

Model 920

Digital Transducer Instrument Instruction Manual



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1.0 PRELIMINARIES

This section contains basic information about receiving, shipping, handling, and maintaining the Model 920-02.

There is also an introduction to provide an overview of the instrument, and some information about how to connect transducers and other devices to it.

1.1 PRECAUTIONS

Please observe the following precautions.

1.1.1 Site Considerations

The Model 920 is a portable instrument. It can operate for up to 8 hours on the fully charged internal battery.

Since the Model 920 is computer equipment, take the same precautions with it as you would a portable or laptop personal computer.

Do not set up or operate in close proximity to heat sources such as radiators or air ducts.

1.1.2 Handling

The Model 920 is a durable design, but avoid situations that will induce vibration and avoid dropping the instrument.

1.1.3 Cleaning

Since The Model 920 instrument is computer equipment, use the same cleaning routine as you would for a laptop computer. The Model 920 is not watertight so do **NOT** let the unit get wet. Keep solvent type cleaners away from the front panel display. Care for the keypad as you would for a personal computer.

1.1.4 On Repacking

Do not throw away the shipping carton and packing materials if possible. They make an ideal container in which to transport the unit should it need to be shipped to another site. A carrying case (PN 38180-000960) is available from RS Technologies.

1.1.5 Before You Begin

NOTE

Notes in this manual are enclosed in shaded boxes such as this one.

Check the packing list to be sure that all equipment, transducers, cables, and other accessories were shipped with your meter.

If you have any questions about this unit, its setup and operation do not hesitate to contact your RS Technologies distributor, representative, or the factory for technical support.

1.2 INTRODUCTION

This introduction provides an overview of the manual and the Model 920 instrument.

1.2.1 How to Use This Manual

This manual is arranged to help you quickly find the information you need for the operation of the Model 920. The manual consists of the following sections.

- ▲ Preliminaries, Section 1.0, provides an introduction to the instrument and the manual
- ▲ Preparation, Section 2.0, provides an overview of the instrument
- ▲ Instrument Setup, Section 3.0, describes transducer and test setup
- ▲ Operation, Section 4.0, covers taking data with the Model 920
- ▲ Other Information, Section 5.0, provides specifications and other information

To locate a topic of interest, first look through the Table of Contents. If you are already familiar with digital instrument operation, read starting from Section 3.0, Instrument Setup. If you are new to digital instrument operation, please read through the entire manual to completely familiarize yourself with this equipment.

1.2.2 Model 920 Operation Overview

The Model 920 recorder is fully configurable for production applications. Setting it up for use is a simple, menu-driven process. The actual steps depend upon whether or not the instrument and transducers have already been set up. Normal operation is made up of the following steps:

1. Connect the transducer that will be used, whether or not it has already been set up and defined.
2. Turn on the power at the power switch. The 920 briefly displays an introduction screen. Note the software version number that should be obtained before making a technical support call.

3. The 920 looks to see if the connected transducer contains a smart transducer identification microchip and displays a screen that tells you so.
4. If the 920 finds a smart transducer, it retrieves the stored information; if the 920 does not find a smart transducer, you may select to use the current transducer or select a different transducer. Refer to paragraph 3.2. At this point the 920 starts a calibration.
5. When the calibration is complete, the 920 displays the results and then displays the Main Menu.
6. Set up a new test or modify existing test setup. Refer to paragraph 3.3.
7. Run the test. Refer to paragraph 4.1.
8. Print data or plot, or send to a remote device. Refer to paragraphs 4.2 or 4.3.

1.2.3 Transducer Selection

There is a library of standard RS Technologies transducer models that can be selected for use. This library includes 5 custom user-defined transducers you may set up for use. The transducer library is displayed by pressing the CAL key. After a transducer is selected, you are prompted to verify the calibration value. After doing so, or entering a new calibration value, the 920 prompts you through a calibration.

1.2.4 Test Setup

You set up the test parameters by pressing the SETUP key. The 920 displays the setup screen from which you make the entries or selections that tailor the instrument to suit your testing requirements. Refer to paragraph 3.2.

1.2.5 Data Recording

The Model 920 recorder features one channel for obtaining torque-only, torque and angle, or force measurements. The tracking value for torque, angle, or force data is displayed in real-time during the test. The 920 also displays the peak value. The 920 is equipped with AutoSave and AutoReset features that allow you to save the data and reset the instrument for the next test automatically, without any manual button pushing.

1.2.6 Viewing Data

The Model 920 lets you view the recorded data or statistics. Press the STORE key to display the store screen. You then make selections to view or print either the numerical data in memory or the current statistics report.

