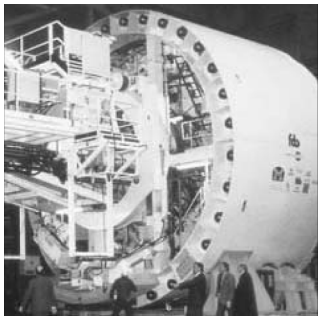
User Manual

Allen-Bradley

Run Up Coast Down Extension Module for the Dynamix 2500 Data Collector

Catalog Number 1441-DYN25-MRUC



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Important User Information

Solid-state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.rockwellautomation.com/literature/) describes some important differences between solid-state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid-state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

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The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence
	**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Table of Contents

Notes:

This manual covers the Dynamix 2500 data collector Run Up Coast Down (RUCD) extension module.

When using the Dynamix 2500 Data Collector Run Up Coast Down Extension Module, you can do the following:

- Record and analyze data from intermittent events and transient vibration signals from non-steady state machines.
- Analyze a machine's critical speeds and resonant frequencies.

Optional Extension Modules

These are the optional extension modules for the Dynamix 2500 data collector:

- 1441-DYN25-4C, 4-channel Activation (1)

  The 4-channel activation lets you take 3- or 4- channel magnitude, time waveform, spectra, and Offroute measurements.
- 1441-DYN25-MBMP Bump Test

  The Bump test (or hammer test) determines the natural frequencies of a machine or a structure.
- 1441-DYN25-MBAL Balancing

  The Balancing test resolves single-plane, two-plane, and static-couple balances with high precision.
- 1441-DYN25-MFRF Frequency Response Function

  The FRF test lets you determine the natural frequencies of a machine as well as sophisticated information about the frequency response of the structure being tested.
- 1441-DYN25-MREC Time Recorder

  The Time Recorder test uses a the instrument as a data recorder for real-time data acquisition and analysis.
- 1441-DYN25-MRUC Run Up Coast Down

  The RUCD test records and analyzes data from intermittent events and transient vibration signals from non-steady state machines.

See Additional Resources on page 6 for a listing of available publications.

(1) This is an activation license for the Dynamix 2500 data collector.

Additional Resources

These documents contain additional information concerning products from Rockwell Automation.

Resource	Description
Dynamix 2500 Data Collector User Manual, publication 1441-UM001	Describes the Dynamix 2500 data collector which provides predictive maintenance by using noise and vibration analysis.
Dynamix 2500 Data Collector Bump Test Extension Module User Manual, publication 1441-UM002	Describes how determine natural (or resonant) frequencies of a machine or structure.
Dynamix 2500 Data Collector Frequency Response Function Extension Module User Manual, publication 1441-UM003	Describes how to determine the natural frequencies of a machine or structure using modal hammer.
Dynamix 2500 Data Collector Balancing Extension Module User Manual, publication 1441-UM004	Describes the direct method to balance your rotating machinery in one or two planes.
Dynamix 2500 Data Collector Time Recorder Extension Module User Manual, publication 1441-UM005	Describes how to use the data collector as a data recorder for real-time data acquisition, post processing, and analysis.
Emonitor User's Guide, publication EMONTR-UM001	Describes data management for predictive maintenance services.
Dynamix 2500 Data Collector Kit Release Notes, publication 1441-RN001	Provides important information on the latest updates, for example, firmware, certifications, warnings, and hardware changes for the data collector.
Dynamix 2500 Data Collector Optional Extension Modules Release Notes, publication 1441-RN002	Provides important information on how to install the Optional Extension Modules onto the Dynamix 2500 data collector.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.ab.com	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/literature. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Installing Optional Extension Modules

The data collector uses the Extension Manager to install and uninstall extension modules. These extension modules are licensed and ordered separately from the basic entry level product.

The installation Secure Digital (SD) cards that you receive work with any Dynamix 2500 data collector. Once you have installed an extension module, the card is locked so that it can be used only with that instrument.

IMPORTANT One installation SD card is required for each instrument that needs to be upgraded.

You can uninstall extension modules if required. When uninstalling an extension module, you have the option to free up the license so you can install the extension module on another instrument. This makes the extension module available to be transferred between units.

IMPORTANT When ever you re-run the OS Loader software, you will re-load only the main OS firmware. The OS loader will backup licence files and data, but not the optional extension modules. Once you have updated the OS firmware, install the latest version of your optional extension modules.

See the Dynamix 2500 Data Collector User Manual, 1441-UM001, for more information.

Install an Extension Module

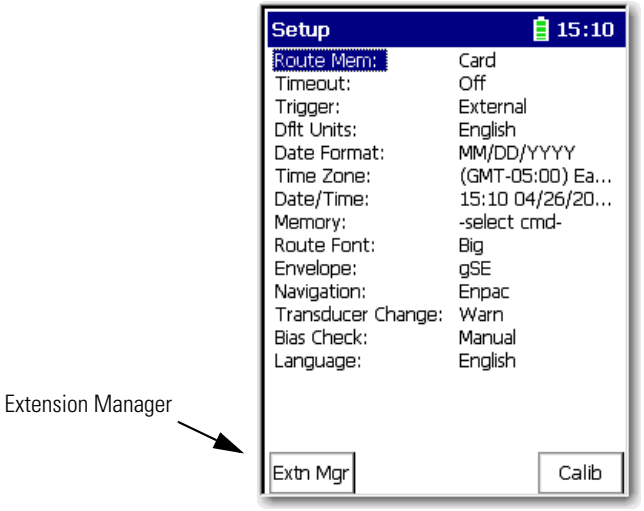
Follow these instructions to install an extension module.

1. Open the base cover at the bottom of the Dynamix 2500 data collector.
2. Place the extension module SD card contact side-up into the unit until it is firmly seated in place.
3. Close the base cover.

4. Apply power to the data collector.

5. From the Main Menu, select Setup Utility and press Enter.

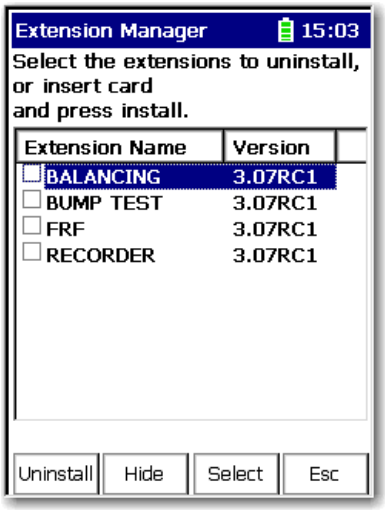
6. Press 0 (Shift) to display the second set of functions.



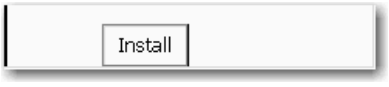
The Extension Manager function remains on the screen for about 3 seconds after releasing 0 (Shift).

7. Press F1 (Extn Mgr).

The Extension Manager screen appears showing the current extension module installations.



8. Press 0 (Shift) to display the Install extension function.

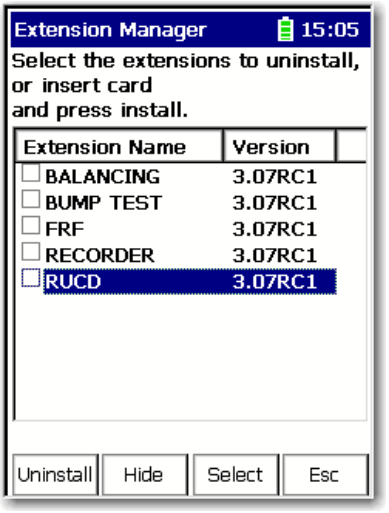


9. Press F2 (Install) to install the new extension module.

When the installation is complete, a confirmation prompt appears.

10. Press F4 (OK).

    The new extension module appears in the list.



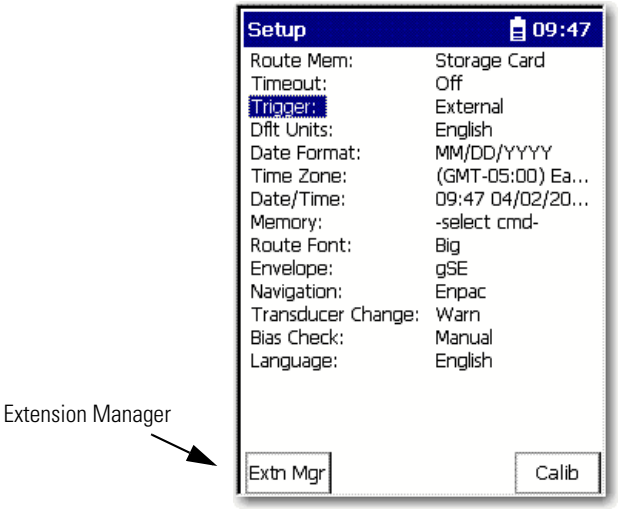
11. Press F4 (Esc) to exit the Extension Manager screen.

Uninstall Extension Modules

Follow these instructions to uninstall an extension module.

