to change and press <Enter>. Depending on the field selected, pressing enter toggles the setting on/off or opens a choice list from which you can select characters or enter values.
- Press Shift+▲ or Shift+▼ to scroll an entire screen of information, much like page up or page down key is used on a computer.

Deleting Setups and Data Within the 440

You can delete an entire part setup and all of its associated data, delete selected subgroups of data, or delete choices lists.

Deleting Part Setups

Deleting an entire part setup removes the part setup and all associated data.

Steps

1. From the Main menu, press ▲ or ▼ to select **More** and press <Enter>.
2. Press ▲ or ▼ to select **Delete** and press <Enter>.

The Delete prompt appears:



3. Select **Delete Parts** and press <Enter>.

The Delete Parts screen appears.



4. Press ▲ or ▼ to select the part setup(s) to delete from the list and press <Enter> to mark each with a checkmark.
5. Press ◀ or ▶ to select **Delete** in the submenu.

A confirmation prompt appears:



6. Select **Yes** and press <Enter>.

Any data associated with the part setup that has not been transferred using support software is marked with an asterisk (*) next to the setup name. If you choose to delete a setup that contains untransferred data, a prompt like the following appears:



7. To delete the part setup and its data select **OK to delete** and press <Enter>.
8. To exit the menu so you can transfer data before deleting the part setup, select **Do not delete** and press <Enter>.

WARNING:



Deleting a part setup deletes all data associated with the setup from the data collector's memory. Part setup deletion is an irreversible procedure.

Deleting Subgroup Data

To delete selected subgroup data from a part setup, perform the following steps.

Steps

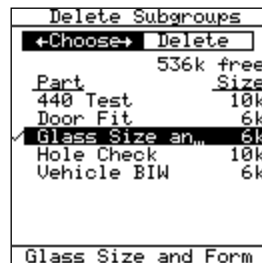
1. From the Main menu, press ▲ or ▼ to select **More** and press <Enter>.
2. Press ▲ or ▼ to select **Delete** and press <Enter>.

The Delete prompt appears:



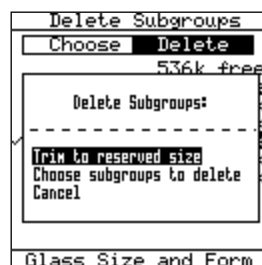
3. Select **Subgroups** and press <Enter>.

The Delete Subgroups screen appears.



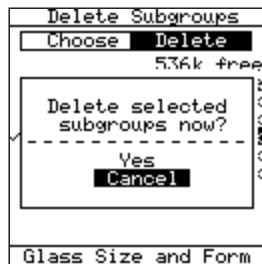
4. Press ▲ or ▼ to select the part setup(s) from which to delete subgroup data and press <Enter> to mark each with a checkmark.
5. Press ◀ or ▶ to select **Delete** in the submenu.

The following prompt appears.



6. Select one of the following options:
 - **Trim to reserved size** – Truncates the number of subgroups stored in the data collector's memory to the number of reserved subgroups allocated when the setup was first dimensioned.
 - **Choose subgroups to delete** – Press ▲ or ▼ to select the number of oldest subgroups to delete.
 - **Cancel** – Cancels the procedure and returns to the Choose Parts list.

The following confirmation prompt appears:



7. Select **Yes** and press <Enter>.
8. Any subgroups associated with the part setup that have not been transferred using support software are marked with an (*) next to the setup name. If you choose to delete a subgroup that contains untransferred data, a prompt like the following appears.



9. To delete the subgroup data select **OK to delete** and press <Enter>.
10. To exit the menu so you can transfer data before deleting the subgroup data, select **Do not delete** and press <Enter>.

Deleting Choice Lists

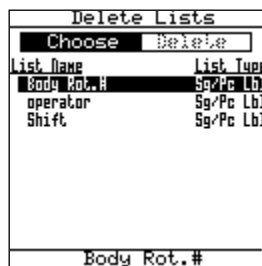
You can delete choice lists from the data collector; however, unless you are transferring an updated part setup with a revised label list, it is recommended that you use your support software to delete label lists.

To delete a choice list from data collector, perform the following steps.

Steps

1. From the Main menu, press ▲ or ▼ to select **More** and press <Enter>.
2. Press ▲ or ▼ to select **Delete** and press <Enter>.

The Delete prompt appears:



3. Select **Delete Lists** and press <Enter>.

The Delete Lists screen appears.

4. Press ▲ or ▼ to select the list(s) to delete and press <Enter> to mark each with a checkmark.
5. Press ◀ or ▶ to select **Delete** in the submenu.
6. Select **Yes** at the confirmation prompt and press <Enter>.

If any part setups in the data collector use a list marked for deletion, the following prompt appears.



7. To delete the list(s) select **OK to delete** and press <Enter>.
8. To exit the menu without deleting the affected list(s), select **Do not delete** and press <Enter>.

Quick Setup

The Quick Setup feature can be used to quickly and easily create a generic part setup in the data collector. This feature is useful for relatively simple data collection applications.

A Quick Setup is added to the existing setups in the data collector; it does not overwrite any of the other existing setups. The following rules apply to setups created using the Quick Setup feature:

- The predefined high and low engineering limits for each characteristic are ± 1.5 .
- The resolution for each characteristic is 0.01.
- The number for the part setup in the Create Part field is automatically inserted by the data collector.
- All characteristics are named in numerical order, such as Characteristic 1, Characteristic 2 and Characteristic 3. The same source is assigned for each characteristic.
- The source can be modified in Review Setup.
- The characteristics and part names cannot be modified in Review Setup.

Steps

1. From the Main menu, press **▲** or **▼** to select **More** and press <Enter>.
2. Press **▲** or **▼** to select **Quick Setup** and press <Enter>.

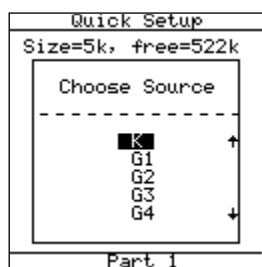
The Quick Setup screen appears:

Quick Setup
Size=5k, free=522k
Characteristics
◀ 1 ▶
Pieces
◀ 1 ▶
Subgroups
◀ 10 ▶
Source: K
Create Part 1
Cancel
Part 1

As you select more characteristics, pieces per subgroup and subgroups, the size of the setup shown in the Size field increases. The number in the free field decreases. The free field shows the amount of RAM that is still available in the data collector.

3. Use **◀◀** or **▶▶** to increase or decrease the number of characteristics.
4. Press **▲** or **▼** to move to the next field on the Quick Setup screen.
5. Use **◀◀** or **▶▶** to increase or decrease the number of pieces.
6. Press **◀◀** or **▶▶** increase or decrease the number of subgroups.
7. Move to the Source field. To change the Source from what is presently shown on the screen, press <Enter>.

The following choice list appears. The list reflects the gage configurations which have been selected for display. (See *Gage List* on page 38 for more information about changing the gage list display).



8. Use the arrow keys to select a source for data input and press <Enter>.
9. At the save prompt, select **Save** and press <Enter> to save the setup or select **Cancel** and <Enter> to exit the screen without saving this setup.

SECTION

7

Data Collection



Overview

Figure 15 shows the sequence for collecting data using the 440 Handheld Data Collector. Each step is described briefly beginning on page 71 and in more detail following the overview.

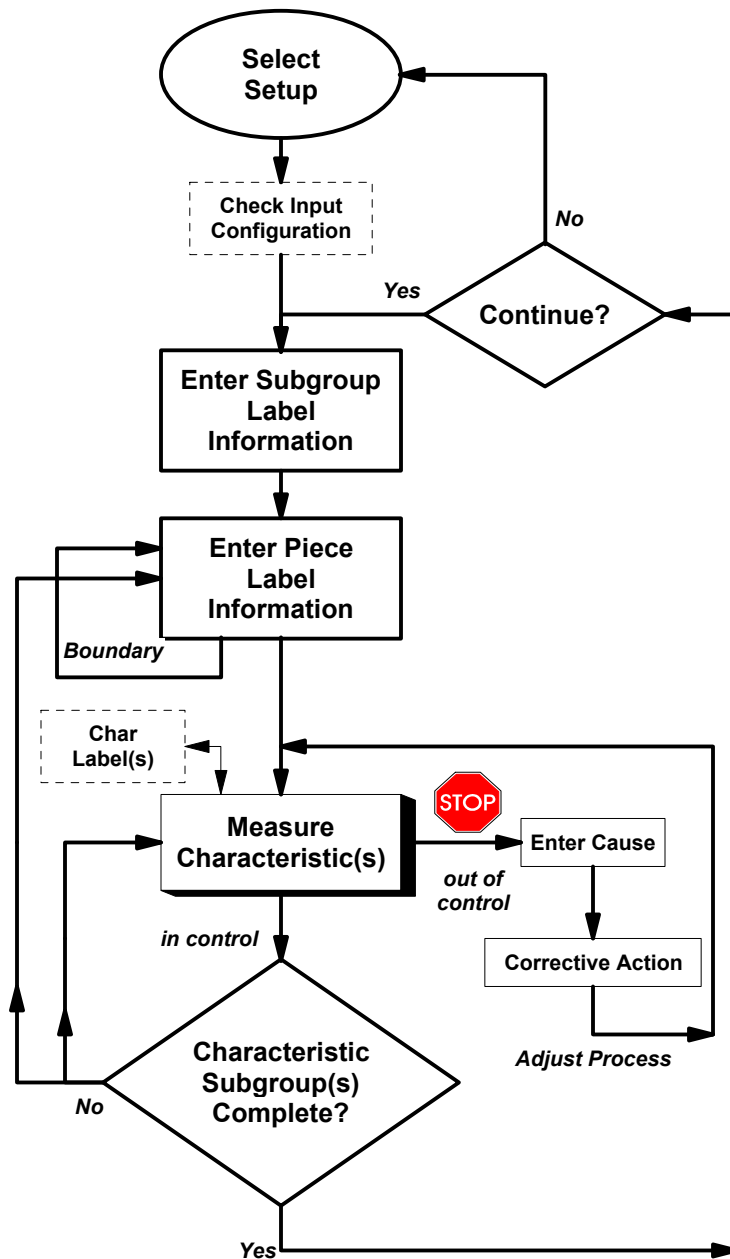


Figure 15. Data Collection Sequence

Data Collection Sequence

1. **Select Setup** –When the data collector is properly configured, select the part setup.
2. **Check Input Configuration** – Ensure that any gages or input devices referenced in the setup, such as barcode wands, are properly configured.

Note: *Normally, this step is performed only once - at the outset of collecting data for a new part setup.*

3. **Enter Subgroup Label Information** (if any) – Enter the subgroup label information, such as Operator Name, Shift, etc. Since subgroup labels are optional, the **Enter Subgroup Label Information** box appears in a dotted outline in the flow diagram.
4. **Enter Piece Label Information** (if any) – If any piece labels are used, enter the piece label information for all pieces of the largest characteristic subgroup either at one time or before each piece is measured for variables data. The flow diagram illustrates this by moving either directly from **Enter Piece Label Information** to **Measure Characteristic(s)** or by looping at **Enter Piece Label Information** until all pieces of the largest characteristic subgroup are inspected. Since piece labels are optional, the **Enter Piece Label Information** box appears in a dotted outline in the flow diagram.
5. **Measure Characteristic(s)** – When the operator completes entering the label information, the data collection sequence proceeds to display a prompt for the first variable characteristic's data. While the operator is collecting data, if an out-of-control condition is detected, the Cause label (and perhaps other characteristic labels) can automatically appear. The operator must respond to the label by indicating what is responsible for the non-normal condition before data collection resumes. Characteristic label values can only be entered when characteristic data is being collected.
6. **Characteristic Subgroup(s) Complete?** – As long as data collection for each characteristic subgroup is incomplete, the 440 Handheld Data Collector continues to prompt you for variable characteristic data. When all the data for each characteristic subgroup is complete, you can choose to continue collecting data for this part setup or you can choose to select a different setup.

Selecting a Part Setup

You can select a part setup that is stored in the data collector either by pressing the <Select> key or by using a barcode reader.

Using the <Select> Key

Steps

1. Power the data collector on.
2. Press <Select> on the Key pad.

The data collector displays a list of part setups that are currently stored in memory.



- The bottom line displays the currently selected part setup. This active part also appears selected in the list.
- The Select Part screen lists part setups either in alphabetical or chronological order depending on how the Part List option is set in the Data Preferences (see *Setting Data Preferences* on page 31).

Note: *If pressing the <Select> key does not display the Select Part menu, you may have no part setups loaded into memory.*

3. If necessary, press ◀ or ▶ to select **Part**.
4. Press ▲ or ▼ to select the part setup.
5. Press <Enter>.

Using a Barcode Wand

Steps

1. Make sure that barcode wand is configured and connected to the data collector (see *Configuring Digital Gage Input Ports* on page 41).
2. To choose a part setup using a barcode wand, scan the part setup name from a list of the barcode symbols for the available part setup names. This list is developed at your site to match your list of parts.

Note: See *Appendix A - Barcode Wands* for more information about setting up barcode wands.

Checking the Input Configuration

Before collecting data with a new part setup, check the label and characteristic input sources for the setup elements to ensure that any gages referenced in the part setup are properly configured.

Checking Input Sources

- **Label Source** refers to the location from which a label value is entered.
- **Characteristic Source** refers to the location where a characteristic value is entered.

For example, a source can be the Key pad (K), a Bar Code Wand (G), or a list (L). The input source is determined by the part setup, but you can change it if necessary.

