Instruction Manual NC002368
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Issue 4

CHATILLON®
DFA Series
Digital Force Gauge

Operating Instructions

Chatillon®

PRECAUTIONS

- **Read the instruction manual completely before attempting to use the DFA Series.** By following the instructions contained in this manual, the optimum accuracy and performance can be attained.

- **Turn off the DFA Series** before connecting or disconnecting any cables to the instrument.

- **Do not overload the DFA Series!** The instrument can handle an overload of up to 150% of the rated full scale. The display will read "Overload" when the gauge exceeds 116% of full scale. When the force applied is removed and "OVERLOAD" is no longer displayed, the gauge will not read above 121% of full scale in the Tension Peak or Compression Peak modes. Therefore, you must contact your local distributor to ensure the load cell was not damaged, unless you are 100% sure the force applied did not exceed 150% of full scale.

- **The DFA Series is designed for axial loading only!** Applying load on an angle or eccentric loading may cause an erroneous reading.

- **Do not use tools to attach accessories to the gauge.** Use "finger-tight" torque only to prevent damage to the load cell.

***IMPORTANT NOTE**: Before using your new DFA Series, fully charge the rechargeable Nicad battery by plugging the supplied battery charger into the battery charger jack at the top of the gauge and the proper AC outlet. Use only the battery charger supplied with the gauge. Using other chargers can overcharge and damage the battery.*

PRODUCT WARRANTY

This instrument is warranted against defects in workmanship, material and design for one (1) year from date of delivery to the extent that AMETEK will, at its sole option, repair or replace the instrument or any part thereof which is defective, provided, however, that this warranty shall not apply to instruments subjected to tampering or abuse, or exposed to highly corrosive conditions.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED AND AMETEK HEREBY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY. AMETEK SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES INCLUDING, BUT NOT LIMITED TO, ANY ANTICIPATED OR LOST PROFITS.

This warranty is voidable if the purchaser fails to follow any and all instructions, warnings, and cautions in the instrument's Instruction Manual.

If a manufacturing defect is found, AMETEK will replace or repair the instrument or replace any defective part thereof without charge; however, AMETEK's obligation hereunder does not include the cost of transportation which must be borne by the customer. AMETEK assumes no responsibility for damage in transit, and any claims for such damage should be presented to the carrier by the purchaser.

ELECTRICAL SAFETY

The DFA Series has been assesed against the essential health and safety requirements of the Low Voltage and the EMC Directives listed below. Based on conformity with the listed directives, the DFA Series are compliant with the following:

Test Standards

EN 50081-1 1992	"Electromagnetic Compatibility- Generic emission standard Part 1: Residential, commercial and light industry."
EN 50082-1 1997	"Electromagnetic Compatibility- Generic immunity standard Part 1: Residential, commercial and light industry."

Applicable Standards

EN 55022 August 1988	"Limits and methods of measurement of radio interference characteristics of information technology equipment." Class B Limits.
EN 61000-4-2	"Part 4: Testing and measurement techniques Section 2: Electronstatic discharge immunity test"
EN 61000-4-3	"Part 4: Testing and measurement techniques Section 3: Immunity to radiated radio-frequency electromagnetic fields"
ENV 50204	"Radiated electromagnetic field from digital radio telephones - immunity test

Summary of Test Results

Basic Standard	Frequency Range/Units	Reference Standard
EN 55022/B	30MHz - 1GHz	EN 50081-1
EN61000-4-2	8kV Air, 4kV Contact	EN 50082-1
EN61000-4-3	27MHz - 1GHz @ 3V/m	EN 50082-1
ENV 50204	3V/m ±900MHz	EN 50082-1

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1.0 INTRODUCTION AND PRODUCT OVERVIEW

Models DFA, DFA-R and DFA-R-ND are members of the CHATILLON® *DFA Series* family of digital force gauges manufactured by AMETEK Test and Calibration Instruments Division. They have been designed to provide accurate compression and tension force measurements via an internal or remote load cell. These instruments have been precisely crafted to provide years of reliable service. Each gauge comes equipped with a rechargeable battery pack, AC battery charger, Accessory Attachments, and a handy Carrying Case.

Table 1.1
DFA Series Product Offering

DFA INTEGRAL		DFA-R DEDICATED REMOTE		DFA-R-ND NON-DEDICATED REMOTE
DFA250G	8 oz x 0.004 oz 250g x 0.1g 2.5N x 0.001N	DFA-R-250G	8 oz x 0.004 oz 250g x 0.1g 2.5N x 0.001N	DFA-R-ND
DFA2	2 lb x 0.0002 lb 1 kg x 0.0001 kg 10 N x 0.001 N 32 oz x 0.004 oz 1000 g x 0.1 g	DFA-R-2	2 lb x 0.0002 lb 1 kg x 0.0001 kg 10 N x 0.001 N 32 oz x 0.004 oz 1000 g x 0.1 g	
DFA10	10 lb x 0.001 lb 5 kg x 0.0005 kg 50 N x 0.005 N 160 oz x 0.02 oz 5000 g x 0.5 g	DFA-R-10	10 lb x 0.001 lb 5 kg x 0.0005 kg 50 N x 0.005 N 160 oz x 0.02 oz 5000 g x 0.5 g	
DFA50	50 lb x 0.005 lb 20 kg x 0.002 kg 250 N x 0.02 N 800 oz x 0.1 oz 20000 g x 2 g	DFA-R-50	50 lb x 0.005 lb 20 kg x 0.002 kg 250 N x 0.02 N 800 oz x 0.1 oz 20000 g x 2 g	
DFA100	100 lb x 0.01 lb 50 kg x 0.005 kg 500 N x 0.05 N 1600 oz x 0.2 oz 50000 g x 5 g	DFA-R-100	100 lb x 0.01 lb 50 kg x 0.005 kg 500 N x 0.05 N 1600 oz x 0.2 oz 50000 g x 5 g	
		DFA-R-200	200 lb x 0.02 lb 100 kg x 0.01 kg 1000 N x 0.1 N 3200 oz x 0.4 oz	
		DFA-R-500	500 lb x 0.05 lb 200 kg x 0.02 kg 2000 N x 0.2 N 8000 oz x 1 oz	
		DFA-R-1000	1000 lb x 0.1 lb 500 kg x 0.05 kg 5000 N x 0.5 N 16000 oz x 2 oz	

DFA-R DEDICATED REMOTE	
REMOTE-2	2lb/1kg/10N
REMOTE-10	10lb/5kg/50N
REMOTE-50	50lb/20kg/200N
REMOTE-100	100lb/50kg/500N
REMOTE-200	200lb/100kg/1kN
REMOTE-500	500lb/200kg/ 2kN
REMOTE-1000	1000lb/500kg/5kN
REMOTE-2000	2000lb/1000kg/10kN
REMOTE-5000	5000lb/2000kg/20kN
REMOTE-10000	10000lb/5000kg/50kN