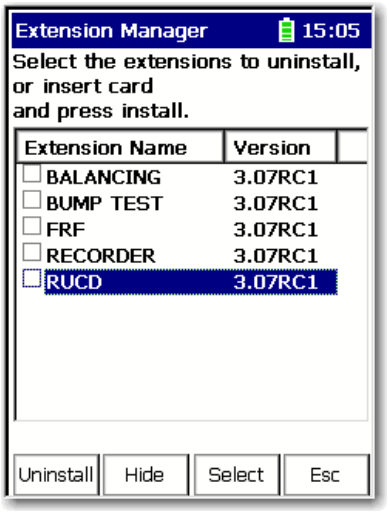
1. Press 0 (Shift) from the Setup Utility screen to display the Extension Manager function.

   The Extension Manager function remains on the screen for about three seconds after releasing 0 (Shift).



2. Press F1 (Extn Mgr).

The Extension Manager screen appears.

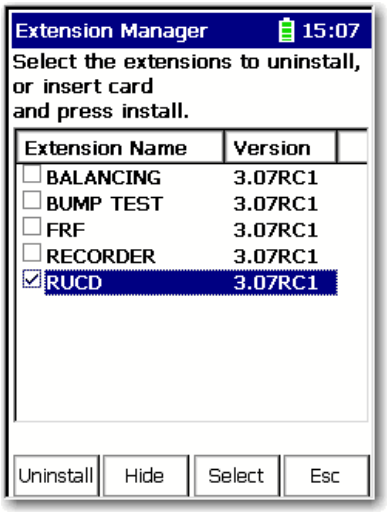


This screen lists the extension modules currently installed and the on the unit.

3. Select the extension module you want to uninstall and press F3 (Select).

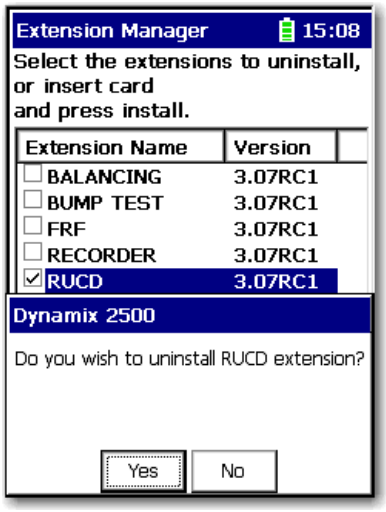
   F3 (Select) toggles the selection on and off.

A checkmark appears next to that extension module.



4. Press F1 (Uninstall).

A confirmation message appears.



5. Make sure your installation card is inserted into the instrument.

IMPORTANT The extension module is uninstalled and the license on the card is released so that the card can be used to install the extension module on another Dynamix 2500 data collector.

If the installation card is not inserted in the instrument and no card, you are is found or the card does not have the extension module license for the unit, you are prompted to insert the correct installation card or continue without freeing the license.

6. Press F2 (Yes) to uninstall the extension module.

7. Press F4 (Esc) to exit the Extension Manager screen.

Manage Extension Modules

The Dynamix 2500 data collector lets you to hide installed extension modules from the Main Menu. You may need to hide an advanced extension module icon from an inexperienced user, for example, RUCD and FRF.

IMPORTANT Once an extension module is hidden, its icon is not represented on the Main Menu or displayed in the Dynamix 2500 data collector About screen.

Follow these instructions to hide or show an extension module icon on the Main Menu.

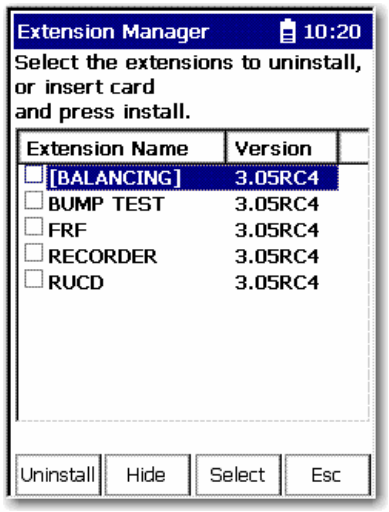
1. Press 0 (Shift) on the Setup Utility screen to display the Extension Manager function.

   The Extension Manager function should remain on the screen for approximately three seconds after releasing 0 (Shift).

2. Press F1 (Extn Mgr).

   The Extension Manager screen appears. The Extension Manager displays a list of installed extensions module.

The extension modules that are hidden are shown in [square brackets].



The F2 (Hide) toggles between Hide and Show depending if the selected extension module is hidden or not.

TIP You have to exit and re-enter the Extension Manager after hiding an extension module to have the Show function appear.

3. Select the extension module that you want to hide or show and press F2 (Show/Hide).

   TIP If you want to show or hide multiple extension modules simultaneously, select each extension module and press F3 (Select).

   A checkbox appears next to each selected extension module. If you select multiple extension modules and some are hidden while others are shown, F2 (Show/Hide) reflects the status of the selected extension module.

4. Press F4 (Esc) to exit the Extension Manager.

Extension Module Battery Status Indicators

The battery status icons show the strength of the battery.

Table 1 - Extension Module Battery Icon Descriptions

Battery Icon	Meaning
	Battery status is good: >30% life remaining.
	Battery status is low: >10% life remaining.
	Battery status is very low: <10% life remaining.
	Battery is charging.

Notes:

Run Up/Coast Down Extension Module

The Run Up/Coast Down (RUCD) extension module is an optional module for the Dynamix 2500 data collector. You install the extension module with the RUCD Secure Digital (SD) card.

See Installing Optional Extension Modules on page 7 for installation instructions.

The Run Up/Coast Down extension module lets the data collector record and analyze data from intermittent events and transient vibration signals from non-steady state machines.

The Run Up/Coast Down extension module is used to record and analyze data from machines where noise or vibration levels are changing with speed or time such as during a run up (increase in speed), coast down (decrease in speed), or other applications causing transient phenomena. You use the data to analyze a machine's critical speeds and resonant frequencies.

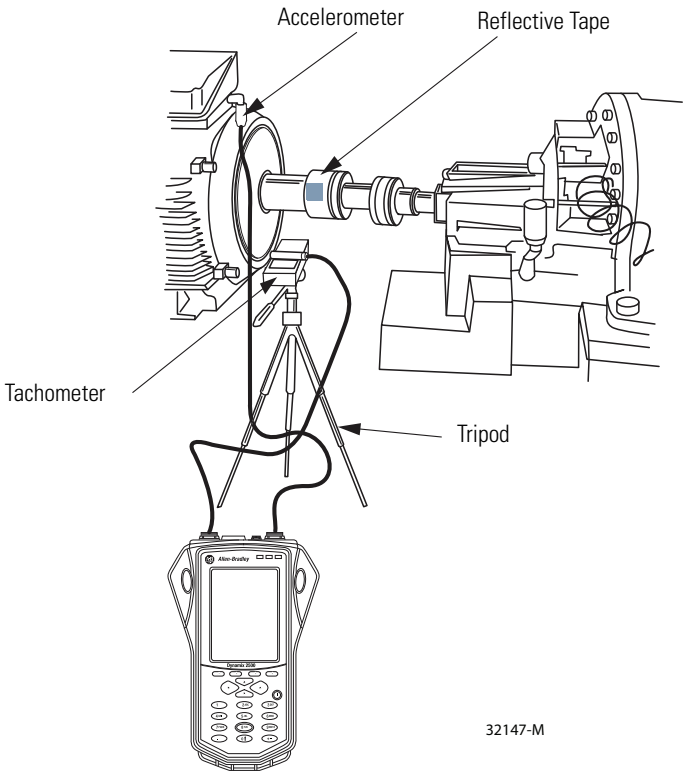
The application acquires a simultaneous noise or vibration signal and a tachometer signal.

This example setup includes the following:

- Accelerometer attached to connector A of the Dynamix 2500 data collector
- Optical tachometer signal connected to the POWER/USB/TRIGGER cable
- Tripod for tachometer signal stability
- Speed reference trigger
- Small piece of reflective tape on the part of the shaft can serve as a reference trigger or you can simply pass the laser over a notch in the shaft

This graphic illustrates a typical Run Up/Coast Down setup.

Figure 1 - Run Up/Coast Down Setup



The recorded data is saved in the form of a Microsoft .wav time waveform file. You can analyze this file and viewed in a variety of different formats including:

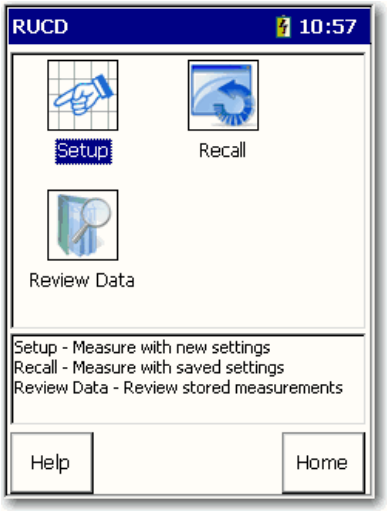
- Bode Plot
- Nyquist Plot
- Table
- Waterfall
- Spectrogram

Set Up Run Up/Coast Down Measurements

The first step in the Run Up/Coast Down extension module is to setup how the measurements are taken by the data collector.