If you enter label values using a gage or barcode wand, the gage port must be configured for this type of use. See Section 4, *Configuring Gages* for more information about configuring gage ports. Also see *Appendix B- Source Input Codes* for information about source identifiers.

To review the input configuration, perform the following steps:

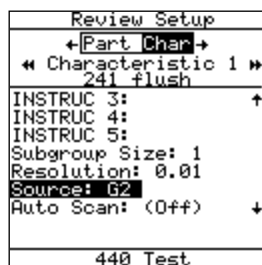
Steps

1. From the Main menu, press ▲ or ▼ to select **More** and press <Enter>.
2. Press ▲ or ▼ to select **Review Setup** and press <Enter>.

The Review Setup screen appears:



3. Press ► to select **Char**.



4. View the source for each label and characteristic in the setup. Use ◀◀ or ▶▶ to move between labels and characteristics.
5. To change the source to match the hardware of the data collector, press ▲ or ▼ to select the Source parameter and press <Enter>.

- Use the simple Key pad to select the letters that represent the sources you want to use. On the alphanumeric Key pad, enter the source identifiers in the edit box. For example, for a **label** source enter:

K,L,G1

- To use the Key pad (K), a list (L), or the gage connected to port G1 to enter the label information. Make sure that you enter the commas between source identifiers.
- Multiple **characteristic** sources must be enclosed in square brackets, such as:

[K,G1a]

See page 175 for more information about source identifiers.

To verify that a gage port is configured for a specific gage, perform the following steps:

Steps

- From the Main menu, press ▲ or ▼ to select **Gage** and press <Enter>.

The Gage List opens:



- If a gage port is not configured for your needs, configure the port as described in Section 4, *Configuring Gages*.

Collecting Data

To collect data for the currently selected part, press the <Data> key on the Key pad. The data collector opens the data collection screen where you last stopped collecting data or at the beginning of the collection sequence if you had not collected any data for the part setup. You can enter data without using the <Data> key under the following circumstances:

Data Collect Mode

If you have set a default screen in the **Auto Data Info** preference, then pressing the <data> key during data collection automatically opens a data entry screen, either characteristic descriptors or limits. See *Setting Data Preferences* on page 31 for more information.

Preview Mode

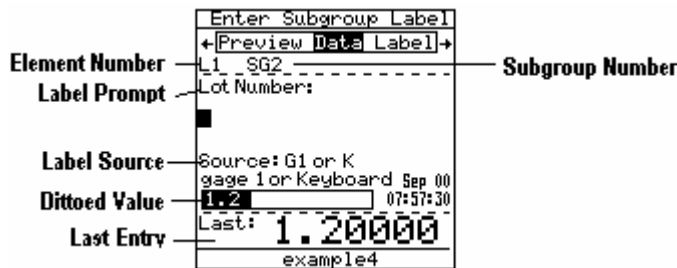
In Preview mode, the data collection data entry screen opens automatically, displaying the reading and a bar graph. This occurs for the following type of entries that accept keyboard or gage input:

- During an autoscan sequence when entering the first characteristic, or
- For a single characteristic entry not associated with autoscan.

Note: Data entry mode will now first default to the 'Preview' screen for characteristics that have a gage source specified.

Entering Label Information

Generally, a part setup begins with one or more prompts for subgroup label values:



Screen Elements

- **Element Number** – The number of the element for which you are being prompted to enter data. L# indicates a subgroup label element, PL# a piece label, and C# a characteristic.
- **Label Prompt** – The data to enter.
- **Label Source** – The source from which the collector expects to get the data.
- **Dittoed Value** – If ditto is enabled for the element, the last value entered for the element is automatically repeated in the data entry box.
- **Last Entry** – The last entry you made, if any. In Autoscan mode, the last two entries are displayed. If you took an out-of-spec reading, the last entry display indicates whether the entry was over (↑) or under (↓) the limit.
- **Subgroup Number** – The subgroup number for which you are currently entering subgroup data.

Steps

1. Enter the requested information for the first label using the source indicated. For example, you may scan a barcode using a barcode wand configured for port G1 or enter data using the Key pad.
 - To enter the dittoed value (the same value as entered previously), press <Enter>.

The data collector accepts the reading and proceeds to the next setup element:



2. Enter label information using the source indicated, for example:
 - For a list source as shown above, press ▲ or ▼ to select the correct choice and press <Enter>.
 - To enter the dittoed value, press <Enter>.

Note: *Additional characters are available by pressing the <Data> key when the character input screen is displayed.*

- To enter the label from the character input screen using an alphanumeric Key pad, press <Symbol>, <Data>.

Entering Characteristic Data

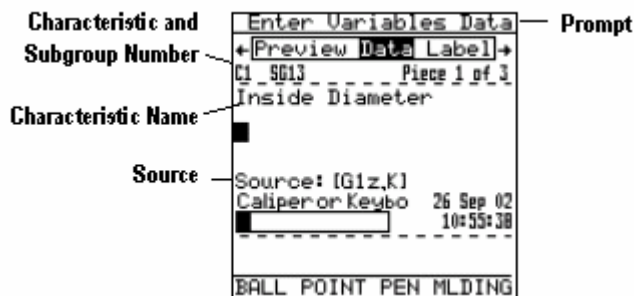
After all label information is entered, such as subgroup and piece label values, the data collection sequence proceeds to prompt for characteristic data. You can enter data in either the Data Entry screen or the Preview screen or view and enter characteristic label data in the Label screen.

If caution limits are defined for the characteristic, the data collector LEDs indicate the status of a reading:

- Red (left) LED – The reading is out of specification.
- Yellow (both LEDs) – Caution Limits are defined, and the reading is between the upper Caution Limit and the upper engineering limit, or between the Lower Caution limit and the lower engineering limit.
- Green (right) LED – The reading is between the upper and lower Caution Limits (if defined), or between the Engineering limits (if Caution Limits are not defined).

Note: *The duration of the LED Indicators is set in the data collector User Preferences.*

The Data Entry Screen



Steps

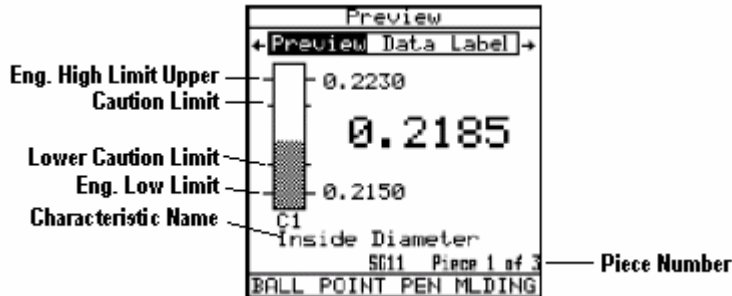
1. If the Enter Variables Data screen is not displayed, press ► to select **Data**.
2. Use one of the sources indicated to enter data.

In the Data Entry screen above, The source for the characteristic is [G1a,K] which means that data can come from either the gage connected to port G1a or from the Key pad.

- To enter data using the Simple Key pad, press <Option>+<Data>. Use the arrow keys to select a character to input and then select <Enter>. Repeat until the full data entry appears in the edit box, and press ►► to enter the data.
- To enter data using the Alphanumeric Key pad, enter the information into the Data Entry Box using the keys on the Key pad.

Preview Screen

Preview Mode provides a graphical representation of data values in a column display during data collection.



Note: Data entry mode will now first default to the 'Preview' screen for characteristics that have a gage source specified.

Steps

1. If the Preview screen is not displayed, press ◀ to select **Preview**.
Notice the column display representing the gage's digital reading.
2. To take a gage reading, either:
 - Press <Enter> on the Key pad
 - Press the thumbswitch/footswitch if attached.

The column display updates immediately to incorporate the new reading into the results, and the LED indicators flash to indicate status as described on page 79.

Preview Mode does not show source formulas. To see a source formula, press ▶ to select **Enter Data**. Enter readings as described previously and press ◀ to select Preview and view the result.

Label Entry

The data collector prompts you for characteristic labels when applicable, however you can enter characteristic label data using the Label option at any time during the data collection.

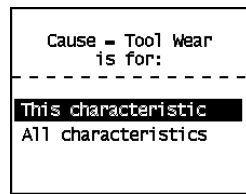
1. Press ◀ or ▶ to move select **Label**.



Double arrows indicate that additional characteristic labels exist. Press ◀◀ or ▶▶ to view the next label.

2. Select the label choice.

You are prompted to apply this label to the current characteristic or all characteristics.



3. Select the applicable response and press <Enter> to proceed.

Characteristic Boundary

After the first characteristic reading is taken, the data collector proceeds to the next characteristic. If characteristic boundary is (On) for the first characteristic, the operator collects the first characteristic's data for each sample in the subgroup before proceeding to the second characteristic.

Out-of-Spec Readings

You can set the data collector to prompt the operator if a reading is out of spec. See “*Setting Data Preferences*” on page 31. If a reading is out of specification and Retake Prompting is set to (On), a prompt similar to the following appears.

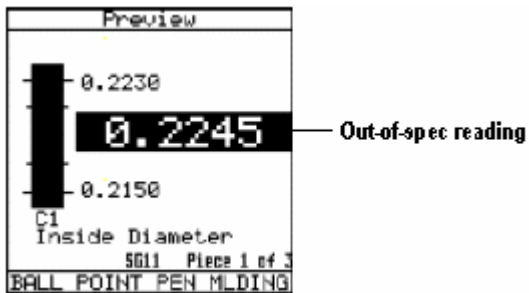


Proceed in one of two ways:

Steps

1. Press <Enter> to retake the reading without saving the initial reading.
2. Press ▼ to select **Accept** and press <Enter> to store the reading as valid. You will be prompted to enter a Cause before data collection proceeds to the next reading.

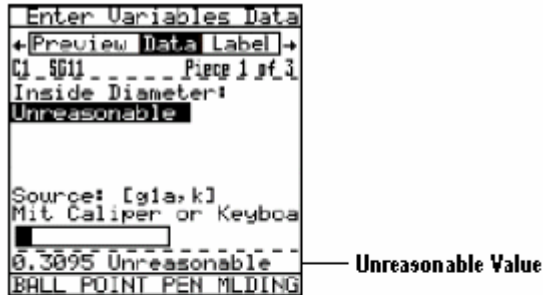
If you are collecting data while in the Preview Mode, the column display indicates an out-of-specification reading immediately using inverse video:



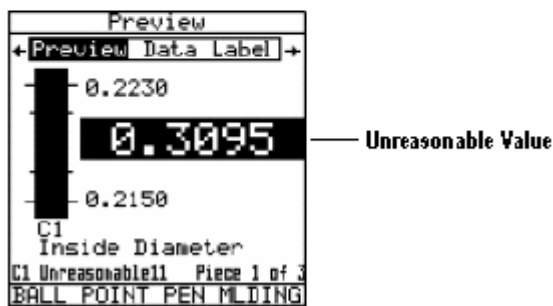
Unreasonable Readings

You can set the data collector’s response to unreasonable readings in the User Preferences. See “Setting Data Preferences” on page 31. The data collector can force the operator to take another reading or can accept the unreasonable reading but assign it a NULL value

An unreasonable reading appears as follows:



Data Entry Screen



Preview Screen

Retaking Readings

At any time during data collection for a part setup, retake a reading by pressing the ◀◀ key until the prompt reappears. The former reading appears selected in the edit box. At this point, the reading can be retaken and the new value replaces the older value. The data collector proceeds to the next setup element in the sequence.

To retake a reading after a subgroup is transferred, perform the following steps.

Steps

1. Press the <Select> key.
2. Press ▶ to **SG** to show a list of subgroups.
3. Press ▲ or ▼ to select the required subgroup to retake from the list (note the date and time stamp).

Select Subgroup		
←Part Char SG →		
Seq	Timestamp	Status
4	20 Apr 96, 12:04:07	Transfer
5	20 Apr 96, 12:05:07	Transfer
6	20 Apr 96, 12:06:07	Transfer
7	20 Apr 96, 12:07:07	Transfer
8	20 Apr 96, 12:08:07	Transfer
9	20 Apr 96, 12:09:07	Transfer
10	20 Apr 96, 12:10:07	Transfer
11	20 Aug 96, 20:12:24	Closed
12		Open
BALL POINT PEN MLDING		

4. Press ◀ to select **Char**.
5. Press ▲ or ▼ to select the characteristic to retake.
6. Press <Shift>+<Data> to jump to the selected location to retake the reading.

The data collector then jumps to the selected point in the data collection sequence and the reading can be retaken.

Using ReAudit

Use the ReAudit option to create a setup that consists of only a subset of selected characteristic from the current setup. ReAudit option is useful for monitoring data for a frequently failing characteristic.

Steps

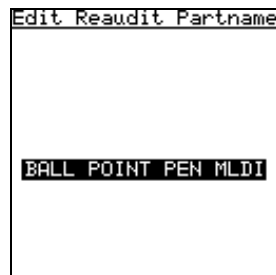
1. Select ReAudit from the Main>More menu.



2. In the Choose Part to ReAudit screen, select the part setup that contains the characteristic to monitor.

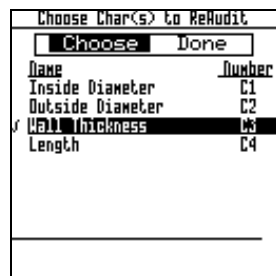
The data collector creates a new setup from the selected part setup and names it the same as the original with the suffix ,R1. Subsequent re-audits of the same part setup would be named ,R2, ,R3, etc.

Note: The new name can only be 32 characters long, including the ,Rx designator. If the setup name is longer than 29 characters, it will be truncated to allow space for the ,Rx designator.