1.2.7 Data Storage & Upload

The Model 920 stores up to 300 readings. The data can be uploaded to a laptop or personal computer via the serial port using the HyperTerminal application provided with Microsoft Windows 95 or other similar serial port communication programs. Test data can then be archived or opened by a spreadsheet or word-processing application for further review, analysis, or report generation.

1.3 CONNECTIONS

In order to record data with this instrument, the transducer must be properly connected to the Model 920. If recording from a single torque-only, torque-angle, or force sensor, simply connect the sensor to the DB-15 receptacle labeled TRANSDUCER.

1.3.1 Printer/Computer Upload

Connect the local printer to the Printer DB-9 serial receptacle labeled SERIAL PORT. If connecting a computer to receive an upload of data, connect the computer to the Printer DB-9 serial receptacle.

1.3.2 Pinouts

The Model 920 uses the following pinouts for connecting transducers to the DB-15 TRANSDUCER input receptacle.

Pin	Function	Pin	Function
1	-Signal	9	+ Excitation
2	+Signal	10	- Excitation
3	GS1	11	GS3
4	GS2	12	GS4
5	Analog Ground	13	Shunt
6	Transducer Type	14	Encoder A
7	Encoder 5V	15	Encoder B
8	Digital Ground		

NOTE: A jumper **MUST** be added when wiring a connector for the Model 920 in order to scale the output of the transducer or input device properly.

Jumper Position	Signal Level
3 & 12	Up to 2.5 mV/V
4 & 12	Up to 4.5 mV/V
None	Up to ± 10 vdc

2.0 PREPARATION

This section of the manual provides an overview of the screens that are displayed by the Model 920-02 and how they are used.

2.1 THE MAIN SCREEN

All operations start from the main screen whether you are ready to run the test or are setting up a new test or transducer. The main screen displays the following:

- ▲ Track mode input that shows the current transducer input value
- ▲ Peak value that was captured on the last cycle
- ▲ The angle of rotation in degrees (if used)
- ▲ The number of the limit set in use
- ▲ The number of cycles recorded for the limit set in use

While the Main Screen is displayed, pressing one of the following keys initiates a special function.

CAL displays the calibration screen where you select, define, and calibrate transducers.

SETUP displays the setup screen where you select limit sets, define test limits or parameters, set the direction of test rotation (CW or CCW), set engineering units, and set the sample size for statistical calculations.

STORE displays the store screen where you can view all readings in memory, the current statistics report, and perform printing functions.

UTILS displays the utility screen where you can delete the last cycle or clear all of the results, set the date and time, set the frequency response, or reset the factory default values.

When displaying one of these screens described above, the following keys are used.

ARROWS are used to move between selections.

ESC is used to return to the previous screen.

ENTER is used to make selection or save any changes.

2.2 CAL SCREEN OVERVIEW

The calibration screen lets you select, define, and calibrate the transducers used with the 920. There is a library of standard RS Technologies torque transducers and room for five (5) custom transducers.

2.3 SETUP SCREEN OVERVIEW

The setup screen lets you set up the test by selecting limit sets, setting limits, engineering units, test direction, and sample size for statistics.

2.4 STORE SCREEN OVERVIEW

The store screen lets you view all readings in history, view the limits set history, view the current statistics report, or print the readings, the limit set history, or the statistics report.

2.5 UTILITIES SCREEN OVERVIEW

The utilities screen lets you clear the last reading or all readings, set the date and time, change the frequency response, reinstall the factory default values, or change the printer baud rate.

3.0 INSTRUMENT SETUP

This section provides instructions for setting up the instrument for testing. This includes selecting and calibrating the transducer, setting the engineering units, and setting all of the test parameters.

3.1 STARTING UP THE 920

Use the following procedure to power up the Model 920.

1. Connect the transducer that will be used, whether or not it has already been set up and defined.
2. Turn on the power at the power switch. The 920 briefly displays an introduction screen. Note the software version number that should be obtained before making a technical support call.
3. The 920 looks to see if the connected transducer contains a transducer identification microchip and displays a screen that tells you so.
4. If the 920 finds a smart transducer, it retrieves the stored information and begins transducer calibration as described in Step 6.
5. If the 920 does not find a smart transducer, it displays information about the transducer that was last used with the 920. You can select a new transducer by pressing the 1 key and scrolling through the transducer library, or you can select the last used transducer by pressing the ENTER key. Either way, after you have made your selection here, the 920 displays the calibration screen as described in Step 6, below.
6. The CALIBRATION screen identifies the currently selected transducer and calibration value. The 920 prompts you to remove any load from the transducer and press ENTER. When the calibration is complete, the 920 displays the results and then displays the Main Menu.