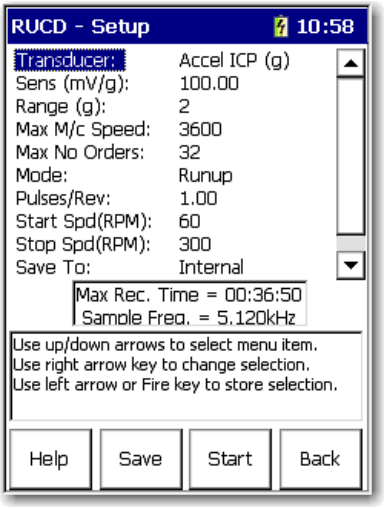
1. Select RUCD on the Main Menu and press the Enter.

   The RUCD screen appears.



2. Select Setup and press Enter to set up the Run Up/Coast Down parameters.

   The RUCD - Setup screen appears.



3. Select a parameter and press the Right arrow to open a list of values.

4. Select or type the parameter value.

5. Press Left arrow to save your selection.

6. Press F2 (Save) to save the current settings to a file.

   See Save Run Up/Coast Down Measurements on page 40 for details.

Use these descriptions to help you configure the parameters in the Run Up/Coast Down Setup screen.

Table 2 - Run Up/Coast Down Setup Parameters

Parameter	Description	Values/Comments
Transducer	Specifies the type of sensor used on Connector A, this is typically Accel (g). The specified sensor type determines available options and engineering units for subsequent setup fields.	Accel ICP (g) (default) Accel (g) Accel ICP (m/s^2) Accel (m/s^2) Vel ICP (mm/s) Vel (mm/s) Vel ICP (ips) Vel (ips) Disp (mils) Disp (µm) Volts AC User (EU)
Sens (mV/EU)	The transducer sensitivity in millivolts (MV) per engineering units (EU).	1…2000 (mV/EU) 100 (default)
Range (EU)	The expected maximum amplitude range value for the incoming input signal. The range should accommodate for unexpected events. If you are unsure about the range value, set the range 10 to 20 times higher than expected.	.1 EU .2 EU .5 EU 1 EU 2 EU (default) 5 EU 10 EU 20 EU (default) 50 EU 100 EU 200 EU 500 EU 1000 EU 2000 EU
Max M/c Speed	The maximum speed that the shaft will reach in rpm. This is used with Max No Orders to determine the sampling rate.	10…60000 rpm 3600 rpm (default)
Max No Orders	The maximum number of shaft orders of interest during analysis. This is used with Max M/c Speed to determine the sampling rate.	1 to 166 32 (default)
Mode	The method for initiating the data collection. • Runup - The data collection starts when the machine speed rises above Start Spd. • Coast down -The data collection starts when the machine speed falls below Stop Spd. • Manual - Manually start data collection by pressing F4 (Start). No tachometer signal is required for this mode.	Runup (default) Manual Coastdown

Table 2 - Run Up/Coast Down Setup Parameters

Parameter	Description	Values/Comments
Pulses/Rev	The number of tachometer signal pulses per revolution of the reference shaft. To acquire a suitable tachometer signal, the tachometer signal must be approximately 1.5 volts peak-to-peak. The adverse effect of excessively short tachometer pulse widths can be addressed by setting the Max No Order to a higher value to increase the sampling rate.	.1…1000 1 (default) This number can be a multiple or a non-integer to accommodate, for example, gear ratios.
Start Spd (RPM)	Sets the speed at which the unit should start collecting data. • If Mode is set to Runup, this value must be less than the Stop Spd. • If Mode is set to Coast down, this value must be greater than the Stop Spd. This parameter is not available if Mode is set to Manual.	10…3600 rpm 60 rpm (default)
Stop Spd (RPM)	Sets the speed at which the unit should stop collecting data. • If Mode is set to Runup, this value must be greater than the Start Spd. • If Mode is set to Coast down, this value must be less than Start Spd. This parameter is not available if Mode is set to Manual.	10…3600 rpm 300 rpm (default)
Save To	Sets the location where data is saved. Save the data to the SD or PC card if the .wav files will be large. Your selection affects the maximum recording time.	Internal (default) SD Card
Max Acq Time (s)	The number of seconds to record the time waveform. This limit applies only if the run up or coast down takes longer than the time set here.	1…1131.65 s 1131.65 s (default)

Collect Run Up/Coast Down Measurements

This section describes the Run Up/Coast Down status indicators and how to collect Run Up/Coast Down data.

Table 3 - RUCD Status Indicators

Indicator	Status	Description
Red	Solid	An overload error (clipping or streaming error) has occurred during data collection.
Amber	Solid	An error has occurred during data collection The status indicator turns off when the error condition disappears.
Green	Flashing Green	No errors occurred during data collection.

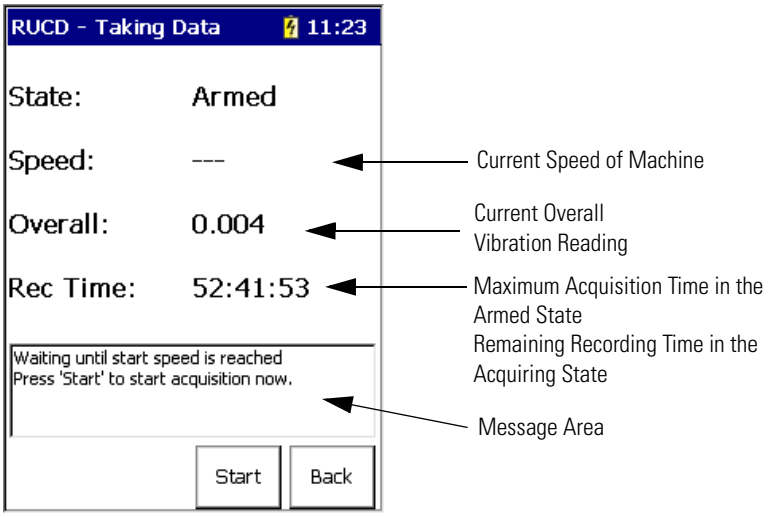
Once you have configured the parameters, you can begin collecting data. The data is automatically recorded as a .wav file, which can then be analyzed using several different types of plots.

1. Using the a tachometer cable, connect the reference input device to the POWER/USB/TRIGGER connector and the transducer to connector A.

2. Align the reference input device (tachometer, optical tachometer, or strobescope) to capture shaft speed.

3. Attach a transducer to the bearing house.
4. Start the machine or stop the machine as needed.
5. From the RUDC Setup screen press F3 (Start).

   The RUCD - Taking Data screen appears.

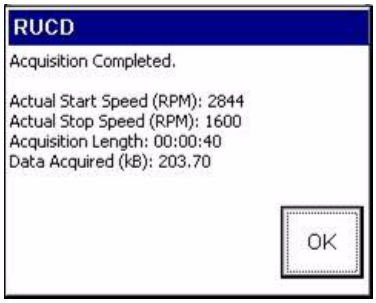


The Dynamix 2500 data collector begins collecting run up or coast down data based on the parameters you selected. The state of the machine is indicated on the screen.

State	Description
Armed	The machine speed has not reached the Start Spd and data collection has not yet started. At any time during this state, you can press F3 (Start) to manually start data collection.
Acquiring	The machine speed has reached the Start Spd and data collection has started. At any time during this state, you can press F3 (Stop) to manually stop data collection.
Error-Clipped	An error occurred during data collection. If a sensor's Range setting is too small to accommodate the signal's amplitude, a message displays in the message error. Press F4 (Back) to return to the RUCD - Setup screen and increase the Range setting.

Data collection is complete when the specified Stp Speed or Maximum Acquisition Time is reached, or you press F3 (Stop).

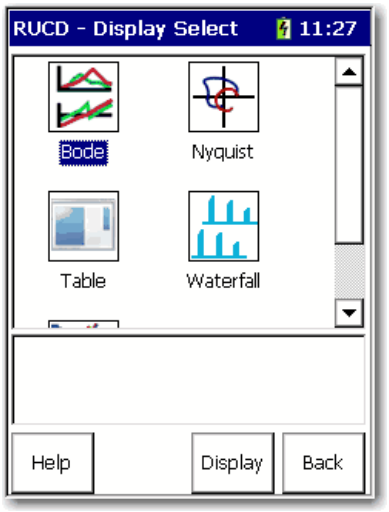
The resulting time waveform is recorded as a Microsoft Windows .wav file and the Acquisition Completed dialog appears on the screen.



TIP If an error occurs during data collection, a message appears in this dialog box.

6. Press F4 (OK) to continue.

   The RUCD - Display Select screen appears.



The Dynamix 2500 data collector provides five different formats for you to use to view the newly recorded time waveform.

7. Select the format and press F3 (Display).

Format	Description
Bode	Displays the magnitude and phase over a varying rpm. See Displaying Measurements by Using a Bode Plot on page 22.
Nyquist	Displays the selected orders as complex data. See Displaying Measurements Using a Nyquist Plot on page 25.

Format	Description
Table	Displays the magnitude and phase of selected orders at the varied rpm speeds in a table format. See Displaying Measurements in Table Format on page 28.
Waterfall	Displays multiple FFT traces overlaid and offset on one single plot. See Displaying Measurements Using a Waterfall on page 31.
Spectrogram	Displays multiple FFT traces on one single plot, using color to indicate relative magnitude. See Displaying Measurements Using a Spectrogram on page 36.

8. When you are finished analyzing the time waveform, you can save it to a file.

   See Save Run Up/Coast Down Measurements on page 40.

