Model 600 Handheld Data Collector

User Guide

95777-004

600 Handheld Data Collector

User Guide

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Contents

SECTION

1 Introduction

Getting Started

Power Requirements

The ASI DataMyte Model 600 Data Collector can be powered with one battery. See Table 1, *Data Power Sources and Rating* for specifications of the types of power sources compatible with the 600, and Table 2, *Battery Usage Time Chart,* for additional information on battery performance.

Table 1: Data Power Source and Rating

Power Source Type	Parameter	Rating
Battery Powered		
Lithium-ion	Voltage	3.7 Volts
	Capacity	4000 mAh

Battery Usage

The ASI DataMyte Model 600 has been designed and optimized to run on one Lithium-ion battery supplied by ASI DataMyte. The Lithium-ion 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 Lithium-ion battery 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 was 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 ASI DataMyte regarding average battery usage*: your usage time may vary depending upon the setup and other use variables*.

Use only batteries approved by ASI DataMyte with this data collector. Risk of battery explosion and / or damage to data collector or charging equipment can result if an incorrect battery type is used.

Table 2: Battery Usage Time Chart

	Light Use	Medium Use	Heavy Use
Usage Definition:			
LED Duration	off	1 sec.	5 sec.
Backlight Duration / Intensity	5 sec / 4	10 sec. / 6	15 sec. / 8
Data Collection Rate	60 sec.	48 sec.	15 sec.
Buzzer Status / Tone	off	soft/12	loud/12
Estimated Collection Time:			
Battery: 4000 mAh Tool: LightStar Series B Torque Wrench*	7 Hours 4 Minutes	6 Hours 41 Minutes	5 Hours 12 Minutes

* The values represent the highest battery usage for the 600 data collector; other applications should experience longer battery life.

Guidelines for Optimum Lithium-Ion Battery Performance

- 600 Lithium-Ion batteries are provided with at least a 35% charge and need to be fully charged before used.
- 600 Lithium-Ion batteries learn their maximum capacity by being cycled (fully discharged or fully charged) numerous times, 3 or more. This conditioning is highly recommended to obtain maximum battery life and performance.
- Conditioning the battery (one cycle) once every 50 charges is recommended to improve the gas gage accuracy and battery capacity.
- Lithium-Ion batteries naturally discharge when not in use and should not be stored for long periods of time without being cycled.
- To maximize service life, spare batteries should be cycled at least every three months and stored at 50% of full charge in a cool temperature, 15 C (59F) or less. Do not freeze.
- Only charge the 600 Lithium-Ion battery (Model No. 57570) in the ASI DataMyte single bay charger Model 95747 or quad bay charger model 95746.
- For additional guidelines for optimizing battery performance, please refer to the following online resource http://www.batteryuniverisity.com/.

Charging the Batteries

The battery charging system in the 600 Handheld Data Collector is different from that of all other ASI DataMyte data collectors. The 600 Handheld Data Collector uses a Lithium-ion battery and batteries are not charged when installed in the unit – even when the USB cable is plugged in. Discharged Lithium-ion 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 takes approx. 3 to 4 hours to complete).

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

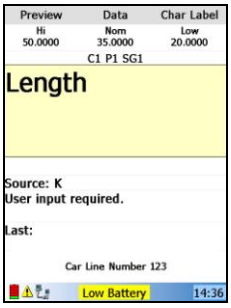
1. Insert the batteries into the charging unit. Be sure to orient the batteries so that the polarity is correct.
2. Connect the charging unit cord.
3. Plug the charging unit cord into a grounded wall outlet.

   The indicators on the charger give the charging status:

   - **Power: Solid Green** – Power is available
   - **Ready: Solid Green** – Battery is ready
   - **Charger or Fault: Solid Yellow** – Battery is charging
     Flashing Yellow – Battery is rejected

Replacing the Batteries

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



The message is repeated 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 ASI DataMyte 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 1.
2. Press down on the tab on the compartment cover and gently lift the cover up.
3. Remove the old battery from the battery compartment.
4. Install the recently charged battery 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.

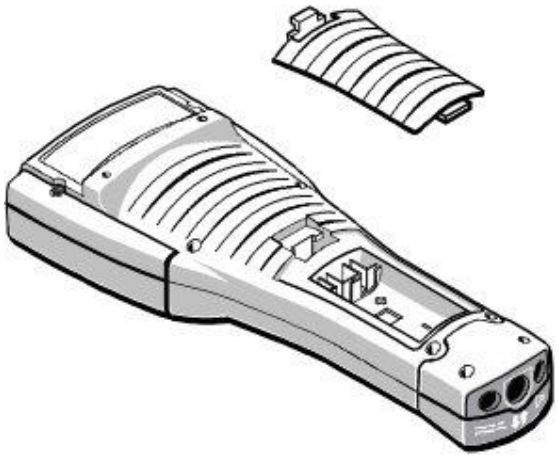


Figure 1. Replacing the Battery

Cleaning Instructions

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 directs the user to important information on the use of this equipment:

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:

The Model 600 data collector is not intended to be connected to a public telecommunications network.

Battery Warnings

WARNING:

Failure to follow any of the following warning statements could result in damage to the Model 600, the batteries, or injury to the operator.

- Mistreatment of a battery may cause the battery to generate heat, explode, or ignite and cause serious injury.
- Do not short battery terminals or cause the (+) and (-) ends to contact metal objects either when handling, carrying, or storing the battery
- Do not expose the battery to fire
- Do not expose the battery to heat or solder to the battery
- Do not expose the battery to moisture
- Do not pierce, crush, or subject the battery to impacts or shocks
- Do not disassemble, or modify the battery. The battery contains safety and protection devices. If these safety and protection devices are damaged, the battery may generate heat, explode, or ignite.
- Do not charge or discharge the battery in any device except those approved by ASI DataMyte.
- If a battery should leak 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 600, the batteries, or injury to the operator.

- Use only ASI DataMyte approved batteries. Risk of battery explosion and / or damage to the data collector or charging equipment can result if an incorrect battery type is used.
- When the battery is worn out, insulate the terminals with adhesive tape or similar materials before disposal.
- Only discharge the battery when ambient temperature is between -20 ^{0} C and + 45 ^{0} C
- Only charge the battery when ambient temperature is between 0 ^{0} C and +45 ^{0} C
- 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 battery charger, batteries, or even harm to the user/operator.
- Immediately discontinue use of the cell if while using, charging, or storing, the cell emits an unusual smell, feels hot, changes color, changes shape, or appears abnormal in any other way.

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 store the batteries in the battery charger.

Battery Charger Cautions

CAUTION:

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

- Use only ASI DataMyte approved battery charger. Risk of battery explosion and / or damage to the charging equipment can result if an incorrect battery charger is used.
- Only charge the battery when ambient temperature is between 0^{0} C and $+45^{0}$ C
- Failure to follow the charging instructions provided could result in poor battery performance, damage to the battery charger, batteries, or even harm to the user/operator.

Agency Approvals and Compliance

FCC Compliance Statement

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

Notice: Any modifications made to this device that are not approved by ASI DataMyte, Inc. may void the authority granted to the user by the FCC to operate this equipment.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

European Union Directives

The product described in this documentation complies with the EU directive 2004/108/EC (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 (Information Technology Equipment – Safety – Part 1: General Requirements), EN 61326-1 (Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements, Class A requirements), EN 55011 (Industrial, scientific, and medical (ISM) Radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement, Class A requirements), EN 61326-2-1 (Electrical equipment for measurement, control, and laboratory use – EMC requirements – Part 2-1: Particular requirements – Test configurations, operational conditions and performance criteria for sensitive test and measurement equipment for EMC unprotected applications), and the following Immunity requirements: EN 61000 – 2, 3, 4, 6, and 8.

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 ASI DataMyte cables be used whenever possible. If ASI DataMyte cables are not used, all peripheral devices should be connected to this device via shielded cables with metalized 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.

Environmental Considerations

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

SECTION

2

600 Data Collector Overview

DM600 – TranSend II Configurations

The 600 Handheld Data Collector along with TranSend II can be configured in a network or a non network configuration. The figures below show both configurations:

Network Configuration

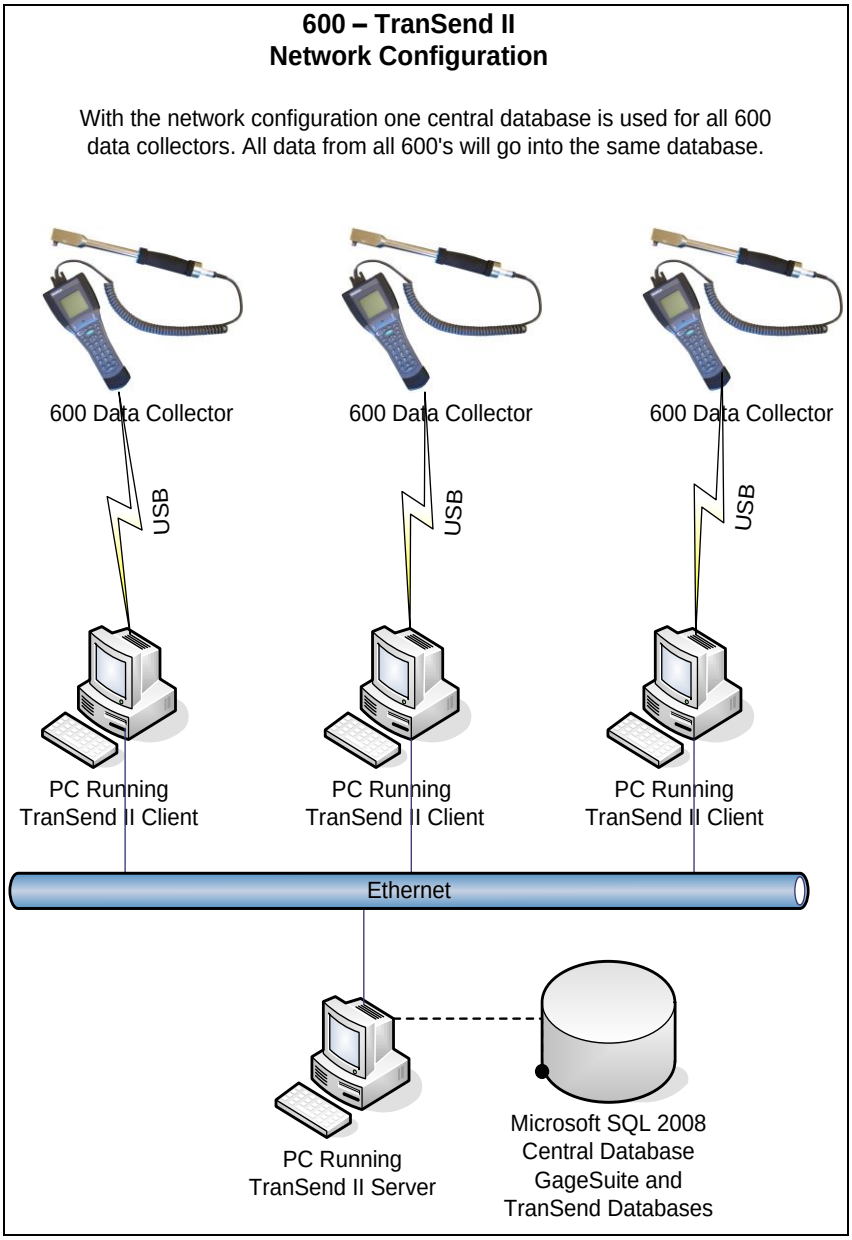


Figure 2. Network

Non Network Configuration

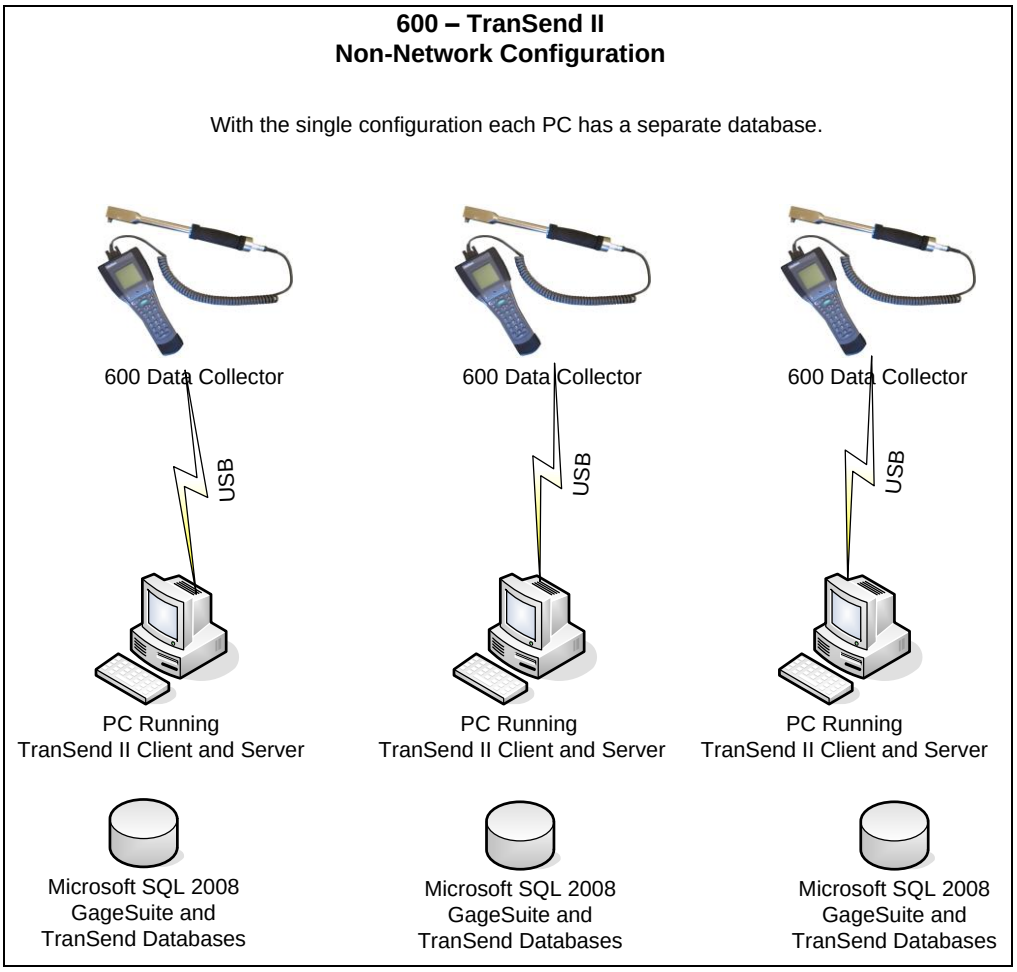


Figure 3. Non Network

Data Collector Features

The 600 Handheld Data Collector is a lightweight, portable data collection device. It has an easy-to-read color LCD panel that can be adjusted for various lighting conditions.

Hardware Features

- 1000 Mb of memory.
- 480 x 640 VGA TFT Active Matrix Color LCD with backlight.
- Optional Digital module for connecting:
  1. Mitutoyo
  2. Federal Maxum
  3. Ono Sokki
  4. LMI Diamondback
  5. CDI
  6. Sylvac Serial
  7. Serial
- Optional Torque module for connecting:
  1. Industry Standard Torque Wrench
  2. LED Indicating Torque Wrench with Angle
  3. Rotary Transducer
  4. Rotary Transducer with Angle
- Optional LMI module for connecting:
  1. LMI 200
  2. LMI 241, 241BW
  3. LMI TP-107
  4. LMI SK5038
- Visual and Audio Feedback – two LED's and a built-in speaker supply operator feedback as data is collected.
- Built-in Flash ROM loader for easy software upgrades.
- USB communications for data-setup transfer.
- Runs on one battery. 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 user defined labels.
- Supports digital gages with the addition of a Digital module.
- Supports analog gages with the addition of a Torque module.
- Supports LMI gages with the addition of a LMI module.
- Support of ASI DataMyte programs such as TranSend II™, as well as with third-party software applications such as Microsoft® Excel™.
- Supported languages: Chinese, English, Ford, French, German, Italian, Portuguese, Spanish
- Graphical representation of data collection in columnar format.
- Graphical representation of collected data in Xbar R, Xbar S and Histogram charts.

Hardware Overview

Data Collector Front View

The 600 Handheld Data Collector standard hand grip contains an alpha-numeric keypad.

Figure 4. Front View

- **Color Display** – The user interface for the data collector is displayed using a 480 x 640 VGA TFT Active Matrix Color LCD with backlight.
- **Alphanumeric Keypad** – Contains additional keys for entering alphanumeric text.
- **Status Indicators** – Two LED indicators are used to indicate the status of a given reading.

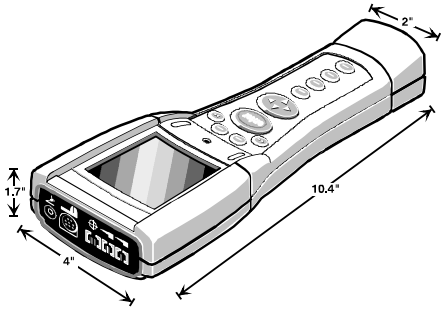


Figure 5. Physical Dimensions

Back View

The back of the 600 Handheld Data Collector provides access to the rechargeable battery compartment.

The 600 Handheld Data Collector accommodates one ASI DataMyte supplied battery. 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 5 for more information about charging and replacing the battery.

The battery charging system in the 600 Handheld Data Collector is different from that of any other ASI DataMyte data collector you may have. The 600 Data Collector uses one battery, and, any batteries left in the 600 will not be charged-even if an USB communications cable 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 or put in backwards.

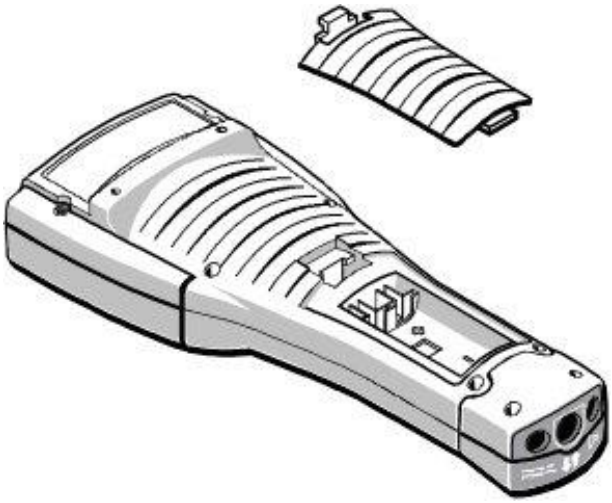


Figure 6. Back View

Bottom View

The bottom of the 600 Handheld Data Collector provides connections for USB communications.

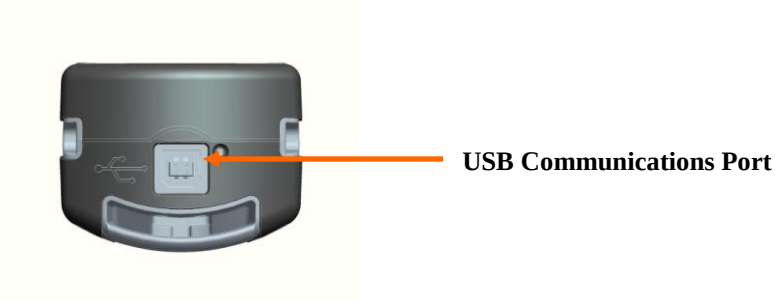


Figure 7. Bottom View

USB Communications Port

The USB communications port is used to connect an ASI DataMyte #95748 cable from the data collector to a computer running support software.

Figure 8. USB Communications Port

Top View

The top end of the 600 Handheld Data Collector contains gage input ports. The exact ports on your data collector may vary, depending on the options purchased.

Analog Gage (LMI) Option

The analog version of the 600 Data Collector includes analog gage connectors that support two analog gage ports.

- One USB gage port
- One digital port
- One dual channel analog gage port can be used for true position gages or an LMI 241 gage.
- Two single channel analog gage ports can be configured for and LMI 200 gage.

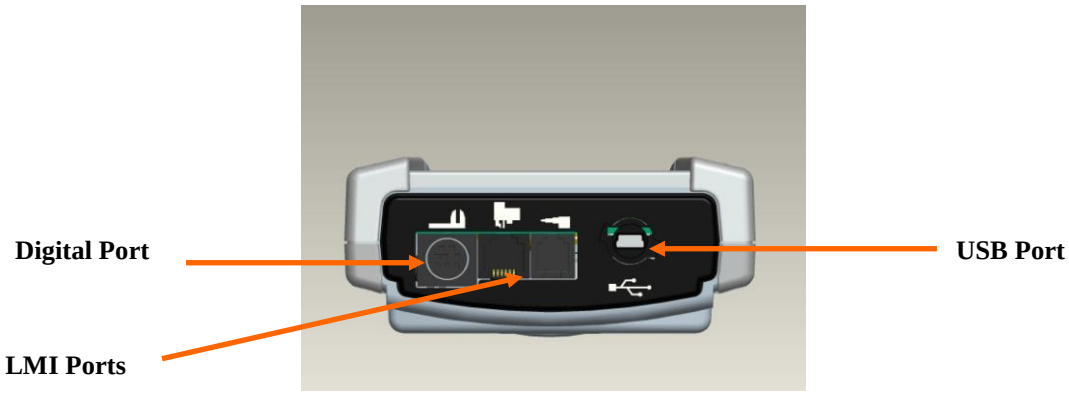


Figure 9. Top View – LMI Option

Torque Option

The torque version of the 600 Handheld Data Collector includes the following ports:

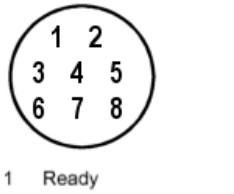
- One USB gage port
- One analog torque wrench port

Note: *The torque module requires calibration annually. Contact ASI DataMyte Customer Service for more information.*

Figure 10. Top View – Torque Option

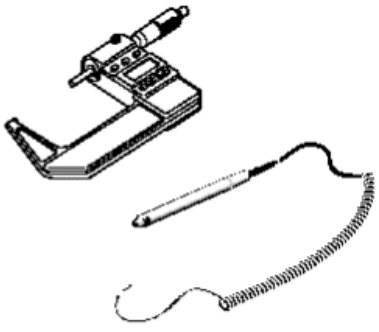
Digital Gage Port

Most digital gages and barcode wands can be plugged into the digital gage port. The cable for the gage is vendor-specific.



1 Ready
2 Request/Fed. Sign
3 Transmit/Data Value
4 Common
5 Receive
6 Serial Clock

Port Pin Assignments



Digital Gage and Barcode Wand

Figure 11. Digital Gage Port

Dual Channel Analog Gages

If the analog option is installed, the dual channel analog gage port is indicated by a gap and flush symbol. The dual channel analog gage port is used for true position gages.

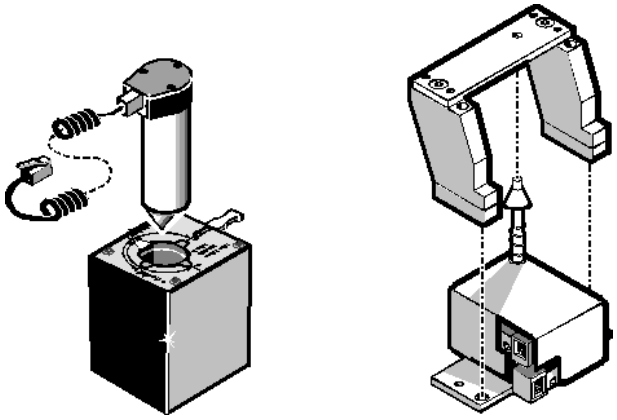


Figure 12. True Position Gages

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 Probe Gage or an LMI 300 Gap and Flush gage as shown in figure 13.

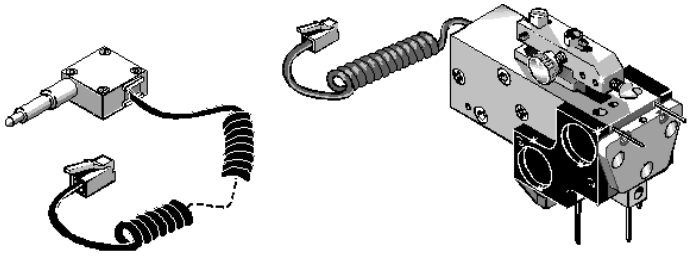


Figure 13. LMI 200 Probe, LMI 300 Gap and Flush Gage

Torque Wrench

When the torque module is installed (see Figure 14), an analog port provides connection for a torque wrench.

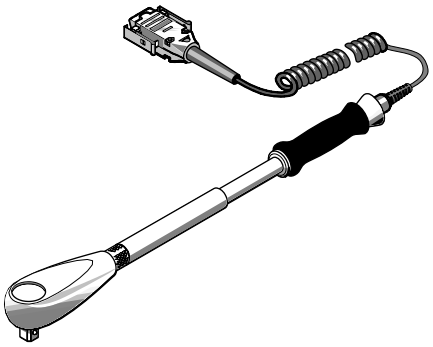


Figure 14. Torque Wrench

Figure 15. Rotary Transducer

Alphanumeric Keypad

The 600 Handheld Data Collector's alphanumeric Keypad uses a number of specialized keys to navigate the data collector interface.