1.1 PRODUCT FEATURES

The key features of the *DFA Series* are:

- Data storage. Stores up to 1000 data values in 99 batches with date and time stamping.
- 10,000 samples per second update rate permits precise capturing of peak compression and tension loads.
- Intuitive Menu System.
- Programmable set points generate alarms that can be used to control test stands and other equipment.
- User selectable/programmable filter rates for data sampling for normal, peak, transmit and analog.
- Rugged aluminum housing offers long life. Top (Front) housing is reversible.
- Load capacity up to 100 lb (internal load cell), and up to 10,000 lb. (external load cell).
- Variable printing formats available.
- Mounting arrangements for attaching to Manual and Motorized Test Stands.
- Ergonomically designed.
- Readings can be scaled using several engineering units: LB, KG, N, OZ, G. This is dependent on the gauge capacity.
- Field calibration.
- RS-232 and Mitutoyo standard output port.
- Can be controlled remotely via RS-232 port.

1.2 DFA-REMOTE AND DFA-R-ND PHYSICAL DIMENSIONS

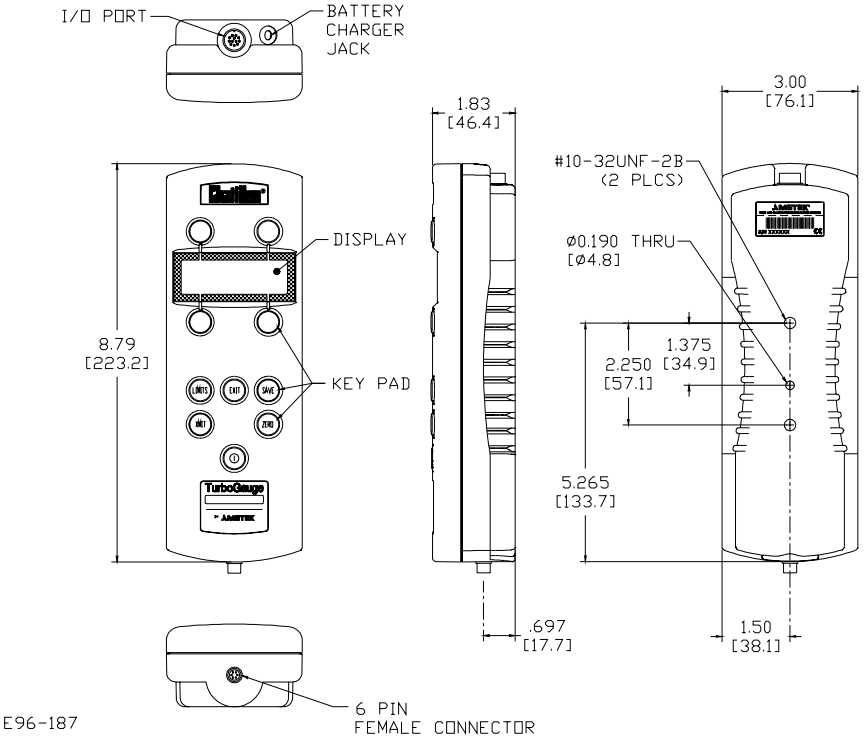
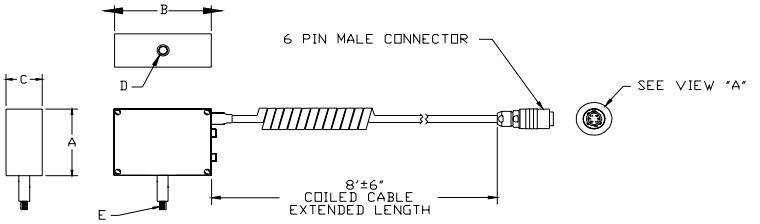


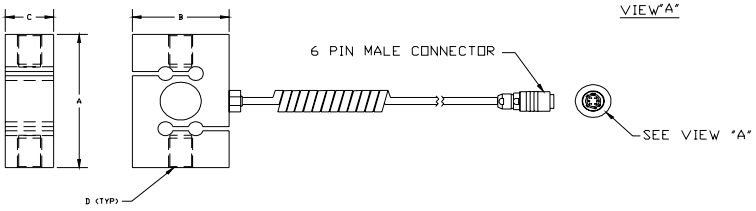
Figure 1.1

DFA-Remote and DFA-R-ND Dimensions

1.3 DFA-REMOTE LOAD CELL DIMENSIONS



10 LBS	1.50 [38.1]	2.00 [50.8]	.75 [19.0]	#10-32	#10-32
2 LBS	1.50 [38.1]	2.00 [50.8]	.75 [19.0]	#10-32	#10-32
250 G	1.50 [38.1]	2.00 [50.8]	.75 [19.0]	#10-32	#10-32
CAPACITY	A	B	C	"D" THREAD	"E" THREAD



1000 LBS	3.00 [76.2]	2.00 [50.8]	1.00 [25.4]	1/2-20
500 LBS	3.00 [76.2]	2.00 [50.8]	1.00 [25.4]	1/2-20
200 LBS	2.50 [63.5]	2.00 [50.8]	.63 [16.0]	1/4-28
100 LBS	2.50 [63.5]	2.00 [50.8]	.63 [16.0]	1/4-28
50 LBS	2.50 [63.5]	2.00 [50.8]	.63 [16.0]	1/4-28
CAP.	A	B	C	D THREAD