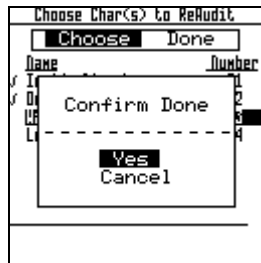
3. Use the on-screen keyboard enter a new name for the new setup.

The next screen lists the characteristics in the part setup.



4. Press ▲ or ▼ to navigate to the first characteristic to include in the ReAudit setup and press <Enter>. A checkmark is placed before the selected characteristic.
5. Repeat to select additional characteristics if necessary.
6. Press ► to select **Done**.

A confirmation prompt appears:



7. Select **Yes** to begin the ReAudit process, or **Cancel** to return to the characteristic list.

When you select **Yes**, the data collector opens the new setup.

8. Collect data for the setup as prompted by the data collector.

Viewing Characteristic Descriptors

Characteristic Descriptors are short descriptive fields used to communicate additional information to the data collector user. Characteristic descriptors must be defined when a part setup is created. You can set up your data collector preferences so that the Characteristic Descriptor is displayed automatically during data collection when the characteristic changes.

See *Setting Data Preferences* on page 31 for more information.

Characteristic descriptors cannot be viewed while in **Preview Mode**.

Steps

1. If necessary, press ◀ or ▶ to select **Data**.
2. Press the <Data> key.

Additional information about the characteristic appears in an overlay such as the following:



3. Press <Data> again to display the specifications for the characteristic.

SECTION

8

Exporting Data



Transferring Data to TranSend

If you are using TranSend software, you can transfer collected data immediately through the serial port, then use a third-party program to analyze the data.

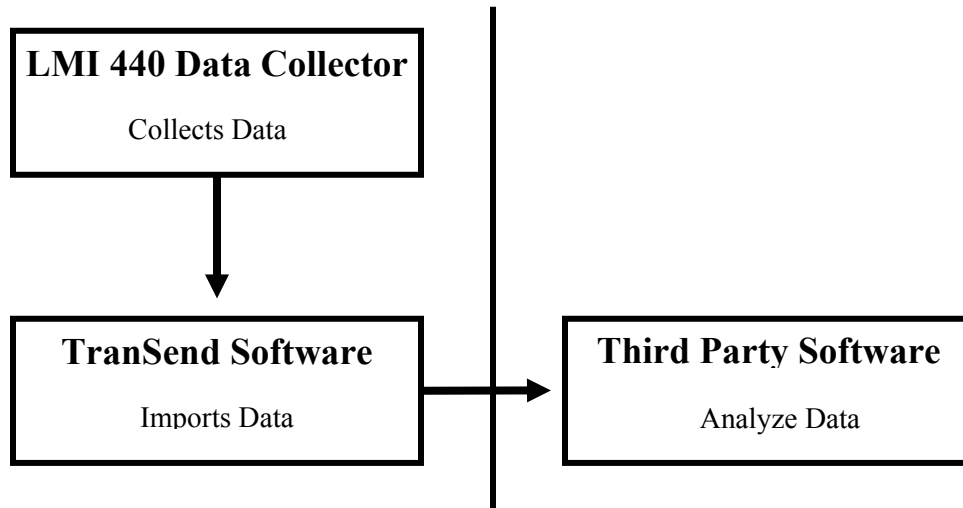


Figure 16. Exporting to TranSend Software

Use the following procedures for transferring data to TranSend software. See the *TranSend User Guide* for detailed procedures.

1) Collect Data

Use the 440 Handheld Data Collector to collect data for the required part setups.

2) Configure TranSend Communications

Ensure that TranSend is properly configured for communication with the 440 Handheld Data Collector.

Steps

1. Attach the LMI 443 cable to a free COM port on the computer running TranSend.
2. From the TranSend Menu, click on the **Settings** button.
3. Select the COM port where the serial cable is attached.
4. Set the baud rate at which to transfer data.
5. Click **OK**.

3) Configure the Data Collector's Communications

Make sure that the 440 Handheld Data Collector's baud rate matches the baud rate set in TranSend.

Steps

1. Attach the LMI 443 cable to the COM port on the 440 Handheld Data Collector.
2. From the Main menu, press ▼ to select **More** and press <Enter>.
3. Press ▼ to select **Preferences** and press <Enter>.
4. At the Preferences Menu, press ► to select to **Comm**.
5. Press ▼ to select **Serial Baud Rate**, and press <Enter>.
6. From the overlay, select the baud rate set above for TranSend.

Import the Collected Data

See the *TranSend User Guide* for detailed procedures.

Steps

1. On the TranSend main screen, click the **Receive Data** button.
2. In the Setup List window, select the setup(s) to transfer.
3. On the right side of the TranSend screen, set the Receive options.
4. Click on the **Receive** button to begin the transfer.

5) Analyze the Data

Use third-party software, such as Microsoft Excel, to analyze the data.

Transferring Data to Third-Party Support Software

Use the following procedures for transferring data to a spreadsheet or database program.

1) Configure the Data Collector's Communications

Set the 440 Handheld Data Collector's communications port to match the baud rate of your communications program to establish a communications link.

Steps

1. Connect the serial cable to the COM port on the 440 Handheld Data Collector.
2. From the Main menu, press ▼ to select **More** and press <Enter>.
3. Press ▼ to select **Preferences** and press <Enter>.
4. At the Preferences Menu, press ► to select to **Comm**.
5. Press ▼ to select **Serial Baud Rate**, and press <Enter>.
6. From the overlay, select baud rate that matches your terminal emulation program.

2) Configure your Communications Software

Steps

1. Connect the serial cable to the COM port on your computer.
2. Set the communications software program to establish a communications link with the 440 Handheld Data Collector. Use the following parameters:
 - Data Bits – 8
 - Stop Bits – 1
 - Parity – None
 - Flow Control – XON/XOFF
 - Baud Rate – must match the data collector's baud rate
 - COM Port – the port where the serial cable is attached

3) Select the Data to Transfer

CAUTION:

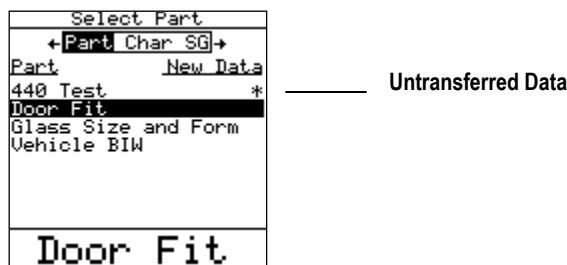


Do not use any interface commands at your communications software to initiate the transfer (i.e. do not type “SET ECHO ON” or “SET PROTOCOL ON” in the terminal window).

Steps

1. When the data collector and your communications software are configured, press the <Select> key to find the part setup data to be exported.

The Select Part menu list appears.



The data collector lists all the available part setups. An asterisk(*) shown to the right of the name of a part setup indicates that some of the data collected for this part setup has not been transferred to the support software. Incomplete subgroups are not transferred, so an asterisk may continue to show on the screen.

The active part line shows the currently selected part setup. The active part also appears highlighted in the list.

Note: *Select Part screen lists part setups either in alphabetical or chronological order. Setting Data Preferences on page 31 for information about how to set this option.*

2. Press <Select>.
3. Press ▲ or ▼ to select the setup (with its data) to export.
4. Press <Enter>.
5. Press ▲ or ▼ to select **Export**.
6. Press <Enter>.

The Export screen appears:



Set Export Parameters

Exported data can be formatted according to the following options.

- **Format** – Refers to the character formatting of the data. Format choices include **Spreadsheet** (tab delimited data entries) and **Database** (comma delimited data entries).
 - **Headers** – Refers to the date/time stamp, label and characteristic names associated with exported data. Choices include **None** (do not export header information), **First Subgroup** (include header information for the first exported subgroup of data only), **Each Subgroup** (include header information for each exported subgroup of data).
 - **Char Labels**—Refers to values (i.e., assignable cause data) entered in response to characteristic labels. The choices are **No** (do not export characteristic label values), or **Yes** (include characteristic label values for each subgroup of data).
7. Press ▲ or ▼ to select the export parameters.
 8. Press <Enter> to toggle the parameter's value.
 9. Press ▲ or ▼ to select **Export Now**, and press <Enter>.
 10. Set up your communication software to capture the text file you are about to send. See your communications software documentation for more information.
 11. From the **Export Now?** overlay, select **Yes**, and press <Enter>.
 12. When the 440 Export screen returns to full view, stop the data capture.
 13. Open your spreadsheet/database program and import the received file (refer to your support software documentation for more information).

SECTION

9

Open Communications



Introduction

Open Communications refers to the 440 Handheld Data Collector's ability to communicate with an RS232-compliant communications package by using a set of interface commands. In particular, the data collector's interface command set includes commands for the following tasks.

- Loading and unloading part setups and data
- Deleting part setups and data
- Editing and loading user-defined languages

Setup Procedures

The following equipment is required to use the data collector's open communications capabilities.

- The 440 Handheld Data Collector unit
- The LMI 443 serial cable
- A host computer running a communications program such as HyperTerminal

1) Configure the Data Collector's Communications

Set the 440 Handheld Data Collector's communications port to match the baud rate of your communications program to establish a communications link.

Steps

1. Connect the serial cable to the COM port on the 440 Handheld Data Collector.
2. From the Main menu, press ▼ to select **More** and press <Enter>.
3. Press ▼ to select **Preferences** and press <Enter>.
4. At the Preferences Menu, press ► to select to **Comm**.
5. Press ▼ to select **Serial Baud Rate**, and press <Enter>.
6. From the overlay, select baud rate that matches your terminal emulation program.

2) Configure your Communications Software

Your communications software program must be set up to establish a communications link to the data collector. Use the following parameters to communicate with the 440 Data Collector.

Steps

1. Connect the serial cable to the COM port on your computer.
2. Set the communications software program to establish a communications link with the 440 Handheld Data Collector. The method for setting these parameters depends on the communications software, however use the following parameters:
 - Data Bits – 8
 - Stop Bits – 1
 - Parity – None
 - Flow Control – XON/XOFF
 - Baud Rate – must match the data collector's baud rate
 - COM Port – the port where the DataMyte serial cable is attached

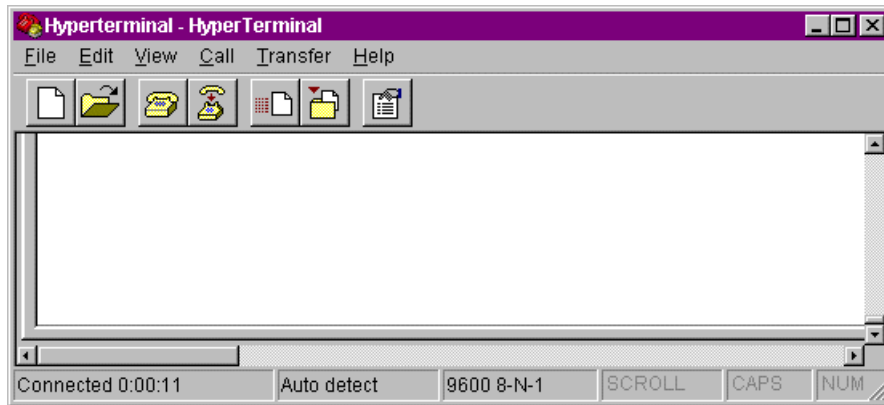
Using Interface Commands

An interface command is a command to the data collector that you enter from the computer. It is executed when you press <Enter> on the computer keyboard. Interface commands allow direct communication between your communications software program and the data collector. Enter the following commands to begin any communication with the data collector.

Steps

1. Make sure your communications software is in Terminal mode. See your communications software documentation for more information.
2. In the terminal editor, type **set echo on** and press <Enter>.
3. The terminal editor should respond with an **ok** message.

Note: *Prior to entering the “set echo on” command, you may not see any characters you type. This is normal.*

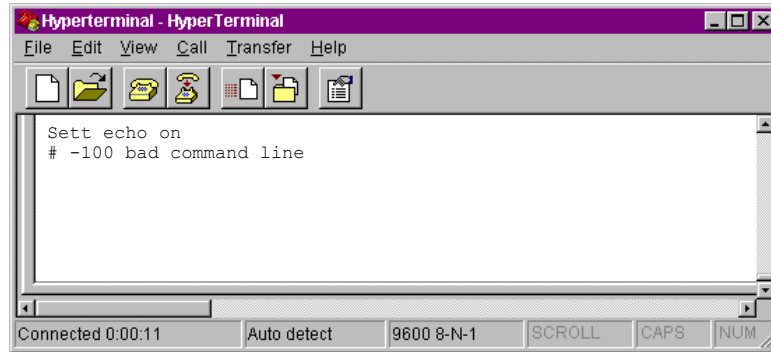


4. For Xmodem protocol, type **set protocol on** and press <Enter>.

The terminal editor should respond with an **ok** message, indicating that the communication link is established between the computer and the data collector.

Error Messages

Interface commands are not case-sensitive. However, if a command is entered incorrectly, the terminal replies with the message **bad command line**. For example, if the command **set echo on** were entered as **sett echo on**, the terminal replies as follows:



A **100 bad command line** message indicates that the command you entered is not recognized. Check the spelling (and syntax) of your command and try again.

Viewing the Interface Command Set

To view a list of the available interface commands type **help** and press <Enter>. The terminal editor then lists the commands that can be used to talk to the data collector.

The following table lists the available interface commands and provides a brief description of the command's purpose.