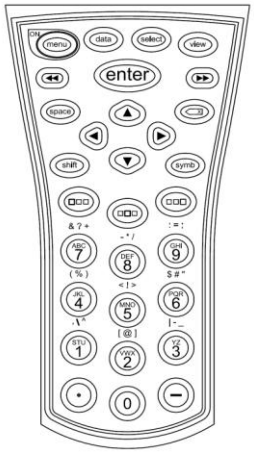


Figure 16. Alphanumeric Keypad

Alphanumeric Keypad Key Combinations

Many Keypad keys work in a series by pressing multiple keys. Key combinations are indicated by a "," between the keys.

The alphanumeric/symbol keys are primarily used for entering the numbers 0 through 9. In addition, each number key is associated with up to three letters. Letters and symbols can be entered into fields by pressing the Left Pointer Key, the Center Pointer Key, or the Right Pointer Key and the corresponding alphanumeric/symbol key.

Note: *The alphanumeric keys are "sticky" which means that they are pressed one at a time.*

Alphanumeric Keypad Key Combinations

Table 3: Alphanumeric Keypad Key Combinations

Key(s)	Function(s)
<menu>	1) Powers collector ON. 2) Displays the Main menu.
<shift>	When entering character string data, changes lower to upper case.
<shift>, <menu>	Move to previous menu action.
<view>	Displays menu for Descriptors, Characteristic Review, Torque Curve, X-Bar & R, X-Bar & S, Histogram and Histogram Statistics selections. As set in Preferences.
<data>	1) Go to the Data Entry screen. 2) While collecting data, pressing the data key displays assigned image.
<select>	Displays the Select Menu, allowing you to select a setup or characteristic.
<symbol>, <select>	While collecting data, displays a prompt to jump to a specified characteristic for data collection.
<enter>	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.
<▲>	Moves a selection cursor to the previous field in a menu or list.
<▼>	Moves the selection cursor to the next field in a menu or list.
<◀>	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.
<▶>	1) Moves the selection cursor to the right while in a menu. 2) Moves the cursor one character to the right in an input box.
<▶▶>	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 move to the next characteristic. 4) When an input box is displayed, close and enter the input string.
<◀◀>	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 move to the previous characteristic. 4) When an input box is displayed, delete the previous character in the input string.

Table 3: Alphanumeric Keypad Key Combinations

Key(s)	Function(s)
<symbol>,  , 1-9	Creates the left symbol shown over the selected number key.
<symbol>,  , 1-9	Creates the center symbol shown over the selected number key.
<symbol>,  , 1-9	Creates the right symbol shown over the selected number key.
<.>	Use the period key to enter a decimal point in a number.
<->	Use the minus key to enter a negative number.
space	Creates a space after a letter, number or symbol.
	Deletes one character to the left of the prompt.
<shift>, 	Deletes a complete line of characters.
 , 1-9	Creates the left letter shown on the top of the key.
 , 1-9	Creates the center letter shown on the top of the key.
 , 1-9	Creates the right letter shown on the top of the key.
<shift>,  , 1-9	Creates the left letter shown on the top of the key in upper case.
<shift>,  , 1-9	Creates the center letter shown on the top of the key in upper case.
<shift>,  , 1-9	Creates the right letter shown on the top of the key in upper case.

Examples of Using the Alphanumeric Keypad

The following example shows which keys to press to create specific letters or symbols. None of the keys on the alphanumeric keypad are pressed at the same time, instead press one key at a time in the order indicated. Key names appear within angle brackets, for example, the Symbol key is written as <symbol> and the number 2 key as <2>.

Table 4: Examples of Using the Alphanumeric Keypad

To Enter...	Press these keys...
#	<symbol>  <6>
Z	 <3>
To enter a source code such as k,g1:	
k	 <4>
,	<symbol>  <1>
g	 <9>
1	<1>

Interface Basics

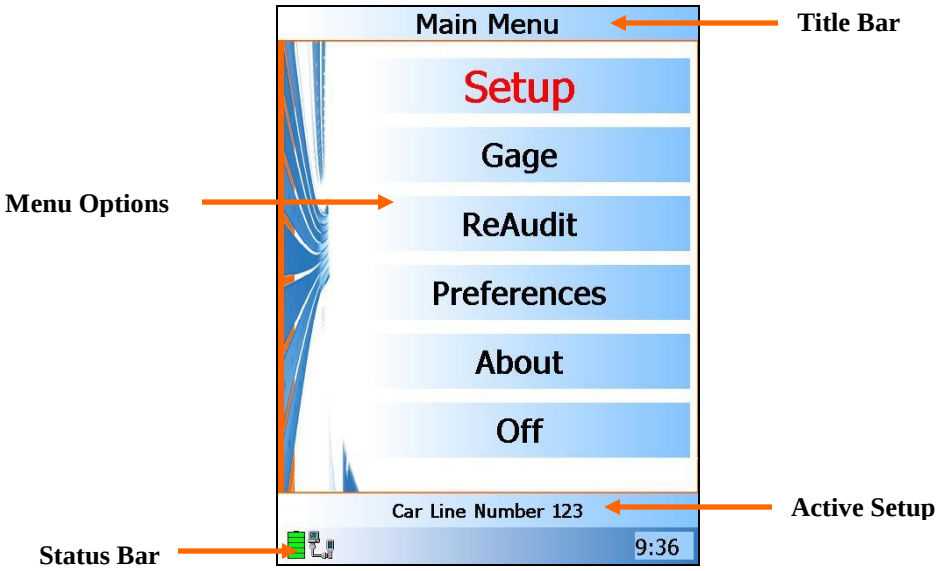
Before starting up the data collector, make sure that the batteries are installed and fully charged.

Powering the Data Collector On

Step

1. Press the <menu> key.

   In a moment, the 600 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.
- **Menu Options** - Submenu Options list the procedures you can perform. The currently selected option is highlighted in red. 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 setup currently active in the data collector.
- **Status Bar** - The Status Bar appears at the bottom of the display and tells you status information for power, time and connectivity.

Powering the 600 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 600 Handheld Data Collector.

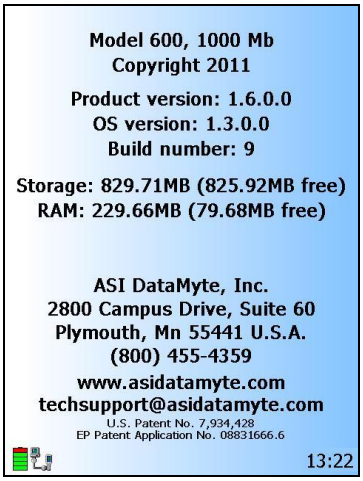
- The data collector model number
- The amount of installed memory in megabytes
- The data collector software version number and build number
- ASI DataMyte's address and technical support telephone number
- Patent information

To display the About screen, perform the following.

Steps

1. Power the 600 Data Collector on.
2. Press ▲ or ▼ to select About and press <enter>.

The About the 600 screen appears:



SECTION

3

Configuring the Data Collector

Introduction

This section contains procedures for configuring preferences and for configuring views for the 600 Handheld Data Collector. Preferences allow you to customize your data collector with settings for features such as key click sound, LED duration, and data collection preferences.

Setting Preferences

1. Press ▲ or ▼ to select **Preferences** and press <enter>.
2. Press ▲ or ▼ to select the device preference to change, and press <enter> to either toggle the parameter value or display a data input prompt. See Table 5 on the following page for a description of each option.

Setting Preferences

Table 5: Preferences

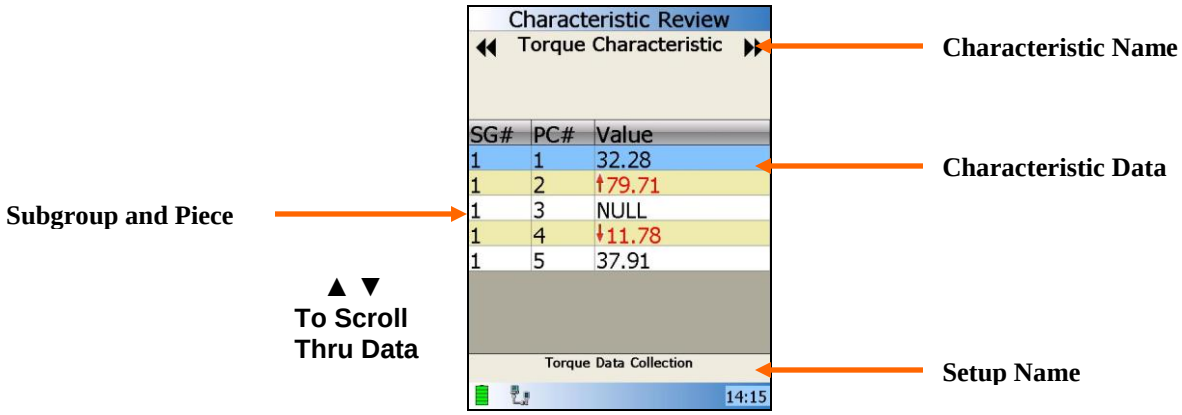
Preference	Description	Settings
Key Click	Clicking sound when Keypad key is pressed.	(On) or (Off)
Key Repeat	Auto-repeat when key is pressed.	(On) or (Off)
Key Case	Determines default case of letter.	(Upper) or (Lower)
Enable Buzzer	Turning on or off the buzzer.	(Enable) or (Disable)
Buzzer Volume	Determines the loudness of the speaker.	(High) or (Low)
Buzzer Tone	Determines the pitch of the speaker.	(1)–(16) (lower to higher)
LCD Brightness	Determines the brightness of the display.	(1)–(8) (dim to bright)
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.	(0)–(999) seconds
Retake Prompting	Determines whether a prompt asking the operator to retake an out-of-spec reading appears during data collection.	(On) or (Off)
Sort Setup List	Determines how the list of setups is displayed.	(AlphaNum) or (None)
Save Torque Option	Determines when torque curve data is stored in memory.	(None), (On Spec Violation), (Exceptions) or (Automatic)
View 1 Option	Determines which default graphical representation of data is displayed when the <view> button is selected.	(None), (Torque Curve), XBar & R Chart), Histogram), (Histogram Stats), (Xbar & S Chart), (Chars Review) and (Descriptors)
View 2 Option	Determines which default graphical representation of data is displayed when <shift> then <view> buttons are selected.	(None), (Torque Curve), XBar & R Chart), Histogram), (Histogram Stats), (Xbar & S Chart), (Chars Review) and (Descriptors)
Languages	Determines which language the data collect application is displayed in.	German, English, Spanish, Ford, French, Italian, Portuguese, and Chinese
Number Decimal Separator	Determines which character is used as the decimal separator.	Dot (.) or Comma (,)

Common Views

The Characteristic Review, Torque Curve (only available with a Torque Module), X-Bar & R, X-Bar & Sigma, Histogram and Histogram Statistics views are common to the ASI DataMyte 600 data collector. These views are displayed by hitting the <view> button on the 600 data collector.

Characteristic Review

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

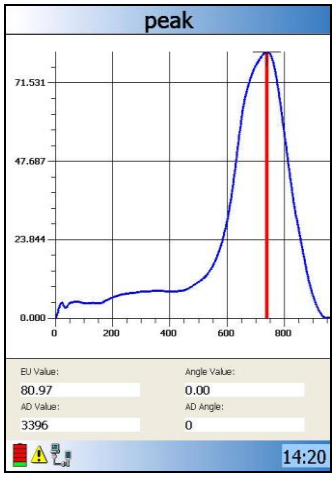


Steps

- Use ◀◀ or ▶▶ to move between characteristics.
- Select a line and press <**shift**>+<**data**> to jump to the selected place in the data collection sequence for a NULL value. This does not function unless there is a NULL value.

Torque Curve

The Torque Curve screen displays the torque curve for the most recent torque event (only available with a Torque Module). The curve and its associated values may be saved for export to appropriate support software, such as TranSend II.



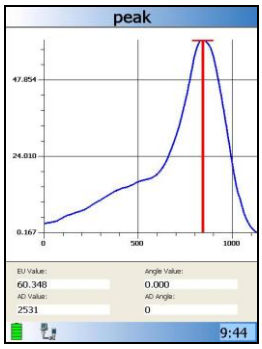
Note:
Saving torque curves is controlled by a setting in the Preferences:
None: No torque curve will be saved.
Out of Spec: A torque curve will be saved each time a data value out of spec is taken.
Exceptions: Torque curves with no saved value will be saved. (Default Setting)
Automatic: All torque reading collected will be saved.

Step

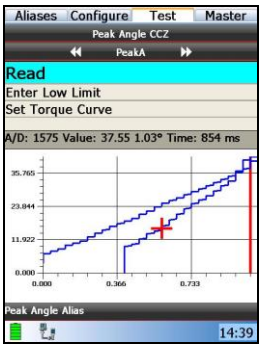
- Press <**shift**>, <**enter**> to save the Torque Curve, making it available for transfer.

Torque View

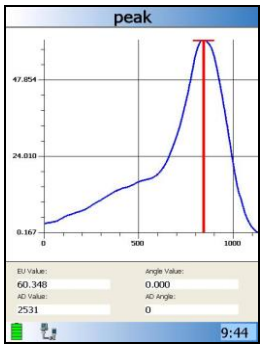
The displayed torque curve will plot the points that occur from the time the analog signal crosses the start threshold to the time that the signal successfully crosses the stop threshold. The torque event will be scaled to fit, regardless of duration:



Torque Curve, View



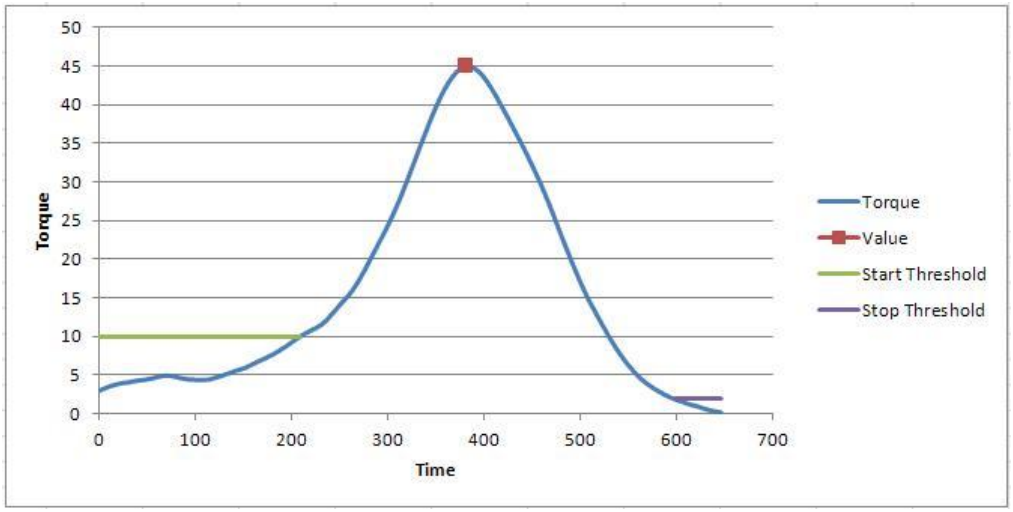
Torque Curve With Angle, Gage Test



Torque Curve, Pick a Point

Torque Curve Export

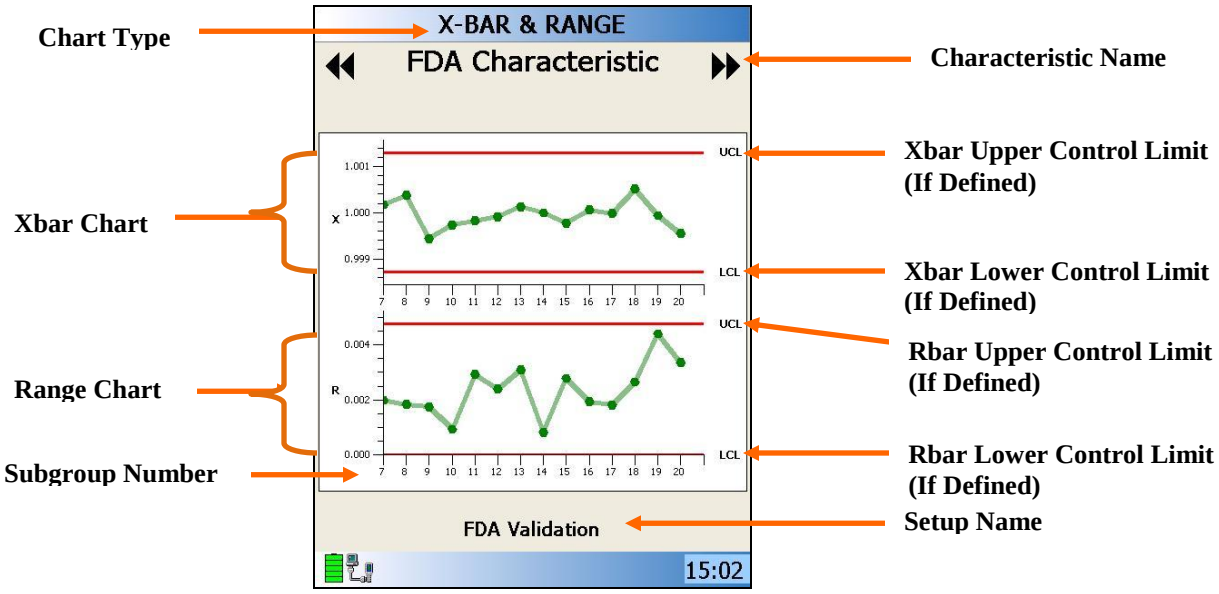
A Torque Curve View may be saved for export to Excel for more detailed analysis. When a Torque Curve View is displayed, pressing <shift><enter> will save the torque curve as a file to be exported at a later time.



Note: You may import Torque Curve data to Microsoft Excel using the ASI DataMyte TranSend II application (an example of which is shown above).

X-Bar & R (Range)

The X-Bar & Range screen displays the data collected for a given characteristic in a setup.



- Use ◄◄ or ►► to move between characteristics.
- Points on the Xbar and Range chart:

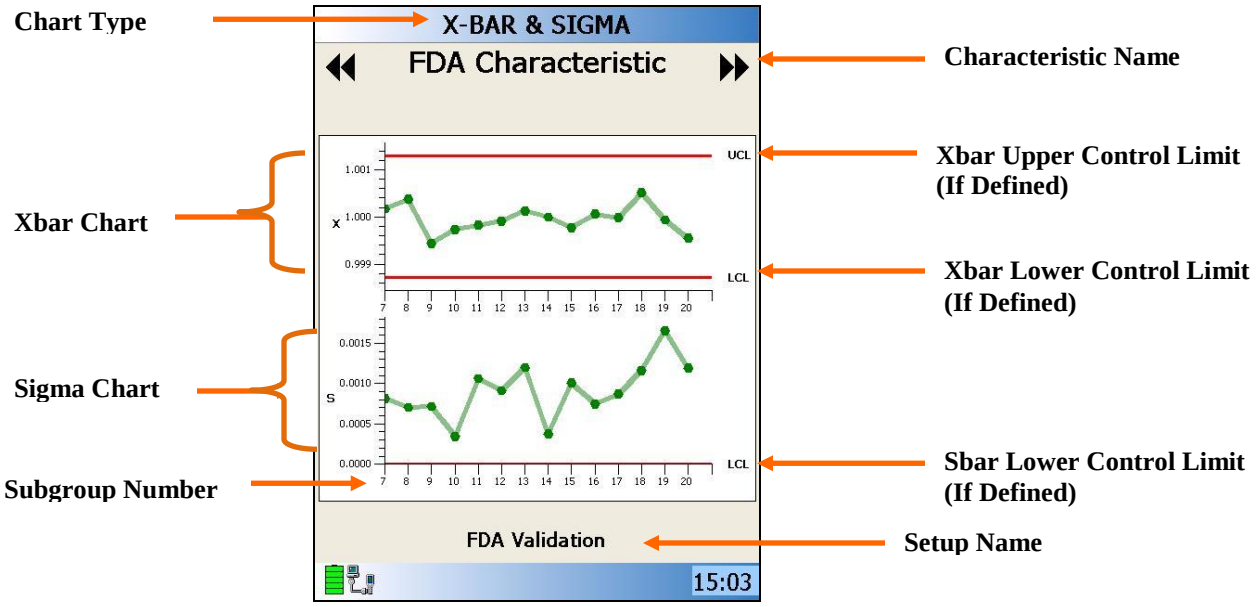
  Mean – (X-bar or MX-bar) The average of a sample which is the sum of readings divided by the number of readings. For Individuals chart, the "Mean" is plotted as a Moving Average.

  R or MR – The range (or Moving Range) of samples. The difference between the highest and lowest readings within a subgroup. For Individuals chart, the "Range" is plotted as a Moving Range.
- A plotted point on the X-bar and Range chart takes any one of the following forms:

  - Point in control
  - Point to represent incomplete characteristic (partially missing data)
  - Point between control limit and 10% greater/less than control limit
  - Point greater than 10 % above UCL
  - Point less than 10% below LCL
- In addition, a point may be missing from the chart, indicating that the subgroup was skipped altogether. There may be no connecting line between to sequential points, indicating that the latter subgroup is incomplete.

X-Bar & S (Sigma)

The X-Bar & Sigma screen displays the data collected for a given characteristic in a setup.



- Use ◀◀ or ▶▶ to move between characteristics.
- Points on the Xbar and Sigma chart:

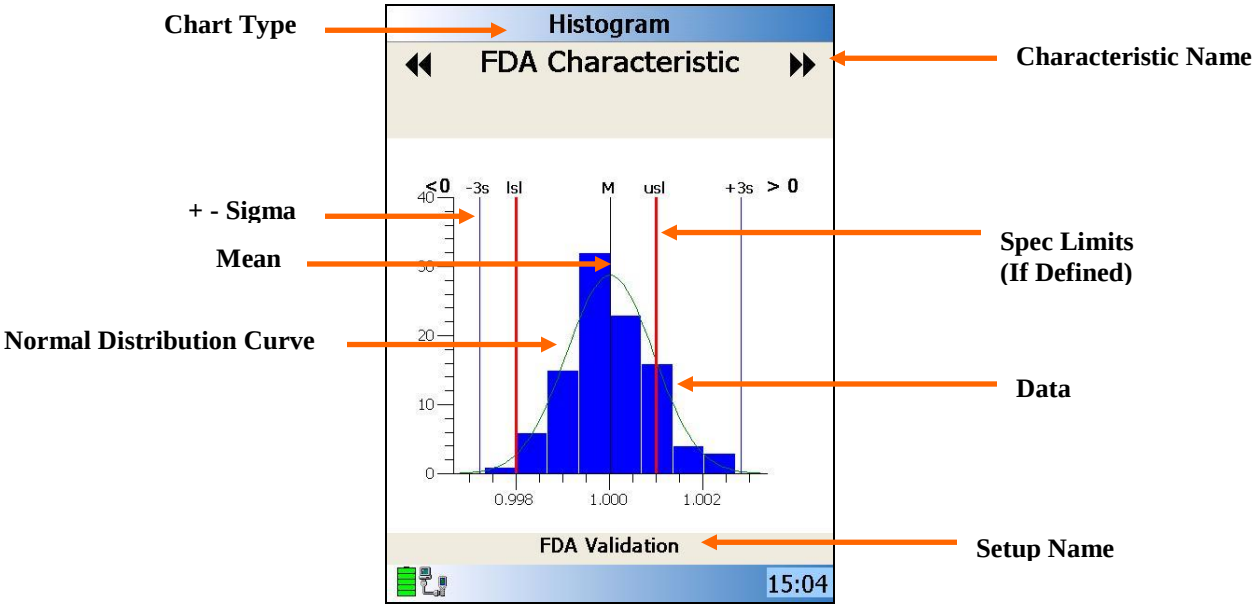
  Mean – (X-bar or MX-bar) The average of a sample which is the sum of readings divided by the number of readings. For Individuals chart, the "Mean" is plotted as a Moving Average.

  S – The sigma of samples. The difference between the highest and lowest readings within a subgroup. For Individuals chart, the Moving Range chart is displayed.
- A plotted point on the X-bar and Sigma chart takes any one of the following forms:

  - Point in control
  - Point to represent incomplete characteristic (partially missing data)
  - Point between control limit and 10% greater/less than control limit
  - Point greater than 10 % above UCL
  - Point less than 10% below LCL
- In addition, a point may be missing from the chart, indicating that the subgroup was skipped altogether. There may be no connecting line between to sequential points, indicating that the latter subgroup is incomplete.

Histogram

The Histogram screen displays the data collected for a given characteristic in a setup.



- Use ◄◄ or ►► to move between characteristics.
- The Histogram Chart displays the following information:

  Upper and Lower Specification Limits (USL and LSL) – The vertical lines indicating the highest and lowest values of a product dimension or measurement that is acceptable.

  Mean and ±3 Sigma Lines – The vertical lines indicating ±3 Sigma from the mean of the distribution.