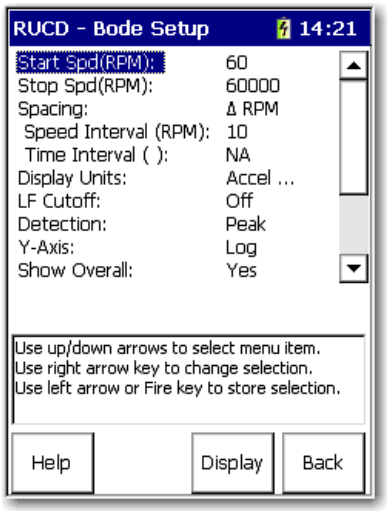
Displaying Measurements by Using a Bode Plot

The Bode plot is actually two graphs of 1X rpm amplitude and phase as a function of frequency. The screen shows both plots at the same time. The top plot shows magnitude versus rpm. The bottom plot shows phase versus rpm.

Set Up the Bode Plot

1. Select Bode on the RUCD - Display Select screen and press F3 (Display).

   The RUCD - Bode Setup screen appears.



2. Select the parameter and press the Right arrow to open a list of values.
3. Select or type in the parameter value.
4. Press the Left arrow to save your selection.

   See Bode Plot Parameters on page 23 to help you configure the parameters.

5. When you are finished, press F3 (Display) to display the Bode plot.

   See Display the Bode Plot on page 24.

Table 4 - Bode Plot Parameters

Parameter	Description	Values/Comments
Start Spd (RPM)	Sets the start speed of the recorded data for the Bode plot. This defaults to the Start Spd value set in the RUCD Setup screen. See Table 2 on page 18.	10…3600 rpm
Stop Spd (RPM)	Sets the stop speed of the recorded data for the Bode plot. This defaults to the Stop Spd value set in the RUCD Setup screen. See Run Up/Coast Down Setup Parameters on page 18.	10…3600 rpm
Spacing	Controls the spacing between collected spectra. • Δ rpm is a fixed speed change between spectra. • % Δ rpm is a percentage speed change between spectra. • Δ Time is a fixed time interval between spectra. • Δ rpm + Δ Time is a combination of speed and time interval settings. If speed stops changing then spectra are calculated using the Time Interval value. • % Δ rpm + Δ Time is a combination of speed and time interval settings. If speed stops changing then spectra are calculated using the Time Interval value.	Δ rpm % Δ rpm Δ Time Δ rpm + Δ Time % Δ rpm + Δ Time Your selection affects the Speed Interval and Time Interval settings.
Speed Interval (rpm)	Sets the speed interval used in calculating FFT spectra. This parameter not used when Spacing is set to Δ Time.	1…240 rpm or % rpm
Time Interval (sec)	Sets the time interval used in calculating FFT spectra. This parameter is not used when Spacing is set to Δ rpm and % Δ rpm.	Enter a value from .001…604800 s
Display Units	Sets the Y-axis units. The available units depends on the transducer used to collect data. See Run Up/Coast Down Setup Parameters on page 18.	Accel (g) Accel (m/s^2) Accel (m/s^2) Vel (mm/s) Vel (ips) Disp (mils) Disp (µm)
LF Cutoff	Determines whether to apply a low frequency filter (0.3 times the running speed) to the data.	Off (default) On
Detection	Sets the signal detection and scaling display for the Bode plot: • Peak - Measured RMS value multiplied by the square root of two (1.4142). • Pk-Pk - Measured RMS value multiplied by two times the square root of two (2.8284). • RMS - Root mean squared signal level of the input signal.	RMS Peak (default) PkPk
Y-axis	Sets the y-axis scaling on the Bode plot: • Linear - The plot grid centers are linearly spaced in Y between the centers of the first and last grid. • Log - The plot grid centers are logarithmically spaced in Y between the centers of the first and last grid.	Linear (default) Log

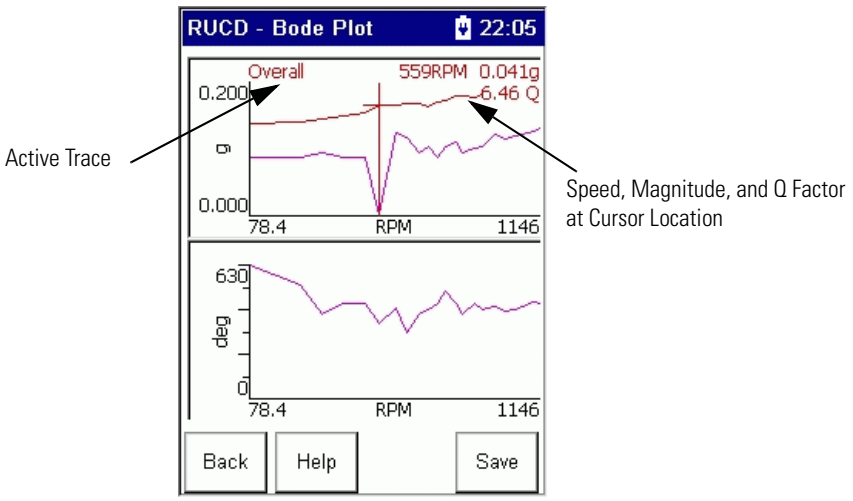
Table 4 - Bode Plot Parameters

Parameter	Description	Values/Comments
Show Overall	Determines whether to display the overall severity as a trace on the Bode plot.	Yes (default) No
Num Traces	Sets the number of traces or order tracks to be displayed on the Bode plot: • The number of traces available is determined by the Show Overall parameter. • Your selection determines the available number of Trace Order parameters.	1 (default) 2 3 4
Trace Order #1…4	The order numbers to be tracked and displayed on the Bode plot. This value cannot exceed the Max No Orders value set in the RUCD Setup screen. See Run Up/Coast Down Setup Parameters on page 18.	.001…166 orders

Display the Bode Plot

When you are done setting up the Bode plot parameters, you can process the data and display the Bode plot by pressing F3 (Display) on the RUCD - Bode Setup screen.

TIP The larger the .wav file, the longer it takes to process the data and display the plot.



The top of the display shows magnitude versus rpm. The bottom of the display shows phase versus rpm:

- To sequence through the traces, press the Up and Down arrows.

  The order number of the current trace is displayed in the top left corner of the screen. To move the cursor along the trace, press the Left and Right arrows.

- From the Bode plot you can also display the data in a Table format or Nyquist plot. To display the data in a table, press 0 (Shift) and F4 (Table).

  See Display the Table on page 30 for more information.

- To display the data in a Nyquist plot, press 0 (Shift) and F1 (Nyqst).

  See Display the Nyquist Plot on page 27 for more information.

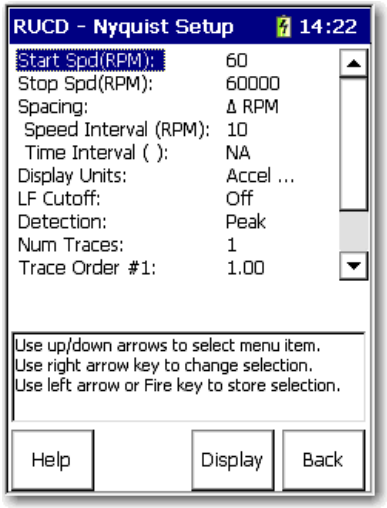
Displaying Measurements Using a Nyquist Plot

The Nyquist plot is a polar representation of the amplitude and phase angle as a function of frequency. Three variables are combined into a single plot in polar format.

Set Up the Nyquist Plot

1. Select Nyquist on the RUCD - Display Select screen and press F3 (Display).

   The RUCD - Nyquist Setup screen appears.



2. Select the option and press the Right arrow to open a list of values.

3. Select or type in a parameter value.

4. Press the Left arrow to save your selection.

   Use the descriptions in Nyquist Plot Parameters on page 26 to help you configure the parameters.

5. When you are finished, press F3 (Display) to display the Nyquist plot.

See Display the Nyquist Plot on page 27.