E96-195

Figure 1.2

DFA-Remote Load Cell Dimensions

1.4 DFA PHYSICAL DIMENSIONS

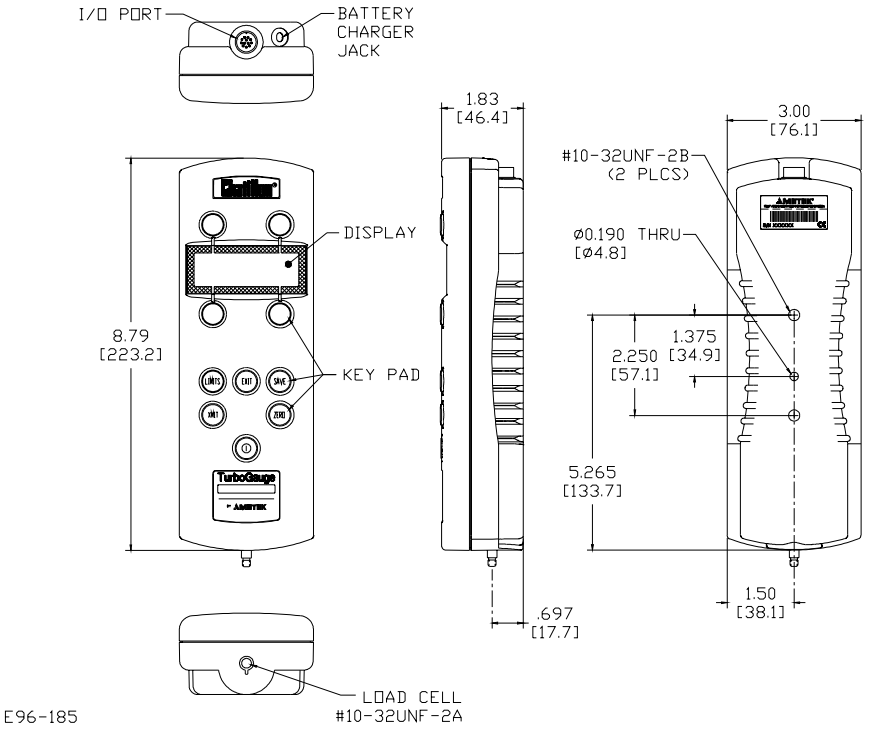


Figure 1.3

DFA Series Dimensions

1.4.1 About the Keypad

The *DFA Series's* keypad consists of six dedicated keys (LIMITS, EXIT, SAVE, XMIT, ZERO and ON/OFF) and four "ATM" style keys (F1 - F4) (see Figure 1.4). The functions of the dedicated keys remain somewhat constant from mode to mode, while functionality of the "ATM" keys varies according to the context. An underlined menu label in the corresponding corner of the display indicates the current function of each key. If a blank is displayed, or a menu label appears with a line through it, the key is inactive in the current context. When an active key is pressed, the gauge emits an audible "beep." Correspondingly, when an inactive keypad key is pressed, the gauge makes no sound.

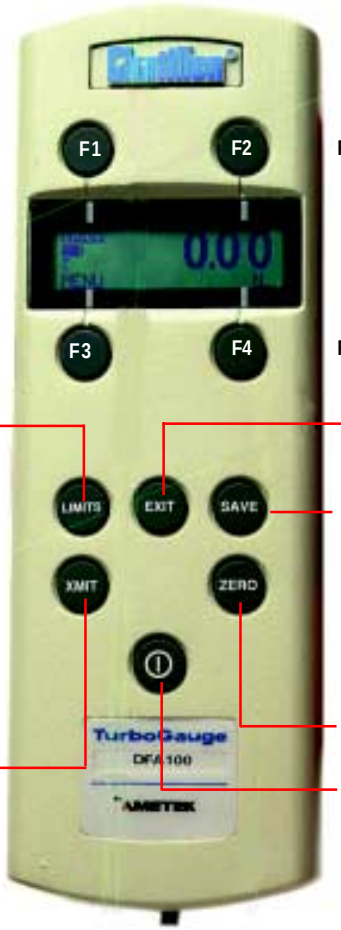


Figure 1.4 Keypad Layout

1.4.2 About the Display

The DFA *Series* display is a LCD dot matrix display. As different keys are pressed, the display adjusts accordingly. The display illustrates different symbols such as: battery symbol indicating the battery is running low; round circle represents that Auto-Shutdown has been activated; force being applied to the load cell is represented by a "C" or "+" for compression or a "T" or "–" for tension; the symbol **L** will be displayed when the applied force exceeds the High or Low force limit. The upper left corner of the display indicates the operational mode (NORM, T-PK or C-PK). The bottom right hand corner represents the measurement unit (LB, KG, N, G, OZ). The display updates 4 times per second when force is applied to the load cell.

NORMAL DISPLAY starts up after the gauge is turned on. F1 key toggles between the standard force measurement setting or settings which capture peak tension or compression force. Indicators below shows portion of battery charge remaining, time remaining until auto shutdown, and whether the high or low force levels are being exceeded. F4 key allows you to toggle display reading between pounds, kilograms, and Newtons, or ounces, grams, and Newtons.

FILTERS MENU lets you set the sampling rate for four different streams of data -- normal force reading, peak force reading, RS-232 transmission and analog output.

SETUP MENU allows you to set the time and date under "Memory" (F1) and to activate various options (F3), such as auto shutdown, sign, and print options. The Units menu (F4) allows you to "lock in" the desired units of measurement, keeping them from being changed accidentally.

COMMUNICATIONS MENU is for selecting Mitutoyo or RS-232 output. This menu lets you quickly and easily set the parameters for RS-232 communications, such as from the gauge to a digital test stand or to a remote computer. Settings include stop bit length, baud rate, and parity, as well as whether units are to be included with the transmission.

SERVICE MENU allows you to adjust the display contrast (F1) lighter or darker . You can also calibrate the gauge (F3) using standard weights, as well as troubleshoot gauge problems with a self-test setting (F4).

Figure 1.5 Display Layout

1.5 RECHARGING BATTERIES

A rechargeable NiCad battery powers the *DFA Series*. Since NiCad batteries continue to discharge when not in use, it may be necessary to recharge the unit before use. When the battery power begins to lose its charge, the Battery Indicator will appear on the display (Figure 1.5). As the battery loses its charge, the dark filling in the indicator slowly disappears. When the indicator is no longer filled, the gauge will automatically shutdown. To recharge the battery, plug the battery charger included with the gauge into the correct voltage source and insert the charger jack into the receptacle on the end of the gauge. Charge the battery for 10-12 hours to yield approximately 8-10 hours of continuous operation. The gauge can be operated continuously with the charger connected. If the NiCad battery pack is disconnected or loses its charge, the Date and Time will have to be reset. However, stored data will remain in the gauge's flash memory.

Note: Before using the gauge, please fully charge the Nicad battery. Use only the battery charger supplied with the gauge. Using other chargers can overcharge and damage the battery.

1.6 CONNECTION TO EXTERNAL DEVICES

The *DFA Series* can be configured to accept input from an external source, and/or to send output to an external data-recording device, such as a strip chart recorder, an RS-232 or Mitutoyo printer, or a personal computer. It can be used in combination with CHATILLON Test Stands and application software such as AUTOTEST or NEXYGEN to meet a wide variety of application requirements. To connect the gauge to a device, attach the appropriate interface cable to the port located at the top of the gauge, and the other end to the external device.

1.7 REVERSIBLE HOUSING

The *DFA Series* is shipped shaft-down on non-remote gauges for stand-mounted applications, and the display on the front of the gauge is configured accordingly. For performing operations in which the gauge will be hand-held, it may be desirable to rotate the front of the casing so that the display and logo will be shown right side up. To do so, remove the two screws from the back of the casing, carefully rotate the front of the casing 180 degrees being careful not to pull, pinch, or twist the wires inside, and then reinstall the screws.