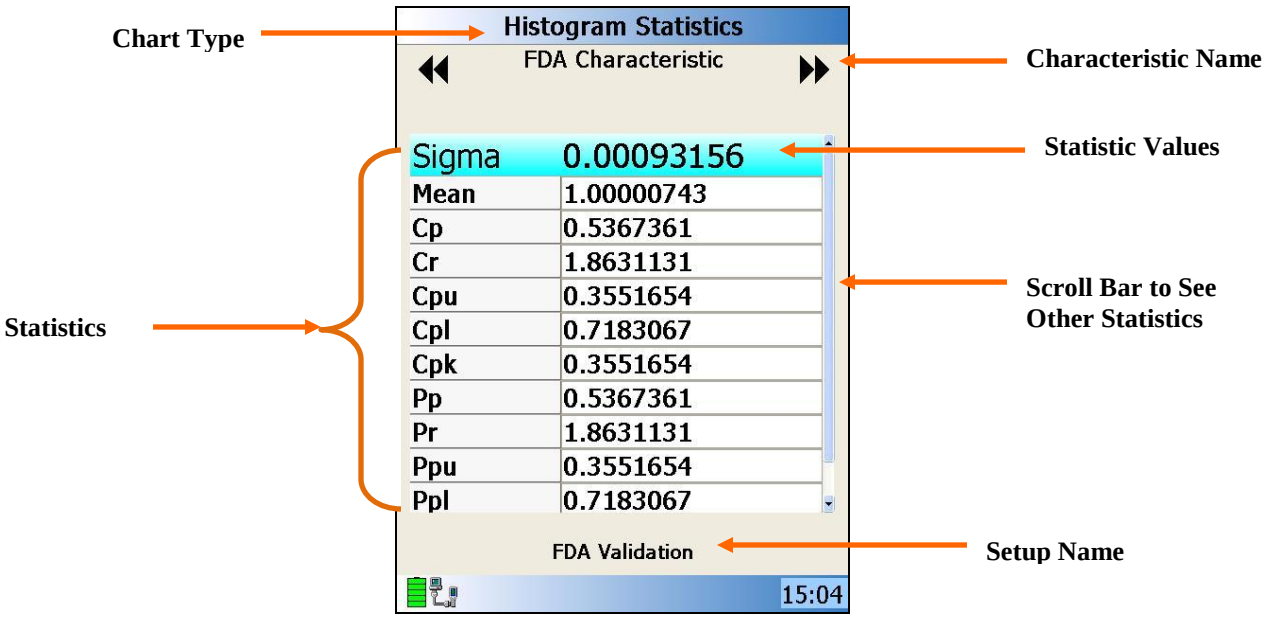
  Frequency –The y axis line represents the number of data points that fall within a class interval. Relative frequency is the frequency divided by the total number of readings in a population.

  Class Interval (Bin Width) – A range of readings of equal length (also called a cell or bin). The entire set of intervals makes up the x axis line over which data points are plotted. Each bar covers an interval and is centered at the midpoint.

The bin width is constrained to be a multiple of the resolution for the characteristic. Without this constraint, histograms would erroneously indicate an uneven distribution of data. If a value falls on the boundary between two bins, it is placed in the bin above the boundary. Points lying outside the distribution may not be shown on the chart; a message **(<0 or >0)** indicates how many values are not displayed and what side of the chart they are on.

Histogram Statistics

The Histogram Statistics screen displays the data collected for a given characteristic in a setup.



- Use ◄◄ or ►► to move between characteristics.
- All statistics are based on the standard sigma calculation.

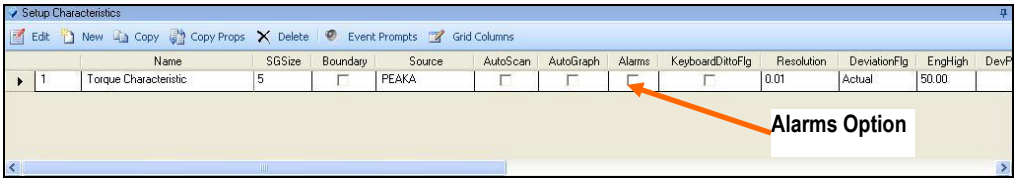
Enabling Alarms

The 600 Data Collector only monitors events on a characteristic when the Alarm is set for the current characteristic. In TranSend II, toggle the Alarm parameter (On) or (Off) for each characteristic. Follow these steps to enable an alarm.

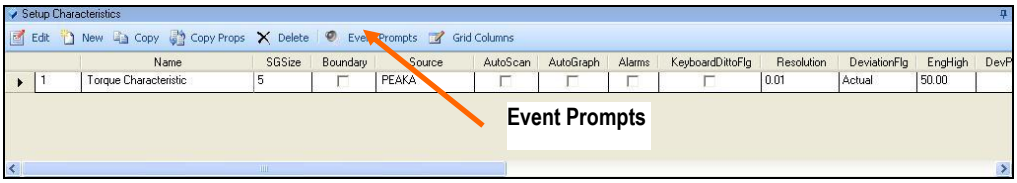
Steps

1. From the TranSend II main menu, select <Setup Editor>.
2. Double click the desired setup.

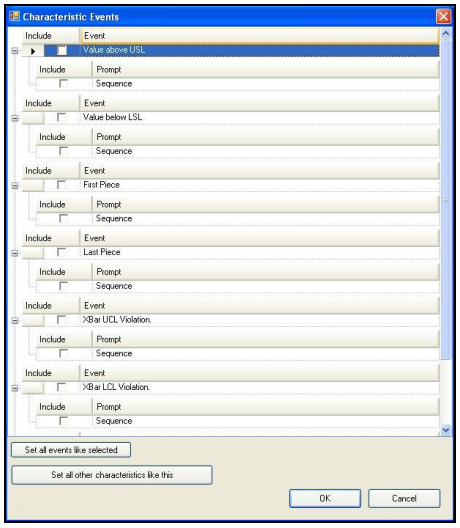
   The Alarms option appears in the Setup Characteristics section.



3. Mouse click to toggle the Alarms setting to **On**.
4. Click <Event Prompts> to display a list of characteristic event conditions to monitor.



5. Press ▲ or ▼ to scroll through the list of conditions, and mouse click at each entry to monitor.
6. When all items are selected, press <**OK**> or set the event conditions.



7. Select the save conditions for this set of event conditions and press <OK>.
    - **Set all events like selected**: apply these conditions to all events in current characteristic. You can then set unique conditions for other characteristics.
    - **Set all other characteristics like this**: apply these conditions to the current characteristic and all characteristic in this setup.
    - **Cancel**: returns to the setup without making any changes.
8. Repeat for each characteristic in the setup (scroll through the characteristics), if necessary.

SECTION

4

Configuring Gages

Introduction

This section includes procedures for configuring, mastering and testing torque tools. Torque Tools are connecting to the Torque Module port on the data collector. The data collector software requires different configuration information depending on these various types. For detailed information about torque tool 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 the gage vendor or ASI DataMyte Technical Support.
- Obtain the required communications parameters from the gage documentation.

Supported Gage Types

The 600 data collector can accept input from the following types of gages:

- **Digital –** C.D.I., Maxum, Mitutoyo, Sylvac Serial, and Ono Sokki digital gages. You should know the gage parameters (if any) for proper gage configuration.
- **Serial** – RS232, TTL, or RS422 gages. Communication parameters (i.e., data bits, stop bits, parity, baud rate, Inquiry/Response strings, etc.) must be known during configuration.

Note*: Barcode Wands are considered serial devices or keyboard wedge.*

- **Continuous Serial –** RS232 with continuous output. 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 600 Handheld Data Collector.
- **Torque Tools** – Torque Wrenches and Rotary Transducers require that the torque module be installed.

Analog Gage Manufacturers

Gages from the following gage manufacturers can be configured for use with the 600 Data Collector.

Analog Gage Manufacturers

Gage Manufacturer	Address
Linear Measurement Instruments, Corporation	101 North Alloy Drive Fenton, Michigan 48430 Phone: 810-714-5811 Fax: 810-714-5711

Gage List

Many different gages can be attached to the 600 Handheld Data Collector to gather information. Each gage used with the data collector is defined in the Gage Suite that is transferred from the TranSend II application. The Gage Suite is used to:

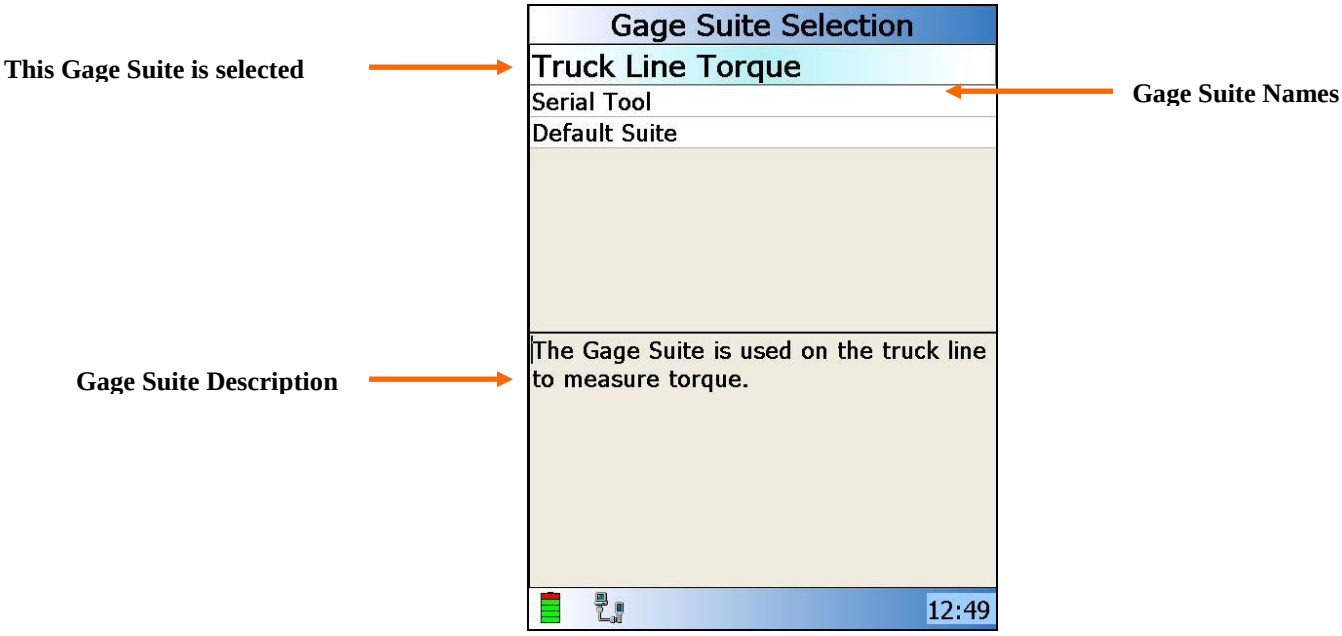
- Provide a List of Gage Input Ports used by the data collector.
- Indicate how a particular Gage Input Port is presently configured.

Perform the following steps to access the Gage Suite.

Steps

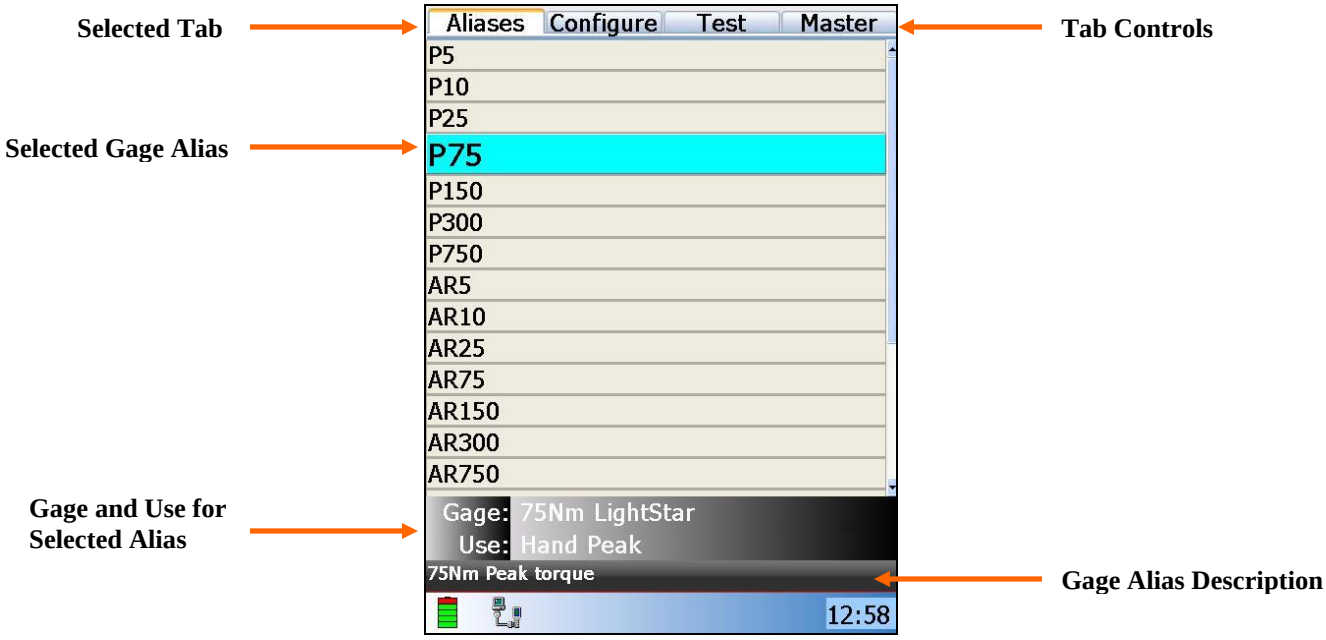
1. From the Main menu, press ▲ or ▼ to select **Gage** and press <enter>.

   The Gage Suite Selection window opens.



2. Press ▲ or ▼ to scroll through the list of gage suites and press <enter> to select.

The Gage Alias window opens.

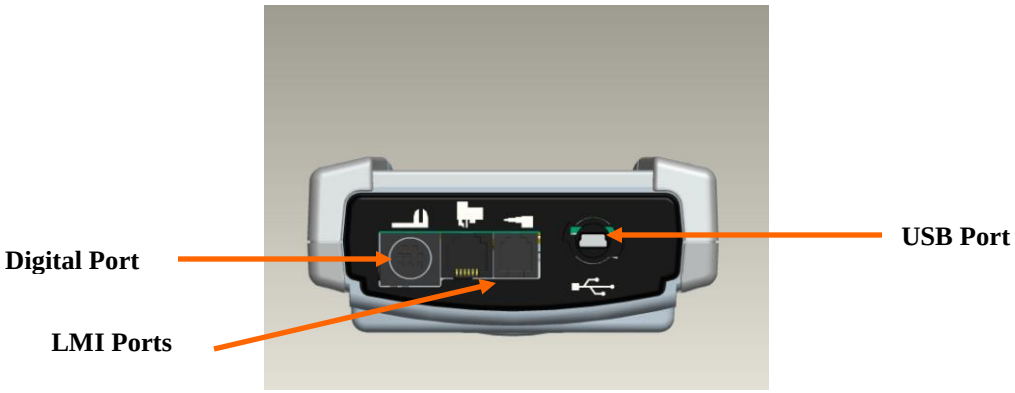


3. Press ◄ or ► to configure, test, or master a port and/or gage (see page 56).

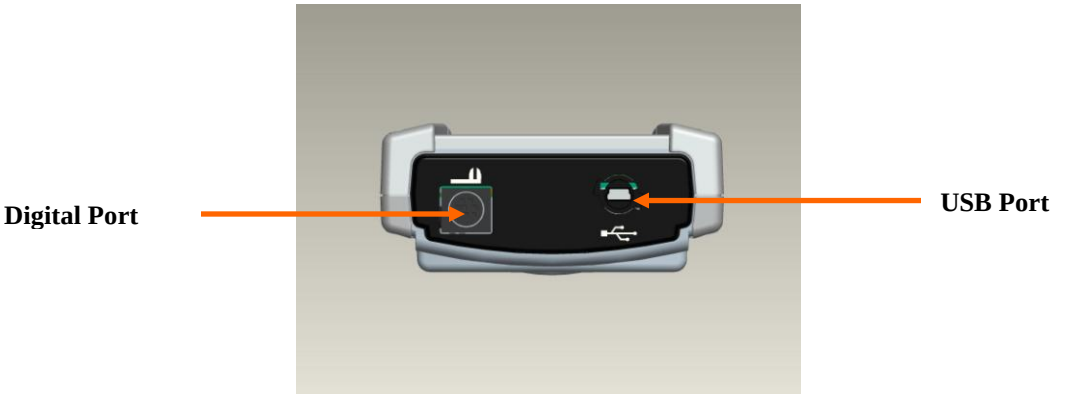
Gage Input Port Identification

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.

Torque Option



LMI Option



Digital Option

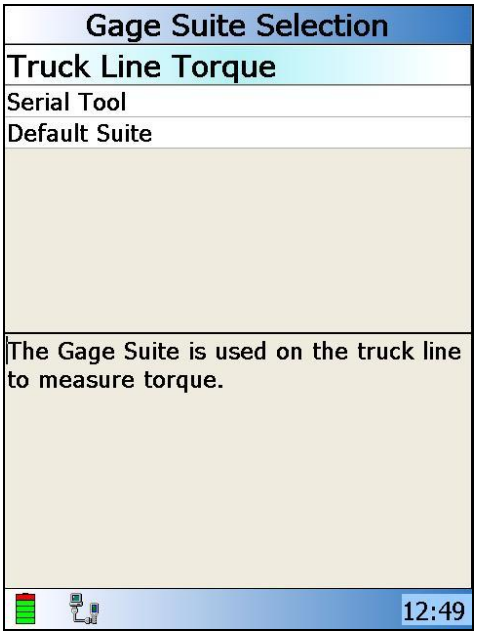
Figure 17. Gage Input Ports

Configuring the Torque Port

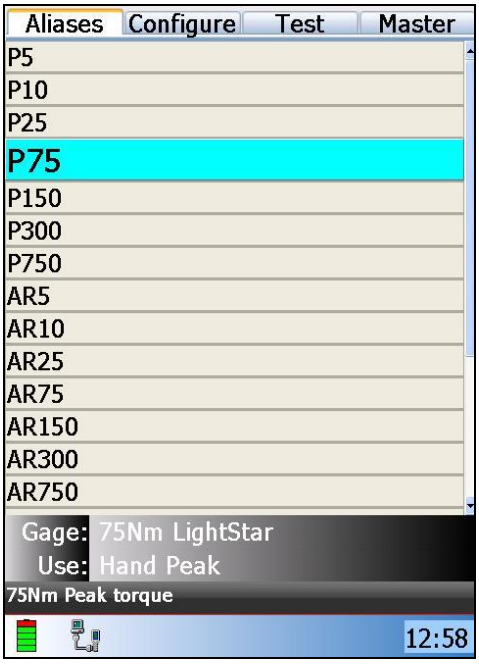
Torque is a measurement of force applied to tighten or remove a threaded fastener (such as a bolt, screw, or nut). Refer to section 7 for more information about torque applications.

Steps

1. Connect the wrench with the appropriate cable to the torque wrench input port.
2. On the Main menu, select **Gage** and press <enter>.



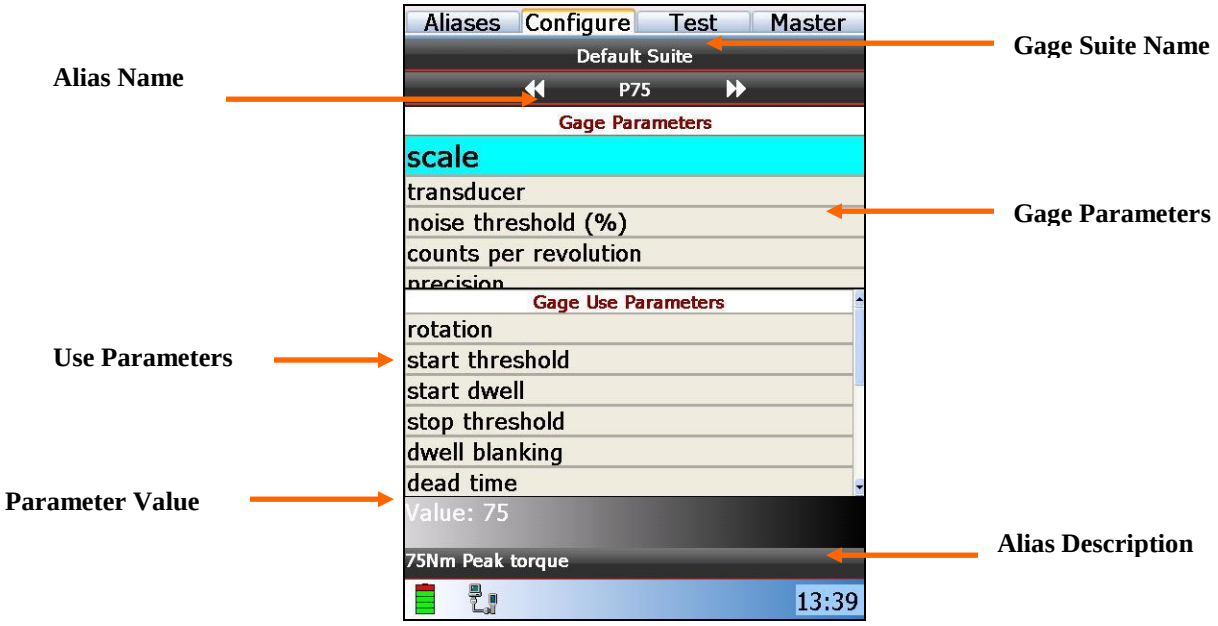
3. Press ▲ or ▼ to select a torque gage suite from the Gage Suite Selection screen.



3. Press ▲ or ▼ to select a torque gage alias from the Gage Alias Selection screen.

4. Press ◄ or ► to select **Configure** in the Alias List submenu.

   The Configure Gage Parameters screen opens for the selected gage alias.



5. Complete the required fields in the Configure Gages screen. See Table 6, “Torque Configuration Options,” on the next page for details about additional options for each (general) parameter.
6. When you have set all of the configuration options, either press the <menu> key or any arrow key.

Torque Port Configuration Options

Table 6: Torque Configuration Options

Field	Description	Options
Scale	Maximum value the torque wrench or in-line transducer is rated for. This value is often stamped on the gage. For a 100 ft/lb wrench, the full scale is 100.	0-10,000
Rotation	Direction that the wrench or fastening device must be turned in the application.	CW, CCW
Transducer	Sensitivity rating of the transducer. Most handheld torque wrenches are 2.0 mv/v. Collector sensitivity is fixed at 2.0 mv/v, with 1.0 and 1.6 values scaled.	1.0 mv/v,1.6 mv/v or 2.0mv/v Bridge
Pick-a-point	This option provides a means of selecting any point from a torque waveform and to store that selected point as the reading.	On, Off
Sample Event (Peak, Pulse, Breakaway, Restart only)	Samples the torque signal at either a change in time or a change in angle.	Time, Angle
Sample Time	The time duration between consecutive signal samples.	0.05, 0.1, 0.5, 1, 3, 5, 10ms
Start Threshold	A percentage of the lower spec limit (or of the full scale if lower spec limit is not defined) that the signal must rise above for the amount of time specified by the value for “Start Dwell” in order to be considered a valid signal. If the value for Start Threshold is too high, it may mask the actual peak signal. If the value is too low, it will not mask the noisy portion of the signal.	2 to 99% of full scale
Start Dwell	Minimum amount of time that the signal must remain above the value set for “Start Threshold” in order to be considered a valid signal. If the value for “Start Dwell” is set too short, random noise may be accepted as data.	0-100 ms
Stop Threshold	A percentage of the full scale value that the signal must remain below for the amount of time set in “Stop Dwell” in order to terminate detection and accept a reading.	1 to (start threshold -1)% of full scale
Stop Dwell	Amount of time that the signal must remain below the “Stop Threshold” in order to terminate detection and accept a reading.	0-1000 ms
Peak Duration (Peak Torque only)	The number of consecutive signal samples that must be within the number of A/D bits as specified by the Peak Zone. To use only the value of the highest point, set duration to 1; to use the value of the plateau, set the value to a number less that number of pixels that make the plateau in the curve plot window.	1-10
Extension Multiplier	This option will multiply the gage result by a constant. This is typically used with gage extensions.	.5 to 2.00

Table 6: Torque Configuration Options

Field	Description	Options
Peak Zone (Peak Torque only)	The number of A/D bits that a number of consecutive signals must be within in order to qualify as a peak. Set this large enough to always take a reading, but small enough so that the point of interest is always in the flat part of the plateau.	1-10
Dwell Blanking	This option determines whether a valid signal will be accepted during the amount of time set in “Start Dwell”.	(On) or (Off)
Dead Time	Minimum amount of time after the signal has fallen below the Stop Dwell time before the data collector can accept another reading.	0-1000 ms
Delta Slope (Breakaway and Restart only)	Required percentage change in the slope of the curve to indicate breakaway.	1- 99%
Counts per Revolution	Angle-based breakaway and Restart constrain the Counts per Revolution to be 9828 to match the LightStar wrench (with angle option). The number of pulses per revolution generated by your rotary transducer with angle. Typically 720, 1440, 2160, 2880, 9828.	0 - 65000
Use (Angle Torque only)	Capture an angle value as data. Hand Set an angle of rotation past a minimum torque.	Capture, Set
Noise Threshold (Not for angle torque)	A percentage of full scale that the input signal must cross before a signal can be considered a valid signal.	2-20%
Gage LED	Set to (On) only if using an LED indicating wrench (if set to (On) with non-LED wrenches, erroneous behavior may result).	(On) or (Off)
Precision	Decimal precision for gage values.	0 to 8
Angle Precision	Decimal precision for angle values.	0 to 8
Alignment Frequency Type	The type of alignment frequency.	Hours or Days
Alignment Frequency	The precision of alignment frequency.	2 to 99 Hours or Days
Over Torque Alert (Breakaway, Restart and Torque At Angle only)	A percentage of full scale that if the input signal crosses will result in an Over Torque message.	0 to 100 % of Full Scale
Timeout (Breakaway, Restart and Torque At Angle only)	Time limit (in seconds) on the duration of an angle based reading.	1 to 10 Seconds
Minimum Rotation (Breakaway and Restart only)	This option determines the minimum rotation before a valid reading can be taken.	0.0 to 5.0 Degrees
Restart Window (Breakaway and Restart	Amount of angular rotation past the break point to discover additional tightening to confirm the break.	0.1 to 9.0 Degrees

Table 6: Torque Configuration Options

Field	Description	Options
only)		
Capture Angle (Torque At Angle Only)	This option determines the minimum angle rotation.	0.25 to 20 Degrees

Torque Type Parameters

The following tables provide additional parameter information for the type of torque measurement selected.