3.2 TRANSDUCER SETUP

The first step in setting up the Model 920 for use is to define, select, and calibrate the transducer. The following paragraphs describe how to set up transducers for use with the Model 920.

3.2.1 Set Up RS Technologies Transducer

Use the following procedure to select and calibrate a different RS Technologies transducer for use with the Model 920. If the transducer was selected, set up, and calibrated during instrument startup (as in paragraph 3.1), this procedure may be skipped.

1. From the main screen, press the CAL key to display the calibration screen.
2. Press 1 and the 920 displays the torque transducer library. The library lists the transducers by Model Number, full scale capacity, and calibration value. Note that the model numbers that are listed twice are those that have more than one capacity. In that case, make sure you select the desired capacity transducer.

Note

You may find it helpful to change the engineering units to those used by the transducer that you wish to set up. This can be done by accessing the setup screen. Refer to paragraph 3.2.

3. Press either the up or down arrow key to scroll through the listed models and capacities. If the transducer you are using is not displayed in the library, refer to the Set Up Custom Transducer procedure (refer to paragraph 3.2.2).
4. When the desired transducer is displayed, press the ENTER key. The 920 displays a screen where

you can update or enter the current calibration value.

5. If the calibration value for the transducer is different from the default value shown in the box, enter it and press the ENTER key. Otherwise, just press the ENTER key. The calibration value can be located on the calibration certificate provided with the transducer.
6. Make sure the correct calibration resistor is mounted in the external binding posts located on the connector panel of the 920.
7. Unload the transducer and press the ENTER key. The 920 first adjusts the zero balance, then spans the electronics to match the shunt calibration value for the transducer. After a successful calibration, the 920 re-displays the calibration screen.
8. Press the ESC key to return to the main screen.

3.2.2 Set Up Custom Transducer

Use the following procedure to select, set up, and calibrate a custom transducer for use with the Model 920. A custom transducer is one that is not listed in the library of standard RS Technologies transducers.

1. From the main screen, press the CAL key.
2. Press 3 and the 920 displays the define customer transducer screen.
3. Press one of the arrow keys to select the user-definable transducer you want to set up. Up to five custom transducers can be set up and stored in the 920. When the desired transducer number is displayed, press the ENTER key.
4. In the FS (*units*) field enter the full scale capacity of the transducer and press the ENTER key.

5. Press the down arrow key and enter the calibration value in the CAL (*units*) field. As with the full scale capacity, be sure to enter the desired number of decimal places. Press the ENTER key.
6. Press the down arrow key and enter the correct number of angle encoder pulses in the PPR field. Enter 0 for transducers without angle encoders. Press the down arrow key.
7. Press the ENTER key to save any changes.
8. Press the ESC key to move back to the calibration screen.
9. Press 1 to select an automatic calibration of the transducer.
10. Make sure the correct calibration resistor is mounted in the external binding posts on the connector panel of the 920.
11. Unload all transducers and press the ENTER key. The 920 first adjusts the zero balance, then spans the 920 to match the shunt calibration value for the transducer. After a successful calibration, the 920 re-displays the calibration screen.
12. Press the ESC key to return to the main screen.

3.3 TEST SETUP

After the transducer is selected, the next step to setting up the Model 920 for use is to set the testing parameters. Use the following procedure to set the torque limits on the Model 920.

1. From the main screen, press the SETUP key to display the setup screen.
2. Enter the number of the limit set you wish to set up first. There are 10 possible sets to choose from (0 through 9).
3. Press 1 to display the Define Limits screen.
4. In the Start (*units*) field enter the transducer input level that will start the test. This value is where the cycle recording begins and should typically be

in the linear tightening portion of the torque-angle curve. After your entry, press the down arrow key.

5. In the End Time (sec) field, enter the amount of time that data is recorded following the Cycle End and press the down arrow key.

NOTE

The Start and End Time values work together to end the recording cycle. When the transducer input drops below the value set in the Start field for the length of time set in End Time field, the recording is completed.

6. In the Low (*units*) field enter the low limit of acceptable torque or force and press the down arrow key. This value is used for calculating statistics.
7. In the High (*units*) field enter the high limit of acceptable torque or force and press the down arrow key. This value is also used for calculating statistics.
8. Press ESC to return to the setup screen.
9. Press the 2 key to toggle between CW (clockwise) and CCW (counterclockwise). This indicates the direction of the test. Typical tightening curves are recorded in clockwise direction. Release angle studies are typically done in counterclockwise.
10. Press the 3 key repeatedly to cycle through the available engineering units. Currently available are lbft, lbin, Nm, Kgcm, Kgm, ozin, Lb, N, and kN.
11. Press the 4 key to select additional setup parameters.