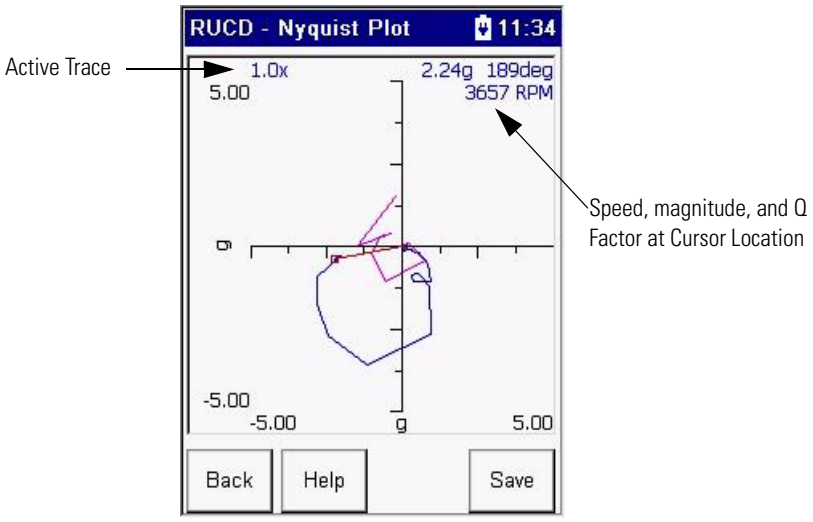
Table 5 - Nyquist Plot Parameters

Parameter Name	Description	Values/Comments
Start Spd (RPM)	Sets the start speed of the recorded data for the plot. This defaults to the Start Spd value set in the RUCD Setup screen. See Run Up/Coast Down Setup Parameters on page 18.	10…3600 rpm
Stop Spd (RPM)	Sets the stop speed of the recorded data for the plot. This defaults to the Stop Spd value set in the RUCD Setup screen. See Run Up/Coast Down Setup Parameters on page 18.	10…3600 rpm
Spacing	Controls the spacing between collected spectra: • Δ rpm is a fixed speed change between spectra. • % Δ rpm is a percentage speed change between spectra. • Δ Time is a fixed time interval between spectra. • Δ rpm + Δ Time is a combination of speed and time interval settings. If speed stops changing then spectra are calculated using the Time Interval value. • % Δ rpm + Δ Time is a combination of speed and time interval settings. If speed stops changing then spectra are calculated using the Time Interval value.	Δ rpm % Δ rpm Δ Time Δ rpm + Δ Time % Δ rpm + Δ Time Your selection affects the Speed Interval and Time Interval settings.
Speed Interval (RPM)	Sets the speed interval used in calculating FFT spectra. This parameter not used when Spacing is set to Δ Time.	1… 240 rpm or % rpm
Time Interval (sec)	Sets the time interval used in calculating FFT spectra. This parameter is not used when Spacing is set to Δ RPM and % Δ RPM.	.001…604800 s
Display Units	Sets the Y-axis units. The available units depends on the transducer used to collect data. See Run Up/Coast Down Setup Parameters on page 18.	
LF Cutoff	Determines whether to apply a low frequency filter (0.3 times the running speed) to the data.	Off On
Detection	Sets the signal detection and scaling display for the plot: • Peak - Measured RMS value multiplied by the square root of two (1.4142). • Pk-Pk - Measured RMS value multiplied by two times the square root of two (2.8284). • RMS - Root mean squared signal level of the input signal.	RMS Peak PkPk
Num Traces	Sets the number of traces or order tracks to be displayed on the plot. Your selection determines the available number of Trace Order parameters.	1 2 3 4
Trace Order #1-#4	The order numbers to be tracked and displayed on the plot. This value cannot exceed the Max No Orders value set in the RUCD Setup screen. See Run Up/Coast Down Setup Parameters on page 18.	.001…166 orders

Display the Nyquist Plot

When you are done setting up the plot parameters, you can process the data and display the Nyquist plot by pressing F3 (Display) on the RUCD - Nyquist Setup screen.

TIP The larger the .wav file, the longer it takes to process the data and display the plot.



The display shows the selected orders as complex data with zero degrees along the positive X-axis and 90 degrees along the positive Y-axis:

- To sequence through the traces, press the Up and Down arrows. The order number of the current trace is displayed in the top left corner of the screen. To move the cursor along the trace, press the Left and Right arrows.
- From the Nyquist plot you can display the data in a table or Bode plot, press 0 (Shift) and F4 (Table).

  See Display the Table on page 30 for more information.
- To display the data in a Bode plot, press 0 (Shift) and then F1 (Bode).

  See Display the Bode Plot on page 24 for more information.

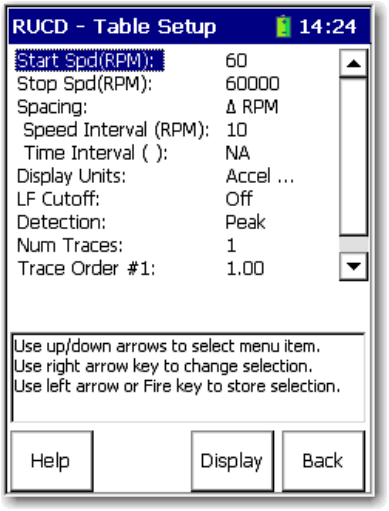
Displaying Measurements in Table Format

The magnitude and phase of selected orders at the varied rpm speeds are displayed in a table.

Set Up the Table

1. Select Table on the RUCD - Display Select screen and press F3 (Display).

   The RUCD - Table Setup screen appears.



2. Select a parameter press the Right arrow to open a list of values.
3. Select or type in a parameter value.
4. Press the Left arrow to save your selection.

   Use the descriptions in Table Parameter Descriptions on page 28 to help you configure the parameters.

5. When you are finished, press F4 (Display) to display the table.

   See Display the Table on page 30.

Table 6 - Table Parameter Descriptions

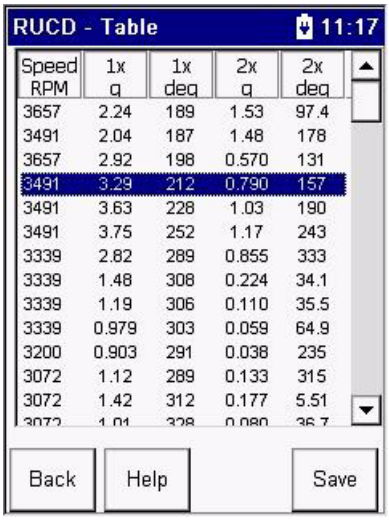
Parameter Name	Description	Values/Comments
Start Spd (RPM)	Sets the start speed of the recorded data for the table. This defaults to the Start Spd value set in the RUCD Setup screen. See Run Up/Coast Down Setup Parameters on page 18.	10…3600 rpm
Stop Spd (RPM)	Sets the stop speed of the recorded data for the table. This defaults to the Stop Spd value set in the RUCD Setup screen. See Run Up/Coast Down Setup Parameters on page 18.	10…3600 rpm

Table 6 - Table Parameter Descriptions

Parameter Name	Description	Values/Comments
Spacing	Controls the spacing between collected spectra: • Δ rpm is a fixed speed change between spectra. • % Δ rpm is a percentage speed change between spectra. • Δ Time is a fixed time interval between spectra. • Δ rpm + Δ Time is a combination of speed and time interval settings. If speed stops changing then spectra are calculated using the Time Interval value. • % Δ rpm + Δ Time is a combination of speed and time interval settings. If speed stops changing then spectra are calculated using the Time Interval value.	Δ rpm % Δ rpm Δ Time Δ rpm + Δ Time % Δ rpm + Δ Time Your selection affects the Speed Interval and Time Interval settings.
Speed Interval (RPM)	Sets the speed interval used in calculating FFT spectra. This parameter not used when Spacing is set to Δ Time.	1…240 rpm or % rpm
Time Interval (sec)	Sets the time interval used in calculating FFT spectra. This parameter is not used when Spacing is set to Δ RPM and % Δ RPM.	.001…604800 s
Display Units	Sets the Y-axis units. The available units depends on the transducer used to collect data. See Run Up/Coast Down Setup Parameters on page 18.	
LF Cutoff	Determines whether to apply a low frequency filter (0.3 times the running speed) to the data.	Off On
Detection	Sets the signal detection and scaling display for the table: • Peak - Measured RMS value multiplied by the square root of two (1.4142). • Pk-Pk - Measured RMS value multiplied by two times the square root of two (2.8284). • RMS - Root mean squared signal level of the input signal.	RMS Peak PkPk
Num Traces	Sets the number of traces or order tracks to be displayed in the table. Your selection determines the available number of Trace Order parameters.	1 2
Trace Order #1-#4	The order numbers to be tracked and displayed in the table. This value cannot exceed the Max No Orders value set in the RUCD Setup screen. See Run Up/Coast Down Setup Parameters on page 18.	.001…166 orders

Display the Table

When you are done setting up the table parameters, you can process the data and display the table by pressing F4 (Display) on the RUCD - Table Setup screen.



Up to two orders of the magnitude and phase data set is displayed in the table:

- To scroll through the table, press the Up and Down arrows.
- You can also display the data in a Bode plot. To display the data in a Bode plot or Nyquist plot, press 0 (Shift) and F4 (Bode).

  See Display the Bode Plot on page 24.
- To display the data in a Nyquist plot, press 0 (Shift) and F1 (Nyquist).

  See Display the Nyquist Plot on page 27.

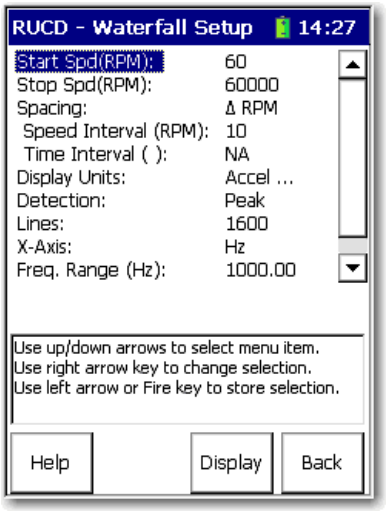
Displaying Measurements Using a Waterfall

The Waterfall plot displays the vibration level in relation to the frequencies at which the vibration occurs. It lets you view several measurements in relationship to each other.

Set Up the Waterfall

1. Select Waterfall on the RUCD - Display Select screen and press F3 (Display).

   The RUCD - Waterfall Setup screen appears.



2. Select the option and press the Right arrow to open a list of values.
3. Select or type in the parameter value.
4. Press the Left arrow to save your selection.