Table 7: Set Torque Parameters

Parameter	Values	Default
Gage Parameters		
Scale	0.0 to 10000.0	100
Transducer	1.0, 1.6, 2.0 mv/v	2.0 mv/v
Noise Threshold (%)	2% to 20% of Full Scale	3%
Counts per Revolution	1 to 65000	9828
Precision	0 to 8	2 Decimal Places
Angle Precision	0 to 8	2 Decimal Places
Gage Use Parameters		
Rotation	CW/CCW	CW
Start Threshold	2% to 100% of Lower Spec Limit (or 5% Full Scale if no LSL)	100%
Stop Threshold *	1% to (Start Threshold – 1)% of Full Scale	2%
Start Dwell	0 to 100 (0.050 ms resolution if less than 10ms)	10 ms
Stop Dwell	0 to 1000	50 ms
Dead Time	0 to 1000	300 ms
Gage LED	On/Off	On
Extension Multiplier	Non Zero	1

* If the actual stop threshold becomes greater than the start threshold, the torque algorithm code will constrain the stop threshold to be equal to the start threshold.

Table 8: Peak Torque Parameters

Parameter	Values	Default
Gage Parameters		
Scale	0.0 to 10000.0	100
Transducer	1.0, 1.6, 2.0 mv/v	2.0 mv/v
Noise Threshold (%)	2% to 20% of Full Scale	3%
Counts per Revolution	Fixed at 9828	9828
Precision	0 to 8	2 Decimal Places
Angle Precision	0 to 8	2 Decimal Places
Gage Use Parameters	**If Sample Event = Time**	
Sample Time	0.050 to 250 (0.050 ms resolution if < 10ms)	1 ms
Rotation	CW/CCW	CW
Pick-a-Point	On/Off	Off
Start Threshold	2% to 99% of LSL (or 5% Full Scale if no LSL)	50%
Stop Threshold **	1% to (Start Threshold – 1)% of Full Scale	2%
Start Dwell	0 to 100 (0.050 ms resolution < than 10ms)	30 ms
Stop Dwell	0 to 1000	50 ms
Dead Time	0 to 1000	300 ms
Dwell Blanking	On/Off	Off
Gage LED	On/Off	On
Peak Duration	1 to 10	1 sample
Peak Zone	1 to 10	1 bit
Extension Multiplier	Non Zero	1
	If Sample Event = Angle	
Rotation	CW/CCW	CW
Pick-a-Point	On/Off	Off
Start Threshold	2% to 99% of LSL (or 5% Full Scale if no LSL)	50%
Stop Threshold **	1% to (Start Threshold – 1)% of Full Scale	2%
Start Dwell	0 to 100 (0.050 ms resolution < than 10ms)	2 ms
Stop Dwell	0 to 1000	350 ms
Dead Time	0 to 1000	300 ms
Dwell Blanking	On/Off	Off
Gage LED	On/Off	On
Peak Duration	1 to 10	1 sample
Peak Zone	1 to 10	1 bit
Extension Multiplier	Non Zero	1

** If the actual stop threshold becomes greater than the start threshold, the torque algorithm code will constrain the stop threshold to be equal to the start threshold.

Table 9: Breakaway Torque Parameters

Parameter	Values	Default
Gage Parameters		
Scale	0.0 to 10000.0	100
Transducer	1.0, 1.6, 2.0 mv/v	2.0 mv/v
Noise Threshold	3% to 20% of Full Scale	3%
Counts per Revolution	Fixed at 9828	9828
Precision	0 to 8	2 Decimal Places
Angle Precision	0 to 8	2 Decimal Places
Gage Use Parameters		
Rotation	CW/CCW	CW
Pick-a-point	On/Off	Off
Start Threshold *	2% to 99% of LSL (or 5% Full Scale if no LSL)	50%
Over Torque	0 to 100% of Full Scale	30%
Timeout	1 to 10 Seconds	10 Seconds
Minimum Rotation	0-5 degrees	1
Restart Window	0.1-9.0 degrees	1.5
Delta Slope	1 to 99	60
Extension Multiplier	Non Zero	1

* If the actual stop threshold becomes greater than the start threshold, the torque algorithm code will constrain the stop threshold to be equal to the start threshold.

Table 10: Restart Torque Parameters

Parameter	Values	Default
Gage Parameters		
Scale	0.0 to 10000.0	100
Transducer	1.0, 1.6, 2.0 mv/v	2.0 mv/v
Noise Threshold	3% to 20% of Full Scale	3%
Counts per Revolution	Fixed at 9828	9828
Precision	0 to 8	2 Decimal Places
Angle Precision	0 to 8	2 Decimal Places
Gage Use Parameters		
Rotation	CW/CCW	CW
Pick-a-point	On/Off	Off
Start Threshold *	2% to 99% of LSL (or 5% Full Scale if no LSL)	50%
Over Torque	0 to 100% of Full Scale	30%
Timeout	1 to 10 Seconds	10 Seconds
Minimum Rotation	0-5 degrees	1
Restart Window	0.1-9.0 degrees	1.5
Delta Slope	1 to 99	60
Extension Multiplier	Non Zero	1

* If the actual stop threshold becomes greater than the start threshold, the torque algorithm code will constrain the stop threshold to be equal to the start threshold.

Table 11: Pulse Torque Parameters

Parameter	Values	Default
Gage Parameters		
Scale	0.0 to 10000.0	100
Transducer	1.0, 1.6, 2.0 mv/v	2.0 mv/v
Noise Threshold	3% to 20% of Full Scale	3%
Counts per Revolution	Fixed at 9828	1440
Precision	0 to 8	2 Decimal Places
Angle Precision	0 to 8	2 Decimal Places
Gage Use Parameters		
Sample Time	0.050 to 250 (0.050 ms resolution if < 10ms)	0.100 ms
Rotation	CW/CCW	CW
Pick-a-point	On/Off	Off
Start Threshold	2% to 99% of LSL (or 5% Full Scale if no LSL)	50%
Start Dwell	0.050 to 50.0 (0.050 ms resolution if < 10ms)	0.25 ms
Stop Dwell	0 to 1000	300 ms
Gage LED	On/Off	Off
Extension Multiplier	Non Zero	1

* If the actual stop threshold becomes greater than the start threshold, the torque algorithm code will constrain the stop threshold to be equal to the start threshold.

Mastering Gages

Mastering a gage calibrates the 600 Handheld Data Collector to known mechanical references (masters). Master an analog gage whenever it is to be used in a new configuration.

Analog Gages

Analog gages must be mastered before they are used for data collection. Although the 600 Handheld Data Collector retains the mastering in memory even when the power is turned off, it is recommended that analog gages be re-mastered periodically. This could be once a shift, once a week, or before each time that the gage is used. Re-master the gage whenever a new gage is used even if the same type of gage is to be used for measurement.

Mastering for analog gages can be of three types:

- One-Point Mastering – Calibrates or masters a gage using one known points as numeric values.
- Two-Point Mastering – Calibrates or masters a gage using two known points as numeric values.
- Three-Point Mastering – Calibrates or masters a gage using two steps that define the scale and direction, and a third step that establishes offset.

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 alias to master from the Gage Suite screen.
5. Press ◄ or ► to select **Master** in the Gage Alias submenu.

   Different options appear at the bottom of the Master Gages screen depending on how the gage was configured. If two-point mastering was selected in the configuration, Master Hi and Master Lo are available. If three-point mastering was selected in the configuration, Master Lo, Master Hi, and Master Zero are available.

Note: *When mastering gages at the full extent of their travel, it may be necessary to set the* Start Threshold *gage parameter to a negative value in order to use the Time at Level option.*

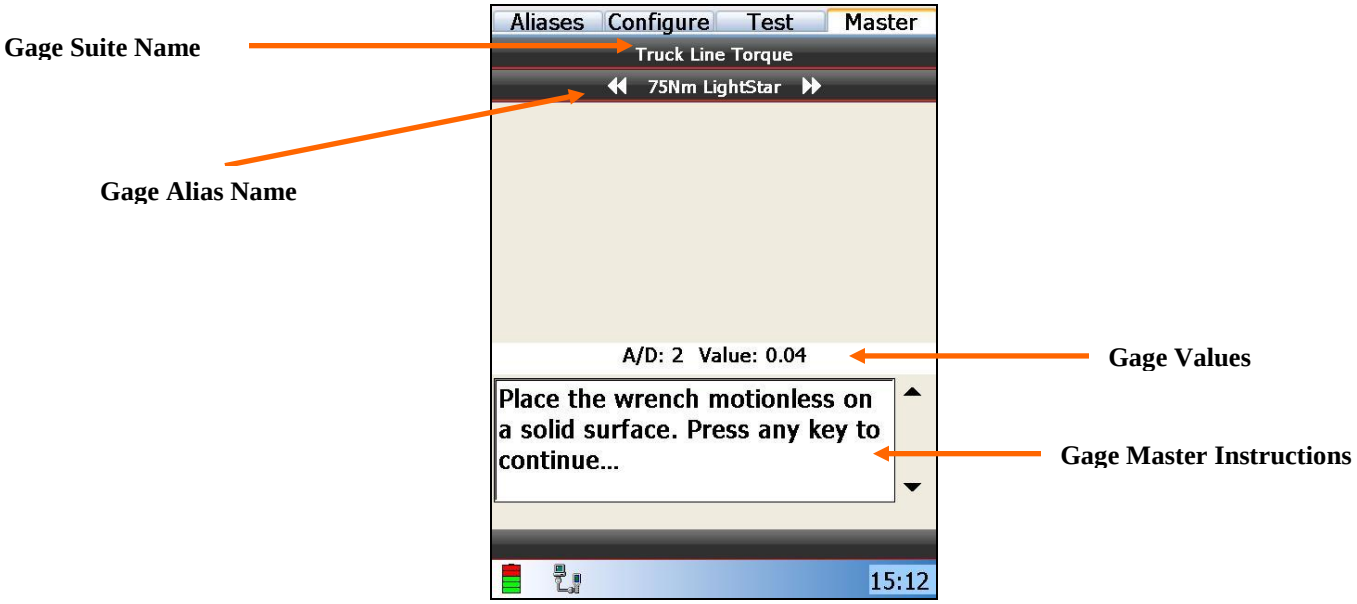
Torque Tools

Most torque tools produce an output voltage of zero when at rest. Because some residual offset is possible, it is necessary to master the output of the tool at a resting value. Moreover, each tool may have different output voltages when at rest. It is recommended that all torque tools used during data collection be mastered before use each shift.

Steps

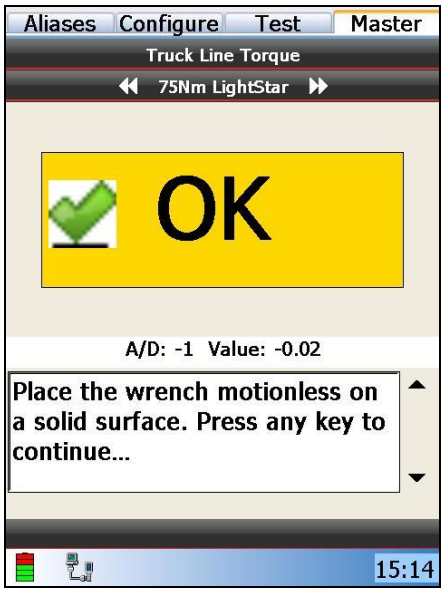
1. Connect the torque tool with the appropriate cable to the Torque input port.
2. On the Main menu, select **Gage** and press <enter>.
3. Select the gage alias to master from the Gage Suite screen.
4. Press ◄ or ► to select **Master** in the Gage Alias submenu.

   The Master Gages screen opens.



5. Allow the torque tool to settle at rest, with no force applied.
6. Press <enter> to master the tool.

   After pressing <enter>, the wrench LED will light yellow until “OK” message appears. If the LED turns red and the message “Fail” appears, retry the mastering operation.



Master OK

Master Fail

Testing Gages

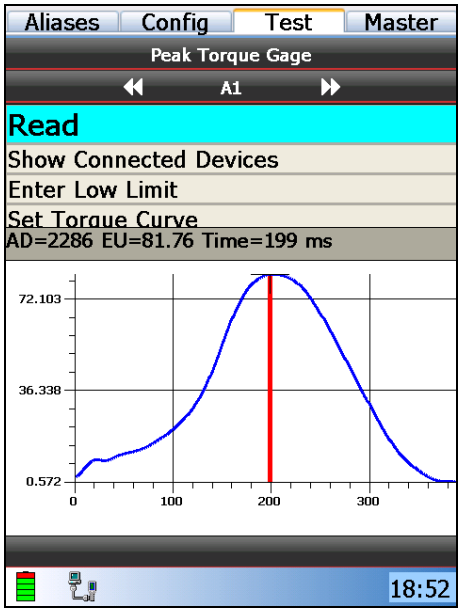
After mastering a gage, test the gage to make sure that it is configured properly and is sending readings to the data collector.

Testing Torque Tools

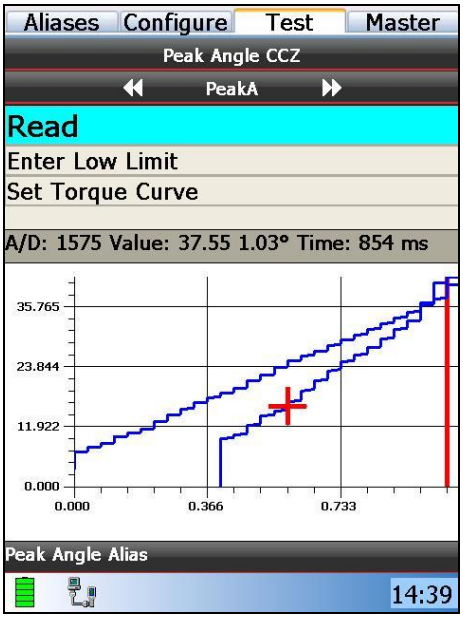
Steps

1. Connect the torque tool with the appropriate cable to the configured Data Collector torque input port.
2. On the Main menu, select **Gage** and press <enter>.
3. Select the gage alias to test from the Gage Suite screen.
4. Press ◄ or ► to select **Test** in the Gage Alias submenu.
5. Verify that the gage reads zero with no load applied to the torque tool.
6. Enter the lower specification limit (Default is 10) or the expected measurement value.
7. Activate the torque tool by applying force to a test bolt.

   Observe the results on the Test Gages screen:



For Angle configurations, your test screen will look similar to the following:



SECTION

5

Working with Setups

Overview

A setup is a group of setup characteristics, labels, and data collector options specifically packaged for use with the ASI DataMyte 600 Data Collector. You create setups using TranSend II and then transfer the setup to the data collector. Figure 18 shows a typical process for working with setups.

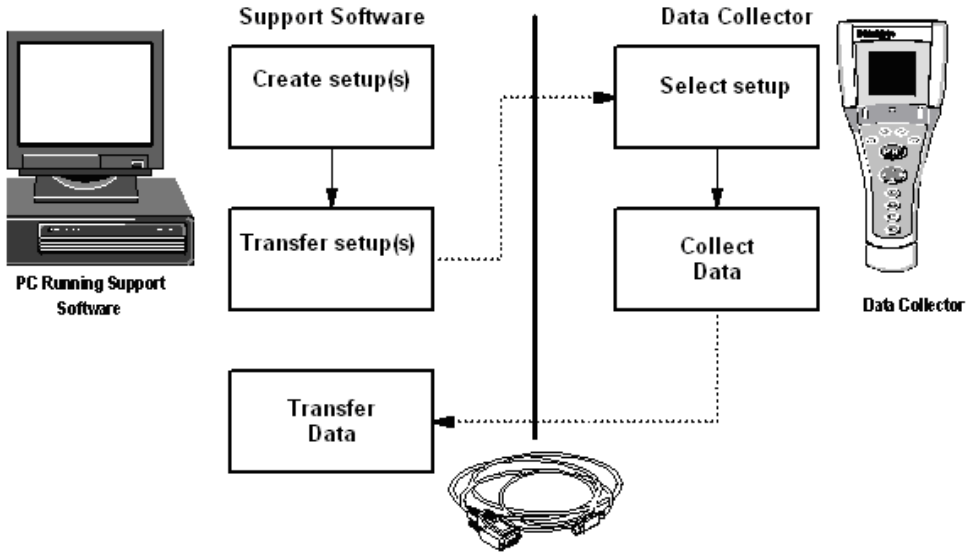


Figure 18. Working with Setups

1. **Create Setup(s)** – Create a setup using the following support software package:
   - TranSend II™
2. **Transfer Setup(s)** – The process for transferring data depends on the support software package used. You will need the ASI DataMyte USB cable to connect the data collector to the computer running the support software.
3. **Select Setup** – Use the 600 Handheld Data Collector interface to select a setup.
4. **Collect Data** – Collect data for the setup.
5. **Transfer Data** – Transfer data back to the support software for analysis and storage.

Transferring Setups

Details about transferring setups to the 600 Handheld Data Collector varies with each software package and is described in their respective user guides. Follow these steps to prepare the data collector to receive a setup.

Steps

1. Connect the data collector to the computer running the support software using the #95754 USB cable.
2. Power the data collector on.
3. Use your support software to transfer the setup to the 600 Data Collector.

SECTION

6
Data Collection

Overview

Figure19 shows the sequence for collecting data using the 600 Handheld Data Collector. Each step is described briefly beginning on page 71 and in more detail following the overview.

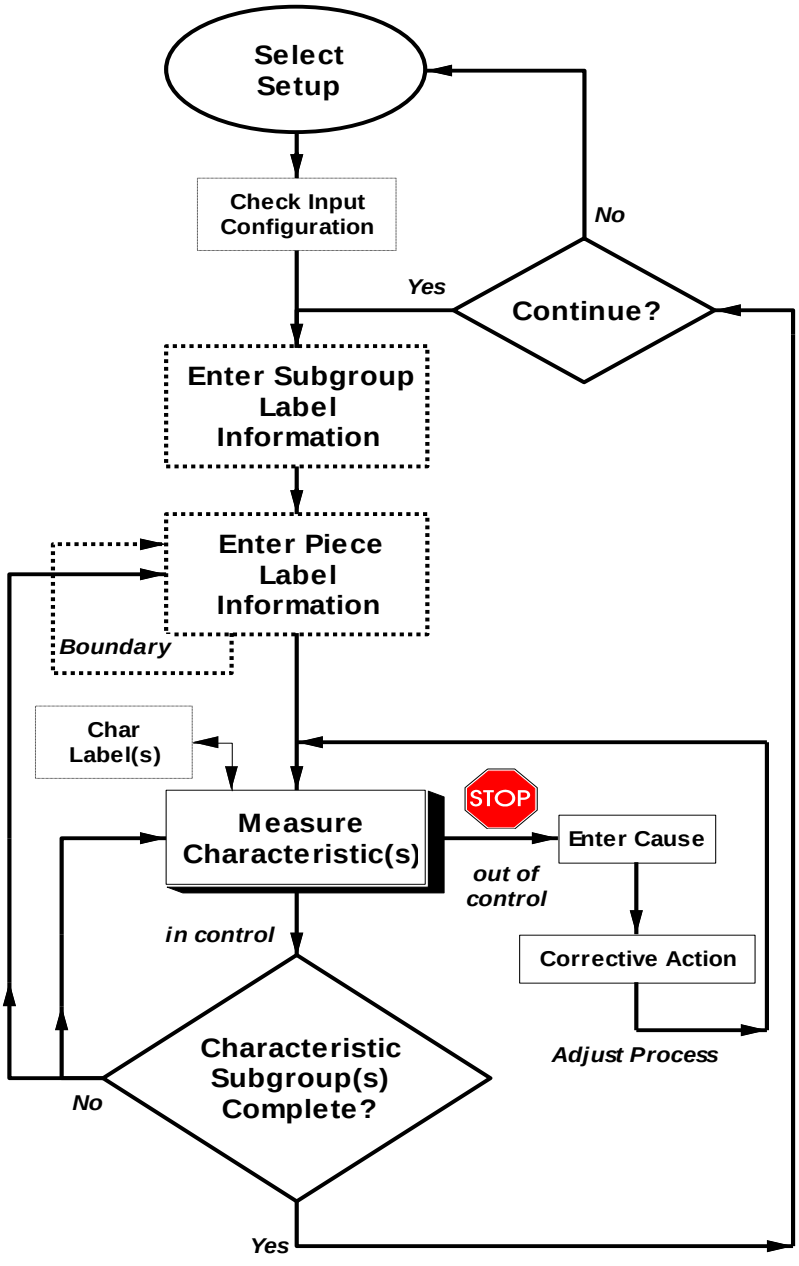


Figure 19. Data Collection Sequence

Data Collection Sequence

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

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

3. **Enter Subgroup Label Information** (if any) – Enter the subgroup label information, such as Operator Name, Shift, etc. Subgroup labels are optional.
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. Piece labels are optional.
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 alarm 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.

Note: *While collecting data, characteristic labels can be set to automatically appear whenever an alarm condition is detected.*

6. **Characteristic Subgroup(s) Complete?** – As long as data collection for each characteristic subgroup is incomplete, the 600 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 setup or you can choose to select a different setup.

Selecting a Setup

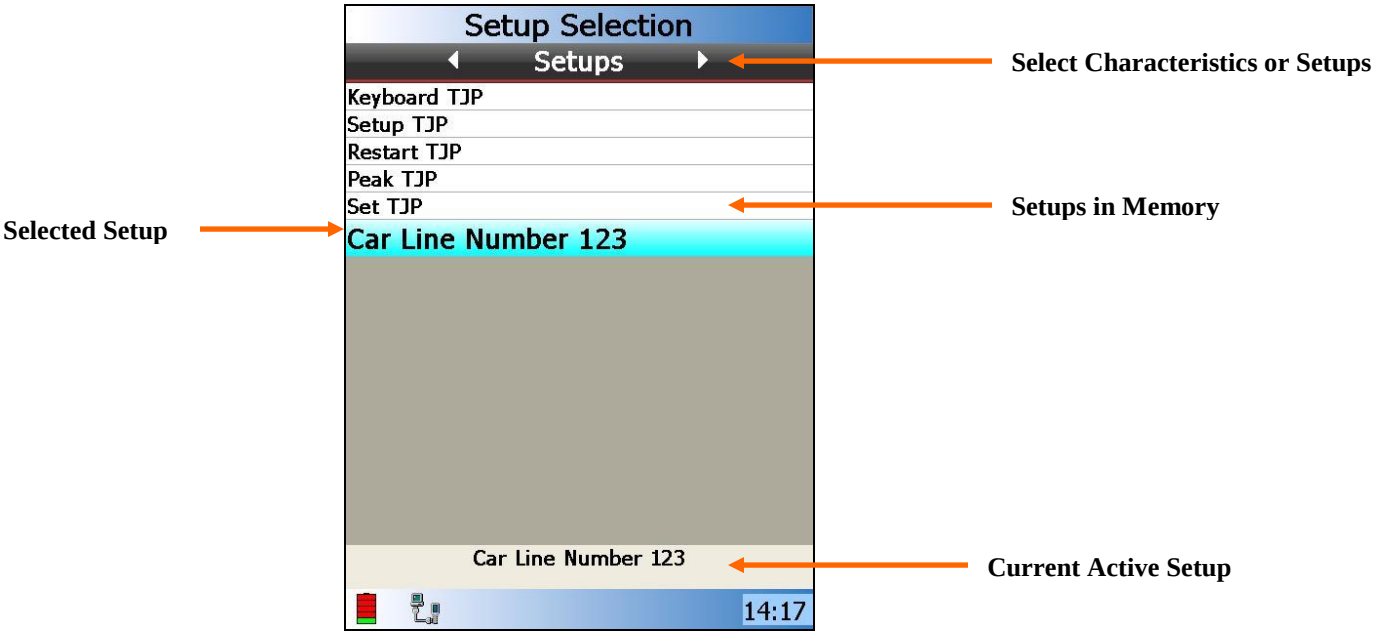
You can select a setup that is stored in the data collector by pressing the <select> key.