12. Press 1 to select to enter the desired sample size for statistical calculations performed for the currently selected limit set.
13. Enter the desired sample size in the SAMPLE SIZE field. This value can be any number from 3 to 25 depending upon the statistical requirements of the test or process. To use all readings in the population as the sample size enter 0.
14. Press ENTER to return to the Setup screen.
15. If using the 920 to monitor the output of a pulse tool, press the 2 key to select the pulse tool window screen.
16. Enter a value (in seconds) that should be used to ignore the tool “windup” spike.
17. Press Enter to save your entry and return to the setup screen.
18. Press 3 to enter a 3-digit numeric code to identify the limit set.
19. Press ESC twice to return to the main screen.
20. To select a different limit set to set up test parameters, press the SETUP key and enter the number of the desired limit set (0-9). Then repeat the procedure described above to program the test settings (refer to Steps 3-19).

3.4 CHANGING FREQUENCY RESPONSE

If it is desirable to change the frequency response of the instrument to suit the test requirements, press the UTILS key to display the utilities screen. Press 3 to toggle through the available frequencies (500 and 1000 Hz and OFF). When the desired frequency is displayed, press the ESC key to return to the main screen.

4.0 OPERATION

This section provides information about how to use the Model 920-02 to record data and upload it to other devices.

4.1 TAKING DATA

Use the following procedure to record data with the Model 920. This procedure assumes that the transducer has been selected, defined, and calibrated per paragraph 3.1 or 3.2, and that the test has been set up per paragraph 3.3.

1. With the main screen displayed, make sure the READY indication is displayed in the lower left corner of the screen. Also note the limit set that is in use. The Lx indicator in the lower left corner of the display tells you which limit set is in use (x = number of limit set).
2. Run down the fastener, or apply the load as required by the test.
3. The track and peak values will increment as the load increases and the "Ready" indication in the lower left corner is replaced with "In Cycle."
4. When the test is complete, the 920 stores the data, resets for the next test, and displays "Ready" in the lower left corner of the display. The previous peak value is displayed and the number of cycles is updated to indicate how many data points are stored in memory.
5. To take data for a different limit set from the main screen, press the number of the limit set (0-9). Note the Lx indicator has changed to show the number of the new limit set (x = number of limit set).

4.2 REVIEWING DATA & STATISTICS

After data has been recorded and stored in the Model 920, you can view the data and statistics by pressing the STORE key. Make your selections as detailed below.

1. Press 1 to view all of the data in memory in the order that they were recorded starting with the most recent. This is called the View All

History report. The number of each reading is indicated along with the limit set number and 3-digit identification code, whether the data was within or outside the limits, the date and time of the reading, and of course, the data itself. Press the arrow keys to scroll through the readings. Hold down one of the arrow keys to scroll quickly through the readings. Press the ESC key to return to the Store screen.

2. Press 2 to view the readings for a given limit set. This is called the View Limit History report. You are prompted to enter the limit set for which you wish to view the data. Then press the down or up arrow key to scroll through the readings for that limit set. When finished reviewing the data, press ESC to return to the Store screen.
3. Press 3 to view the statistics for a given limit set. This is called the View Statistics report. You are prompted to enter the limit set for which you wish to view the statistics. Then press the down or up arrow key to scroll through the statistics for that limit set. Displayed are the number of readings, the low reading, mean reading, high reading, the range of readings, the standard deviation, +3 sigma, -3 sigma, Cpk, and Cp. When finished reviewing the statistics, press ESC to return to the Store screen.

4.3 PRINTING DATA AND STATISTICS

After data has been recorded, you can print it out using the following procedure.

1. Connect a serial printer to the serial port (portable battery-powered printer is available from RS Technologies).
2. To print the stored data or statistics reports, press the STORE key to display the store screen.

3. Press 4 to print the available reports as detailed below.
4. Press 1 to print the All History report that contains all of the data in memory. This prints the readings in the order that they were taken, regardless of the limit set to which they belong.
5. Press 2 to print the Limit History report that contains the data and statistics for each limit set regardless of the order in which the readings were obtained.
6. Press 3 to print the All Limits report. This prints the tool identification information and the setup information for each limit set.
7. After making your selection, press ESC to return to the main screen.

4.4 SENDING DATA TO A COMPUTER

Use the following procedure to upload the recorded data and statistics to a laptop or desktop computer.

NOTE

The computer will receive data via the HyperTerminal application that is provided with Windows 95 and Windows 98.