Table 21: Open Communications Commands

Command	Description
receive	Tells the data collector to prepare to receive a file. The communications program must be instructed to send the file as a separate step.
receive language	Tells the data collector to receive a user-defined language file. The communications program must be instructed to send the file as a separate step.
delete setup <partname>	Deletes the setup and all of its data indicated by the <partname> variable.
delete alldata <partname>	Deletes all run data associated with the setup indicated by the <partname> variable.
delete olddata <partname>	Deletes all transferred data associated with the setup indicated by <partname>. The data that has not yet been transferred is not deleted.
set time MM/DD/YY hh:mm:ss	Sets the data collector's internal date and time (i.e., internal clock).

Table 21: Open Communications Commands

Command	Description
set delay <seconds>	Sets the amount of time, in seconds, to delay before a transfer (send) is initiated. The default value is 5 seconds. <Seconds> can range from 0 to 60.
set timeout <seconds>	Sets the amount of time, in seconds, before which a transfer timeout occurs. If this amount of time elapses when the data collector is waiting for a transfer, the current operation is aborted. <Seconds> can range from 0 to 60 (a value of zero means do not time-out).
set eof <charcode>	The End of File (eof) character is used 1) to mark the end of a file sent from the data collector or 2) to detect the end of a file received by the data collector. The charcode value must be a number from 0 to 255 representing an ASCII character, and the default is ASCII 26.
Set abort <charcode>	This is a character that the data collector uses to end a file transfer because of an error when receiving a file. The charcode value must be a number from 0 to 255 representing an ASCII character, and the default is ASCII 3.
Set protocol <boolean>	Set the XModem protocol option on (1) or off (0). When the XModem protocol is used, the Delay and EOF interface parameters are not used.
Set echo <boolean>	Set the character echo option on or off. If set to 'on,' then command line characters received by the collector will be sent back to the sender.
send setup <partname>	Send a setup file from the data collector to the communications program. The communications program must be instructed to receive the file as a separate step.
send alldata <partname>	Sends all subgroup data associated with the part setup indicated by the <partname> variable. The communications program must be instructed to receive the file as a separate step.
send alldata4 <partname>	Sends all subgroup data associated with the part setup indicated by the <partname> variable. In addition, the timestamp of the year is 4 digits. The communications program must be instructed to receive the file as a separate step.
send newdata partname>	Sends all run data associated with <partname> that has not yet been transferred. The communications program must be instructed to receive the file as a separate step.

Table 21: Open Communications Commands

Command	Description
send newdata4 <partname>	Sends all run data associated with <partname> that has not yet been transferred. In addition, the timestamp of the year is 4 digits. The communications program must be instructed to receive the file as a separate step.
send trendfile	Sends the trend setup file if one exists. The communications program must be instructed to receive the trend file as a separate step.
send gagefile	Sends the gage setup file if one exists. The communications program must be instructed to receive the gage file as a separate step.
send passwordfile	Sends the password file if one exists. The communications program must be instructed to receive the password file as a separate step.
send collector	Sends information about the data collector including: <ul style="list-style-type: none"> • Model number • Version number • Data collector ID • Total amount of memory in 'k' bytes • Amount of unused (free) memory in 'k' bytes • Data collector's current date and time
send partlist	Sends a formatted list of setups in the data collector's memory.
send language	Sends a user-defined language file to the communications program. The communications program must be instructed to receive the language file as a separate step.
export format <format>	When used with the export alldata command or the export newdata command, exports either a spreadsheet or database format depending on which is selected. <format> can be 0 for spreadsheet or 1 for database.
export headers <option>	When used with the export alldata command or the export newdata command, exports the header information including the date/time stamp, label and characteristic names associated with the exported data if selected for the first subgroup or for each subgroup. <option> can be 0 for none, 1 for first subgroup, or 2 for each subgroup.

Table 21: Open Communications Commands

Command	Description
export nominals <boolean>	Transfers the nominal value and the Eng Hi/Lo limits for each characteristic. If the limit choice for the characteristic is set to Actual, then the actual Eng limits are transferred. If the limit choice for the characteristic is set to Deviation, then the Eng limits are derived from the nominal value +/- tolerance values. The <boolean> variable of 0 signifies off and 1 signifies on. The export headers option must be active to use the export nominals function.
export char.labels <boolean>	When used with the export alldata command or the export newdata command, exports an assignable cause value for a characteristic label for each subgroup of data if a value is selected. The <boolean> variable of 0 signifies off and 1 signifies on.
export alldata <partname>	Transfers in the export format all subgroup data marked closed or transferred that are associated with the <partname> variable. All exported subgroups are marked as transferred. The communications program must be instructed to receive the file as a separate step.
export newdata <partname>	Transfers in the export format all closed subgroups of data associated with the <partname> variable. All exported subgroups are marked transferred. The communications program must be instructed to receive the file as a separate step.

Unloading Part Setups and Data

Unloading Part Setups

You can retrieve part setups from the data collector using the **send** commands as described below.

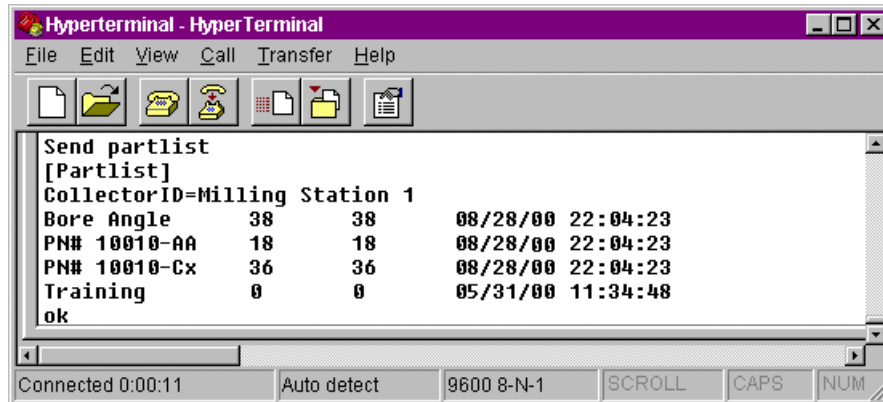
Send Partlist Command

Use the **send partlist** command to view a list of the part setups stored in the data collector and information about whether data from each setup has been transferred to the computer.

Steps

1. Make sure that communications are established between the data collector and the computer as described in *Setup Procedures* on page 96.
2. Type **send partlist** in the terminal editor window.
3. Press <Enter>.

The data collector responds by sending the following information.



Send Setup Command

Unload setups from the data collector to archive them for safekeeping, or to edit them and then transfer them back to the data collector. The process described here uses the XModem protocol to transfer binary data with error correction. If your communications program does not support the XModem protocol, you must perform text-based transfers. Consult your communications software documentation for more information.

Steps

1. If not done already, type **set protocol 01** in the terminal editor window
2. Press <Enter>.

The data collector replies with **ok**—indicating that it is now set to transmit data using the XModem protocol.
3. Type **send setup <partname>**, where <partname> is the setup part name exactly as listed.
4. For example, to have the data collector send the part setup called “Bore Angle” to the communications program, type **send setup Bore Angle**.
5. Press <Enter>.

Note: *The setup name must be spelled exactly as it is listed in the [PartList] block or the data collector returns an error message (#43—Part Not Found).*

6. Use your communications software program to receive the file being sent by the data collector. For more information, see your communications software documentation.
7. If prompted, type in a name that the setup will be stored under on the computer.

Troubleshooting

1. If an error # -43 part not found message (or other error message) appears, perform the following steps:
2. Check the cabling from the host PC's COM port to the data collector.
3. Ensure that the part setup does not already exist in the data collector (if it does, you must first delete the setup and then retransfer).
4. Ensure that the part setup is correctly formatted (see Section 5 for syntactical information).
5. Ensure that you are using the correct protocol: for XModem transfers, issue the command “set protocol 1” to the data collector; for non-XModem transfers, issue the command “set protocol 0.”
6. Ensure that you have a proper amount of delay time set; use the “set delay” command to increase the amount of time the collector will wait before a timeout results.

Unloading Part Setup Data

You can retrieve data from the data collector using the **send** commands as described below.

Purpose: To unload part setup data from the data collector, to archive it for safekeeping, to edit it, or to use it for third-party software analysis.

Send Alldata Command

Transfer data from the data collector to archive it for safekeeping, to edit it, or to analyze it using a third-party software. Use the **send alldata <partname>** command to send all the data associated with the named setup (partname) to your computer.

Steps

1. Make sure that communications are established between the data collector and the computer as described in *Setup Procedures* on page 96.
2. Type **send alldata <partname>** in the terminal editor window, where <partname> is the setup part name exactly as listed.

For example, for the data collector to send all data associated with the part setup called Bore Angle, type **send alldata Bore Angle**.

3. Press <Enter>.

Note: *The setup name must be spelled exactly as it is listed in the [PartList] block or the data collector returns an error message (#43—Part Not Found).*

4. Use your communications software program to receive the file being sent by the data collector. For more information, see your communications software documentation.
5. If prompted, type in a name that the setup will be stored under on the computer.

Send Newdata Command

Use the send newdata <partname> command to send untransferred data associated with the named setupp (partname) to your computer.

Steps

1. Make sure that communications are established between the data collector and the computer as described in *Setup Procedures* on page 96.
2. Type **send newdata <partname>** in the terminal editor window, where <partname> is the setup part name exactly as listed.

For example, for the data collector to send all data associated with the part setup called Bore Angle, type **send newdata Bore Angle**.

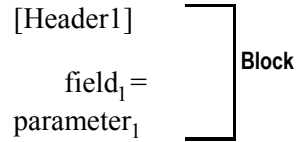
3. Press <Enter>.

Note: *The setup name must be spelled exactly as it is listed in the [PartList] block or the data collector returns an error message (#43—Part Not Found).*

4. Use your communications software program to receive the file being sent by the data collector. For more information, see your communications software documentation.
5. If prompted, type in a name that the setup will be stored under on the computer.

Using the Data File

A part setup data file is an ASCII text file that contains the data associated with a part setup. The structure of the data file is as follows:



The data file is divided into several **blocks** of keyword fields that are assigned user-supplied values. Each block is identified with a **header**.

For example, the first block of the data file begins with the header called **[PartData]**. Beneath the header are fields related to the block. For instance, the “name=” field contains the value “Bore Angle” which refers to the name of the part setup. Other blocks provide the data for a given part setup element:

Block Name	Description	Affected Elements
[SubgroupData]	Timestamp for subgroup	Setup name, Setup creator, and Last Modified fields
[SubgroupLabelData]	Header for subgroup labels	Subgroup label value fields
[PieceLabelData]	Header for piece labels	Piece label value fields
[VariableCharData]	Data for characteristic, including [CharLabelData] and [VariableData] blocks	Characteristic name and event detection flag.
[CharLabelData]	Header for characteristic labels	Char label values (only if EventFlag=1).
[VariableData]	Header for characteristic data	Individual piece readings.

The following excerpt from a sample data file contains indentations and to help identify the function and scope of each item.

```

[PartData] ; General Part Data
  name=Bore Angle ; part setup name
  creator=John Doe ; creator name
  lastModified=08/28/04 22:04:23 ; last modified date/time

  [SubgroupData] ; 1st Subgroup
    newdata=1 ; unharvested data flag
    collectTimestamp=08/28/00 24:16:07 ; Subgroup timestamp
    collectorID=Milling Station ; collector ID

    [SubgroupLabelData] ; Subgroup Labels and Values
      Lot Number=11 32354
      Operator=Max

    [Variable CharData] ; General Characteristic data
      name=Angle ; characteristic name
      eventFlag=1 ; trend/assignable cause flag
      Event=A point above RUCL ; detected event

      [CharLabelData] ; characteristic label data
        Cause=TOOL WEAR ; Cause Label and data

      [VariableData] ; characteristic values
        P1=0.2190 ; piece 1
        P2=0.2200 ; piece 2
        P3=0.2210 ; piece 3

    [SubgroupData] ; 2nd Subgroup
    ...

```

Loading Part Setups and Data

Once you have edited your part setup(s) or data files, load part setups back to the data collector using a communications software program.

Loading Part Setups

The **receive** command instructs the data collector to receive a part setup or data file from the communications program and store the file in the data collector's memory.

Steps

1. Make sure that communications are established between the data collector and the computer as described in *Setup Procedures* on page 96.
2. Type **receive** in the terminal editor window.
3. Press <Enter>.
4. Use your communications software program to send the file to the data collector. For more information, see your communications software documentation.

Loading Data Files

The procedures for loading a data file to the data collector are the same as the procedure for sending a part setup file.

Troubleshooting

If an error # -300 bad setup file message (or other error message) appears, perform the following steps:

1. Check the cabling from the host PC's COM port to the data collector.
2. Ensure that the part setup does not already exist in the data collector (if it does, you must first delete the setup and then retransfer).
3. Ensure that the part setup is correctly formatted (see Section 5 for syntactical information).
4. Ensure that you are using the correct protocol: for XModem transfers, issue the command "set protocol 1" to the data collector; for non-XModem transfers, issue the command "set protocol 0."
5. Ensure that you have a proper amount of delay time set: use the "set delay" command to increase the amount of time the collector will wait before a timeout results.

Deleting Setups and Data

To increase the amount of memory in the data collector, delete unused part setups and data from the data collector.

Deleting Part Setups

CAUTION:

Deleting a part setup deletes all data associated with the setup from the data collector's memory. Part setup deletion is an irreversible procedure. Verify that you have transferred the part setup and its data before performing the delete procedure.