   Use the descriptions in Waterfall Plot Parameters on page 31 to help you configure the parameters.

5. When you are finished, press F3 (Display) to display the Waterfall plot.

   See Display the Waterfall Plot on page 33.

Table 7 - Waterfall Plot Parameters

Parameter Name	Description	Values/Comments
Start Spd (RPM)	Sets the start speed of the recorded data for the plot. This defaults to the Start Spd value set in the RUCD Setup screen. See Run Up/Coast Down Setup Parameters on page 18.	10…3600 rpm
Stop Spd (RPM)	Sets the stop speed of the recorded data for the plot. This defaults to the Stop Spd value set in the RUCD Setup screen. See Run Up/Coast Down Setup Parameters on page 18.	10…3600 rpm

Table 7 - Waterfall Plot Parameters

Parameter Name	Description	Values/Comments
Spacing	Controls the spacing between collected spectra: • Δ rpm is a fixed speed change between spectra. • % Δ rpm is a percentage speed change between spectra. • Δ Time is a fixed time interval between spectra. • Δ rpm + Δ Time is a combination of speed and time interval settings. If speed stops changing then spectra are calculated using the Time Interval value. • % Δ rpm + Δ Time is a combination of speed and time interval settings. If speed stops changing then spectra are calculated using the Time Interval value.	Δ rpm % Δ rpm Δ Time Δ rpm + Δ Time % Δ rpm + Δ Time Your selection affects the Speed Interval and Time Interval settings.
Speed Interval (RPM)	Sets the speed interval used in calculating FFT spectra. This parameter not used when Spacing is set to Δ Time.	1…240 rpm
Time Interval (sec)	Sets the time interval used in calculating FFT spectra. This parameter is not used when Spacing is set to Δ RPM and % Δ RPM.	.001…604800 s
Display Units	Sets the Y-axis units. The available units depends on the transducer used to collect data. See Run Up/Coast Down Setup Parameters on page 18.	
Detection	Sets the signal detection and scaling display for the plot: • Peak - Measured RMS value multiplied by the square root of two (1.4142). • Pk-Pk - Measured RMS value multiplied by two times the square root of two (2.8284). • RMS - Root mean squared signal level of the input signal.	RMS Peak PkPk
Lines	The number of lines (bins) of resolution for the FFT spectra. The larger the number of lines, the better the frequency resolution of the measured data in the spectra. Similarly, the higher the number of lines, the longer it takes to display the spectra in the plot.	100 200 400 800 1600 3200 6400 12800
X-axis	Sets the x-axis frequency units for displaying spectra/FFT data: • Hz - Displays spectra in Hertz, cycles per second. • CPM - Displays spectra in cycles per minute. • Orders - Displays spectra in orders of the operating speed.	Hz CPM Orders Your selection affects the Freq Range and LF Cutoff parameters.
Freq. Range (EU)	The maximum frequency for the measurement. The frequency range is determined by the X-axis parameter.	10…2000 Hz 600…120000 CPM .001…166 Orders

Table 7 - Waterfall Plot Parameters

Parameter Name	Description	Values/Comments
LF Cutoff (EU)	Sets a low frequency cutoff filter to remove noise from the analysis. The available options are determined by the X-axis selection.	Off 21.6 CPM 66 CPM 120 CPM 600 CPM 4200 CPM .36 Hz 1.1 Hz 2 Hz 10 Hz 70 Hz

Display the Waterfall Plot

When you are finished setting up the plot parameters, you can process the spectral data by pressing F3 (Display) on the RUCD - Waterfall Setup screen.

TIP The larger the .wav file, the longer it takes to process the data and display the plot.

Optimize the Waterfall Plot

Additional parameters display on the screen letting you to control how the spectra appear in the waterfall plot.

1. Select the option and press the Right arrow to open a list of values.
2. Select or type in a parameter value.
3. Press the Left arrow to save your selection.

   Use the descriptions in Waterfall Plot Setup Parameters on page 34 to help you configure the parameters.

4. When you are finished and ready to display the waterfall plot, press F3 (Display).

Table 8 - Waterfall Plot Setup Parameters

Parameter Name	Description	Values/Comments
Z-axis	Controls the spacing between the collected spectra. • RPM- FFTs spaced depending on the rpm at which they were recorded. • Timestamp- FFTs spaced depending on the time the data was recorded. • Even Spacing- FFTs spaced evenly along the Z-axis.	RPM Timestamp Even Spacing
No. Spectra	Controls the number of spectra to display on the waterfall plot. The spectra are displayed as follows: • The first spectrum is always displayed. • The last spectrum is always displayed. • The other spectra (No. Spectra minus first and last spectrum) are evenly distributed on the plot.	2…60 spectra
Trace Offset	Sets the angle of the Z-axis on the plot.	0° (C) 22.5° (C) 45° (C)
Trace Height	Controls the height of the spectra on the plot.	Small Medium Large
Disp. Order	Controls the order in which to display the spectra. • Forward- Display spectra from oldest (front of the waterfall) to newest (rear of the waterfall). • Reverse- Display spectra from newest (front of the waterfall) to oldest (rear of the waterfall).	Forward Reverse
Blanking	Eliminates the display of data below a certain level on the Y-axis. This setting helps clarify the presence of machine orders or structural frequencies.	0%…25%

View the Waterfall Plot

After setting up the Waterfall spectra, press F3 (Display) on the Waterfall Display Setup screen.

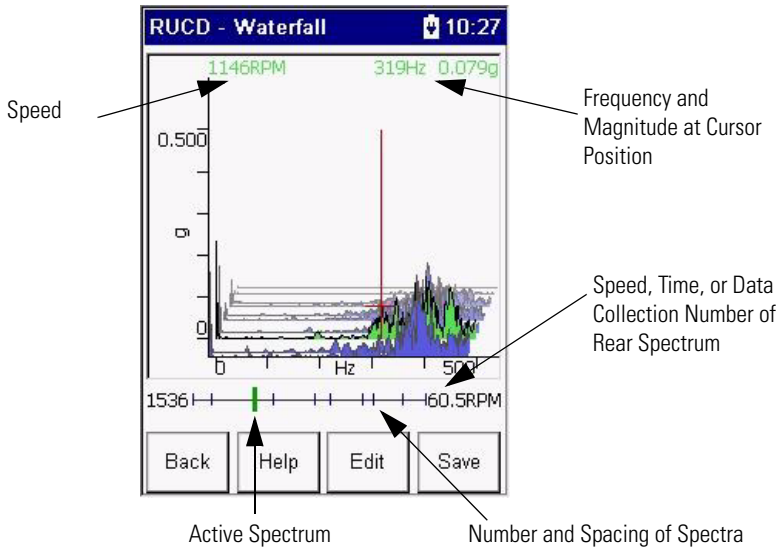
At the bottom of the waterfall plot is a display area that indicates the active spectrum, and provides information (number of spacing of spectra, speed) on how the spectra are displayed in the waterfall plot.

TIP If more than sixty spectra were collected, the ticks along the line indicate which spectra were selected to be displayed.

See No. Spectra on page 34 for more information.

Cursor Movement

Use the Up and Down arrows to sequence through the displayed spectra. The active spectrum displays in green. The zero positions of the X and Y-axis move to



be relative to the active spectrum. Use the Left and Right arrows to move the cursor on the active spectrum.

TIP Press P to quickly move the cursor to the next significant peak.

Z-axis Zoom

The Z-axis zoom lets you to zoom in around the current trace. The display area updates to indicate the number and position of the spectra displayed on the screen. The zoom capability is only available when the No. Spectra parameter is set to a number less than the number of extracted spectra.

See No. Spectra on page 34 for more information.

To use the Z-axis zoom feature, press 0 (Shift) and the +/- key. Repeat this key sequence to continue zooming in. After the highest zoom level is reached, the above procedure will cause you to zoom out.

TIP There are more zoom levels available when there are fewer spectra displayed in the plot.

Displaying Measurements Using a Spectrogram

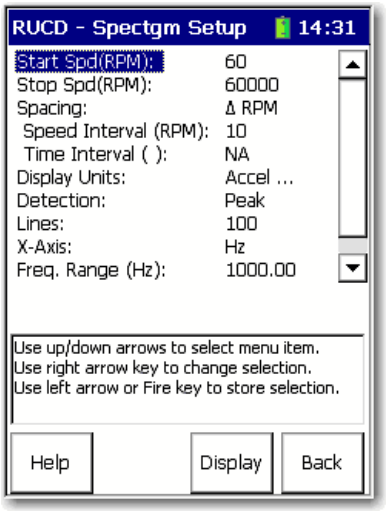
The Spectrogram plot is a three-dimensional color intensity plot displaying the amplitude of spectral components as a function of both time and frequency. Typically the horizontal and vertical axes correspond to time and frequency. The intensity corresponds to amplitude.

Set Up the Spectrogram Plot

Follow these instructions to setup the plot.

1. Select Spectrogram on the RUCD - Display Select screen and press F3 (Display).

   The RUCD - Spectrogram Setup screen appears.



2. Select a parameter and press the Right arrow to open a list of parameters.

3. Select to type in a parameter value.

4. Press the Left arrow to save your selection.

   Use the descriptions in Spectrogram Plot Parameter Descriptions on page 37 to help you configure the parameters.