NOTE: When removing the screws to the back casing for any reason, please take the proper ESD (Electro Static Discharge) precautions. Touching the circuit board without taking the proper ESD precautions may cause damage to the circuit board.

1.8 SETTING UP FOR SAFE USE

The *DFA Series* should be properly setup before accurate and most of all, safe measurements can be made.

Only when you have verified that you will be conducting a safe test, proceed as follows:

1. Determine what and how it will be tested and verify that the *DFA Series* can handle the test.

2. If desired, mount the gauge or load cell in the test fixture.

3. If you will be powering the instrument from the AC line, plug the charger into its jack on the instrument. Plug the charger into the correct AC voltage outlet (the required AC voltage and frequency are listed on the charger).

4. Otherwise, if you will be powering the instrument from batteries, fully charge the batteries before using.

5. Attach all necessary attachments and plug in the cables. Route the cables so they do not interfere with the tests.

6. Zero the gauge by holding down the F1 key while pressing the ZERO key.

7. Attach the specimen and begin to take measurements.

2.0 FRONT PANEL OPERATION

The *DFA Series* can operate in one of the four modes: Normal, Data Save, Limits Setup and Configuration.

2.1 NORMAL MODE

The principal function of the Normal mode is to provide indications of load applied to the load cell. *Instantaneous force*, *peak-tension* and *peak-compression* readings can be displayed and scaled in a variety of units of measure.

2.1.1 Selecting Type of Measurement – Capturing Peaks

The gauge continuously measures instantaneous tension or compression forces (often called normal readings). It also captures peak-tension and peak-compression forces. The menu label associated with the F1 key (upper left corner) indicates which measurement is being displayed. Pressing the F1 key will cycle between Normal, T-Peak, and C-Peak measurements. The menu label will read NORM, T-PK, C-PK, respectively.

2.1.2 Selecting Units of Measure

Force indications can be displayed in various units of measure. Depending on the gauge capacity you may be able to select from two sets of three units each: [LB, KG, N] or [OZ, G, N]. The menu label associated with the F4 key indicates which unit of measure is selected. Pressing the F4 key will cycle between three units within the set. See Section 2.4.6 for more information on selecting the set of measurement units.

2.1.3 Zeroing

Zeroing allows you to exclude the weight of accessories and attachments from the indicated force readings. It also clears captured peak tension and compression readings. To zero the gauge, momentarily press the ZERO key. Only the current measurement type (i.e., NORM, T-PK, C-PK) will be zeroed. To zero and clear all measurement types, hold down the F1 key while pressing the ZERO key.

The zeroing takes approximately 0.5 seconds. If the load applied to the gauge varies during that time, you will get a warning message: UNSTABLE ZERO, DO YOU WANT TO USE THIS VALUE? Select YES (F3) to accept although further readings may be inaccurate. Select NO (F4) to abort and try again.

2.1.4 Transmitting Readings

Pressing the XMIT key will cause the gauge to transmit a single reading (current measurement type and current units) through the output port (MITUTOYO or RS-232).

2.2 DATA SAVE MODE

The Data Save Mode permits the operator to store up to 1000 data sets acquired during tests. Each data set consists of 7 items: (1) batch number, (2) sample number, (3) tension peak value, (4) compression peak value, (5) indicated instantaneous force with unit of measure (normal value), (6) date and (7) time. For your convenience, you can group the data sets into batches numbered from 01 through 99 where a batch can hold up to 999 data sets; the total number of data sets in all batches is limited to 1000. Data is stored in a nonvolatile memory and is retained even if you turn off the gauge or remove the battery.

Stored data sets can be reviewed (displayed), printed to the output printer, or uploaded to a personal computer.

2.2.1 Storing Readings

While in the Normal mode, press the SAVE key to enter the Data Save mode. The gauge operates just like in the Normal mode except that now, the F2 and F3 keys have a different meaning and additional information is shown on the display.

As previously, the F1 key selects the type of measurement being displayed, i.e. instantaneous force, peak-tension or peak-compression force, and the F4 key is used to select the unit of measure. The ZERO and ZERO-F1 keys zero the current reading or all readings, respectively. The XMIT key causes the gauge to send the current reading through the output port.

The NB (F2) key is now used to close the current batch and open a new one, while the REVIEW (F3) key invokes the Data Review screen.

The top line of the display shows "BATCH XX#YYY" where "XX" is the current batch number and the "YYY" indicates the data set index where the next data set will be stored. The bottom line shows percentage of data memory used. When 100% is indicated, the memory is full and no more data can be stored until the memory is cleared. In the Data Save Mode (not Data Review mode), the gauge will display the word "FULL" where the "BATCH XX#YYY" is displayed when the memory is full. Also, if 999 data sets are stored in a single batch, the gauge will display "BATCH FULL."

To save the current reading, momentarily press the SAVE key. A complete data set is stored and the data set index is incremented. To save another data set, simply press the SAVE key again. To close the current batch and open a new one, press the NB key.

All saved data sets can be reviewed by pressing the REVIEW (F3) key to invoke the Data Review screen. Note that the Data Review screen cannot be invoked if there is no data stored.

To clear memory (and erase ALL saved data) hold down the ZERO key and press the SAVE key when in the Data Save mode, not Data Review.

2.2.2 Reviewing and Printing Stored Readings

To enter the Data Review screen, press the REVIEW (F3) key from the Data SAVE Mode. The gauge displays the most recently saved measurements. The top line of the display shows "Batch XX#YYY" where "XX" indicates the current batch number (01 - 99), and "YYY" is the Data Set within the batch (001 - 999). The second line shows the captured instantaneous force and units of measure. The third line shows the peak-tension and peak-compression data. The fourth line shows the date and time the data was stored.

Use the **BAT** ∧ (F1) and **BAT** ∨ (F3) keys to select other batches for review. Use the ∧ # (F2) and ∨ # (F4) keys to select data sets with a batch. Press XMIT key to send all data sets in the selected batch to the output port using the currently selected print format. See Section 2.4.3 for data/print format details.

Press the EXIT or SAVE key to return to the Data Save mode.

2.3 LIMIT MODE

The High and Low Set Points are designed to alert the user when a load applied to the *DFA Series* trips one or both of the programmed limits. The High or Low Set point alarm is tripped when the load is arithmetically higher or lower than the programmed "trip" value, respectively. The set points provide visual, I/O, serial port as well as audible indications:

- The *visual* indication is a **L** , which will be displayed when the High or Low limit is exceeded. This symbol will be displayed regardless of the mode of operation.