Steps

1. Make sure that communications are established between the data collector and the computer as described in *Setup Procedures* on page 96.
2. Type **delete setup <partname>** in the terminal editor window, where <partname> is the setup part name exactly as listed.

For example, to delete a part setup called Bore Angle, type **delete setup Bore Angle**.

3. Press <Enter>.

The terminal editor replies with **ok**, indicating that the entire part setup has been deleted.

Note: *The setup name must be spelled exactly as it is listed in the [PartList] block or the data collector returns an error message (#43—Part Not Found).*

Deleting Data

Delete alldata Command

Enter **delete alldata <partname>** to delete all the data associated with the named part setup. The procedures for executing this command are the same as those explained previously.

Delete olddata Command

Enter **delete olddata <partname>** to delete all the data associated with the named part setup that has already been transferred to support software. The procedures for executing this command are the same as those explained previously.

Other Interface Commands

Set Time Command

The set time command sets the data collector's date and time. The syntax for the command is as follows:

set time MM/DD/YY hh:mm:ss (Military Format)

For example, to set the data collector's date and time to December 12th, 2000 at 1:30 p.m., enter:

set time 12/12/00 13:30:00

If you do not enter the date and time correctly, an error message #-100 bad command line appears. Re-enter the date and time according to the syntax listed previously.

Send Collector Command

Use the send collector command to obtain information about the data collector with which you are communicating. The syntax for the command is as follows.

send collector

The data collector sends the following information:

- **Model** – The LMI Corporation data collector model
- **Version** – The current version of the data collector's ROM software
- **CollectorID** – The user-defined name given to the data collector2
- **MemorySize** – The total amount of installed RAM
- **FreeMemory** – The current amount of available RAM
- **Time** – The data collector's date and time setting

Creating Gage Files

A Gage File is an ASCII text file sent to the data collector to easily configure the data collector's gage input ports.

The 440 Handheld Data Collector provides a gagefile template that can be transferred and edited in the same way as the part setup template.

Steps

1. Make sure that communications are established between the data collector and the computer as described in *Setup Procedures* on page 96.
2. Type **help gagefile** at the terminal editor.

The terminal editor displays a gage file template.

Note: *If a gage file already exists in the data collector, use the **send gagefile** command and receive the file using your communications program.*

3. Copy the contents of the gage file from the terminal editor and paste it into an ASCII editor.
4. Edit the gagefile template according to your preferences and save it as an ASCII file. See *Gagefile Template* below and *[Gage] Block Parameters* on page 114 for details about how the gage file template is set up. See *Section 4, Configuring Gages* for details about gage configuration parameters.
5. After editing the gage template file, transfer it to the data collector according to the procedures in the previous section on transferring part setup files to the data collector.

Gagefile Template

The gage file is divided into five [Gage] blocks of keyword fields that are assigned user-supplied values. Each block refers to a gage input port on the data collector. To configure a particular gage input port, specify the gage parameters in a designated [Gage] block.

The following excerpt shows that port G1 is configured for a barcode wand (called “Wand”) and port G1a is configured for a Mitutoyo gage (called “Mit 6” Cal”).

```
[GageSetup]
name=gagefile
  [Gage]
  name=Wand
  port=G1
  type=SRL-01
    StringType=R
    BaudRate=9600
    DataBits=8
    StopBits=1
    Parity=N
    RemoteKbd=off
    Inquiry=
    Response=
    Trigger=
  [Gage]
  name=Mit 6" Cal
  port=G1 a
  type=DMY-01
```

[GAGE] BLOCK PARAMETERS

The following table summarizes the parameters used in each [Gage] block. See Section 4 for information about serial parameters and Inquiry, Response and Trigger strings.

Table 22: Gage Parameters

Gage	Type=	Parameters
C.D.I.	DCD-01	Resolution=(L or H)
Precision = 0-8		
Maxum	DFM-01	None
Mitutoyo	DMY-01	None
Oni Sokki	DNS-01	None
Serial	SRL-01	Data Type=(T or R or N or I)
Baud Rate=(110-19200)		
Data Bits=(7 or 8)		
Stop Bits=(1 or 2)		
Parity=(N or O or E)		
RemoteKbd=(on or off)		
Inquiry=<string>		
Response=<string>		
Trigger=<string>		
Continuous Serial	SRL-02	Same parameters as serial
Sylvac Serial	DSS-01	None

Creating Password Files

A Password Table can be assigned to the data collector to restrict access to data collector functions. For example, if you password-restrict data entry, the data collector prompts the operator for a password before starting data collection.

The 440 Handheld Data Collector provides a password file template that can be transferred and edited in the same manner as the part setup template.

Steps

1. Make sure that communications are established between the data collector and the computer as described in *Setup Procedures* on page 96.
2. Type **help passwordfile** at the terminal editor.
The terminal editor displays a password file template.
3. Copy the contents of the password file template from the terminal editor and paste it into an ASCII editor.
4. Edit the template according to your preferences and save it as an ASCII file. See *Password File Template* below and *[ProtectFunction] Block Parameters* on the following page for details about how the password file template is set up.
5. After editing the template file, transfer it to the data collector according to the procedures in the previous section on transferring part setup files to the data collector.

Note: *If a password file already exists in the data collector, use the **send passwordfile** command and receive the file using your communications program.*

Password File Template

The password file is divided into [ProtectFunction] blocks of keyword fields that are assigned user-supplied values. Each block refers to and defines a specified data collector function. To configure a password-restricted condition, specify the parameters within a designated [ProtectFunction] block.

```
[PasswordFile]
name=passwordfile           ; name for file
masterPassword=123          ; enter master password here
collectorPassword=abc       ; enter collector password here
[ProtectFunction]
    function=PWFEND         ; password to enter data
    partLevel=0             ; no part password
    collectorLevel=1        ; collector password req'd
    masterLevel=1           ; master password opens
    function=PWFCCCL        ; pswd to calc control limits
    collectorLevel=1        ; collector password req'd
    ...
```


Password Types

You can use the following types of passwords:

- masterPassword-Global password, highest level. Required password when a [ProtectFunction] is active.
- collectorPassword-Required password when a [ProtectFunction] is active.
- partPassword-Global password for access to a particular part setup. Part passwords are only in force if the part setup includes reference to a part password.

[ProtectFunction] Block Parameters

The following table summarizes the parameters used in each [ProtectFunction] block.

Table 23: Protect Function Parameters

Function to Protect	Mnemonic (i.e., Function=)
Entering data	PWFEND
Editing data	PWFEDD
Retaking data	PWFRTD
Deleting part setups and data	PWFDEL
Editing gage configuration	PWFEGC
Editing user preference	PWFEDP
Editing part setups	PWFEDS
Roll-off untransferred subgroups	PWFRUS
Calculating control limits	PWFCCL
Editing communication preferences	PWFECC
Editing Data Preferences	PWFEDC

Creating User-Defined Languages

A user-defined language is a set of strings set up for use with the 440 Handheld Data Collector. This allows you to customize any terms, as well as to install a custom-defined language for use with the data collector.

The procedure for implementing user defined language prompts for use with the 440 Handheld Data Collector consists of four basic steps:

1. Send the (active) language file from the data collector to the communications program.
2. Edit the language file using an ASCII editor.
3. Receive the edited language file.
4. Install the language file on the data collector.

Send Language Command

Use the Send Language command to download the current language file from the data collector.

Steps

1. Make sure that communications are established between the data collector and the computer as described in *Setup Procedures* on page 96.
2. To access the active language file from the data collector, type **send language** at the terminal editor.

The Active Language is set in the data collector preferences. See *Setting Communications Preferences*.

3. Use your communications software program to send the file to the data collector. For more information, see your communications software documentation.

Editing the Language File

Open an ASCII editor and load the language file. Various strings appear in the editor (strings end with the "\$" symbol). Some strings are preceded by special codes, such as ^, ~, etc.

Naming the Language File

The line that reads **^0 english** is the name given to the language file you are creating. Replace **english** with an identifying language name. Be careful not to erase the preceding **^0** code before the language name parameter.

Editing Strings

Each string in the language file ends with a \$ character and may be preceded by a code. Translate or edit the required strings, but leave the string terminator (\$) and any preceding codes intact.

Receive Language Command

Use the Receive Language command to send the language file to the data collector.

Steps

1. To send the edited language file to the data collector, enter the command **receive language** at the terminal editor.
2. Use your communications software program to send the language file to the data collector. See your communications software documentation for more information on how to receive data files.

Installing the User-Defined Language File

At the data collector, perform the following steps to install the user-defined language file.

Steps

1. From the Main menu, press ▼ to select **More** and press <Enter>.
2. Press ▲ or ▼ to select **Preferences** and press <Enter>.
3. Press ◀ or ▶ to select **Comm**.
4. Press ▲ or ▼ to select **Language**, and press <Enter>.
5. From the overlay, select the user-defined language and press <Enter>.

The message “Loading Language” appears, and in a moment the User-Defined Language is ready to be used at the data collector.

Creating Setups Using a Text Editor

If you do not use TranSend software, you can use a standard text editor to create a part setup and then transfer it to the data collector using open communications.

1. Obtain the part setup template-Use the open communications procedures described previously to transfer the setup template from the 440 Data Collector to the communication software's terminal editor.
2. Edit the template-Use a text editor (i.e., Microsoft™ Notepad or equivalent), edit the template by substituting your own setup parameters. Save the edited template as an ASCII file.
3. Transfer the part setup file-Use the open communications procedures described previously to transfer the setup to the 440 Handheld Data Collector. If the file is validly constructed, the data collector recognizes the file as a part setup for which data can be collected.

Obtaining the Part Setup Template

The 440 Data Collector contains a part setup template that you can transfer to your computer using open communications.

Steps

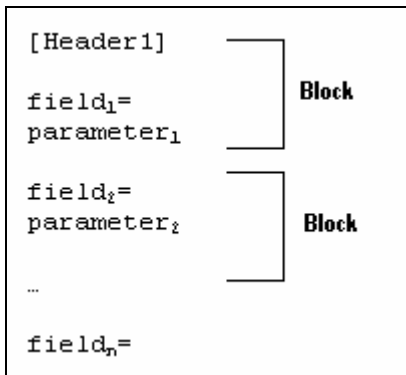
1. Make sure that communications are established between the data collector and the computer as described in *Setup Procedures* on page 96.
2. Type **help setup** at the terminal editor and press <Enter>. The terminal editor displays a part setup template. The setup template begins with the header [**PartSetup**] and ends with the last entry under the header [**ListEntry**].
3. In the terminal editor, copy the text beginning with [**PartSetup**] and ending with the **Choice=Code3** line and paste it into a text editor.
4. Save the file as TEMPLATE.TXT.
5. Edit the template according to your preferences and save it as an ASCII file. See *Editing the Part Setup Template* on page 120 for details about the part setup template.
6. After editing the template file, transfer it to the data collector according to the procedures in the previous section on transferring part setup files to the data collector.

Note: *If a password file already exists in the data collector, use the **send passwordfile** command and receive the file using your communications program. See page 122*

Editing the Part Setup Template

Part Setup Template

The part setup template is an ASCII text file used to define the various elements of a part setup. The structure of the template is as follows:



The template is divided into several blocks of keyword fields that are assigned user-supplied values. Each block is identified with a unique **header**.

For example, the first block of the data file begins with the header called **[PartSetup]**. Beneath the header are fields related to the block. The fields in the template contain default information, for example, the “name=” field contains the value “example” which you edit to create a new part setup.

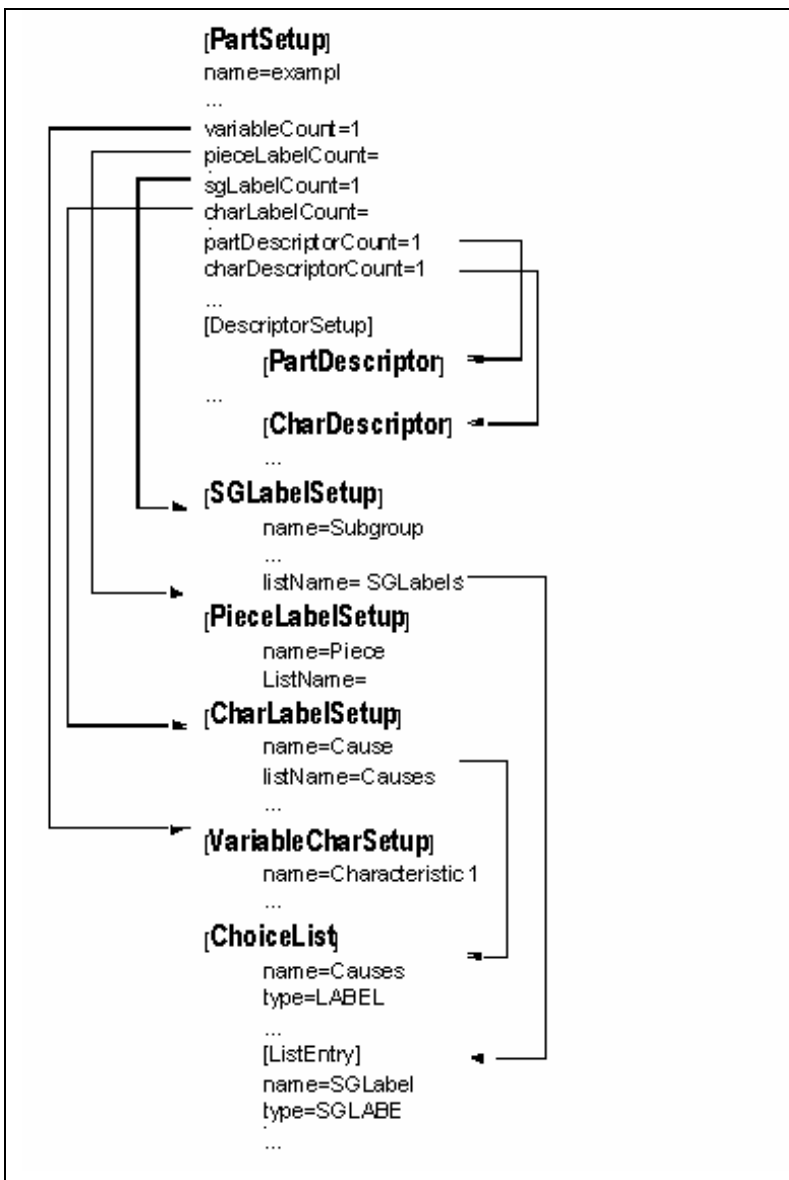
Use the part setup template as a model for creating your own part setups for the 440 Data Collector. After you edit the fields, save the template under a different file name. Then, transfer the file to the 440 Data Collector.