Using the <select> Key

Steps

1. Power the data collector on.
2. Press <select> on the keypad.

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



- The bottom line displays the currently selected setup. This active setup also appears selected in the list.
- The Select Setup screen lists setups either in alphabetical or chronological order depending on how the Part List option is set in the Preferences (see *Setting Preferences* on page 34).

Note: *If pressing the <select> key does not display the Setup Selection menu, you may have no setups loaded into memory.*

3. If necessary, press ◄ or ► to select characteristics of the highlighted setup.
4. Press ▲ or ▼ to select the setup.
5. Press <enter>. Setup is selected and data collect is entered.

Checking the Input Configuration

Before collecting data with a new setup, check the label and characteristic input sources for the setup elements to ensure that any gages referenced in the 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 Keypad (K), a gage alias (peak), or a list (L). The input source is determined by the setup.

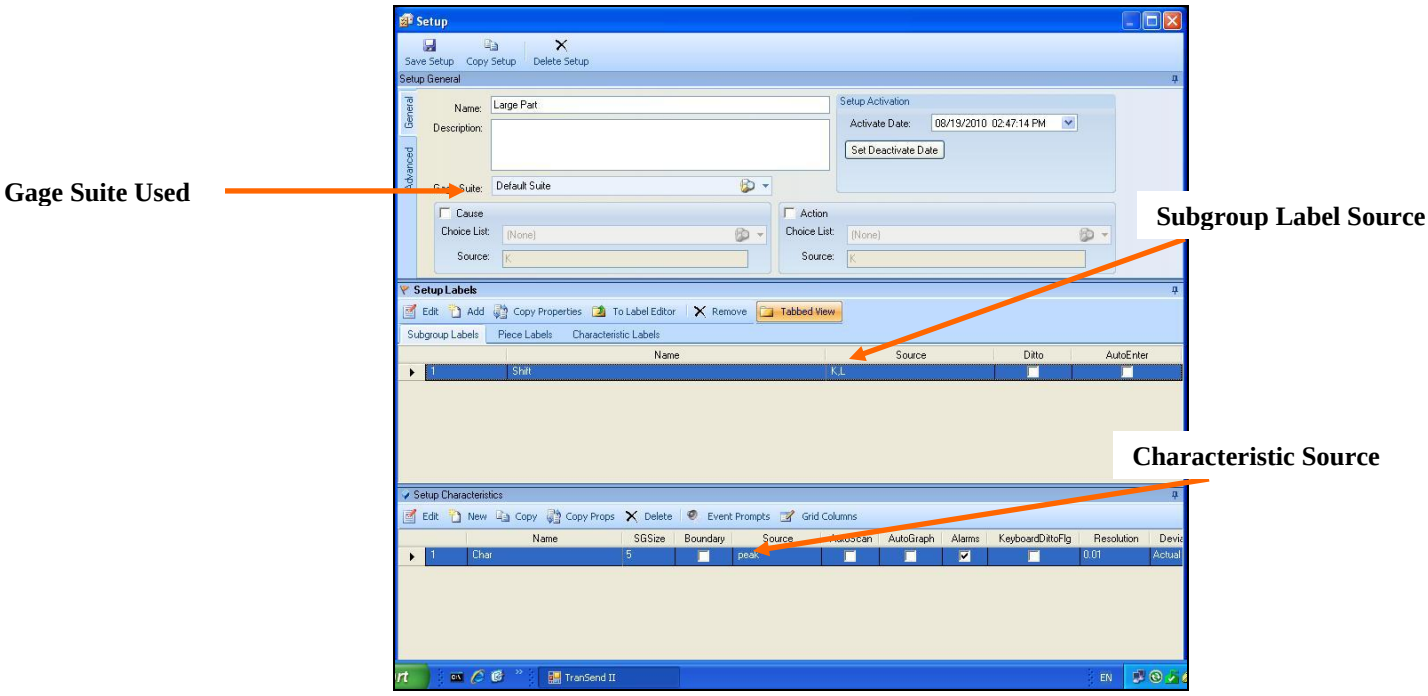
  If you enter label values using a gage, the gage port must be configured for this type of use. See Section 4, *Configuring Gages* for more information about configuring gage ports. Also see *Appendix A - Characteristic Source* for information about source identifiers.

  Source information cannot be reviewed in the 600. It can only be reviewed in the support software (TranSend II). To review the input configuration, perform the following steps:

Steps

1. Start the TranSend II software.
2. From the Main menu, press <Setup Editor>.
3. Select the setup by double clicking on the setup name.

   The Setup screen appears:



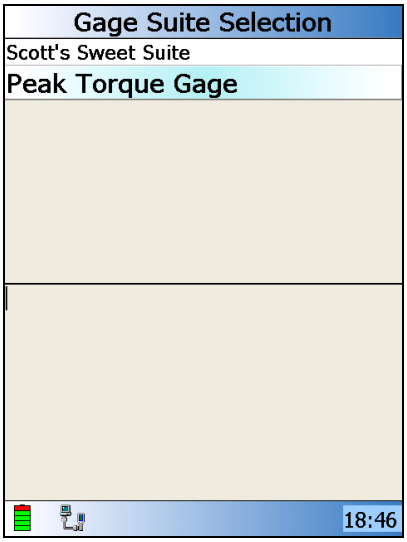
To verify that a Gage Suite is configured for a specific setup, perform the following

Steps

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

   The Gage Suite Selection opens:

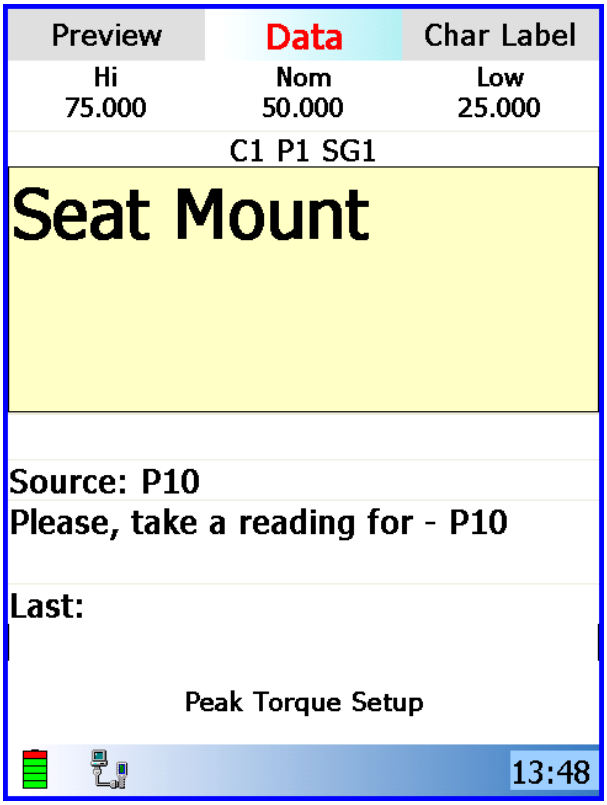
List of Gage Suite Names



2. If a Gage Suite is not displayed that matches the Gage Suite selected in the Setup, configure the Suite as described in Section 4, *Configuring Gages*.

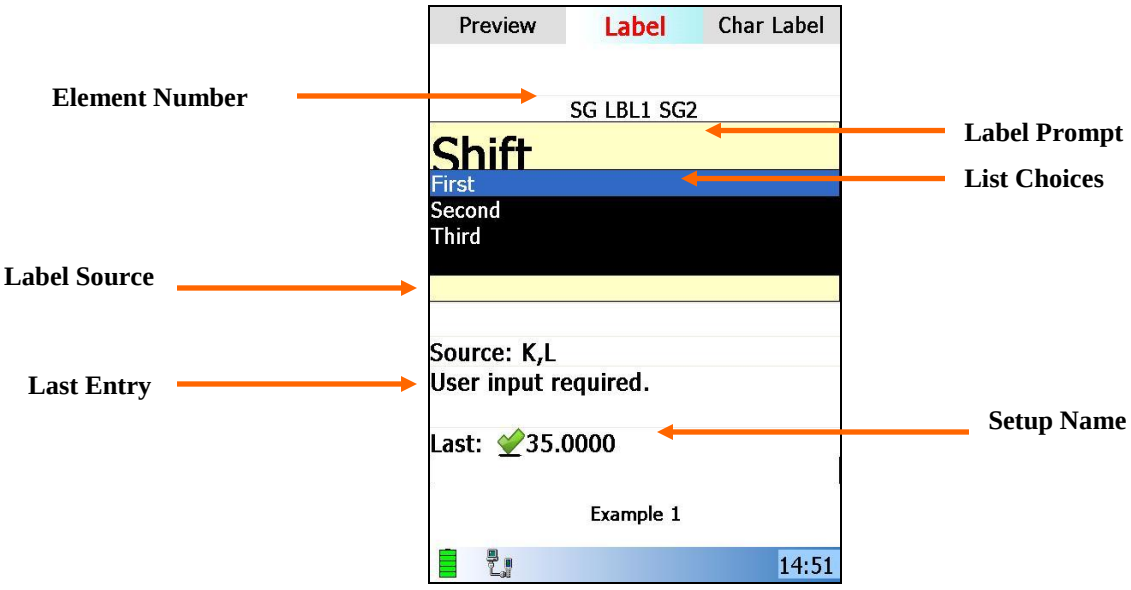
Collecting Data

To collect data for the currently selected setup, press the <data> key on the keypad. 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 setup.



Entering Label Information

Generally, a 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. SG LBL# indicates a subgroup label element, P L BL# a piece label, and C# a characteristic. SG# indicates the subgroup number.
- **Label Prompt** – Name of label to enter.
- **Label Source** – The source from which the collector expects to get the data.
- **List Choices** – List of predetermined choices.
- **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.
- **Setup Name** – The setup name for which you are currently entering subgroup data.

Steps

1. Enter the requested information for the first label using the alias indicated. For example, you may scan a barcode using a barcode wand configured for port USB or enter data using the keypad.

   - 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 alias 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>.

Entering Characteristic Data

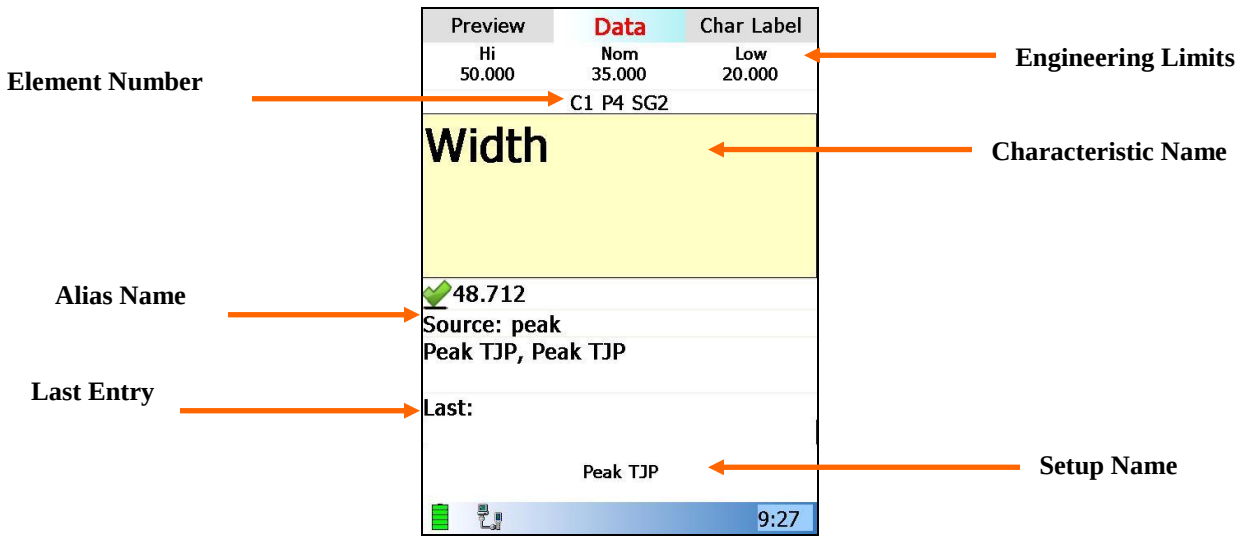
After all label information is entered, such as subgroup and piece label values, the data collection sequence proceeds to prompt for variable characteristic data. You can enter data in either the Data Entry screen or the Preview screen or view and enter characteristic label data in the Char Label screen.

If engineering limits/caution limits are defined for the characteristic, the data collector LED's indicate the status of a reading:

- Red (left) LED – The reading is out of engineering limits.
- Green (right) LED – The reading is between the engineering limits.
- Orange (left and right) LED – The reading is within the caution limits.

Note: The duration of the LED Indicators is set in the data collector Preferences, see page 34.

The Data Entry Screen



Steps

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

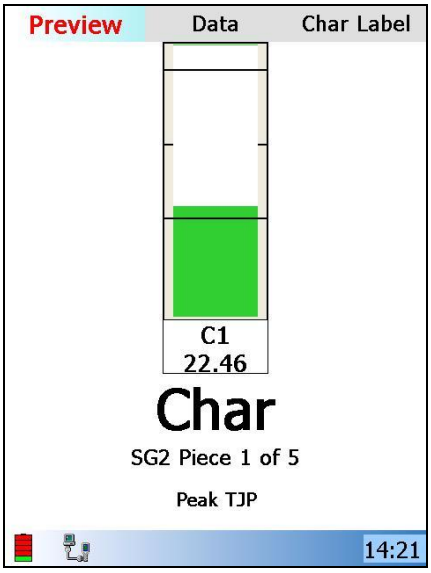
   In the Data Entry screen above, the source for the characteristic is peak which means that data can come from the gage connected to the alias peak.

   - To enter data using the alphanumeric keypad, enter the information into the Data Entry Box using the keys on the keypad.

Preview Screen

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

The Preview screen in torque applications shows a zero-based column graph. As you exert force on the torque wrench, the column "fills" upward, then drops back to zero when the force is removed (for torque applications, Preview Mode is enabled *only* for Peak and Set torque types as well as LMI gages).



Note: Data entry mode will now first default to the 'Preview' screen for characteristics that have a gage source specified—if the torque module or LMI module is not installed (if the torque module is installed, data entry will not default to Preview Mode).

Steps

1. If the Preview screen is not displayed, press ◄ to select **Preview**.

   Notice the column display representing the gage's digital reading.

2. For non-torque gages, to take a gage reading:
   - Press <enter> on the keypad.

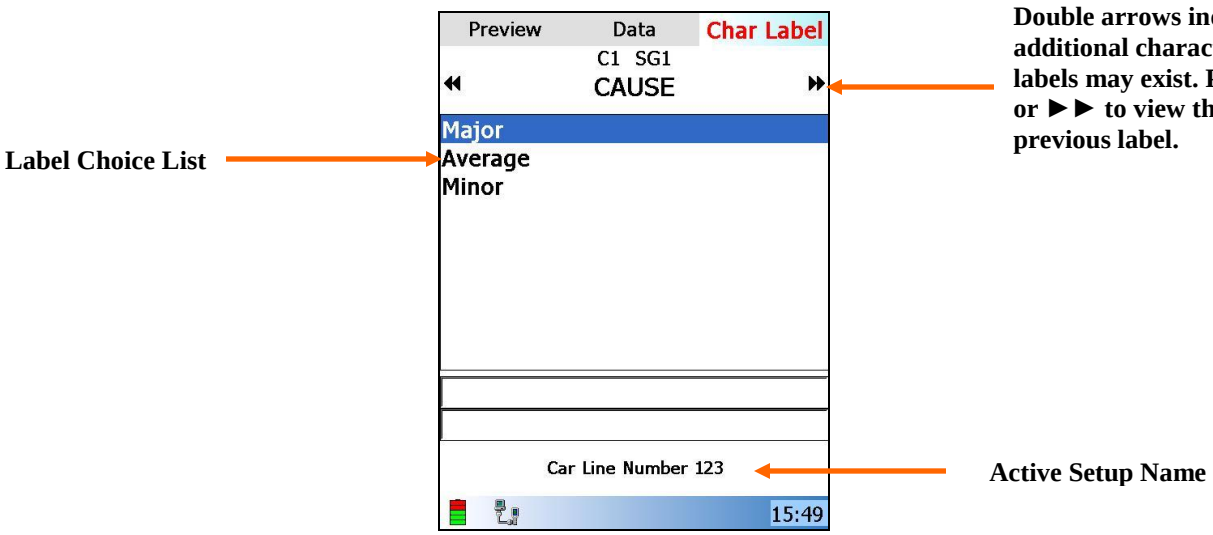
   The column display updates immediately to incorporate the new reading into the results, and the LED indicators flash to indicate status as described on page 33.

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 may enter characteristic label data using the Label option tab at any time during the data collection.

1. Press ◄ or ► to move to **Char Label**.



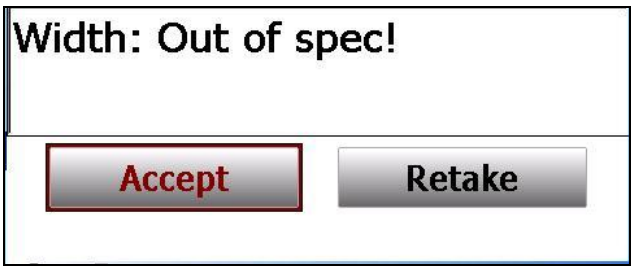
2. Select any label choice.

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. The boundary option is set in the support software, TranSend II.

Out-of-Spec Readings

You can set the data collector to prompt the operator if a reading is out of spec. See *"Setting Device Preferences"* on page 32. If a reading is out of specification and Retake Prompting is set to (On), a prompt similar to the following appears.



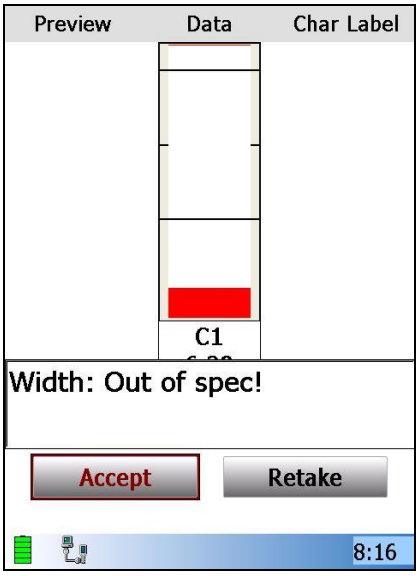
Prompted Out of Spec Prompt

Proceed in one of two ways:

Steps

1. Press <enter> to **Accept** the reading as valid.
2. Press ▼ to select **Retake** the reading without saving the initial reading.

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

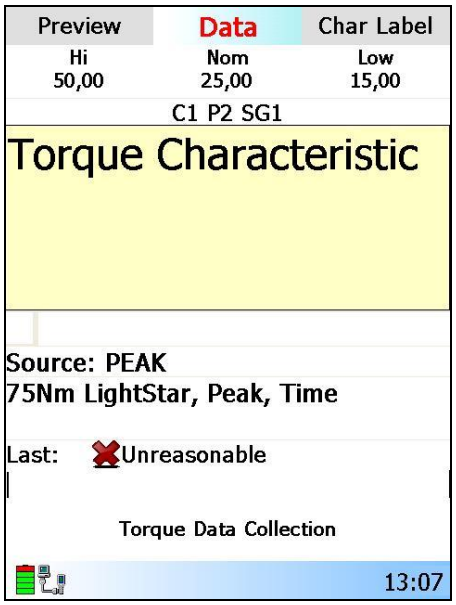


Preview Out of Spec Prompt

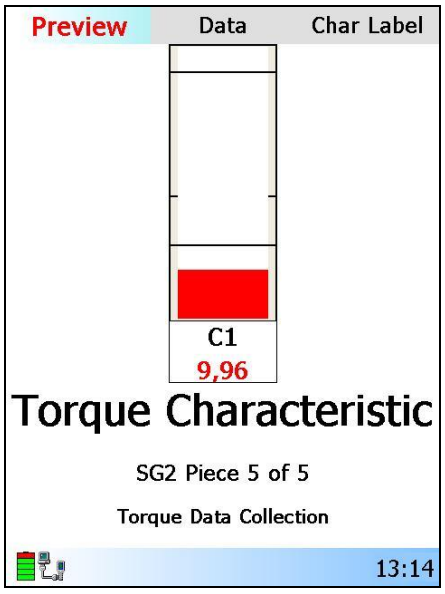
Unreasonable Readings

The data collector will force the operator to take another reading.

An unreasonable reading appears as follows:



Data Collect



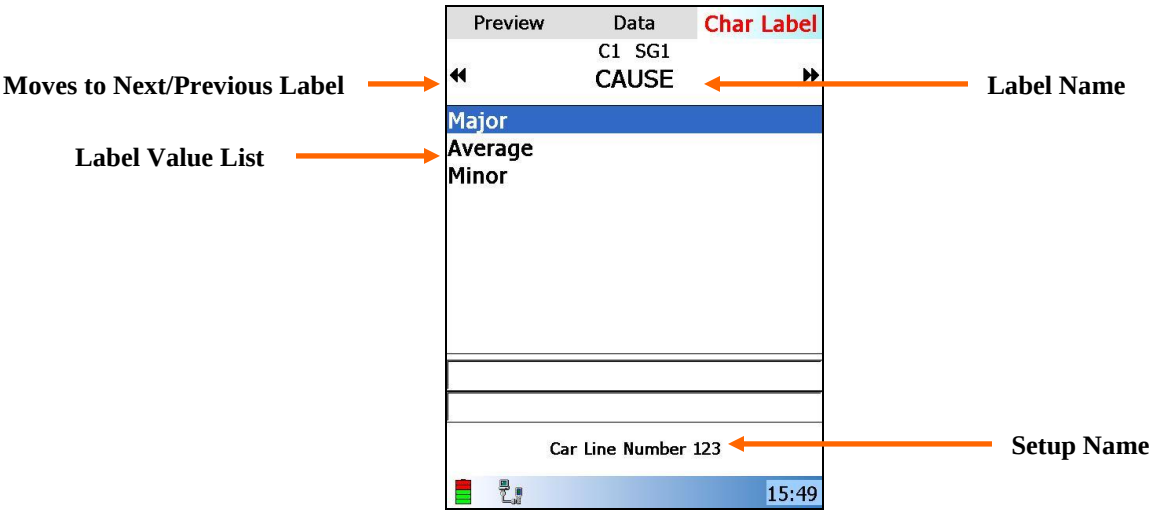
Preview

Assignable Cause Entries

If an assignable cause condition (limit violation, first or last piece) is detected, the Cause prompt automatically appears. Alarms must be active for the characteristic, refer to *Enabling Alarms* on page 42.

Steps

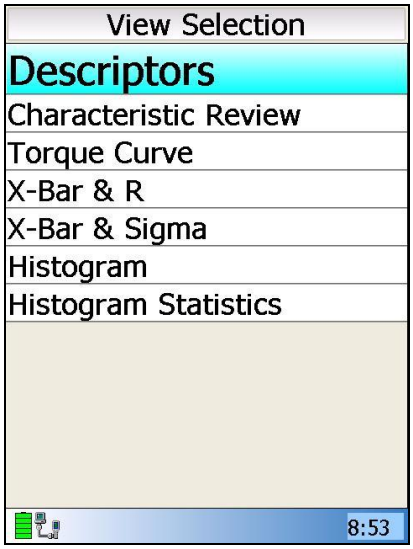
1. Press ▲ or ▼ to select an assignable cause from the label list.
2. Press <enter>.



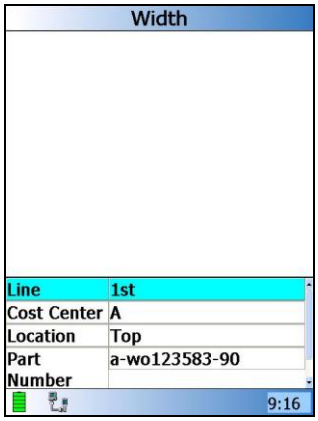
After a value is entered in response to the Cause prompt, other characteristic label(s) may also appear depending on the setup's configuration.