- The *I/O* indication is given by changing the logic level on Pin 9 of the I/O connector. The limit condition is present when the pin reads +5V.

- The *serial port* indication is given by transmitting a single "**!**" when approaching the limit, repeatedly transmitting "**'**" on exceeding the low set point, and "**$**" on exceeding the high set point. The serial port indications can be enabled/disabled.

- The *audible* indication is given by beeping continuously as long as the alarm condition exists. The audible indication can be enabled/disabled.

With the gauge in the main menu screen, which is the screen that is displayed when the gauge is turned on, press the LIMITS key to access the Limits Menu. Four choices appear HI_LIM (edit high limit), LO_LIM (edit low limit), TRANSMIT (enable/disable serial port indications), and BUZZER (enable/disable audible indications).

2.3.1 Changing High Set Point

Press the HI_LIM (F3) key to enter the configuration screen for the high set point. The current setting is displayed in the upper left corner of the display; a leading "C" or "T" letter indicates compression or tension direction. The least significant (right most) digit is underlined to indicate that it is selected for changing. Pressing the F1 key will cycle through all digits allowing you to activate them for editing.

By pressing the F2 or F4 keys the high-limit can be increased or decreased to the desired value. The menu labels describing these keys change depending on whether the currently displayed high-limit value is in compression or tension range. The F2 key is labeled DECREASE C/INCREASE T, while the F4 key is labeled INCREASE C/DECREASE T.

Press the OK (F3) key to accept a new value of the high-limit and return to the previous menu. Press the EXIT key to exit without making changes (i.e., abort).

2.3.2 Changing Low Set Point

Press the LO_LIM (F4) key to enter the configuration screen for the low set point. The current setting is displayed in the upper left corner of the display; a leading "C" or "T" letter indicates compression or tension direction. The least significant (right most) digit is underlined to indicate that it is selected for changing. Pressing the F1 key will cycle through all digits allowing you to activate them for editing.

By pressing the F2 or F4 keys the low-limit can be increased or decreased to the desired value. The menu labels describing these keys change depending on whether the currently displayed low-limit value is in compression or tension range. The F2 key is labeled DECREASE C/INCREASE T, while the F4 key is labeled INCREASE C/DECREASE T.

Press the OK (F3) key to accept a new value of the low-limit and return to the previous menu. Press the EXIT key to exit without making changes (i.e., abort).

2.3.3 Enabling Serial Port Indications

Press the TRANSMIT (F1) key to enter the configuration screen (TRANSMIT LIMITS:) for the serial port indications. Two menu labels are displayed: OFF (F3) and ON (F4). A box surrounding one of the labels signifies the current configuration selection. To enable the function, press the ON (F4) key. To disable, press the OFF (F3) key. If the configuration changes, the menu automatically returns to the previous menu level, otherwise no action is taken. Press EXIT key to exit to the previous menu with no changes.

2.3.4 Enabling Audible Indications

Press the BUZZER (F2) key to enter the configuration screen (BUZZER:) for the audible indications. Two menu labels are displayed: OFF (F3) and ON (F4). A box surrounding one of the labels signifies the current configuration selection. To enable the function, press the ON (F4) key. To disable, press the OFF (F3) key. If the configuration changes, the menu automatically returns to the previous menu level, otherwise no action is taken. Press EXIT key to exit to the previous menu with no changes.

2.4 CONFIGURATION MODE

The Configuration Mode facilitates setup, configuration and the customizing of the *DFA Series* to satisfy varying needs of users.

2.4.1 Filtering Setup

Due to the extremely fast update rate of the *DFA Series*, minor vibrations not related to the test may be picked up by the instrument causing the instantaneous readings to "jump around." The instrument can be programmed to dampen the following types of readings: normal, peak, analog and transmit.

The configuration of the filters can be changed from the Filter Settings screen accessed by pressing the MENU (F3) key followed by the FILTERS (F1) key followed by a particular filter key. The filter's figure of merit (shown on the bottom line of the display) indicates number of updates per second. Thus, lower values indicate more filtering. Press the INCREASE (F2) (or DECREASE (F4)) key to increase (decrease) the number of samples per second. Press the OK (F3) key to accept the new configuration and return to the previous menu. Press the EXIT key to exit with no changes (i.e., abort).

The allowable filter values are tabulated below:

Table 2.1 Filter Settings

Filter	**Updates per Second**
Normal	0.5, 1, 2, 5, 10, or 20
Peak	1, 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, or 10,000
Transmit	0.5, 1, 2, 5, 10, 20, 50, 100, or 200
Analog	0.5, 1, 2, 5, 10, 20, 50, 100, or 200

Table 2.2 Filter Definitions

- **Data Collect** — nonadjustable low pass filter that updates 100 times per second and is usually selectable via computer software (see Table 3.1).
- **Normal** — affects instantaneous force measurements.
- **Peak** — affects peak tension and compression values.
- **Transmit** — affects measurements transmitted in response to a Y2 command (See Table 3.1)
- **Analog** — affects the analog output.

2.4.2 Configuring Output Port

The output port of the *DFA Series* supports RS-232 Serial Port and Mitutoyo Port standards for easy interfacing to printers, personal computers, and Mitutoyo devices. Before a connection between the gauge and an external device can be established, the output port must be properly configured.

First, a proper communication standard must be selected. Press the MENU (F3) key, followed by the COMM (F4) key to enter the DEVICE: selection screen. Two menu labels are displayed: MITUTOYO (F3) and RS-232 (F4). A box surrounding one of the labels signifies the current configuration selection.

2.4.2.1 Enabling the Mitutoyo Output

To enable the Mitutoyo standard, press the MITUTOYO (F3) key. If a box surrounds MITUTOYO it is the active choice. If a box appears and flashes 3 times, MITUTOYO has been selected and the gauge automatically returns to the previous menu level. Press the EXIT key before making any changes to exit to the previous menu. Proceed to Section 2.4.3 to configure the print format for reviewing stored data.

*NOTE: When a Mitutoyo printer is attached to a gauge and the gauge is powered up or down, the following will print "*NO DATA*".*

2.4.2.2 Enabling and Configuring the RS-232 Output

To enable the RS-232 Serial Port standard or to further configure the port, press the RS-232 (F4) key. A secondary menu, permitting configuration of the word length, parity, baud rate and format is entered. Press EXIT key to exit to the previous menu with no changes to the configuration. Proceed to Section 2.4.3 to configure the print format for reviewing stored data.