Navigating the Part Setup Template

The **[PartSetup]** block is the first block in the template file. Fields in the **[PartSetup]** block are related to other blocks in the template.

For example, if a part setup contains two subgroup labels, the `sgLabelCount` field is assigned a “2” value and the **[SGLabelSetup]** block must be completed for each subgroup label. Likewise, if a list of label values is assigned to one of the subgroup labels, the `listName` field must be assigned a name and the **[ChoiceList]** block must be completed for the list. This also applies to setting up characteristic and piece labels. Each block is described in more detail in the following pages.

The following illustration shows the relationship between the various blocks in the part setup template.



[Part Setup] Block

The [PartSetup] block is the first block in the template file. Under its header are various fields used to name and dimension the part setup.

```
[PartSetup]
  name=example
  creator=
  lastModified=
  variableCount=1
  pieceLabelCount=1
  sgLabelCount=1
  charLabelCount=1
  partDescriptorCount=1
  charDescriptorCount=1
  maxSampleSize=1
  reservedSubgroupCount=10
```

Name Field

The name field is assigned an alphanumeric string of up to 32 characters that determines the name of the part setup. The part setup name must be unique. The data collector does not accept the transfer of a part setup if one with the same name already exists in its memory.

Creator Field

The creator field is optional. It is a case-sensitive alphanumeric string of up to 24 characters identifying the author of the part setup.

lastModified Field

The lastModified field is an optional field assigned a numerical string of up to 20 characters. It identifies the date and time the setup was created or last saved with any modifications.

The format of the string must be as follows:

mm/dd/yy hh:mm:ss

Both the date and the time must be included in the string and the time must be in military format (i.e., 23:00:00 for 11:00 p.m.).

variableCount Field

Variable characteristics are aspects of a product that can be objectively measured and monitored for control and capability, such as part dimensions. During data collection, the variables characteristic appears as a prompt for variables data. The methods for inputting variables data include the use of various types of gages or measuring devices (as well as the keyboard).

The variableCount field is used to specify how many variable characteristics your part setup will include (from 1 to 999 characteristics). The actual maximum number of characteristics used to create part setups depends on the data collector's available memory.

Note: *Each variable characteristic in the part setup requires its own definition in the [VariableCharSetup] block.*

pieceLabelCount Field

A label is a prompt to the operator asking for information during data collection. A piece label is used to attach information to each piece in a part setup. Examples of piece labels might be Serial Number or Cavity #. Piece labels normally appear either right after any subgroup label prompts or at the start of the first variable characteristic.

Specify the number of piece labels to use in your part setup by entering a number (from 0 to 10) in the pieceLabelCount field.

Note: *Each piece label in the part setup requires its own definition in the [PieceLabelSetup] block.*

The sgLabelCount Field

A subgroup label acts as an informational “tag” attached to every characteristic subgroup used in a part setup. Subgroup labels normally appear as prompts at the beginning of data collection (i.e., Operator, Shift Number, etc.). The value entered for the subgroup label is attached to the data collected for all characteristic subgroups (and can later be used to filter collected data).

Specify the number of subgroup labels to use in your part setup by entering a number (from 1 to 10) in the sgLabelCount field.

Note: *Each subgroup label in the part setup requires its own definition in the [SGLabelSetup] block.*

charLabelCount Field

A characteristic label is used to tag a characteristic subgroup with information. Examples include Gage SN#, Vendor ID, and the Cause label. The Cause label is a required characteristic label on models with the SPC option that “tags” a particular characteristic subgroup when an out-of-control condition occurs.

Specify the number of characteristic labels to use in your part setup by entering a number (from 1 to 3) in the charLabelCount field. The Cause label is **required** on models with the SPC option.

Note: *Each characteristic label in the part setup requires its own definition in the [CharLabelSetup] block and in the [ChoiceList] block if choice lists are used.*

partDescriptorCount Field

A part descriptor is a simple descriptive field used to tag information to the setup you are creating (part descriptor values are viewable at the data collector). A setup may use up to five part descriptors.

Specify the number of part descriptors to use in your part setup by entering a number (from 1 to 5) in the partDescriptorCount field.

Note: *If you use any part descriptors, you must define the name and value fields for each one in the [DescriptorSetup], [PartDescriptor] block.*

charDescriptorCount Field

Characteristic Descriptors are short descriptive fields that can be used to communicate important information. These fields are displayed on the data collector by pressing the <Data> key when collecting data for a characteristics.

Specify the number of characteristic descriptors to use in your part setup by entering a number (from 0 to 5) in the charDescriptorCount field.

Note: *If you use any characteristic descriptors, you must define the name and value fields for each one in the [DescriptorSetup], [charDescriptor] block. The descriptor name is limited to 12 characters.*

maxSampleSize Field

A characteristic subgroup can be defined as a predetermined number of pieces for which a specific characteristic's data will be collected. The number of samples that comprise a characteristic subgroup is called the sample size. In a given setup, the sample size for different characteristics can vary. That is, a setup could have two characteristics: C1 (for characteristic 1) has a sample size of 2, and C2 has a sample size of 3.

The maxSampleSize field requires that you specify the sample size of the largest characteristic subgroup your part setup will use (a given characteristic can accommodate sample sizes from 1 to 200).

reservedSubgroupCount Field

The number of "Reserved Subgroups" refers to the minimum number of subgroups for which the data collector will always reserve memory. This does not mean that you cannot store more than the reserved number of subgroups. However, when the total number of subgroups exceeds the available memory, Subgroup Rolloff is triggered.

Replace the default reservedSubgroupCount value of 10 with a minimum number of subgroups for which the data collector will reserve space before a rolloff occurs.

[SGLabelSetup] Block

When you specify that your part setup is to include subgroup labels, set the sgLabelCount value in the [PartSetup] block:

```
[PartSetup]
  name=example
  creator=
  lastModified=
  variableCount=1
  pieceLabelCount=1
  sgLabelCount=1 _____ Enter the number of subgroup
                             labels in the part setup
  charLabelCount=1
  partDescriptorCount=1
  charDescriptorCount=1
  maxSampleSize=1
  reservedSubgroupCount=10
```

Then, define each subgroup label in your part setup in the [SGLabelSetup] block:

```
[SGLabelSetup]
  name=Subgroup L1
  ditto=1
  autoEnter=0
  source=k
  listName=
  dataLogging=1
```

name Field

Each subgroup label of your part setup must be given a unique name. Subgroup label names can be up to 12 alphanumeric characters long.

Replace the default name **Subgroup L1** with the name for your subgroup label.

ditto Field

When used with a label entry, ditto automatically **echoes** or repeats the last label value in the data entry box if prompted by the same label.

The ditto option saves data entry time because the operator can simply press <Enter> to confirm the value shown at subsequent prompts.

Set the Ditto parameter to 1 (on) or 0 (off).

autoEnter Field

Auto Enter is a data collector option that automatically inputs a previous value. When used in conjunction with ditto, the user enters the value for the label once, and thereafter the value is automatically repeated (dittoed) and input (auto entered) into the data collector. Auto Enter is a time-saver in situations where the process information during data collection does not change. With both Ditto and Auto Enter activated, you only input subgroup label information once, perhaps at the start of a shift. Set the autoEnter parameter to 1 (on) or 0 (off).

source Field

Source refers to the location from which the label value is entered. Some options are Key pad (K), a Barcode Wand (G1), or a List (L). The default source is L for a Label list. If you enter label values using a Barcode Wand, enter the gage port where the Barcode Wand is connected. You can specify that the source for the label can come from either the Keyboard or List or Gage port by separating each identifier with a comma.

K,L,G1

listName Field

If your label source includes a list (L), you must specify a value for the listName parameter (up to 32 characters long).

In addition, when you use a label list, you must fill out the [ChoiceList] block for each label list in your part setup.

```
[SGLabelSetup]
name=Subgroup L1
ditto=1
autoEnter=0
source=k
listName= Operators
dataLogging=1
```

If you use a list for entering label values, specify the list name here and make sure that the [ChoiceList][ListEntry] block defines the list entries (see below).

The listName value must match the name provided in the name field in the [ChoiceList] block. The type parameter must be SGLABEL for subgroup label values (LABEL is for characteristic and piece label lists).

[ListEntry] Block

Use the [ListEntry] block to set up the actual list options that appear on the choice menu. Subgroup label values are limited to 24 characters in length; characteristic label values are limited to 16 characters in length.

```
ChoiceList
name=Operators ;name of label list
lastModified= ;date of last modification
; type values: LABEL or SGLABEL
type=SGLABEL ; subgroup label list
[ListEntry]
choice=Bobby ; list values
choice=Kris
choice=Jose
```

dataLogging Field

The Data Logging option displays label data as it is collected. Set the dataLogging parameter to 1 (on) or 0 (off).

[PieceLabelSetup] Block

When you specify that your part setup is to include piece labels, first set the pieceLabelCount value in the [PartSetup] block:

```
[PartSetup]
  name=example
  creator=
  lastModified=
  variableCount=1
  pieceLabelCount=1
  sgLabelCount=1
  charLabelCount=1
  partDescriptorCount=1
  charDescriptorCount=1
  maxSampleSize=1
  reservedSubgroupCount=10
```

Enter the number of piece labels in the part setup

Then, define each piece label in your part setup in the [PieceLabelSetup] block:

```
[PieceLabelSetup]
  name=Piece L1
  boundary=0
  ditto=1
  autoEnter=0
  source=k, l
  listName=
  dataLogging=1
```

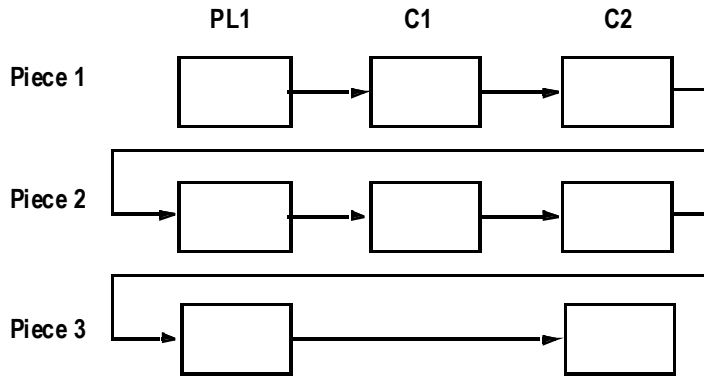
Set the parameters for each piece label

The name, ditto, autoEnter, source, and dataLogging fields are the same as for the subgroup labels. The only additional field is the boundary field.

boundary Field

Set the Boundary parameter to 1 (on) or 0 (off).

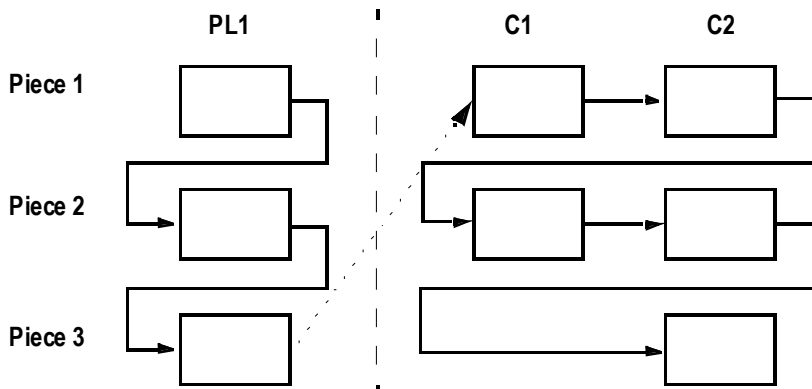
The default sequence for collecting piece label data is to enter it for the given piece and then collect data for the characteristics of that piece.



In this example:

1. Take piece 1 of 3 and enter the piece label (PL1) data.
2. Then, measure characteristics C1 and C2.
3. Continue with piece 2 of 3 and do the same.
4. Since the largest characteristic subgroup is C2 (with a subgroup size of 3), enter the piece label data for Piece 3.
5. This time, however, measure characteristic C2 for Piece 3 and all the characteristic data for this instance of the data collection sequence is collected.

Placing a **Collect Boundary** on a piece label causes the data collector to repeatedly prompt for piece label values until each piece in the largest characteristic subgroup has been examined before moving to the next setup element.



In this example:

1. Take piece 1 of 3 and enter the piece label data.
2. Then, (since a boundary is on the piece label) enter piece label data for pieces 2 and 3.
3. Once all of the piece label data is entered, continue to collect data for the characteristics.