Viewing "View Selections"

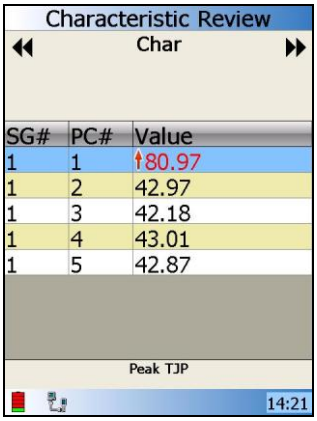
Press the <view> key at any time or <shift> then <view> to see the View Selections for the current setup.



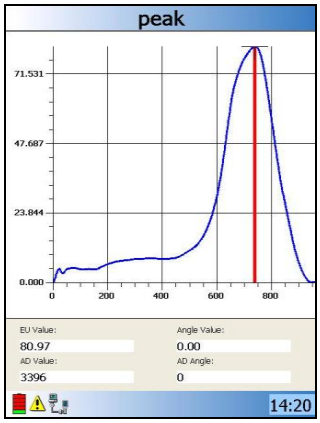
1. **Descriptors** – Displays the Descriptors for the current setup.
2. **Characteristic Review** – Displays collected data for the current setup/characteristic.
3. **Torque Curve** – Displays the last taken torque curve.
4. **X-Bar & R** – Displays an X-Bar and Range chart for the current setup/characteristic.
5. **X-Bar & Sigma** – Displays an X-Bar and Sigma chart for the current setup/characteristic.
6. **Histogram** – Displays a Histogram chart for the current setup/characteristic.
7. **Histogram Statistics** – Displays Histogram Statistics for the current setup/characteristic.



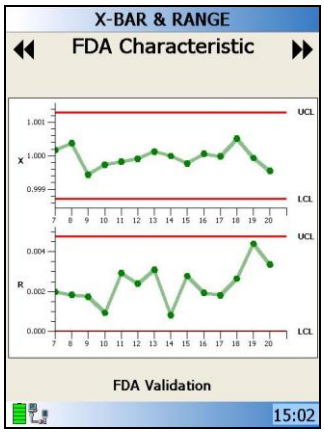
Descriptors View



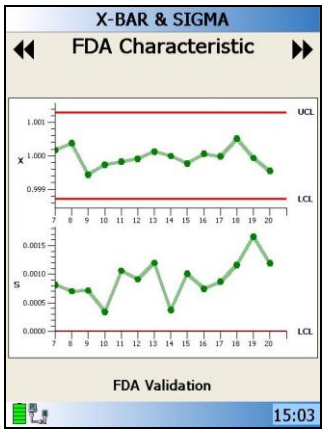
Characteristic View



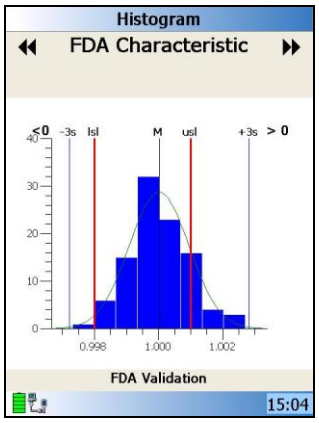
Torque Curve View



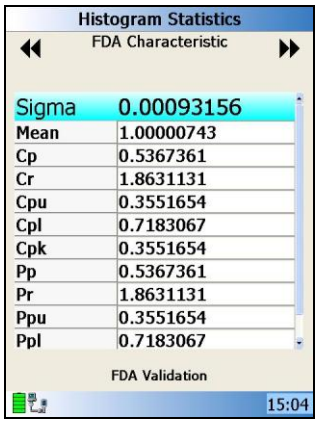
X-Bar & R



X-Bar & S



Histogram

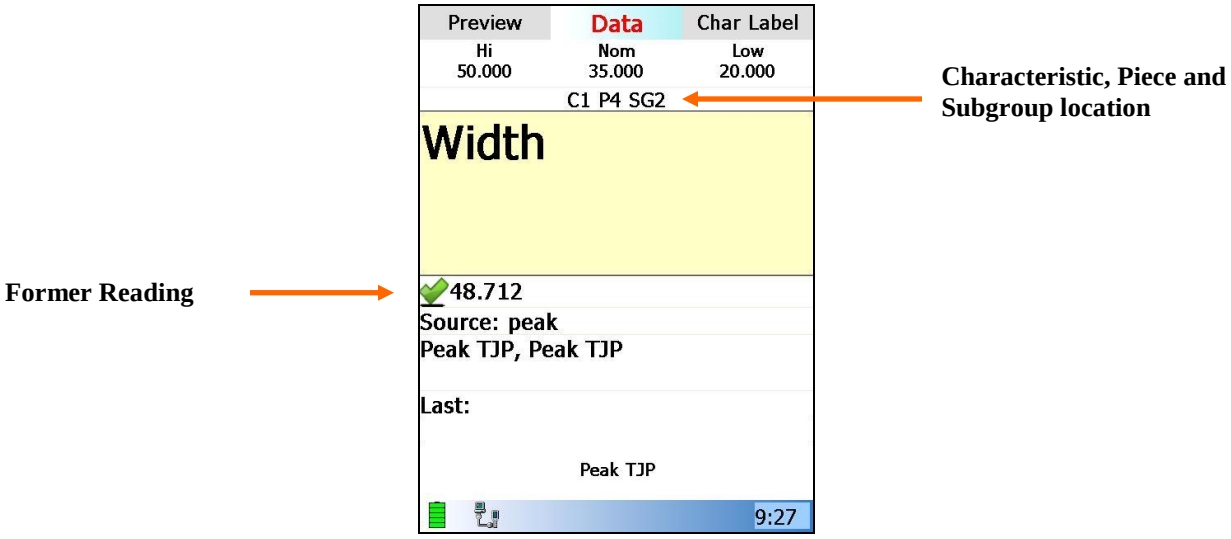


Histogram Statistics

Retaking Readings

At any time during data collection for a setup, retake a reading by pressing the ◄◄ key until the reading you wish to change is displayed. The former reading appears. 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.

Retaking a reading in the DM600 after a subgroup is transferred to TranSend II is not allowed.



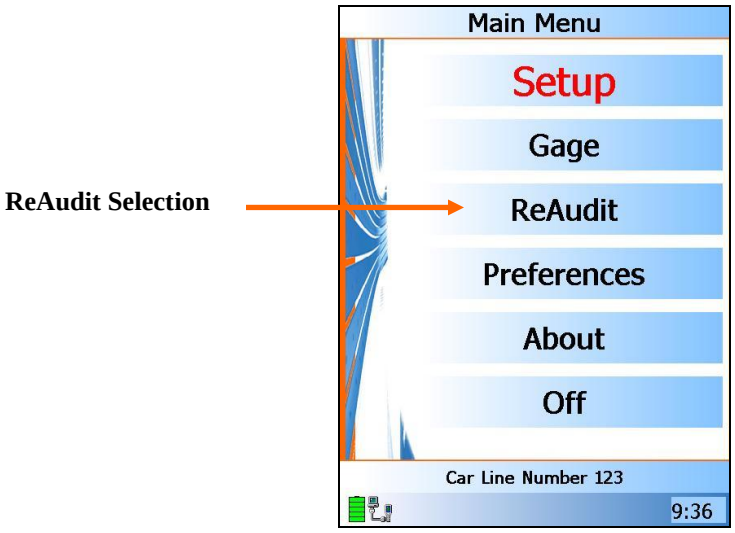
Data Collect View

Using ReAudit

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

Steps

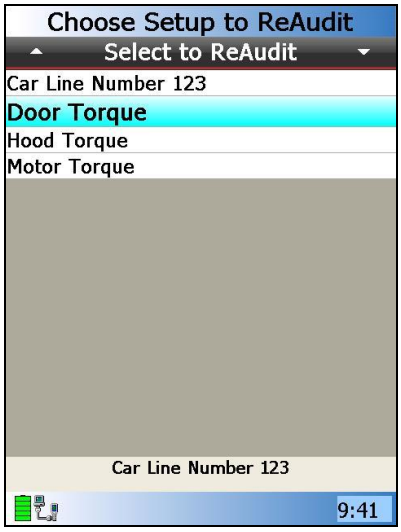
1. Select ReAudit from the Main menu.



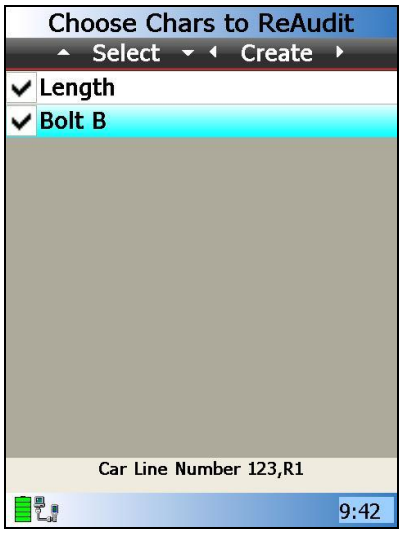
2. In the Choose Setup to ReAudit screen, select the setup that contains the characteristics to monitor.

   The data collector creates a new setup from the selected 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. The next screen lists the characteristics in the 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.

Note: *Pressing "Shift + ◢" will select all characteristics and pressing "Shift + ◤" will unselect all characteristics.*

5. Repeat to select additional characteristics if necessary.
6. Press ◄ or ► to select **Create.**

   The newly created setup opens in data collect.
7. Collect data for the setup as prompted by the data collector.

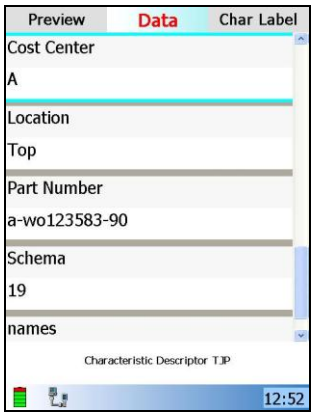
Viewing Characteristic Descriptors

Characteristic Descriptors are short descriptive fields used to communicate additional information to the data collector user. Characteristic descriptors can be defined when a setup is created in TranSend II. Characteristic descriptors can be viewed while in **Preview Mode or Prompted Data Collect 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:



Viewing Images

Characteristic images are descriptive photographs used to communicate additional information to the data collector user. Characteristic images must be defined when a setup is created in TranSend II.

Characteristic images can be viewed while in **Prompted Data Collect** and **Preview Modes**.

Steps

1. From the data collect view, press <data>.

2. Press <data> again to display the characteristic descriptors for the characteristic.

SECTION

7

Residual Torque Measurement

Introduction

What is Residual Torque?

Torque is defined as force that causes twisting or turning. Residual torque may be defined as the torque that remains on a threaded fastener after it has been tightened. The purpose of residual torque measurement is either to assess the performance of a power tool that fastened a given joint, or to simply determine whether the torque on given joint is sufficient for its intended purpose.

For example, for safety purposes the torque on the lug nuts of a vehicle should not be below 110 Nm. Measuring the residual torque will determine if the lug nut is safe for use.

Another example: The power tool that installs that lug nut is supposed to install it between 120-160 Nm. Measuring the residual torque on the fastener will determine if the power tool is performing as it should.

How do we measure residual torque?

We measure residual torque by means of applying torque to the tightened fastener and observing the behavior of the fastener. This is usually performed with a hand torque wrench.

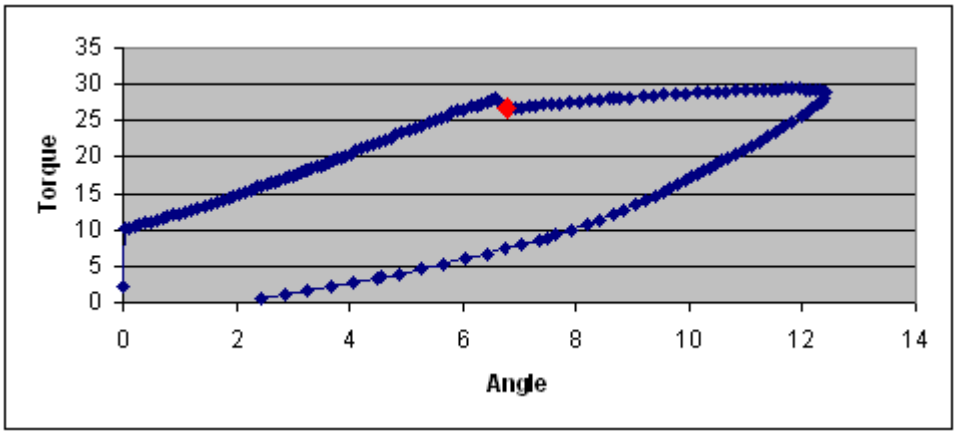
Selecting a Measurement Strategy

Different applications require different measurement strategies.

Angle Based Restart

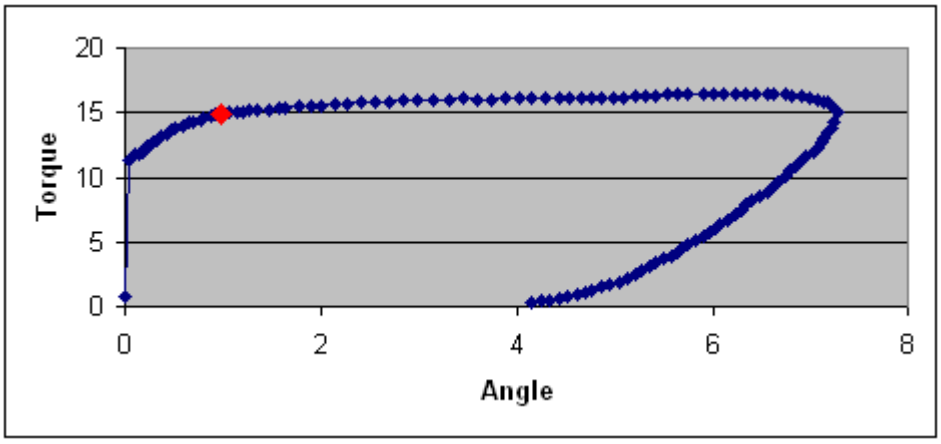
Restart Torque is used in residual torque measurement applications where you need to remove the effects of stiction. The restart point is essentially the point at which the installing tool ended the application of torque. Paint, temperature differences, lock washers, metallic adhesion, and adhesive compounds can all increase the amount of force required to break the fastener loose. To more accurately record the torque applied by the original fastening process, it may be preferable to record the point after the breakaway when the fastener "restarts." This is the preferred measurement strategy for almost all joints.

The following represents force applied over time on a high stiction joint in a Restart torque application:



Restart on a high stiction joint

The following curve represents force applied over time on a low stiction (i.e., well-lubricated) joint in a restart torque application:



Proper Technique - How to pull the wrench

- Slow steady pull until fastener moves 1.5 degrees until LED lights or buzzer sounds.

Best Application

- Determining the point to which a power tool has fastened the joint. This is the recommended algorithm for checking power tool performance and estimating clamp load.

Most Problematic Application

- Not suitable for applications where the work piece is rotationally unstable or when additional rotation will not apply additional torque (i.e., a fastener beyond yield). Another example is a very long shank bolt where the head may start to turn before the threads turn producing a false double break.

Joint Characteristics

- Good for all joint types.

Error Conditions

- Work piece rotation may result in a false reading
- Jerking the wrench may result in no reading

Source-Based Gage Override

- The default value for change of slope is 60%. If a given joint requires greater sensitivity to capture the break point, decrease this percentage. This can be accomplished by modifying the characteristic source. For example, Angle {40} will override the gage configuration to use a slope of 40%. It is unlikely you will ever need this feature.

Angle Based Restart Summary

Strengths:

- Operator independent
- Instant LED and buzzer notification of fastener motion and measurement status
- Little or no training required
- Most repeatable method for measuring torque required to keep a fastener in motion after breakaway
- Eliminates overshoot errors
- Eliminates false readings due to early release

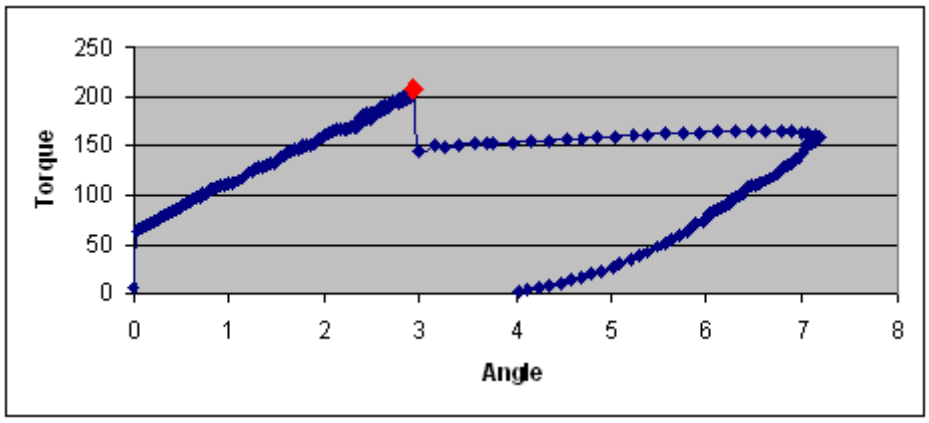
Weaknesses:

- Requires rotationally stable work piece
- Not suitable for fasteners torqued to yield

Angle based Breakaway

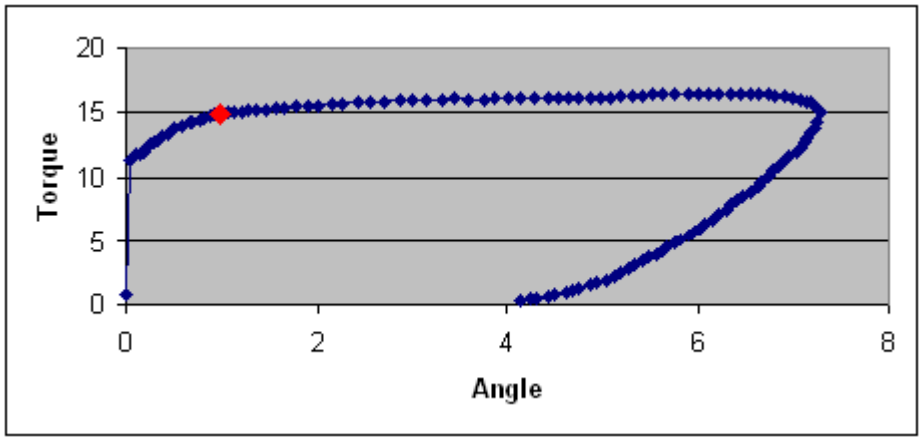
Angle Based Breakaway is the torque required to start a fastener in motion qualified by angle to eliminate false readings.

The following curve represents the force applied over angle on a high stiction joint in a breakaway torque application:



Angle Based Breakaway on a high stiction joint

The following curve represents the force applied over angle on a low stiction (i.e., well-lubricated) joint in a breakaway torque application:



Angle Based Breakaway on a well-lubricated joint

Proper Technique - How to pull the wrench

- Slow steady pull until fastener moves 1.5 degrees until LED lights or buzzer sounds.

Best Application

- Measuring the torque required to start a fastener in motion. For example, lug nuts on a vehicle where the purpose of the measurement is to determine if they are too tight for a customer to break them free.

Most Problematic Application

- Not suitable for applications where the work piece is rotationally unstable or when additional rotation will not apply additional torque (i.e., a fastener beyond yield). Another example is a very long shank bolt where the head may start to turn before the threads turn producing a false double break.

Joint Characteristics

- Good for all joint types.

Error Conditions

- Work piece rotation may result in a false reading
- Jerking the wrench may result in no reading

Source-Based Gage Override

The default value for change of slope is 60%. If a given joint requires greater sensitivity to capture the break point, decrease this percentage. This can be accomplished by modifying the characteristic source. For example, Angle {40} will override the gage configuration to use a slope of 40%. It is unlikely you will ever need this feature.

Angle Based Breakaway Summary

Strengths:

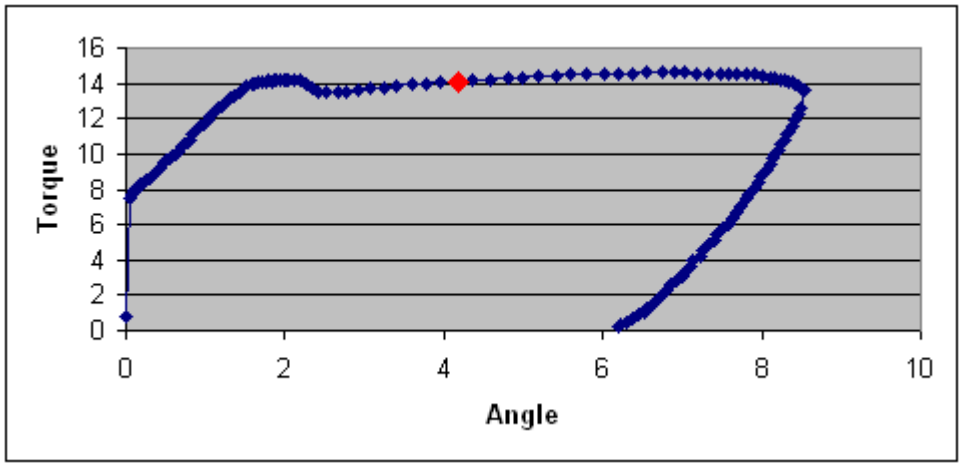
- Operator independent
- Instant LED and buzzer notification of fastener motion and measurement status
- Little or no training required
- Most repeatable method for measuring torque to turn
- Eliminates overshoot errors
- Eliminates false readings due to early release

Weaknesses:

- Requires rotationally stable work piece
- Not suitable for fasteners torqued to yield

Torque at Angle

Torque at Angle is the measured torque at a preset number of degrees of sensed rotation past a starting torque threshold. Note: Sensed rotation includes windup in the wrench, the work piece, the socket, the extension, as well as the fastener rotation itself.



Torque at Angle Chart

Proper Technique - How to pull the wrench

- Slow steady pull until LED lights or buzzer sounds.

Best Application

- Fasteners that exhibit a double break such as extremely long shank bolts where the head turns before the threads and fasteners torqued to yield where angle based restart and breakaway are not appropriate.

Most Problematic Application

- Applications where there is a significant degree of variation on flexibility or rotational instability from one work piece to the next.

Joint Characteristics

- Best for those rare joints that experience a double break.

Error Conditions

- Excessive work piece rotation may result in a false reading

Source-Based Gage Override

Overriding the gage configuration capture angle can be accomplished by modifying the characteristic source. For example, Angle {2.7} will override the gage configuration capture angle to use 2.7 degrees of rotation past the start threshold. Since different joints using different sockets, extensions, etc. will have a different amount of windup, this value may need to be customized on a per measurement basis. The capture angle should always be past windup and within the fastener rotation portion of the torque/angle curve. See above.

In addition, the start threshold from which angle is measured can be established on a per-measurement basis using the form Angle{2.7}{35}, where 2.7 is the overriding capture angle and 35 is the start threshold in torque units.

Torque at Angle Summary

Strengths:

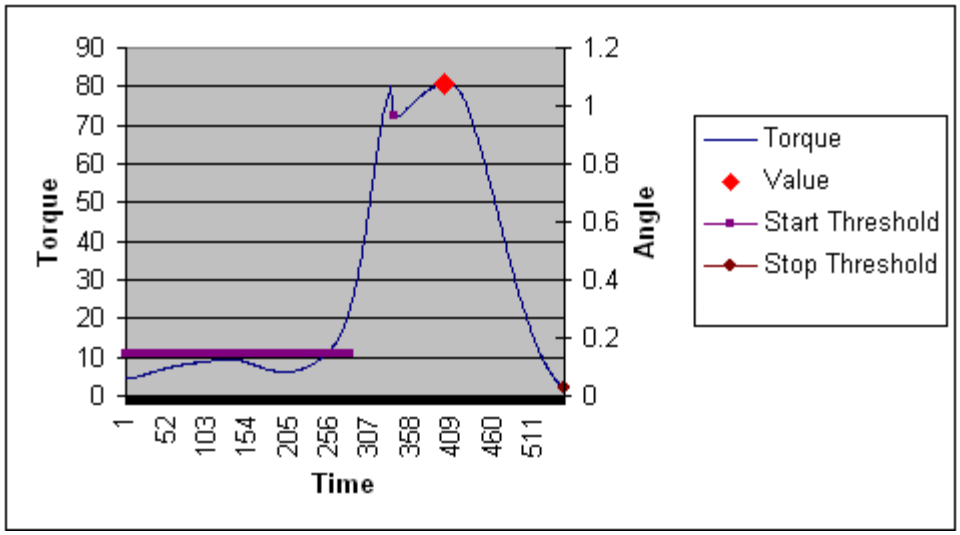
- Operator independent
- Instant LED and buzzer notification of fastener motion and measurement status
- Little or no training required
- Eliminates overshoot errors
- Eliminates false readings due to early release

Weaknesses:

- Requires rotationally stable work piece
- Has greater variability than angle based restart or angle based breakaway
- Capture angle needs to be set individually for each joint type to be audited

Peak

Peak torque is the highest measured value during a torque event represented by the maximum torque required to turn a fastener. The following curve represents the force applied over time in a peak torque application:



Proper Technique - How to pull the wrench

- Creep up slowly and release the wrench the instant the fastener turns.