2.4.2.3 Configure RS-232 - Word Length

The RS-232 transmitter/receiver of the *DFA Series* can be configured for 8/1 (8 data bits, 1 stop bit) or 7/2 (7 data bits, 2 stop bits) operation. Press the LENGTH (F1) key, to invoke the (LENGTH:) selection screen. Two menu labels are displayed: 7/2 (F3) and 8/1 (F4). A box surrounding one of the labels signifies the current configuration. Press the key associated with the desired word length. If the configuration changes, the box surrounding the selection will flash three times and the menu automatically returns to the previous menu level, otherwise no action is taken. Press EXIT key to return to the previous menu.

2.4.2.4 Configure RS-232 - Parity

The RS-232 transmitter/receiver of the *DFA Series* can be configured for EVEN or NONE parity. Press the PARITY (F3) key, to invoke the PARITY: selection screen. Two menu labels are displayed: NONE (F3) and EVEN (F4). A box surrounding one of the labels signifies the current configuration selection. Press the key associated with the desired word length. If the configuration changes, the box surrounding the selection will flash three times and gauge will return to the previous menu level, otherwise no action is taken. Press EXIT key to return to the previous menu.

NOTE: When word length 7/2 and parity EVEN are both selected, the RS-232 transmitter / receiver is actually configured for 7 data bits, 1 stop bit, and EVEN parity.

2.4.2.5 Configure RS-232 – Baud Rate

The RS-232 transmitter/receiver of the *DFA Series* can be configured to operate at 300, 600, 1200, 2400, 4800, 9600, 19,200, 28,800, 38,400, 57,600, 115,200 baud. Press the BAUD (F4) key, to invoke the BAUD: selection screen. Three menu labels are displayed: DECREASE (F4), INCREASE (F2), and OK (F3). The current baud rate is displayed on the bottom line of the display. Press INCREASE / DECREASE keys to change the baud rate. Press the OK (F3) key to accept the new baud rate and return to the previous menu. Pressing the EXIT key will not save any changes and will return the gauge to the previous menu.

2.4.2.6 Configure RS-232 – Transmit Units

The readings transmitted via the RS-232 port of the *DFA Series* can be appended with the unit of measure information. Press the UNITS (F2) key, to invoke the TRANSMIT UNITS: selection screen. Two menu labels are displayed: WITH UNITS (F3) and NO UNITS (F4). A box surrounding one of the labels signifies the current configuration selection. Press the key associated with the desired selection. If the configuration changes, the box surrounding the selection will flash three times and the gauge will return to the previous menu level, otherwise no action is taken. Press EXIT key to return to the previous menu.

2.4.3 Formatting Stored Data Printouts

The *DFA Series* supports 1 COLUMN, 2 COLUMN and 7 COLUMN format for data printing with RS-232. Mitutoyo is 1 COLUMN only.

- **1 Column Format** The format is used for printers that can accept only data (for example Mitutoyo printer/data collector). All data sets in the current batch are printed. Since the format prints a single column of readings, you must specify the type of measurement (Normal, Peak-compression, or Peak-tension) to be printed.

- **2 Column Format** The format is used with ASCII printers or personal computer uploads. All data sets in the current batch are printed; seven lines per set in 2 columns.

Type	Data
Batch	01
Sample	001
T-Peak	-20.185 kg
C-Peak	00.000 kg
Normal	00.000 kg
Date	12/12/1998
Time	16:41:07

- **7 Column Format** The format is used with ASCII printers or personal computer upload. All data sets in the current batch are printed one set per line in seven columns. Columns are labeled: Batch, Sample, T-Peak, C-Peak, Normal, Date and Time. See sample below.

Batch	Sample	T-Peak	C-Peak	Normal	Date	Time
01	001	-20.185 kg	00.000 kg	00.000 kg	12/12/1998	16:41:07

To invoke the print format screen (PRINT:) press the MENU (F3) key followed by the SETUP (F3) key followed by the OPTIONS (F3) key followed by the PRINT (F3) key. Three menu labels are displayed: 1 COLUMN (F3), 2 COLUMN (F4), and 7 COLUMN (F2). A box surrounding one of the labels signifies the current selection. Press the key associated with the desired selection. If the configuration changes, the box surrounding the selection will flash three times and the gauge will return to the previous menu level, otherwise no action is taken. The 1 COLUMN selection is an exception as it invokes a secondary setup screen. Press EXIT key to return to the previous menu.

When the 1 COLUMN format is selected, a secondary setup screen is invoked permitting selection of the data type to be printed. Three menu labels are displayed: NORMAL (F1), T-PEAK (F2), and C-PEAK (F4). A box surrounding one of the labels signifies the current selection. Press the key associated with the desired selection. If a different data type is selected, the box surrounding the selection flashes three times and the gauge returns to the previous menu level, otherwise no action is taken. Press EXIT key to return to the previous menu.

2.4.4 Adjusting the Display Contrast

The graphical LCD display of the *DFA Series* may have to be adjusted to provide the best contrast for the viewing angle and ambient temperature.

To invoke the display adjustment screen (CONTRAST:) press the MENU (F3) key followed by the SERVICE (F2) key followed by the DISPLAY (F1) key. Three menu labels are displayed: OK (bottom left corner), LIGHTER (upper right corner), and DARKER (bottom right corner). Use the LIGHTER / DARKER keys to adjust the contrast. When satisfied, press the OK (F3) key to accept the new setting and return to the previous menu. Pressing the EXIT key will not save any changes and will return the gauge to the previous menu.

2.4.5 Adjusting Date and Time

The *DFA Series* is equipped with a real-time calendar clock and is Year 2000 Compliant. The clock will remember the date and time, as long as a working battery is connected to the gauge. Occasionally, it may become necessary to adjust the date and time settings.

To invoke the time adjustment screen (SET TIME /DATE:) press the MENU (F3) followed by the SETUP (F3) key followed by the MEMORY (F1) key followed by the SET TIME (F3) key. Four menu labels are displayed: < (F1), > (F3), DECREASE (F4), and INCREASE (F2). The current date and time are shown in the top left and bottom left of the display using MM/DD/YYYY HH:MM:SS format where MM indicates month (01-12), DD indicated day (01-31), YYYY indicates year (1998-2200), HH indicates hours (00-23), MM indicates minutes (00-59) and SS indicates seconds (00-59). The active field is underlined. Use the INCREASE / DECREASE keys to adjust the active field. Use the < (F1) and > (F3) keys to select the active field. When satisfied, press the EXIT key to accept the new setting and return to the previous menu. There is no provision to exit to the previous menu with no changes.

NOTE: If the NiCad battery pack is disconnected or loses its charge, the Date and Time will have to be reset. However, stored data will remain in the gauge's flash memory.