1. Connect the Model 920 to a serial port of the computing device using a 9-pin serial cable (available from RS Technologies).
2. Start the HyperTerminal application. The executable file is *hypertrm.exe*.
3. The first time you use HyperTerminal with the 920, you will need to set up the connection. If you have already done so, simply click on the connection icon and go to Step 7. If you haven't yet setup a connection follow Steps 4-6.
4. HyperTerminal displays the *Connection Description* dialog box into which you enter a name for the connection and choose the icon

that will be associated with the connection and placed in the HyperTerminal program group. Enter an appropriate name into the field, such as "Direct to Model 920", choose an icon, and then click on OK.

5. In the *Connect To* dialog box, select the communications port that you will be using in the *Connect Using* field. Make sure the port you choose is functional on your computer. Then click on OK.
6. In the *Com x Properties* dialog box that is displayed confirm the communications protocol (x = com port number). Make sure the baud rate of the com port matches that of the Model 920 (9600 is recommended). Refer to paragraph 4.7. Click on OK.
7. In the *Transfer* menu of HyperTerminal, select the option you prefer from the following: 1) *Capture Text* will show the information on the screen and place it in a file that you designate; 2) *Capture to Printer* will transfer the data to the local printer attached to the computer.
8. Once you have made your selection in Step 7 above, go to the 920 and select the report you want to upload, as described in paragraph 4.3. All History is a list of all readings in the order that they were taken; Limit History contains the data and statistics separated into limit sets; All Limits contains just the limit set information (no data).
9. The data is transferred to the computer in ASCII text format and can be manipulated using any word processing, spreadsheet, or other application that can import such files.
10. Press the EXC key on the 920 when ready to return to the main screen.

4.5 ERASING DATA

Two options are provided with the Model 920 to erase data: one lets you erase all data in memory; the second lets you erase the last recorded cycle in

memory. To do so, press UTILS from the main screen and the 920 displays the Utilities screen. Press 1 to display the memory screen. Then press 1 to delete the last reading or press 2 to clear all results from memory.

4.6 SETTING DATA & TIME

To update the date and time, press the UTILS key to display the utilities screen. Then press 2 to display the set date and time screen. With this screen you can enter the correct month, day, year, hour (using 24-hour time base), and minutes one at a

time. Enter the correct values using the numeric keys. Press the down arrow key to move to the next setting. Press the ENTER key to save your changes and then press ESC to return to the utilities screen. Press ESC to return to the main screen.

4.7 SETTING BAUD RATE

Pressing the UTILS key followed by the 4 key can set the baud rate for the printer. Press the 2 key to toggle through the available selections.

5.0 OTHER INFORMATION

This section provides some additional information about the instrument including specifications.

5.1 SPECIFICATIONS

The following specifications apply to the Model 920. Some special system program configurations may include or delete identified features.

A/D Resolution	16 bit
Accuracy	±0.5% FS Peak Mode ±0.25% FS Track Mode
Angle Input	Quadrature, up to 2880 PPR depending upon transducer type
Angle Resolution	Up to 1/8-degree
Bridge Excitation	5 vdc
Calibration	External binding posts
Communications Port	RS 232 serial for printout or upload to computer via HyperTerminal
CW/CCW Operation	Software selectable
Data Memory	Automatic storage of 300 peak torque-angle or force readings, scrolling feature for viewing readings, last reading deletable
Dimensions	2.750 inches depth x 4.375 inches wide x 8.500 inches high
Display	LCD, 20 alphanumeric characters by 4 lines with 5-digit data readout plus 6 digits for angle
Enclosure	High impact plastic with shoulder strap

Engineering Units.....	Software selectable (lbft, lbin, ozin, Nm, kg-cm, kgm, lb. and N)
Frequency Response	Software programmable 500 and 1000 Hz, and off
Humidity	5 to 95% N.C.
Input Power	Metal Hydride (NimH) battery, AC adapter 115 vac, low battery charge warning
Input Signal	Compatible with conventional strain gage transducers with outputs ranging from 0.8 to 5.0 mV/V and with high level devices up to ±5 vdc
Keypad	16-key numeric and special function
Maximum Angle Count	10,000 degrees
Multiple limit sets	10 w/definable limits and separate data banks
Operating Temperature	0-55 °C
Printout	Transducer and limits data, time and date stamped peak data, angle at peak (if used), and statistics
Recommended Recalibration	Yearly
Statistics	High, low, mean, standard deviation, ±3 sigma, Cpk, and Cp; calculations based on programmed sample size or entire population
Supplied with	Battery charger, instruction manual, shoulder strap
Warranty	One year from date of receipt
Weight	1.5 lbs.



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