Best Application

- Fasteners where the operator can easily determine (i.e., by sight) that the fastener has moved.

Most Problematic Application

- Fasteners where the operator cannot easily determine (i.e., by sight) that the fastener has moved. Applications where the work piece is in motion or vibration may be mistaken for fastener motion.
- Joints where stiction can vary from little or none to very large on one fastener to the next.

Joint Characteristics

- All types.

Error Conditions

- Excessive overshoot will yield a false high measurement
- Wrench release before fastener motion will generate a false low measurement

Peak Summary

Strengths:

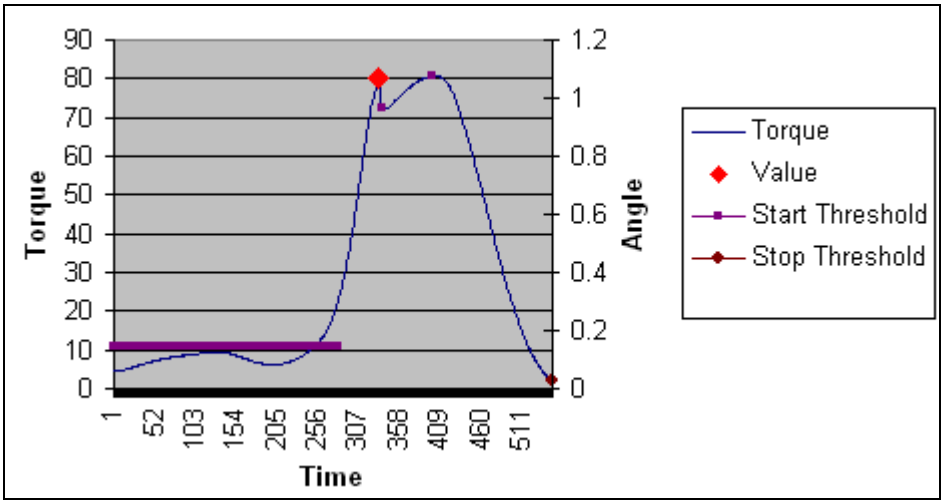
- Simplicity

Weaknesses:

- Operator dependence
- Significant training required
- Best technique is *very slowly* increasing pressure until fastener turns
- Variations in human reaction time result in overshoot
- Early release causes false low
- Excessive overshoot causes false high

Torque vs. Time Breakaway

Torque vs. Time Breakaway is the point at which there is a sharp change in slope in the torque/time curve, normally caused by the start of fastener motion.



Proper Technique - How to pull the wrench

- A fast high-speed pull.

Best Application

- Well-lubricated hard joints. For example, new fasteners immediately after installation.

Most Problematic Application

- Low stiction soft joints.
- Use by other than highly trained and highly skilled operators.

Joint Characteristics

- Best for high stiction joints.

Error Conditions

- A slow pull will frequently produce a false low reading.

Torque vs. Time Breakaway Summary

Strengths:

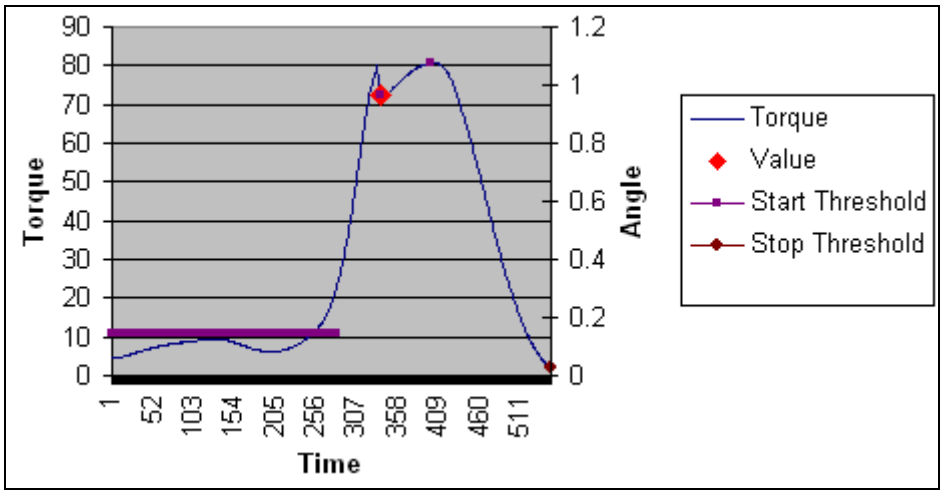
- Most Accurate measure of torque to turn

Weaknesses:

- High operator dependence
- Substantial training required
- Operator technique easily causes errors

Torque vs. Time Restart

Torque vs. Time Restart is the torque required to keep a fastener in motion immediately after breakaway.



Proper Technique - How to pull the wrench

- A fast high-speed pull.

Best Application

- High stiction joints that produce a sharp break in the torque time curve. For example, a painted or corroded joint.

Most Problematic Application

- Low stiction soft joints.
- Use by other than highly skilled operators.

Joint Characteristics

- Best for high stiction joints.

Error Conditions

- A slow pull will frequently produce a false low reading.

Torque vs. Time Restart Summary

Strengths:

- Most accurate for measuring torque required to keep a fastener in motion after breakaway

Weaknesses:

- High operator dependence
- Substantial training required
- Operator technique errors easily cause large measurement errors

Set Torque

Set Torque is a technique whereby a tone will sound when the wrench applies a preset amount of torque to a fastener. This is used where it is necessary to check for minimum torque on a fastener without causing fastener motion. For example, a joint locked with a chemical adhesive may be checked to ensure the fastener does not rotate when the predefined amount of torque is applied.

Proper Technique - How to pull the wrench

- Slowly apply until tone is heard and then release. If the fastener fails to move, the joint passes inspection; if it moves, the joint fails inspection.

Best Application

- Adhesively locked fasteners.

Most Problematic Application

- Fasteners where the operator cannot easily determine (i.e., by sight) that the fastener has moved.

Joint Characteristics

- All types.

Error Conditions

- Overshoot causing fastener motion.

Set Torque Summary

Strengths:

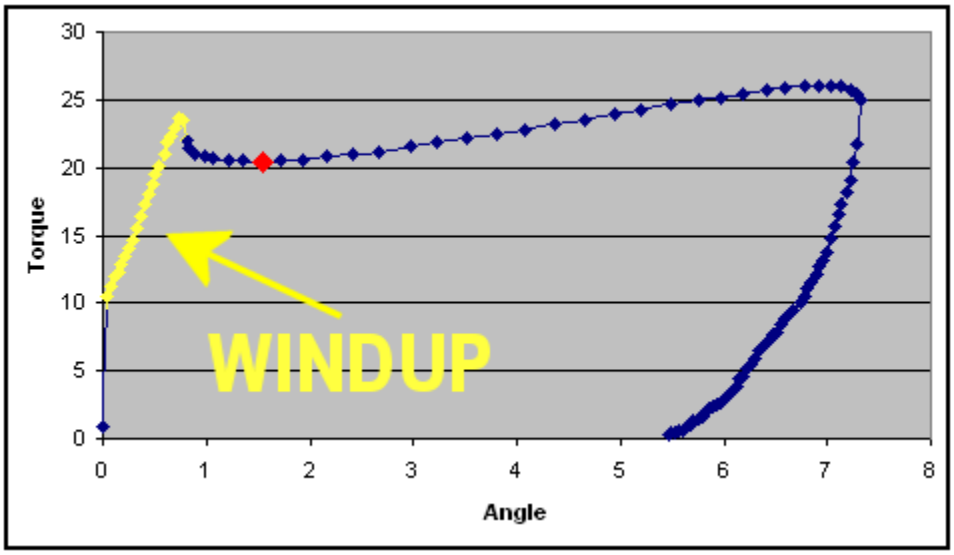
- Ideal for adhesive lock fasteners where a check for minimum without check for motion is required

Weaknesses:

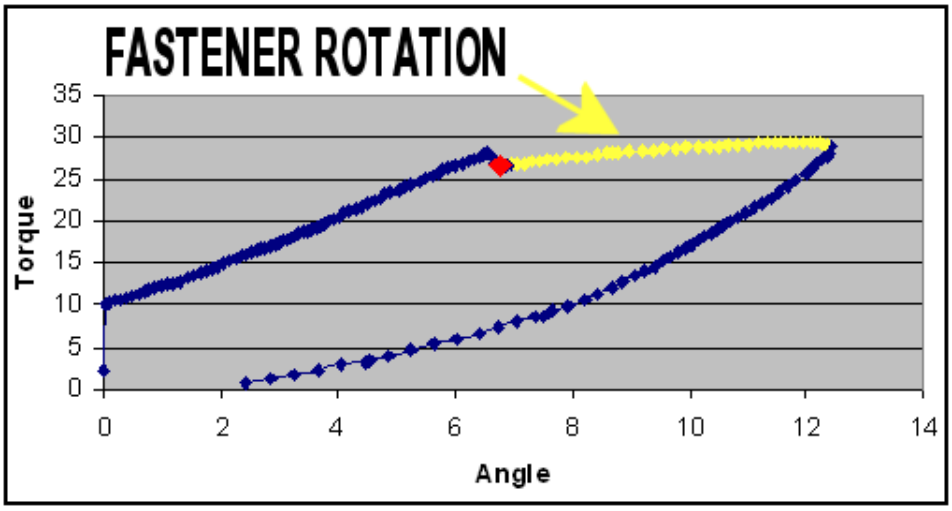
- Limited application

Theory of Operation for Angle-Based Restart and Angle-Based Breakaway

When measuring residual torque the wrench senses two kinds of angular motion. The first is windup, which is caused by flex in the work piece, metallic wrench drive, extension, socket, and bolt head. Typically windup is only a few degrees (or a fraction of a degree). For the same joint, windup will be greater with a long socket, long extension, crow's foot, or rubber mounted work piece. See below.



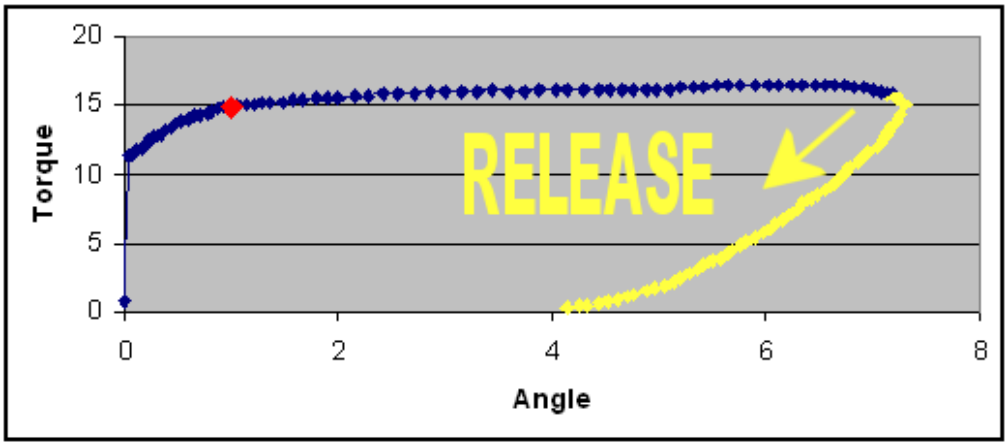
The second type of motion detected by the wrench is fastener rotation:



Both angle-based breakaway and restart are based on the change of slope between windup and fastener rotation. This allows rejection of "slip offs" that do not result in fastener motion. In addition, excessive follow through will not cause erroneously high readings as the data point captured is independent of final wrench release.

Both angle-based breakaway must detect additional tightening to confirm the break point.

When reviewing a torque/angle curve, release is a form of "unwinding":



Capturing Multiple Values from a Single Torque Event

The 600 has the ability to Autoscan two characteristics that measure a single torque event as long as the second characteristic is Torque at Angle, Angle Based Restart, or Angle Based Breakaway. This feature will be useful to compare the variability of different measurement strategies, or for example to quantify the effects of stiction by capturing both Angle Based Restart and Breakaway and calculating the difference in a third characteristic.

Note that Pick-a-Point must be off for the AutoScan function to work. Turning Pick-a-Point On will disable the AutoScan function while collecting data.

Quantify Effects of Stiction

Characteristic	Source	AutoScan
C1 (Restart)	Angle Based Restart gage configuration	Off
C2 (Breakaway)	Angle Based Breakaway gage configuration	On
C2 (Stiction Calculation)	C1-C2	On

Establishing residual torque specification limits

You may have residual torque specification limits established in your organization. If not, we recommend the following procedure for establishing them.

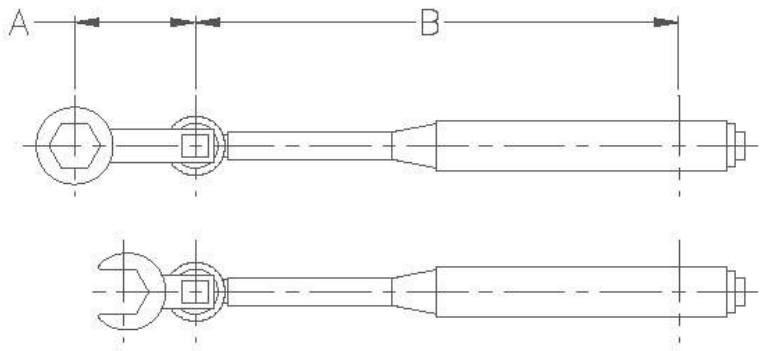
Since static friction is greater than dynamic friction, joints can relax after tightening, and there is variability in the residual measurements, specification limits may be established as follows:

Step	Action	Example
1.	Note installation (dynamic) specification limits.	70Nm to 90Nm
2.	Take a large sample (30 to 100 pieces) of dynamic measurements. The larger the sample the better, and the more operators doing the residual measurements the better.	
3.	Measure the residual torque on each of the joints measured dynamically.	
4.	Find the mean of the dynamic measurements.	78Nm
5.	Calculate the standard deviation of the dynamic measurements.	1.0Nm
6.	Find the mean of the residual measurements.	86Nm
7.	Calculate the standard deviation of the residual measurements.	1.5Nm
8.	Determine the mid point of the dynamic specification limits. Lower spec limit plus upper spec limit all divided by two.	(70+90)/2 = 80
9.	Determine the midpoint of the residual specification limits. Mean of residuals times mid point of dynamic spec divided by mean of dynamic measurements	80*86/78 = 88.2
10.	Establish the tolerance spread of the residual limits. Tolerance of dynamic limits times residual standard deviation divided by dynamic measurements standard deviation.	(90-70)*1.5/1.0 = 30
11.	Establish the upper residual specification limit. Calculated mid point for residual measurements plus half the calculated tolerance.	88.2+30/2 = 103.2
12.	Establish the lower residual specification limit. Calculated mid point for residual measurements minus half the calculated tolerance.	88.2-30/2 = 73.2

Using Torque Wrench Extensions

Adapter extensions are sometimes required when the fastener location, on which a torque reading is to taken, does not allow direct access with a conventional socket. When an adapter is used it has the effect of extending, or in some cases shortening, the pivot point of the torque wrench and thus creating a lever arm affect that must be accounted for when taking measurements.

See *Appendix B - Torque Wrench Adapters* for details about how to calculate scaling factors for use with torque wrench adapters.



SECTION

8

Dynamic Torque Measurement

Torque Wrenches

The most commonly used measurement device for torque is a transducer which uses an increasing voltage output to indicate an increase in torque. The 600 Handheld Data Collector converts this voltage signal to a digital value that represents the force used.

When calibrated using a 350 Ω bridge, the Torque Module provides the following measurement accuracy (using clockwise motion):

2.0 mv/v signal: ± 0.1% static applications, ± 0.2% dynamic applications.

The torque module should be calibrated annually to maintain this accuracy.

Torque Verification Recommendations

ASI DataMyte recommends that companies implement a verification system in order to minimize equipment malfunction on the production line. As with any other measurement tool, verification of torque accuracy should be done on a periodic basis between calibrations (e.g., daily or at each shift change) in order to ensure that the data collection system is functioning properly. Torque verification is recommended after the unit is dropped or after any abnormal event (e.g., extreme temperatures, electro-static discharge hit, etc.). Torque measurement equipment can be verified by using a "dead weight" test or by replacing the torque wrench with a torque simulator.

Dynamic Torque Applications

In dynamic torque applications, in-line transducers are typically installed between the fastening tool and the fastener. For example, with an air stall tool, the in-line transducer is placed between the tool and the socket on the fastener. The torque is measured as it is applied by the process; the desired measurement to record is the maximum (or peak) force applied by the process. The voltage the transducer produces when the peak force is attained is converted by the 600 Handheld Data Collector into a digital value that represents the force applied.

Dynamic Torque Applications

In static applications, the transducer is fitted into the head of a hand held torque wrench. An operator then uses a torque wrench to audit the torque applied by a fastening system after the fastening process is complete.

The operator applies torque to the fastener by pulling on the torque wrench. When the force applied by the operator exceeds the static frictional force of the joint, the fastener begins to move. At the precise moment that the fastener begins to move, the torque applied by the operator is approximately equal to the torque applied by the fastening process. The transducer sends a voltage to the data collector, which is converted into a digital value that represents the torque applied.

Torque Wrench Adapters

Adapter extensions are sometimes required when the fastener location, on which a torque reading is to taken, does not allow direct access with a conventional socket. When an adapter is used it has the effect of extending, or in some cases shortening, the pivot point of the torque wrench and thus creating a lever arm affect that must be accounted for when taking measurements.

See *Appendix B - Torque Wrench Adapters* for details about how to calculate scaling factors for use with torque wrench adapters.

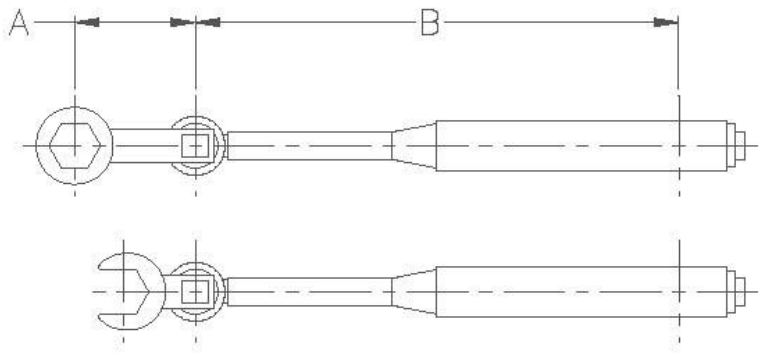


Figure 20. Torque Wrench Adapters

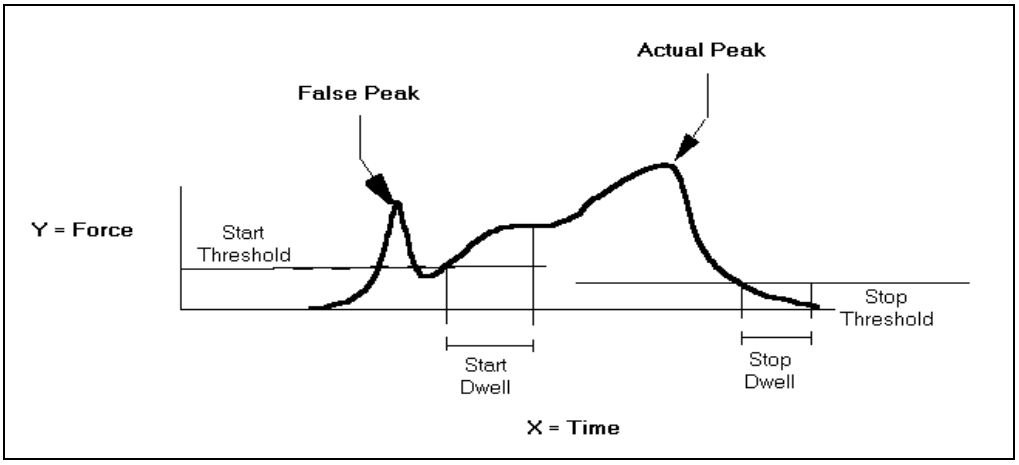
Torque Algorithms

The 600 Handheld Data Collector uses one of three different algorithms (or sets of rules) to convert the transducer's analog signal to a digital value that represents the force applied. The algorithms are: Peak, Pulse and Set Torque.

Peak Torque

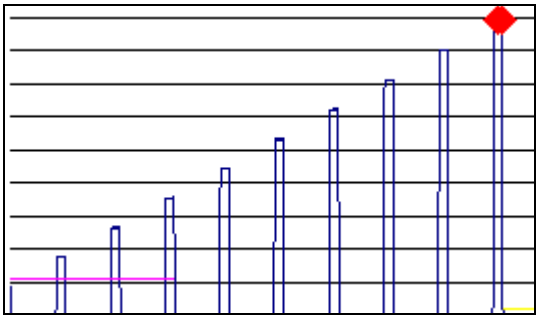
Peak Torque is used to measure the torque on a fastener at installation. This is done by monitoring the voltage signal generated by an in-line transducer and recording the maximum or peak reading. Since fastening systems, such as air stall tools, can produce a series of peaks during the installation of a single fastener, the parameters for the peak algorithm can be configured to read only the desired peak signal.

The following curve represents the force applied over time in a peak torque application.



Pulse Torque

Pulse Torque measures the highest peak from a series of peaks. This requires higher sampling frequency than for typical air stall tools or DC electric tools.



Note: The pulsed torque gage type will be capable of sample rates as fast as 50 micro-seconds (20Khz).

Pulse Count

When a gage type is set to Pulsed Torque, the number of pulses that occur between snug and the occurrence of the peak reading can be recorded. Snug is typically defined as 50% of the lower specification limit.

To capture the Pulse Count an auto-scanned pair of characteristics must be set up where the first characteristic source is 'Gx' (where 'Gx' is a pulsed torque gage type configuration) and the second characteristic source is of the form 'Cnt(Gx)'. Note that the Cnt() function is used to count pulses.

In the gage test mode, pulse counts will be displayed with the peak value for pulsed torque gage type configurations.

Angle

An Angle gage type will support three different applications: Torque and Angle, Angular Displacement, and Angle Set. In addition, a change in angle may be used as a sample event for torque measurements alternatively to a change in time.

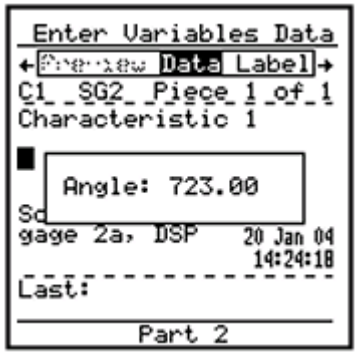
Torque and Angle—To capture the installation torque and angle between snug and peak, an auto-scanned pair of characteristics must be set up where the first characteristic source is set up for Peak (or Pulse) and a second characteristic is setup for Angle (capture). When the torque event is captured, the angle will be measured between snug (were snug is the start threshold for the first characteristic) and peak.

Example:

Source of C1 = Angle {13.7} (where Angle is configured Type=Peak (or Pulse) and 13.7 = start threshold or snug)
Source of C2 = Angle (where Angle is configured Type = Angle, Use = Capture)

Note: In the gage test mode, when an analog reading occurs for a torque gage setup, the angle value will also be displayed if angle encoder pulses are present and the next gage setup in the gage list is an angle gage type. In the gage master mode, the angle value will be displayed in real-time if the gage setup is an angle gage type.

Angular Displacement—To capture angular displacement, one characteristic, C1, is set up as the source of Dsp(angle), where angle is configured for angle (capture) and Dsp() is a function used to record angular displacement. Angular displacement is then obtained by rotating an angle transducer between start and stop key presses (<Enter>) while in data entry mode:



Typical Application: Tool Checking

C1 is configured as above, C2 is configured for keyboard input, C3 is the difference between C1 and C2 and is auto scanned with C2. The Angle Transducer is installed on an angle-capable run-down tool that has its own angle display. Zero the display on the run-down tool and press <Enter> on the data collector to start the measurement. Rotate the tool approximately 360 degrees and press <enter> again. Key in the angle as displayed on the run-down tool for C2. C3 will detect any deviation between the two angular measurements.

Angle Set— Angle Set is for hand assembly where joints or clamp load is critical, and a given angular rotation of the transducer past "snug" is required (for example, when a fastener needs to rotate 6 degrees past 30 Nm of torque).

To apply the 'set angle' algorithm, an auto-scanned pair of characteristics (C1 and C2) must be set up where the C1 source is 'Gx' and 'Gx' is Type=Peak, and C2 is set up where source is 'Gxn' and 'Gxn' is an angle gage type configuration with the 'Use' parameter set to 'Set'.

Per Above Example:

Source of C1 = Peak{30} (where Peak is configured Type=Peak and 30 = start threshold, i.e., snug)
Source of C2 = Angle (where Angle is configured Type = Angle, Use = Set) and the lower spec limit is set to 6.0.

As force is applied to the transducer, the angle of rotation is recorded when the applied torque achieves "snug." As rotation continues, the operator will be alerted (by a "let go tone") when the amount of rotation exceeds the lower spec limit for C2.

Note: If the second characteristic source has the format 'Gxn{y}' where y is an angle value in degrees, y will be substituted as the 'nice' alarm threshold instead of the characteristic's low limit.