2.4.6 Selecting and Locking Units of Measure

The *DFA Series* permits selection of units of measure from two sets in most gauge capacities: [LB, KG, N] and [OZ, G, N]. Further, it offers a unit-lockout feature. If enabled, the lockout prevents the operator from changing units of measure.

2.4.6.1 Selecting the Units of Measure Set

To invoke the units setup screen (UNITS:) press the MENU (F3) key followed by the SETUP (F3) key followed by the UNITS (F4) key. Three menu labels are displayed: LOCK (F2), LB/KG/N (F3), and OZ/G/N (F4). A box surrounding one of the bottom labels signifies the current configuration selection. Press the key associated with the desired selection. If the configuration changes, the box surrounding the selection will flash 3 times and the screen returns to the previous menu level, otherwise no action is taken. Press EXIT key to return to the previous menu.

2.4.6.2 Disabling Changing of Units of Measure (Unit-Lockout Feature)

The *DFA Series* offers unit-lockout feature. If enabled, the lockout prevents the operator from changing units of measure. Press the LOCK (F2) key, to invoke the LOCK: selection screen. Two menu labels are displayed: LOCK (F3) and UNLOCK (F4). A box surrounding one of the labels signifies the current configuration selection. Press the key associated with the desired selection. If the configuration changes, the box surrounding the selection will flash 3 times and the screen returns to the previous menu level, otherwise no action is taken. Press EXIT key to return to the previous menu.

2.4.7 Configuring the Sign Display

By default the letters C (compression) and T (tension) on the display signify the direction of force applied to the *DFA Series*. Alternately, + (compression) and – (tension) notation may be selected, or the direction indications may be disabled altogether.

NOTE: This selection only affects the gauge display; RS-232 and Mitutoyo outputs always transmit compression with no sign and tension with a negative sign.

To invoke the sign configuration screen, press the MENU (F3) key followed by the SETUP (F3) key followed by the OPTIONS (F3) key followed by the SIGN (F2) key. Three menu labels are displayed: NONE (F1), C/T (F3), and +/- (F4). Press the key associated with the desired selection. If the configuration changes, the box surrounding the selection will flash 3 times and the screen returns to the previous menu level, otherwise no action is taken. Press EXIT key to return to the previous menu.

2.4.8 Configuring Auto-Shutdown

The Auto-Shutdown feature (if enabled) will turn off the *DFA Series* after 10 minutes of inactivity. As the time advances to 10 minutes, the circle slowly fills until it is full and the gauge will then turn-off. Inactivity is defined as no keypad activity, no commands received via output port, and no significant change in applied force. This feature can be disabled, if desired.

To invoke the Auto-Shutdown configuration screen (SHUTDOWN:) press the MENU (F3) key followed by the SETUP (F3) key followed by the OPTIONS (F3) key followed by the SHUTDOWN (F4) key. Two menu labels are displayed: OFF (F3) and ON (F4). A box surrounding one of the labels signifies the current configuration selection. To enable the auto-shutdown function, press the ON (F4) key. To disable, press the OFF (F3) key. If the configuration changes, the box surrounding the selection will flash 3 times and the gauge will return to the previous menu level, otherwise no action is taken. Press EXIT key to return to the previous menu.

2.4.9 Performing the Self Test

In the Self Test operation, the *DFA Series* performs a series of self-tests. The Self Test menu displays facts about the gauge settings and allows the operator to verify that the keys are working properly. The Self Test is accessed by pressing the following keys: MENU (F3) key followed by the SERVICE (F2) key followed by the SELF TEST (F4) key.

Once the Self Test mode is accessed, the operator may continue to scroll through the Self Test by pressing the F4 key, which is identified by the NEXT or PROCEED label. To return to the previous menu push the F3 key labeled PREVIOUS. Pressing the EXIT key during any step except for the Keypad Test will terminate the test and return the gauge to the previous menu. The Keypad Test — the last step of the Self Test mode – can be exited only by pressing the ON/OFF key. The remainder of this section provides more details on the seven Self Test operations.

- SOFTWARE VERSION
- SOFTWARE REVISION
- CAPACITY: the capacity of the gauge is displayed in the unit of measurement that has been selected (LB, KG, N).
- % FULL SCALE: indicates the force being applied to the gauge as a percentage of full scale. This percentage does take into account any tare that has been applied (i.e., 100 lb. gauge with a 10 lb. tare applied will read 10% Full Scale).
- PLACE GAUGE HORIZONTALLY: tells the operator to place the gauge horizontally.
- ZERO LOAD: PASS or FAIL will show on the display. If PASS is indicated, then proceed to the next step. If FAIL is the result, the load cell may be damaged and you will need to consult your local distributor, as the gauge may need to be serviced.
- KEYPAD TEST: When a key is pressed, except for the ON/OFF key, the display indicates the key's function. The only way to exit this screen is to press the ON/OFF key, which turns the gauge off.

2.4.10 Selecting Capacity for the Non-Dedicated Remote

This menu selection is active only if the *DFA Series* is configured with remote, non-dedicated load cells (i.e., it is a DFA-R-ND gauge). It is used to select the capacity of the load cell so the gauge indications are properly scaled.

To invoke the Capacity selection screen (CAPACITY:) press the MENU (F3) key followed by the SETUP (F3) key followed by the CAPACITY (F2) key, then press the FORCE (F3) key. The current capacity is shown on the bottom line of the display. Three menu labels are displayed: DECREASE (F2), INCREASE (F4), and OK (F3). Press INCREASE / DECREASE keys to change the capacity. Press the OK (F3) key to accept the new capacity and return to the previous menu. Press EXIT key to exit to the previous menu with no changes.

2.4.11 Calibrating the DFA Series

The DFA Series has a built-in calibration procedure that permits verification and adjustments to the gauge without returning it to the factory. The following are required:

- You must have a way to mount the gauge with the internal load cell or the external load cell vertically for application of tension and/or compression force.

- The *DFA Series* will permit calibration by using deadweights representing 100% of the rated full scale. For example, calibrating a 10 lb. gauge, the deadweights must be 10 lbs., at correct gravity.

- You must have a safe method of axially applying the deadweights to the load cell in the compression direction.

The calibration process is invoked from the Normal mode by pressing the MENU (F3) key followed by the SERVICE (F2) key followed by the CALIBRATE (F3) key. The following question will appear: CALIBRATE FOR NON-DEDICATED REMOTE LOAD CELL? Two menu labels are displayed: YES (F3) and NO (F4). Press NO to calibrate the Remote (Dedicated DFA-R) and/or internal load cell (DFA gauges) and proceed as per Section 2.4.11.1, or press YES to calibrate the Non-Dedicated external load cell (DFA-R-ND gauges) and proceed as per Section 2.4.11.2. Otherwise, press the EXIT key to abort the calibration process.