[CharLabelSetup] Block

When you specify that your part setup includes characteristic labels, first set the charLabelCount value in the [PartSetup] block.

```

[PartSetup]
  name=example
  creator=
  lastModified=
  variableCount=1
  pieceLabelCount=1
  sgLabelCount=1
  charLabelCount=1
  partDescriptorCount=1
  charDescriptorCount=1
  maxSampleSize=1
  reservedSubgroupCount=10
    
```

Enter the number of characteristic labels in the part setup

Then, define each characteristic label in your part setup in the [CharLabelSetup] block.

```

[CharLabelSetup]
  name=Piece L1
  ditto=1
  source=L
  listName=Widget Causes
  dataLogging=1
    
```

The name, ditto, autoEnter, source, and dataLogging fields are the same as for the subgroup labels. If you use a label list, make sure that you define each label in the [ChoiceList] block.

Note: *The Cause Label is a required characteristic label in SPC and each characteristic label must be defined in the [CharLabelSetup] block.*

```

[ChoiceList]
  name=Widget Causes ; name of label list
  lastModified= ; date of last modification
  ; type values: LABEL or SGLABEL
  type=LABEL ; char label list
    [ListEntry]
      choice=Tool Wear ; list values
      choice=Machine Downtime
      choice=Operator Error
  name=Operators ; name of label list
  lastModified= ; date of last modification
  ; type values: LABEL or SGLABEL
  type=SGLABEL ; subgroup label list
    [ListEntry]
      choice=Bobby ; list values
      choice=Kris
      choice=Jose
      choice=Frank S

```

The listName value must **match** the name provided in the name field in the [ChoiceList] block and the type parameter must be LABEL for characteristic label values (SGLABEL is for subgroup label lists only).

Multiple entries can be made under a given block.

[VariableCharSetup] Block

The variableCount field is used to specify how many variable characteristics your part setup includes (from 1 to 999 characteristics).

```
[PartSetup]
  name=example
  creator=
  lastModified=
  variableCount=1 Enter the number of variable
                  characteristics in the part setup
  pieceLabelCount=1
  sgLabelCount=1
  charLabelCount=1
  partDescriptorCount=1
  charDescriptorCount=1
  maxSampleSize=1
  reservedSubgroupCount=10
```

Define each variable characteristic in your part setup separately within the [VariableCharSetup] block:

```
[VariableCharSetup]
  name=Characteristic 1
  subgroupSize=1
  resolution=0.00005
  autoScan=0
  trendAlert=1
  source=k
  boundary=0
  graphLogging=0
  engNominal=
  limitChoice=ENG
  engHigh=
  engLow=
  ; or: limitChoice=TOL
  ; tolPlus=
  ; tolMinus=
  reasHigh=
  reasLow=
  cautionPercent=
  ; primaryChart, secondaryChart values: xbarR xbarS histogram histogramStats
  primaryChart=xbarR
  secondaryChart=histogram
  dataLogging=1
  keyboardDitto=0
```


name Field

Each variable characteristic of your part setup must be given a *unique* name. Characteristic names are case sensitive and can be up to 24 alphanumeric characters long.

Replace the default characteristic name **Characteristic 1** with the name of the characteristic to define.

subgroupSize Field

A Characteristic Subgroup is defined as a predetermined number of pieces for which a specific characteristic's data is collected. The number of pieces that comprise a characteristic subgroup is called the subgroup size. The subgroup size selected must not exceed the MaxSampleSize parameter in the [PartSetup] Block.

Replace the default subgroupSize value of 1 with a value from 1 to 200 (note that the value must not exceed the value specified for MaxSampleSize).

resolution Field

Resolution refers to the expression of the smallest unit of measure used when a dimension is measured. The resolution setting affects the number of places to which a data value is rounded when entered.

For example: If you set the resolution to .0001 for a characteristic, and you take a reading for this characteristic of .00025, the actual reading stored will be .0003. The data collector rounds the gage reading to accommodate the characteristic resolution.

Replace the default resolution “0.00005” with the required resolution for the characteristic.

autoScan Field

Setting a characteristic to **Auto Scan** causes the data collector to automatically take the reading and then proceed to the next characteristic, if any. Auto Scan is used when a gage sends a continuous output or when the characteristic is a calculated formula that should automatically be calculated.

Set the autoScan parameter to 1 (on) or 0 (off).

trendAlert Field

A data collection trend is a collection of subgroups whose values exhibit a sequence that may indicate that a characteristic is going out of control. Trend Alert is a data collection option that causes the data collector to alert the operator when a trend or control limit violation occurs.

When Trend Alert is active (i.e., on) for a given characteristic and the data collector detects a trend, the cause prompt is automatically displayed. The cause prompt asks the operator to enter an Assignable Cause (in this case, a reason entered for the detected trend) that marks the characteristic subgroup as non-normal.

Set the trendAlert parameter to 1 (on) or 0 (off).

source Field

Variable characteristic source refers to the location where you get data for a particular reading (i.e., a gage, the Key pad, or a formula). Specify the source for each characteristic (up to 80 characters) under the [VariableCharSetup] block. See *Appendix B- Source Input Codes* on page 143 for details about valid source definitions.

boundary Field

The default sequence for collecting characteristic data is to measure characteristic-by-characteristic for each piece.

Placing a “Boundary” on a characteristic causes the data collector to repeatedly prompt for the bounded characteristic's data before moving to the next characteristic in the sequence.

Set the boundary parameter to 1 (on) or 0 (off).

graphLogging Field

Set the graphLogging parameter off (0) for the characteristic.

limitChoice Field

Characteristic specifications refer to the required properties or dimensions of a particular product's characteristic. The limitChoice field is used to describe characteristic specifications in one of two ways.

- ENG (engineering limits)-Limits specified as upper specification limit and lower specification limit with nominal.
- TOL (deviation limits)-Limits specified as nominal and ± deviation as upper specification limit and lower specification limit, respectively.

Set the limitChoice parameter to either ENG or TOL.

Engineering Specifications

If you set the limitChoice field to ENG, set the nominal, upper and lower specification limits for the characteristic.

```
[VariableCharSetup]
...
engNominal=1.00      ; nominal value
limitChoice=ENG      ; Engineering Limits
engHigh=1.1          ; engineering high
engLow=.9            ; engineering low
```

Deviation Specifications

If you set the limitChoice field to TOL, set the nominal and ± tolerance for the characteristic.

```
[VariableCharSetup]
...
engNominal=1.00      ; nominal value
limitChoice=TOL      ; tolerance from nominal
tolPlus=.1           ; positive tolerance
tolMinus=.1          ; negative tolerance
```

Reasonable Limits

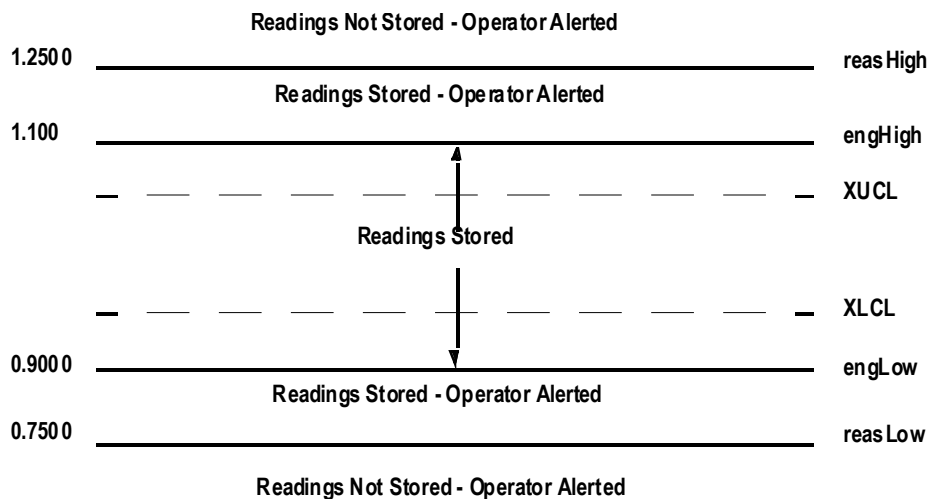
Reasonable Limits refer to user-defined limits above or below which a reading is considered “unreasonable” and is thus not stored. Reasonable limits are used to screen obviously bad input during data collection (i.e., if an operator accidentally measures length instead of width).

Reasonable Limits should not be used as specification limits. Set Reasonable Limits outside of specification limits, but close enough so that incorrect readings are not accepted.

```
[VariableCharSetup]
...
reasHigh=1.25      ; reasonable high
reasLow=.75        ; reasonable low
```

The Effect of Limits at the Data Collector

The manner in which limits for variable characteristics are implemented while collecting data can be illustrated with the following scheme:



The effect of Limits while collecting data are determined by whether the Trend Alert and Control Limits are active for the characteristic.

cautionPercent Field

Caution Limits are specified as a percentage of the characteristic's total specification. Two of the three limits (upper, lower, or nominal) must be specified for caution limits to be used. Caution limits are affected by the relationship between the part's nominal (or midpoint, if nominal is undefined) and its tolerance. The cautionPercent value places upper and lower threshold limits beyond which an operator is alerted.

To “tighten” caution limits, use a larger cautionPercent value; to “loosen” caution limits, use a smaller cautionPercent value.

Caution Limits are indicated immediately by the LEDs on the data collector. The status of an individual reading during data collection is shown by these LEDs:

- Red (left LED) – The reading is out of specification and is not stored.
- Yellow (both LEDs) – The reading is between the upper Caution Limit and the upper engineering limit; or between the lower Caution Limit and the lower engineering limit.
- Green (right LED) – The reading is between the upper and lower Caution Limits (or between the engineering limits if Caution Limits are not defined).

Note: *If Caution Limits are not defined in the part setup, the LEDs only display the Red (left)/Green (right) indications.*

Caution Limits are determined by the following formulas:

- Upper Caution Limit: $\text{Engr. High} - ((\text{Engr. High} - \text{Nominal}) * \text{cautionPercent})$
- Lower Caution Limit: $\text{Engr. Low} + ((\text{Nominal} - \text{Engr. Low}) * \text{cautionPercent})$

dataLogging Field

Data Logging is a data collection option for displaying collected characteristic data on either a terminal or on a printer. To enable data logging for the characteristic, set the dataLogging field to 1 in the template:

keyboardDitto Field

Keyboard Ditto allows the Key pad input from the previous entry to be “echoed” or displayed again the next time a prompt for the same characteristic appears during data collection. The operator presses <Enter> to confirm that the former entry is applicable in this case. To enable keyboard ditto for the characteristic, set the keyboardDitto field to 1 in the template.

[CharLabelPrompting] Block

The [CharLabelSetup] block is used to define any characteristic labels (including the Cause label) your part setup uses. The [CharLabelPrompting] block within the Char Label Setup defines which characteristic labels are displayed when an assignable cause condition is detected. (This available only on an SPC-equipped 440 Data Collector.)

```
[CharLabelSetup]
name=Cause

...
[CharLabelPrompting]
charLabel=Cause ; this label displayed
    [PromptConditions]
        condition=CLV
        condition=RUN
        condition=SFT
        condition=IN1
        condition=IN2
        condition=MIX
```

When collecting data, the data collector displays a characteristic label prompt if any of the [PromptConditions] specified in this block occur and trend alert is on. Specify the conditions under which a characteristic label (including the cause label) displays by filling in the [PromptConditions] block under the [CharLabelPrompting] block.

- CLV (control limit violation)-Display the assignable cause prompt whenever a reading (or the mean of readings) exceeds an upper or lower control limit.
- RUN (run trend)-A run trend occurs when a predefined number of consecutive subgroups (x) fall into an ascending or descending pattern.
- SFT (shift trend)-A shift trend occurs when a predefined number of consecutive subgroups (x) fall on one side of the centerline.
- IN1, IN2 (instability trends)-An instability trend occurs when a number of subgroups (x) out of a set of subgroups (y) fall beyond a specified sigma value (z) on one side of the centerline. You can specify two discrete instability trends. They are IN1 and IN2.
- MIX (mixture trend)-A mixture trend occurs when a run of subgroups (x) falls outside (?y) Sigma of the centerline.
- SYS (systematic variable trend)-A systematic variable trend occurs when a run of subgroups (x) “systematically” alternate up and down.
- HLV, LLV (engineering limit violations)-Display the assignable cause prompt whenever a reading (or the mean of readings) exceeds an upper or lower engineering limit.
- FST, LST (first/last subgroup)-Display the assignable cause prompt at the beginning and end of a subgroup.

SECTION

10

Appendices



Appendix A - Barcode Wands

Key pad Duplication

This section provides information about creating barcodes that can be used to duplicate Key pad functions.

Steps

1. From the Main menu, press ▼ to select **Gage** and press <Enter>.
2. Press ▲ or ▼ to select the gage input port on which your barcode wand is installed.
3. Press ► to select to **Configure**.
4. Press ▲ or ▼ to select **Additional Parameters** and ensure that it is toggled to (On).
5. Press ▲ or ▼ to select **Remote Keyboard** and ensure that it is toggled to (On).
6. Press any key, and at the Save prompt, select **Save to current gage** and press <Enter>.

Creating Barcodes

Once the barcode wand is properly configured, you need the Full ASCII Code 39 font to create barcodes to emulate data collector functions. Use the following table to create the barcodes.