Sample Event: Angle

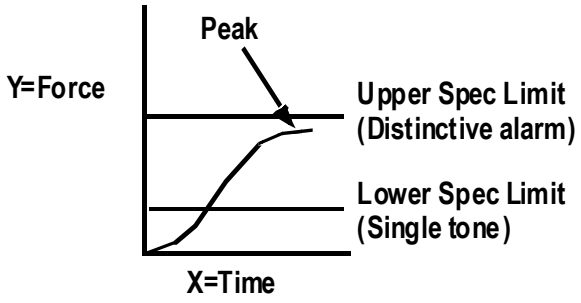
Torque algorithms may be configured to be sampled by a change in angle or by a change in time (in previous releases, sampling was only time-based).

A 'Sample Event' parameter has been added to torque gage configurations. If set to 'Angle' (instead of 'Time'), the analog signal will be sampled for algorithm satisfaction whenever the angular displacement changes.

Set Torque

Set torque is used in applications where fastening is done manually with a hand held wrench. This is typically found in low volume production applications, such as aircraft assembly, or as a rework tool in more automated settings. For example, head bolts on a 6-cylinder engine may be fastened with a closed loop multi-spindle in-line system. Those engines that are tagged for rework may be quickly checked with the data collector using Set Torque, even where multiple fasteners with different torques are involved. Set Torque allows you to record the maximum or peak torque applied and also provides audible signals to the operator when the lower and upper specifications limits have been surpassed. The lower spec limit is indicated with a release tone and the upper spec limit is indicated with a distinctive alarm.

The following curve represents the force applied over time in a set torque application, and also shows lines where the specification limits are reached:



Pick-a-Point

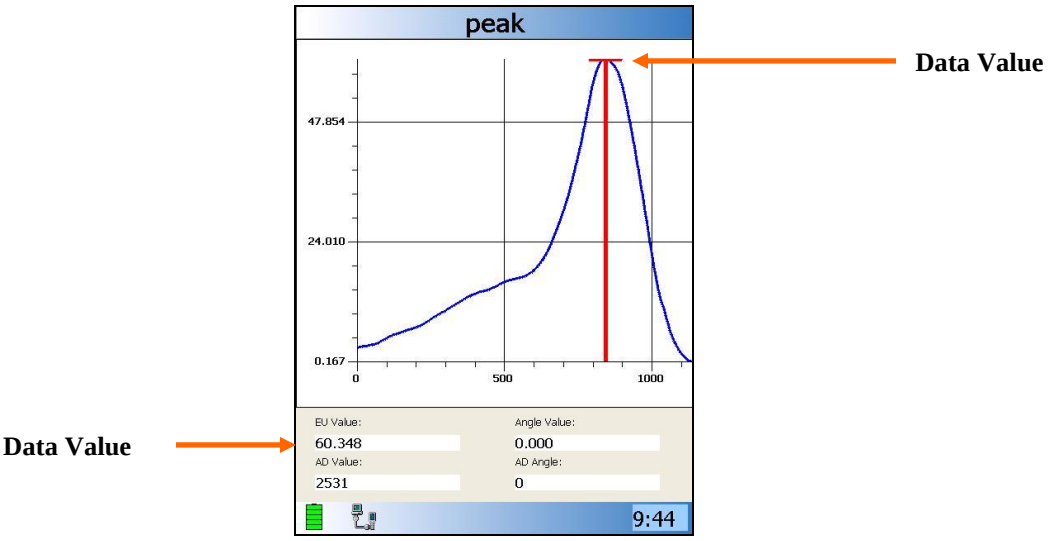
Normally, the value of the characteristic for the piece is determined by the algorithm in the data collector based on the torque type selected in the gage configuration. Use Pick-a-Point to select any point from the torque curve to enter as the data value.

The pick-a-point feature can be used for any port where the Gage configuration uses Peak, Breakaway, or Restart, and where Pick-a-Point has been turned on for the gage setup.

Steps

1. Make sure that **Pick-a-Point** is set to ON in the gage (Use Parameter) configuration.
2. Use the gage to take a reading as part of the normal data collection process.

   The data collector displays the torque curve in the data collection window instead of storing the reading. The data value is indicated by the red cursor:



You can accept the value indicated, continue to take readings, or use the arrow keys to move the cursor to the point on the curve that you want to record.

3. Press <enter> to accept the value shown by the Cursor Value.

SECTION

9

Exporting Data

Introduction

Data collected using the 600 Handheld Data Collector can be analyzed using ASI DataMyte support software such as TranSend II™ software. The data can also be analyzed using various third-party software applications such as Microsoft® Excel™.

TranSend II Software

If you are using ASI DataMyte TranSend II software, you can transfer data from the data collector and then use either an ASI DataMyte analysis program or a third-party program to analyze the data.

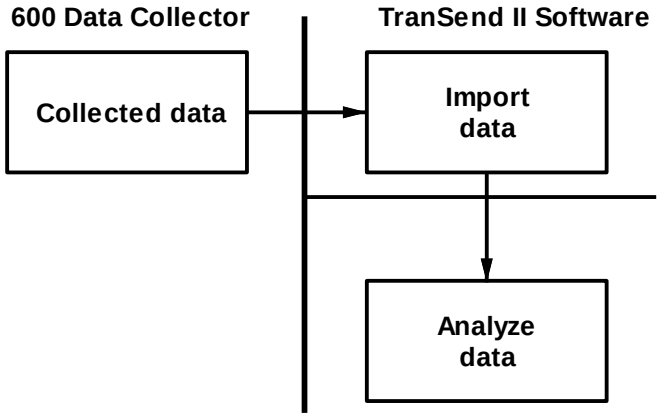


Figure 21. Exporting to TranSend II Software

Transferring Data to TranSend II

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

1) Collect Data

Use the 600 Handheld Data Collector to collect data for the required setups.

2) Configure TranSend II Communications

Ensure that TranSend II is properly configured for communication with the 600 Handheld Data Collector.

Steps

1. Attach the #95748 cable to a free USB port on the computer running TranSend II.
2. On the TranSend II main screen, click the **Options** button.
3. On the Receive Data screen, set the Receive Data options.

3) Import the Collected Data

See the *TranSend II User Guide* for detailed procedures.

Steps

1. On the TranSend II main screen, click the **Open Collector** button.
2. All setups with data are automatically imported as specified in the Receive Data Options screen.

4) Analyze the Data

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

SECTION

10

Flash Update Procedures

600 Flash Update Introduction

Firmware refers to the operating system and program code stored in microprocessor chips in the 600 Handheld Data Collector. "Flash" firmware refers to the ability of the chips to be updated without physically replacing any components such as ROM chips in the data collector. The flash firmware update is completed by using the TranSend II software application. You will need the firmware file to proceed. The firmware image file will need to be in a specific location in order to update

- **Firmware File** – Download the Flash Firmware file from either the ASI DataMyte Web Page or the TranSend II - DM600 DVD. Since ASI DataMyte offers many different flash update files, contact Technical Support for the name of the update file.
- **File Location –** Copy the firmware image file to the following location.
  C:\Program Files\ASI DataMyte\TranSend II\ASIDM600

IMPORTANT: If you are an ASI DataMyte TranSend II User, refer to the *TranSend II User Guide* to perform these flash update procedures.

Note: *The flash update procedure also updates the torque module firmware if a torque module is installed.*

The flash update procedure also updates the language translations.

Obtaining the Image File

Software updates are available from the ASI DataMyte web site (www.asidatamyte.com) through the Technical Support link or the TranSend II - DM600 DVD. For assistance in updating your 600 Handheld Data Collector, contact ASI DataMyte Technical Support.

Image File from Web Site

Steps:

1. Navigate to the Download Files section of the ASI DataMyte web site.
2. Select **Model 6xx Files** from the Hardware list and click on **Go**.
3. Download the Update instructions.
4. Download the applicable image file.

   The image file is contained within a WinZip® archive.
5. Unzip the *.exe file to a folder on your computer.

Image File from DM600 DVD

Steps:

1. Install TranSend II.
2. Select Start – All Programs – ASI DataMyte – TranSend II – ASIDM600
3. In Windows Explorer, the current image file is displayed.
4. The image file ends with an extension of ".bin".

Setting up Communications

To install the new firmware on your data collector, first establish communications between the computer that contains the update file and the data collector and transfer the flash update file.

Steps:

1. Connect the #95748 cable from your computers USB port to the USB port on the 600 Handheld Data Collector.

   Caution: *Before performing the Flash Update procedure, it is recommended that you back up all setups and data and reinitialize the 600.*

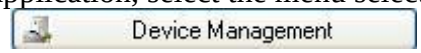
2. Power the data collector ON.
3. Start the TranSend II application.

Transferring the Firmware Update File

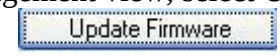
The data collector uses TranSend II communications while using the flash loader program.

Steps:

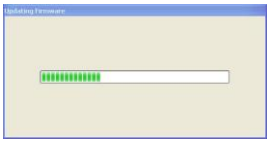
1. From the TranSend II application, select the menu selection **Device Management**.



2. From the Device Management view, select **Update Firmware**.



3. The firmware update file begins transferring to the data collector. A progress bar is displayed.



4. After the progress bar is no longer displayed, a message is displayed on the DM600.

5. During the file transfer, the data collector's right LED flashes green. This indicates normal operation.
6. When the transfer is complete, the data collector automatically reboots.
7. Total estimated firmware update time is approximately 2 minutes.

   If an error condition exists, first reattempt the transfer. If problems persist, write down any error codes or messages. Call Technical Support for assistance.

SECTION

11

Appendices

Appendix A - Characteristic Source

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

Source Location Symbols

The 600 Handheld Data Collector uses symbols to refer to source locations. For variables data, multiple sources are comma delimited; for label data, multiple sources are comma delimited. For instance, the source line K, Peak refers to either the Keypad or a gage alias.

The following table lists valid Source Location Symbols.

Table 12. Source Location Symbols

Source	Meaning	Examples
K	Keyboard	K
XXXXX	Alias name, Up to five characters	Peaks, GI
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 13. Operator Symbols

Source	Meaning	Examples
-	Minus	(C1-C2), Peak-C1
+	Add	(C3+C2), (Peak+Peak+Peak)*0+Peak
*	Multiply	(C3*N)-.2, Peak*.0005, C3*C4
/	Divide	(C1/C2), C4/.018
|	Through	(C1|5), (Peak|4)
~ or ^	Exponent	(C1~2), (Peak~2)/3.1416, (Peak^2)
(,)	And	AVG(C1,C2,C3)
[,]	Or	[Peak,K]1
{ *n* }	Start Threshold (Torque) -- where *n* overrides the start threshold defined for the torque tool	Peak{14.7} Note that *n* 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*peak

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 14. 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	(Peak=N)*(Peak-0.002)

Function Operators

The following table lists function operators for creating Source Formulae.

Table 15: Function Operators

Function	Meaning	Examples
Abs	Absolute Value	ABS(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(PEAK)
Cos	Trigonometric Cosine	COS(C2)
Dsp	Angular Displacement	DSP(PEAK)
Max	Maximum Value	MAX(S2), MAX(PEAK|4)
Med	Median Value	MED(S2), MED(C1|5)
Min	Minimum Value	MIN(S9), MIN(C1|7)
Rng	Range	RNG(C1|5), RNG(PEAK|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)
Tps	True Position	TPS(ALIAS,C1), TPS(ALIAS,ALIAS,ALIAS)

Notes:

1. Atan(x)—Returns the arc tangent of x, in degrees (–90° to +90°).
2. Asin(x)—Returns the arc sine of x, in degrees (–90° to +90°). The range of x is: -1 <= x <= 1.
3. Acos(x)—Returns the arc cosine of x, in degrees (0° to +180°). The range of x is: -1 <= x <= 1.
4. Cnt—Used in combination with Pulse measurement. Example: Peak is configured for Pulse; Characteristic 1 (C1) has a Source of Peak; Characteristic 2 (C2) is auto-scanned with C1 and has a Source of CNT(Peak). When a fastener is rundown with a pulse tool, C1 captures installation torque and C2 captures the number of pulses from snug to peak.
5. 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 B - Torque Wrench Adapters

Using a Torque Adapter Extension

Adapter extensions are sometimes required when the fastener location, on which a torque reading is to taken, does not allow direct access with a conventional socket. When an adapter is used it has the effect of extending, or in some cases shortening, the pivot point of the torque wrench and thus creating a lever arm affect that must be accounted for when taking measurements.

When the adapter is positioned at 0°, 90°, or 180° with respect to the torque wrench, calculations are performed based only on the length of the extension and the length of the torque wrench. When the adapter is oriented at angles between 0° and 90° or 90° and 180° the calculations are based on the effective length of the adapter.

Torque Adapter Orientations

Adapter In Line With the Torque Wrench

1. Measure the wrench's handle length (distance from transducer center point and point where the force is applied, usually the center of the wrench grip area).
2. Measure the length of the adapter.
3. Add the two together and divide by the original length. That's your scaling factor. For example:

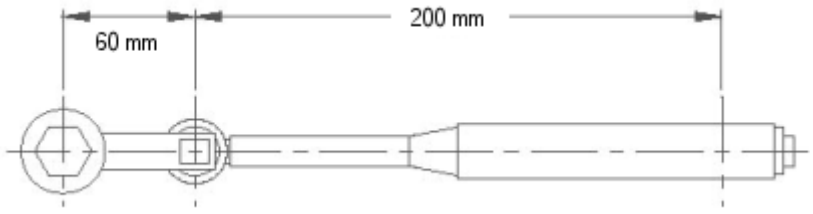


Figure 22: Adapter in Line with Torque Wrench

Example:

Scaling factor = (200+60) / 200 = 260/200 = 1.3

Source Example: Peak*1.3

Adapter Used at an Angle Between 0° and 90° to the Torque Wrench

1. Measure the wrench's handle length (distance from transducer center point and point where the force is applied, usually the center of the wrench grip area).
2. Measure the distance from the center of the adapter fastener connection to the center point of the transducer along the line of the torque wrench handle as shown below. Note this result will be less than the length of the adapter itself.
3. Add the two together and divide by the original length. That's your scaling factor. For example:

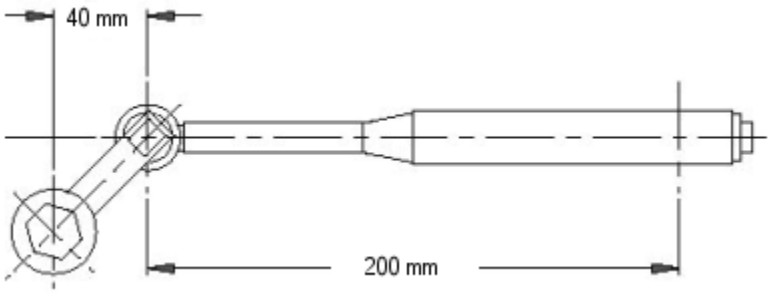


Figure 23: Adapter at Angle Between 0° and 90°

Example:

Scaling factor = (200+40) / 200 = 240/200 = 1.2

Source Example: Peak*1.2

Adapter Used at an Angle of 90° to the Torque Wrench

1. Measure the wrench's handle length (distance from transducer center point and point where the force is applied, usually the center of the wrench grip area).
2. If the adapter is at 90°, the scaling factor will be 1.0 because there is no change in the effective length of the wrench. Therefore there is no need to adjust the gage address by multiplying it by 1.

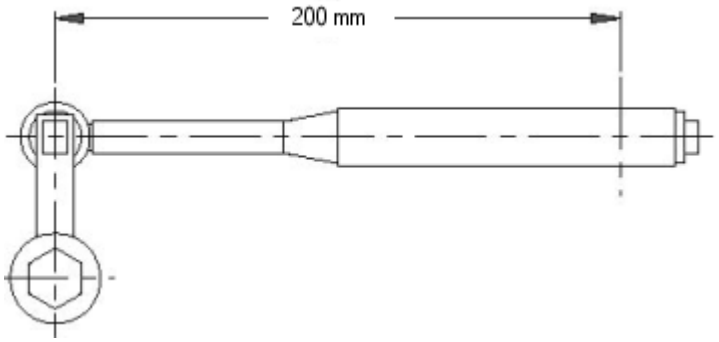


Figure 24: Adapter at 90° Angle

Example:

Scaling factor = (200+0) / 200 = 200/200 = 1.0

Source Example: Peak

Adapter Used at an Angle Between 90° and 180° to the Torque Wrench

1. Measure the wrench's handle length (distance from transducer center point and point where the force is applied, usually the center of the wrench grip area).
2. Measure the distance from the center of the adapter fastener connection to the center point of the transducer along the line of the torque wrench handle as shown below. Alternately, if the angle of the extension to the torque wrench is known this may be used in the calculations.
3. Subtract the two and divide by the original length. That's your scaling factor. For example:

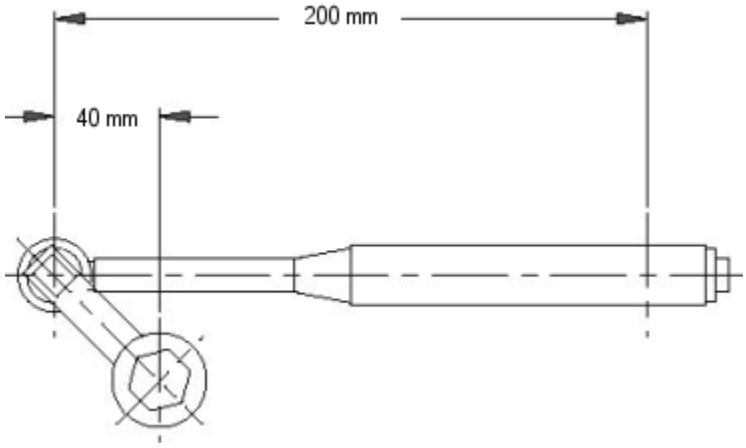


Figure 25: Adapter at Angle Between 90° and 180°

Example:

Scaling factor = (200-40) / 200 = 160/200 = 0.8

Source Example: Peak*0.8

Adapter in Line at 180° with the Torque Wrench

1. Measure the wrench's handle length (distance from transducer center point and point where the force is applied, usually the center of the wrench grip area).
2. Measure the length of the adapter.
3. Subtract the two and divide by the original length. That's your scaling factor. For example:

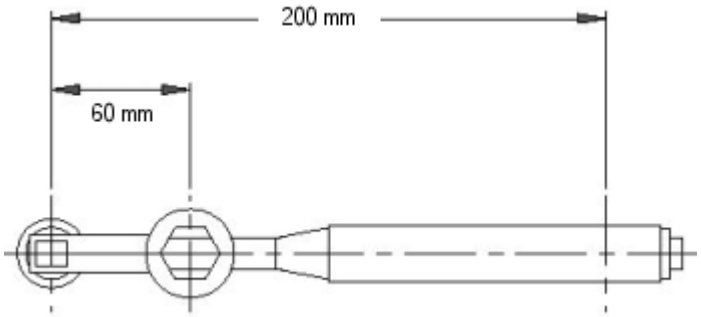


Figure 26: Adapter in Line at 180°

Example:

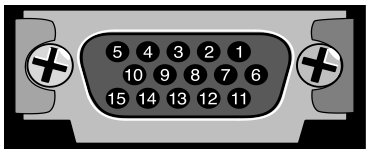
Scaling factor = (200-60) / 140 = 140/200 = 0.7

Source Example: Peak*0.7

Appendix C – Port Pin Diagrams

Analog Port Pinout

The following diagram of the ASI DataMyte 600 Analog Port indicates the pins with their corresponding functions:

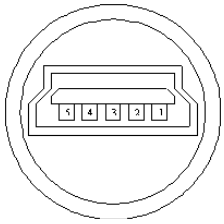


Analog Port

Pin	Function	Pin	Function
1	2.5V EXC	9	+5v Digital
2	EXC Common	10	Digital Common
3	+IN (Low-Level)	11	SW IN
4	-IN (Low-Level)	12	Reserved
5	Guard	13	A Phase
6	Green LED	14	B Phase
7	Reserved	15	Red LED
8	Reserved		

USB Gage Port Pinout

The following diagram of the ASI DataMyte 600 USB Gage Port indicates the pins with their corresponding functions:

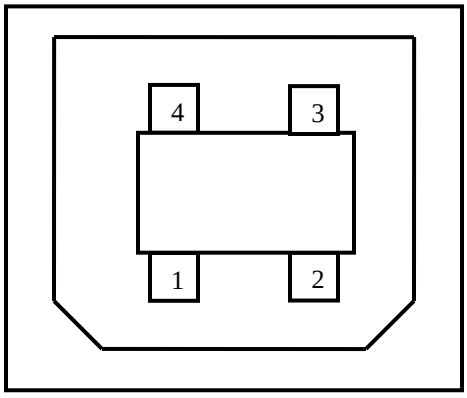


USB Gage Port

Pin	Function
1	VBUS +5V
2	D-
3	D+
4	NC
5	GND

USB Communications Port Pinout

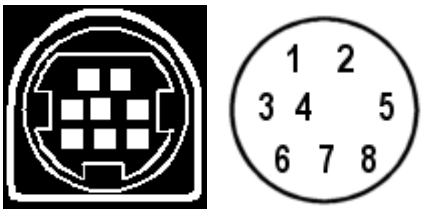
The following diagram of the ASI DataMyte 600 USB Communications Port indicates the pins with their corresponding functions.



Pin	Function
1	VBUS +5V
2	D-
3	D+
4	GND

Digital Gage Port Pinout

The following diagram of the ASI DataMyte 600 Digital Gage Port indicates the pins with their corresponding functions:

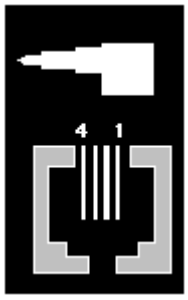


Pin	Function	Pin	Function
1	Ready, 1's	5	RXD, 4's
2	REQ, FED Sign 2's	6	Serial Clock
3	TXD	7	+ 5v
4	GND	8	Serial Data, 8's

LMI Port Pinouts

The following diagrams of the ASI DataMyte LMI ports indicate the pins with their corresponding functions:

Connector	Pin	Function
	1	– Excitation
	2	+ Excitation
	3	– Excitation
	4	+ Excitation
	5	A Signal Input
	6	B Signal Input

Connector	Pin	Function
	1	Read Switch Input
	2	– Excitation
	3	+ Excitation
	4	Signal Input

Support Information

This section contains information on ASI DataMyte maintenance agreements and technical support.

Technical Support

ASI DataMyte Technical Support experts are only a phone call away. Contact Technical Support for the following reasons:

- To assist in installing and configuring ASI DataMyte equipment
- To help implement data collection applications
- To help setup and configure gauges, multiplexers and accessories
- To troubleshoot ASI DataMyte equipment or support software

Technical Support is available free of charge during the initial warranty period and to current SMA customers.

- **Phone**: **800-207-5631** or **763-553-0455**
  Call Monday through Friday between 7:30 AM and 4:30 PM Central Standard Time.
- **Fax: 763-553-1041**
  Fax your questions to ASI DataMyte Technical Support at any time. Please include in the email your name, phone number, the hours you can be reached, and a detailed description of the problem.
- **Email: techsupport@asidatamyte.com**
  Email your questions to ASI DataMyte Technical Support at any time.

ASI DataMyte Customer Service

ASI DataMyte Customer Service can be reached at **763-553-1040** Monday through Friday between 7:30 a.m. and 4:30 p.m. Central Standard Time. Call ASI DataMyte Customer Service to perform any of the following tasks.

- Place orders
- Return ASI DataMyte equipment for service
- Upgrade ASI DataMyte equipment
- Inquire about the status of an order or repair

To expedite your service, be sure to have your ASI DataMyte customer number and, if applicable, your SMA contract number ready.

Support and Maintenance Agreements

Support and Maintenance Agreements (SMA) are available for the full line of ASI DataMyte hardware and software products. Benefits of an SMA contract include:

- Toll free number for Technical Support and Customer Service, which automatically prioritizes your call
- Free software/firmware updates/accessories coverage as specified by seller
- Free repair of your ASI DataMyte hardware products
- Free calibration service with certificate, starting the day after we receive the ASI DataMyte Data Collectors (*exception: consult ASI DataMyte for Torque Wrenches, a NON-ASI DataMyte product*)
- Free return shipping on repairs and calibration
- Repair turnaround is three-days, starting the day after we receive the product (*exceptions: multiple Data Collectors of five or more and Torque Wrenches - consult ASI DataMyte for turnaround time*)
- Accessories coverage as specified by seller
- Upgrades at reduced rates and service fee waived
- Increased trade-in values
- Special discounts on training and field service
- Free loaner data collectors if needed during repairs (5xx, 9xx, 3xxx only), subject to availability

If you have already purchased an SMA contract for this product, this warranty is extended for the duration expressed in the contract. Please call **763-553-1040** for more information about ASI DataMyte SMA contracts.

Index


Preview
Hi
40.00
Data
Nom
Char Label
C1 P2 SG1
Low
30.00
3
Engine Compartment
13:45
Enter

I n d e x