5. When you are finished, press F3 (Display) to display the Spectrogram plot.

   See Display the Spectrogram Plot on page 38 for more information.

Table 9 - Spectrogram Plot Parameter Descriptions

Parameter Name	Description	Values/Comments
Start Spd (RPM)	Sets the start speed of the recorded data for the plot. This defaults to the Start Spd value set in the RUCD Setup screen. See Run Up/Coast Down Setup Parameters on page 18.	10…3600 rpm
Stop Spd (RPM)	Sets the stop speed of the recorded data for the plot. This defaults to the Stop Spd value set in the RUCD Setup screen. See Run Up/Coast Down Setup Parameters on page 18.	10…3600 rpm
Spacing	Controls the spacing between collected spectra: • Δ rpm is a fixed speed change between spectra. • % Δ rpm is a percentage speed change between spectra. • Δ Time is a fixed time interval between spectra. • Δ rpm + Δ Time is a combination of speed and time interval settings. If speed stops changing then spectra are calculated using the Time Interval value. • % Δ rpm + Δ Time is a combination of speed and time interval settings. If speed stops changing then spectra are calculated using the Time Interval value.	Δ rpm % Δ rpm Δ Time Δ rpm + Δ Time % Δ rpm + Δ Time Your selection affects the Speed Interval and Time Interval settings.
Speed Interval (RPM)	Sets the speed interval used in calculating FFT spectra. This parameter not used when Spacing is set to Δ Time.	1…240 rpm
Time Interval (sec)	Sets the time interval used in calculating FFT spectra. This parameter is not used when Spacing is set to Δ RPM and % Δ RPM.	.001…604800 s
Display Units	Sets the Y-axis units. The available units depends on the transducer used to collect data. See Run Up/Coast Down Setup Parameters on page 18.	
Detection	Sets the signal detection and scaling display for the plot: • Peak - Measured RMS value multiplied by the square root of two (1.4142). • Pk-Pk - Measured RMS value multiplied by two times the square root of two (2.8284). • RMS - Root mean squared signal level of the input signal.	RMS Peak PkPk
Lines	The number of lines (bins) of resolution for the FFT spectra. The larger the number of lines, the better the frequency resolution of the measured data in the spectra. Similarly, the higher the number of lines, the longer it takes to display the spectra in the plot.	100 200 400 800 1600 3200 6400 12800
X-axis	Sets the X-axis frequency units for displaying spectra/FFT data: • Hz - Displays spectra in Hertz, cycles per second. • CPM - Displays spectra in cycles per minute. • Orders - Displays spectra in orders of the operating speed.	Hz CPM Orders Your selection affects the Freq Range and LF Cutoff parameters.

Table 9 - Spectrogram Plot Parameter Descriptions

Parameter Name	Description	Values/Comments
Freq. Range (EU)	The maximum frequency for the measurement. The frequency range is determined by the X-axis parameter.	10…2000 Hz 600…120000 CPM .001…166 Orders
LF Cutoff (EU)	Sets a low frequency cutoff filter to remove noise from the analysis. The available options are determined by your X-axis selection.	Off 21.6 CPM 66 CPM 120 CPM 600 CPM 4200 CPM .36 Hz 1.1 Hz 2 Hz 10 Hz 70 Hz

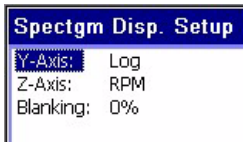
Display the Spectrogram Plot

When you are done setting up the plot parameters, you can process the spectral data by pressing F3 (Display) on the RUCD - Spectrogram Setup screen.

TIP The larger the .wav file, the longer it takes to process the data and display the plot.

Optimize the Spectrogram Plot

Additional parameters display on the screen letting you to control how the spectra appear in the spectrogram plot.



1. Select a parameter and press the Right arrow to open a list of values.
2. Select or type in a parameter value.
3. Press the Left arrow to save your selection.

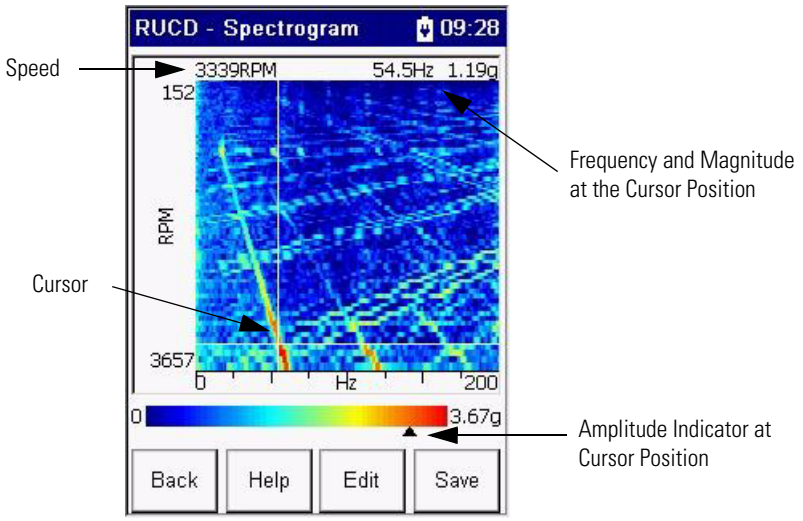
   Use the descriptions in Spectrogram Plot Setup Parameters on page 39 to help you configure the parameters.
4. When you are finished and ready to display data, press F3 (Display) to view the Spectrogram.

Table 10 - Spectrogram Plot Setup Parameters

Parameter Name	Description	Values/Comments
Y-axis	Sets the Y-axis scaling on the spectrogram plot: • Linear - The plot grid centers are linearly spaced in Y between the centers of the first and last grid. • Log - The plot grid centers are logarithmically spaced in Y between the centers of the first and last grid.	Linear Log
Z-axis	Controls the spacing between the collected spectra: • RPM- FFTs spaced depending on the rpm at which they were recorded. • Timestamp- FFTs spaced depending on the time the data was recorded. • Even Spacing- FFTs spaced evenly along the Z-axis.	RPM Timestamp Even Spacing
Blanking	Eliminates the display of data below a certain level on the Y-axis. This setting helps clarify the presence of machine orders or structural frequencies.	0%…25%

View the Spectrogram Plot

After setting up the Spectrogram spectra, press F3 (Display) on the Spectrogram Display Setup screen.



The Spectrogram plot uses color to indicate the amplitude of the signals. Red means a higher amplitude and blue means a lower amplitude:

- Use the Up and Down arrows to sequence through the displayed spectra.
- Use the Left and Right arrows to move the cursor on the active spectrum.

TIP Press P to quickly move the cursor to the next significant peak.

Save Run Up/Coast Down Measurements

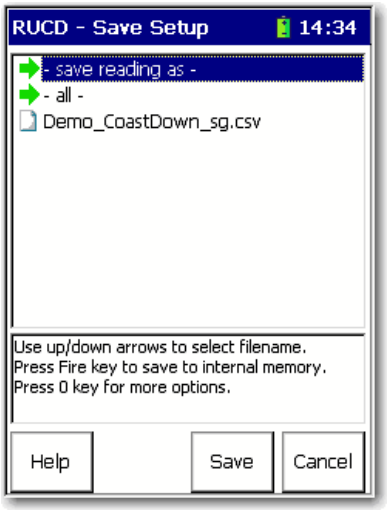
The Run Up/Coast Down setup parameters and measurements can be saved to a file which you can recall at a later time. The collected data is saved in the form of a time waveform (.wav file).

You can save the RUCD setup and measurement anytime the Save function is displayed on the screen.

Follow these steps to save a RUCD measurement.

1. Do one of the following:
   - Press F3 (Save) if you are saving the data from the Setup screen.
   - Press F4 (Save) if you are saving the recorded data from a plot screen.

   The RUCD - Save Data screen appears.



2. Do one of the following:
   - To save the data to an existing file, highlight the file, and press F4 (Save). Press F2 (Yes) to overwrite the existing file. You can return to the Save screen without overwriting the file by pressing F3 (No).
   - To save the data to a new file, highlight save reading as and press F4 (Save). Enter a file name using the keypad or accept the default file name (current date timestamp).

3. When the entry is complete, press F4 (OK).

IMPORTANT	The setup parameters are saved along with the measurement when you press F4 (Save) on the RUCD - Save Data screen.

4. When you are finished, press F1 (Cancel).

Recall a Setup

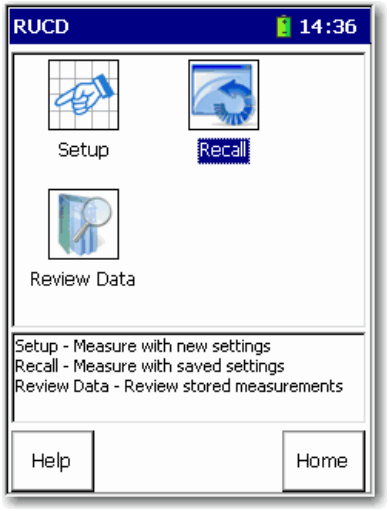
You can recall a previously saved setup and use it to collect another measurement. The setup may have been saved only as a setup, or may have been saved with the recorded data.

See Save Run Up/Coast Down Measurements on page 40 for more information.

Follow these steps to recall a setup.