Table 30: Key pad Functions

Key pad Function	Code 39 Font Keystrokes
<Menu>	*%A\$A%A*
<Data>	*%A\$B%A*
<View>	*%A\$C%A*
<Select>	*%A\$D%A*
<◀◀>	*%A\$E%A*
<▶▶>	*%A\$F%A*
<▲>	*%A\$G%A*
<▼>	*%A\$H%A*
<◀>	*%A\$I%A*
<▶>	*%A\$J%A*
<Delete>	*%A\$K%A*
<Enter>	*%A\$M%A*
<Shift>+<Menu>	*%A\$N%A*
<Shift>+<Data>	*%A\$O%A*
<Shift>+<View>	*%A\$P%A*

Table 30: Key pad Functions

Key pad Function	Code 39 Font Keystrokes
<Shift>+<Select>	*%A\$Q%A*
<Shift>+<◀◀>	*%A\$R%A*
<Shift>+<▶▶>	*%A\$S%A*
<Shift>+<▲>	*%A\$T%A*
<Shift>+<▼>	*%A\$U%A*
<Shift>+<◀>	*%A\$V%A*
<Shift>+<▶>	*%A\$W%A*
<Shift>+<Delete>	*%A\$X%A*
<Shift>+<Enter>	*%A\$Y%A*
Power ON/OFF	*%A\$Z%A*
Print Screen	*%A%E%A*
First SG Label	*%A%CS%A*
Next Subgroup	*%A%CT%A*
Next Part	*%A%CU%A*
<Option>+<Select> (Simple Key pad)	*%A%CK%A*
<Option>+<▲> (Simple Key pad)	*%A%CM%A*
<Option>+<▼> (Simple Key pad)	*%A%CN%A*
<Symbol>+<Select> (Alphanumeric Key pad)	*%A%CK%A*
<Symbol>+<▲> (Alphanumeric Key pad)	*%A%CM%A*
<Symbol>+<▼> (Alphanumeric Key pad)	*%A%CN%A*

Remember that Full ASCII Code39 precedes and appends an asterisk (“*”) to each barcode, e.g.,

%A\$A%A (<Menu> Key function)

* ♂ A \$ A ♂ A *

Barcode Wand Security

Inserting a “serial trigger” character pair to your regular ASCII 3 of 9 barcodes ensures that barcode information is not erroneously entered in response to a data collection label. The inserted character pair acts as a filter for unwanted information. For example, if an operator were to scan a barcode for **Operator**, the data collector would not accept the reading if the label prompted for **Vendor Label**.

Character Pair Control Codes

The following is a list of Code 3 of 9 character pairs that can be used to precede your barcodes:

Table 31: Character Pair Control Codes

Pair	Code	Pair	Code	Pair	Code	Pair	Code
\$A	Soh	%A	Esc	\$N	So	%N	^
\$B	Stx	%B	Fs	\$O	Si	%O	_
\$C	Etx	%C	Gs	\$P	Dle	%P	{
\$D	Eot	%D	Rs	\$Q	Dc1	%Q	
\$E	Enq	%E	Us	\$R	Dc2	%R	}
\$F	Ack	%F	;	\$S	Dc3	%S	~
\$G	Bel	%G	<	\$T	Dc4	%T	DEL
\$H	Bs	%H	=	\$U	Nak	%U	NUL
\$I	Ht	%I	>	\$V	Syn	%V	@
\$J	Lf	%J	?	\$W	Etb	%W	`
\$K	Vt	%K	[\$X	Can	%X	DEL
\$L	Ff	%L	\	\$Y	Em	%Y	DEL
\$M	Cr	%M]	\$Z	Sub	%Z	DEL

Decide on the character pair(s) to precede your barcodes. Choose a consistent character pair for each type of barcode you are using. For example, use \$A before all operator label barcodes, or use \$C before all Vendor label barcodes.

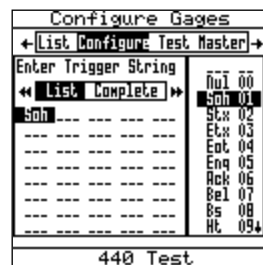
Configuring the Barcode Wand

To add a serial trigger to a gage port or to a gage subconfiguration, follow the steps below.

Steps

1. From the Main menu, press ▼ to select **Gage** and press <Enter>.
2. Press ▲ or ▼ to select the gage input port on which your barcode wand is installed.
3. Press ► to select to **Configure**.
4. Press ▲ or ▼ to select **Additional Parameters** and ensure that it is toggled to (On).
5. Press ▲ or ▼ to select **Trigger** and ensure that it is toggled to (On).
6. Press ▼ to select the “=” and press <Enter>.
7. Press ◀◀ to select **List..**
8. Use ◀ or ▶ to position the insertion point on the left side of the overlay.
9. Use ▲ or ▼ to select the character pair from the list and press <Enter>.

In the example below, the Barcode Reader waits for the code Soh (\$A) before accepting any data on the gage input port.



10. Press ►► to select **Complete**, and press <Enter>.
11. Press any key, and at the Save prompt, select **Save to current gage** and press <Enter>.

Implementing Barcode Wand Security

Steps

1. First, create or edit a part setup so that label values of one class come from the gage port source using the "\$A" trigger string (i.e., g1), and the other subgroup label values come from the source using the "\$C" trigger string (i.e., g1a).

For example, you could have your part setup use g1 as source for an Operator label and g1a as source for a Vendor label.

2. Next, create barcodes so that barcodes of one class will be preceded by the "\$A" trigger string, while barcodes of another class will be preceded by the "\$C" trigger string (using the previous example, create "Operator" barcode values with a \$A prefix and Vendor labels with a \$C prefix).

Barcode Samples (Code 3 of 9 Extended)

The following sample barcodes are set up using gage ports g1 and g1a. Serial triggers are implemented to only allow operator names containing the serial trigger string "\$A" before the barcode and company names containing the serial trigger string "\$C" before the barcode:

Billy (\$A prefixed)

* \$ABi111y*

Acme (\$C prefixed)

* \$CACME*

Jose (\$A prefixed)

* \$Ajose*

Appendix B- Characteristic Source

This appendix provides information about specifying valid source formulas for characteristics and labels for your setups.

Source Location Symbols

The 440 Handheld Data Collector uses symbols to refer to source locations. For variables data, multiple sources are comma delimited inside of square brackets; for label data, multiple sources are comma delimited without square brackets. For instance, the source line [K,G1a] refers to either the Key pad or a gage attached to the first subconfiguration of port 1.

The following table lists valid Source Location Symbols.

Table 32. Source Location Symbols

Source	Meaning	Examples
K	Keyboard	K
Gnx	Gage on COM port x	G1, g2a
Gxy	Gage on port x, subconfiguration letter y	G1a, G1b, G1c, G1d
Cx	Characteristic x	C1, C4, C12
Sx	Subgroup x	S2, S4, S6
N	Nominal	C1-N, N-.00012
Constant	A Number	1.6, G1+1.6, max(7.3,G1)

Operator Symbols

The following table lists Operators for creating Source Formulae.

Table 33. Operator Symbols

Source	Meaning	Examples
-	Minus	(C1-C2), G2-C1, G1a-C2
+	Add	(C3+C2), (G1+G1+G1)*0+G13
*	Multiply	(C3*N)-.2, G1*.0005, C3*C4
/	Divide	(C1/C2), C4/.018
	Through	(C1 5), (G1 4)
~ or ^	Exponent	(C1~2), (G1~2)/3.1416, (G1^2)
(,)	And	AVG(C1,C2,C3)
[,]	Or	[G1,K]1
{ n }	Start Threshold (Torque) -- where <i>n</i> overrides the start threshold defined for the torque tool	G2{14.7}, G2g{19.3} Note that <i>n</i> represents an actual torque value (e.g.. 14.7 lbft, or 19.3 Nm).

You can also allow math calculations on the gage ports of a source that accepts keyboard and/or gage input, such as:

[k,-1*g1]

Boolean Operators

A Boolean expression evaluates to either 1 (true) or 0 (false). You can use Boolean Operators in source formulae to create “if-else” logical constructions.

The following table lists Boolean operators for creating source formulae.

Table 34. Boolean Operators

Source	Meaning	Examples
>	if x is greater than y, return 1, else return 0	((C1>10)+(C1<5))*((C1-N)*(C2*-1))
<	if x is less than y, return 1, else return 0	((C1<C2)*C1)*C2
+	if x equals y return 1 else return 0	(G1=N)*(G1-0.002)

Function Operators

The following table lists function operators for creating Source Formulae.

Table 35: Function Operators

Function	Meaning	Examples
Abs	Absolute Value	ANS(C2), ABS(AVG(C1 7))
Acos	Arc Cosine	ACOS(C1)
Asin	Arc Sine	ASIN(C1)
Atan	Arc Tangent	ATAN(C1)
Avg	Average	AVG(C1 5), AVG(S1,S2)
Cnt	Pulse Count	CNT(G2)
Cos	Trigonometric Cosine	COS(C2)
Dsp	Angular Displacement	DSP(G2A)
Max	Maximum Value	MAX(S2), MAX(G1 4)
Med	Median Value	MED(S2), MED(C1 5)
Min	Minimum Value	MIN(S9), MIN(C1 7)
Rng	Range	RNG(C1 5), RNG(G1 8)
Sdv	Standard Deviation	SDV(S2), SDV(S2,S3)
Sin	Trigonometric Sin	SIN(C1)
Sqt	Square Root	SQT(C1)
Sum	Summation	SUM(C2 4)
Tan	Trigonometric Tangent	TAN(C1)
Tmn	Min TIR	TMN(G1 3)
Tmx	Max TIR	TMX(G1 4)
Tps	True Position	TPS(G1,C1),TPS(G2,G3,G4)
Trg	Range of TIR	TRG(G1 2)

Notes:

- **Atan(x)**—Returns the arc tangent of x, in degrees (-90° to $+90^\circ$).
- **Asin(x)**—Returns the arc sine of x, in degrees (-90° to $+90^\circ$). The range of x is: $-1 \leq x \leq 1$.
- **Acos(x)**—Returns the arc cosine of x, in degrees (0° to $+180^\circ$). The range of x is: $-1 \leq x \leq 1$.
- **Cnt**—Used in combination with Pulse measurement. Example: G2 is configured for Pulse; Characteristic 1 (C1) has a Source of G2; Characteristic 2 (C2) is auto-scanned with C1 and has a Source of CNT(G2). When a fastener is rundown with a pulse tool, C1 captures installation torque and C2 captures the number of pulses from snug to peak.
- **Dsp**—Used in Angle measurements. The Displaced Angle value will be captured between a start (<Enter>) and stop <Enter> command.

Order of Operations

Source expressions are evaluated in standard mathematical order. Anything with parenthesis is completed first. Multiplication and division are performed before addition and subtraction.

Appendix D–Utility Menu

The 440 Handheld Data Collector's Utility Menu provides several maintenance and information options. To access the menu, perform the following steps.

1. From the Main Menu, press ▲ or ▼ to select **More** and press <Enter>.
2. Press ▲ or ▼ to select **About** and press <Enter>.
3. Press <Option>+<Menu> if using the simple Key pad,
or
Press <Symbol>, <Menu> if using the alphanumeric Key pad.

The Utility Menu opens:



The Utility Menu provides the following options:

- **Export Error Log** – This selection exports a log of unexpected hardware and software occurrences to an attached printer via the communications port.
- **Display Version Number** – This selection shows the following information: Collector Model Number, Collector ROM version number, Serial Number, amount of installed memory, and LMI Corporation address and phone number.
- **Flash Loader** – See Section 10 for more information about the Flash Loader.
- **Reinitialize Memory** – This selection will clear all part setup data from memory. All data is then lost. This selection does not, however, clear your gage, data, and communication preferences. Use this command with care!
- **Set Defaults** – This menu choice resets your communication, data and user preferences to the factory default settings. For 440 Handheld Data Collectors, this command will also reset trend settings to the factory default settings.
- **SN:** – The serial number of this 440 Handheld Data Collector (which should match the serial number marked on the back of the 440 Handheld Data Collector). The serial number is required to receive firmware updates from the LMI Corporation web site.

Appendix E–PCX Screen Captures

A “PCX” file is a widely-used bitmap graphics file format developed by Zsoft® Corporation. The 440 Handheld Data Collector has the capability to capture LCD screen images into a series of PCX-compatible files.

Initially these files are stored in the 440 Handheld Data Collector. However, using the data collector's Open Communications capability (see Section 9), you can transfer the PCX files to your computer view and edit them using a standard graphics editor. PCX screen capturing can be used to create paper copies of data collector screen images for training purposes.

Activating the PCX Screen Capturing Option

Complete the following steps to access the PCX screen capture option.

Steps

1. From the Main menu, press ▼ to select **More** and press <Enter>.
2. Press ▲ or ▼ to select the **Preferences** and press <Enter>.
3. Press ◀ or ▶ to select to **User**.
4. Press ▲ or ▼ to select the **Printscreen to pcx file** and toggle it ON.

Note: If Printscreen to PCX preference is OFF, the current LCD image is sent to the communications port in Epson format.

5. Press <Option>+<View> on the simple Key pad at any time to take a “snapshot” of the current screen,

or

Press <Symbol>, <View> on the alphanumeric Key pad at any time to take a “snapshot” of the current screen.

Each time you press <Option>+<View> or <Symbol>, <View>, the data collector stores the current screen image as 1.pcx.

<Option>+<View>	Simple Key pad
<Symbol>, <View>	Alphanumeric Key pad

Transferring PCX files

Using Open Communications, establish a communications link between the data collector and your communications software. See Section 9 for more information about open communication. In your communication software's terminal editor, enter the command:

send file 1.pcx

Deleting PCX Files

PCX files, though relatively small in size, consume data collector memory. After transferring the PCX files to your computer, you should delete them at the data collector.

In your communication software's terminal editor enter the command:

delete file *.pcx

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