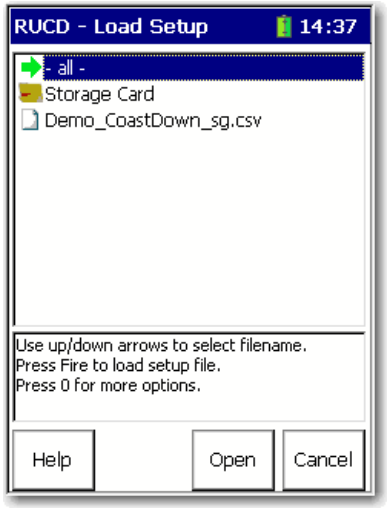
1. Select RUCD on the Main Menu and press Enter.

   The RUCD screen appears.



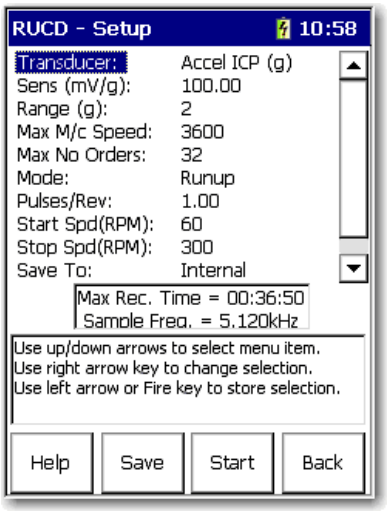
2. Select Recall and press Enter.

   The RUCD - Load Setup screen appears.



3. Select the filename that you want recall and press F3 (Open).

   The RUCD - Setup screen appears.



   You can edit the settings or start collecting data:

   - For information on editing the settings, see Set Up Run Up/Coast Down Measurements on page 17.
   - For information on collecting RUCD measurements, see Collect Run Up/Coast Down Measurements on page 19.

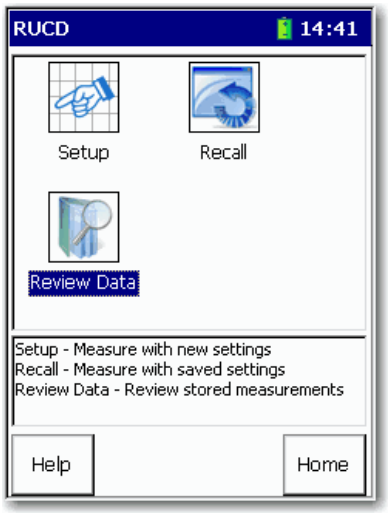
Review Run Up/Coast Down Measurements

You can review previously saved RUCD measurements with the Dynamix 2500 data collector. The instrument saves the recorded data in the form of a time waveform (.wav file).

Follow these steps to review an RUCD measurement.

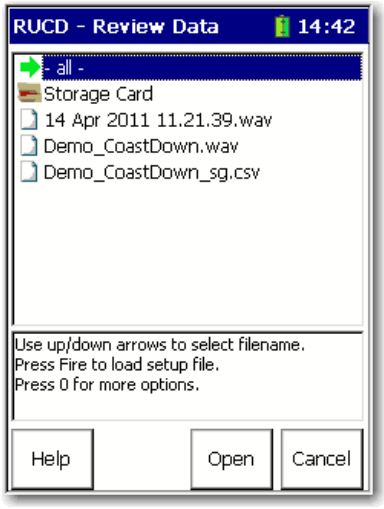
1. Select RUCD on the Main Menu and press Enter.

   The RUCD screen appears.



2. Select Review Data and press Enter.

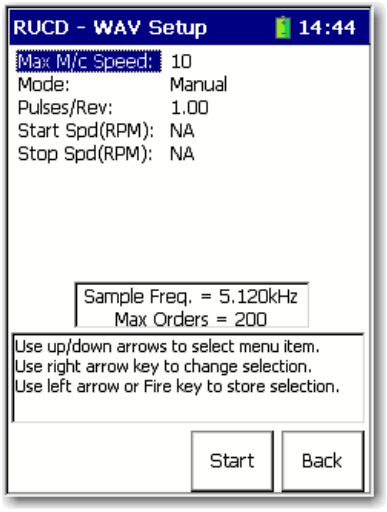
   The RUCD - Review Data screen appears.



3. Select the filename that you want review and press F3 (Open).

   If you select a .wav file, the RUCD - WAV Setup screen appears. Otherwise the appropriate plot setup screen appears.

The RUCD - WAV Setup screen lets you to setup the .wav file parameters.



TIP The instrument reads the .wav file to determine the maximum speed present. If the number of pulses per revolution is not equal to 1, enter the correct value before processing.

4. Select the parameter and press the Right arrow to open a list of values.
5. Select or type in a parameter value.
6. Press the Left arrow to save your selection.

   Use the descriptions in WAV Setup Parameter Descriptions on page 44 to help you configure the parameters.
7. When you are finished, press F3 (Start).

   The Display Select screen appears letting you select the appropriate plot to view the recorded time waveform.

Table 11 - WAV Setup Parameter Descriptions

Parameter Name	Description	Values/Comments
Max M/c Speed	The maximum machine speed in the .wav file.This parameter is set to the highest detected m/c speed.	
Mode	The method used in the .wav file to initiate data collection. When in doubt, select manual: • Runup - The data collection starts when the machine speed rises above Start Spd. • Coast down -The data collection starts when the machine speed falls below Stop Spd. • Manual - Manually start data collection by pressing F4 (Start). No tachometer signal is required for this mode.	Runup Coast down Manual
Pulses/Rev	The number of tachometer signal pulses per revolution of the reference shaft.	This value may affect the Max M/c Speed value.
Start Spd (RPM)	The speed used in the .wav file to start collecting data.	These parameters are not available if Mode is set to Manual.
Stop Spd (RPM)	The speed used in the .wav file to stop collecting data.	

Screen Capturing

Screens can be saved as a bitmap (.bmp) image to internal memory or to the Secure Digital (SD) card. Press 0 (Shift) and 7 and follow the instructions.

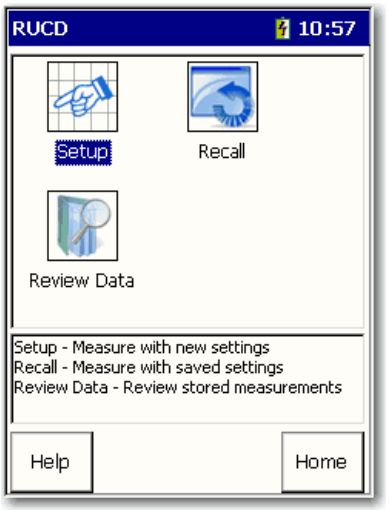
Delete Run Up/Coast Down Files

You can delete a RUCD measurement or setup from the Dynamix 2500 data collector.

Follow these steps to delete a file.

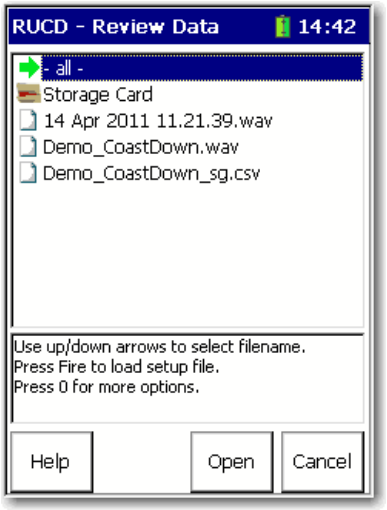
1. Select RUCD on the Main Menu and press Enter.

   The RUCD screen appears.



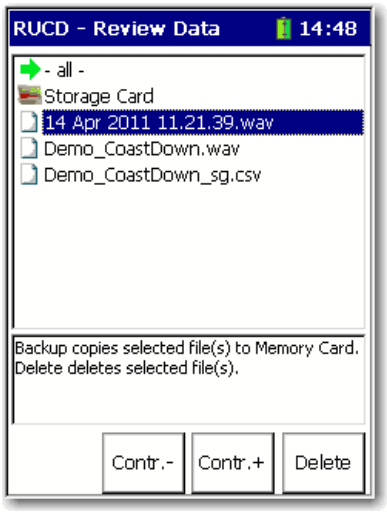
2. Select Review Data to delete a measurement or Recall Data to delete a setup and press Enter.

   The RUCD - Review Data screen appears.

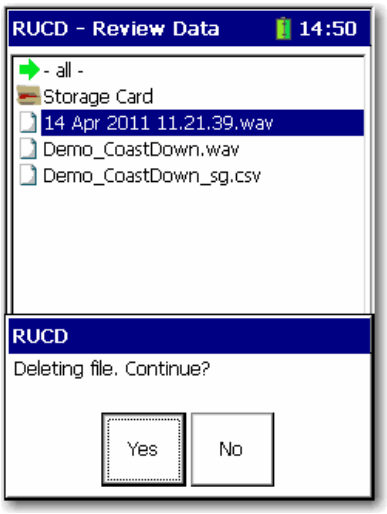


3. Select the appropriate filename or select all to delete all the files.

4. Press 0 (Shift) and F4 (Delete) to delete the selected files.



5. Press F2 (Yes) to delete.



Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products.
At http://www.rockwellautomation.com/support/, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/support/.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/support/americas/phone_en.html, or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

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