Note: At any point in the Calibration process, pressing the EXIT key discards the new calibration data and returns the gauge to the Main Menu.

2.4.11.1 Calibration of the Internal Load Cell and the Dedicated Remote

This section leads you step-by-step through the calibration of a *DFA Series* with internal (DFA gauges) or dedicated external (DFA-R gauges) load cell:

- **STEP 1** The display prompts you to “SELECT UNITS TO CALIBRATE”. Press the F2 key to cycle through available units of measure. Press the BACK (F3) key to return to the previous step of the calibration. Otherwise, press the ACCEPT (F4) key to conform the unit of measure and proceed to the next step.

- **STEP 2** The display prompts you to “SELECT CAPACITY”. Press the F2 key to cycle through available capacities for the selected unit of measure. Press the BACK (F3) key to return to the previous step of the calibration. Otherwise, press the ACCEPT (F4) key to conform the capacity and proceed to the next step.

  Predefined capacities depend on the selected unit of measure:

  LB: 2, 5, 10, 20, 50, 100, 200, 500, 1000

  KG: 1, 2, 5, 10, 20, 50, 100, 200, 500

  N: 2.5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000

  OZ: 8, 32, 80, 160, 320, 800, 1600, 3200, 8000, 16000

  G: 250, 1000, 2000, 5000, 10000, 20000, 50000

- **STEP 3** The display prompts you to “PLACE GAUGE IN HORIZONTAL POSITION.” Press the BACK (F3) key to restart the calibration. Otherwise, disconnect any fixtures or weights from the gauge and place it in a horizontal position. Then press the PROCEED (F4) key to zero the gauge and proceed to the next step; the gauge displays “ZEROING” and proceeds to the next selection.

- **STEP 4** The display prompts you to “SETUP GAUGE FOR COMPRESSION MEASUREMENT WITH NO LOAD.” Press the BACK (F3) key to return to the previous step of the calibration. Otherwise, set up the gauge for Compression measurement by mounting it vertically and attaching any fixtures that are necessary to apply the full-scale Compression load. Apply the full scale load to the gauge, exercise the load cell three times, then remove the full scale load. Press the PROCEED (F4) key to zero the gauge and proceed to the next step; the gauge displays “ESTABLISHING OPERATIONAL ZERO” and proceeds to the next selection.

- **STEP 5** The display prompts you to “ADD FULL SCALE COMPRESSION LOAD.” Press the BACK (F3) key to return to the previous step of the calibration Otherwise, apply the full-scale load to the gauge. Press the PROCEED (F4) key and proceed to the next step; the gauge displays “CALIBRATING FULL SCALE” and proceeds to the next selection.

- **STEP 6** The display prompts you to “REMOVE FULL LOAD FOR ZERO CHECKING.” Press the BACK (F3) key to return to the previous step of the calibration. Otherwise, remove the load from the gauge. Press the PROCEED (F4) key and proceed to the next step; the gauge displays “CHECKING ZERO LOAD CONDITION” and proceeds to the next selection.

- **STEP 7** At this point, if the calibration process was successfully completed, the display shows “CALIBRATION COMPLETE.” Press the BACK (F3) key to restart the calibration, or press the SAVE (F4) key to save the new calibration and return to the Normal mode. If the calibration failed, the gauge displays “CALIBRATION VALUE OUTSIDE ALLOWABLE RANGE.” Press the RESTART (F3) key to restart the calibration, or press the ABORT (F4) key to discard the new calibration and return to the Normal mode.

2.4.11.2 Calibrating External Non-Dedicated (ND) Load Cells

The calibration of a DFA Series with a non-dedicated external (DFA-R-ND gauges) load cell follows the same procedure (Section 2.4.11.1), except that Steps 1 and 2 are not performed. A load cell simulator must be used instead of weights. Please perform the following:

- **STEP 3** Set the simulator to 0.0 MV/V
- **STEP 4** Set the simulator to 0.0 MV/V
- **STEP 5** Set the simulator to 3.0 MV/V
- **STEP 6** Set the simulator to 0.0 MV/V

When all the calibration steps have been performed and accepted the gauge's capacity will indicate 100 lbs. If a different capacity load cell is going to be used, the force capacity of the gauge will need to change. To do this press the following keys: MENU (F3) from the main menu, SETUP (F3), CAPACITY (F2), FORCE (F3) and then select the appropriate capacity associated with the load cell that will be used.

The DFA-R-ND gauge capacity ranges are 2, 10, 50, 100, 200, 500, 1000, 2000, 5000 and 10000 lbs. Other units of measurements are KG, N, G, and OZ. Please note that the maximum overload for the DFA-R-ND is 150%, which is the same as the DFA and DFA-R.

Note

At the 2 lb, non-dedicated gauge capacity, if a loadcell simulator is connected to the gauge after calibration, the gauge will read ±2.2026 lbs when the simulator is set to 3.0mV/V. All other capacities read nominal values (10, 50, 100, 200, 500, 1000, 2000, 5000 and 10,000 lbs).

Full scale analog output is ±2.0V at 2.2026 lbs. All other full scale analog outputs are at nominal capacities (10, 50, 100, 200, 500, 1000, 2000, 5000 and 10,000 lbs).

3.0 REMOTE OPERATION AND SETUP

The *DFA Series* can accept and execute commands through the RS-232 serial port. The command set is tailored to make it easy to configure and operate the instrument under a computer program control. The string commands are sent as strings of ASCII characters. The following string commands are recognized:

Table 3.1
Remote Operation and Setup Commands

Command	Response	Description
F		Toggles between Data Collect Normal and Peak Modes
P		Steps through Peak Modes: Normal, Tension Peak, Compression Peak
R		Resets the gauge: zeroes all modes.
S	^N-MODE^^^<CR><LF> or TP-MODE^^^<CR><LF> or CP-MODE^^^<CR><LF> or DC-MODE^^^<CR><LF>	Sends currently selected mode: Normal, Tension Peak, Compression Peak and Data Collect
U		Steps through Units in the following order: oz, g, N
U		Steps through Units in the following order: lb, kg, N
X or ?	±99.999^lb<CR><LF> or ±9999.9^kg<CR><LF> or ±99.999^N<CR><LF> ±99.999^oz<CR><LF> or ±9999.9^g^<CR><LF> or ±99.999^N^<CR><LF> ERROR^^^^^<CR><LF>	Sends data on display with the position of the decimal place the same as on display. If in Data Collect Mode, sends data from the Data Collect filter instead. If "Transmit Units" is set to transmit without units, oz, g^, and N^ are replaced by ^^. Response during force overload.
Z		Zeroes the currently selected mode: Normal, Tension Peak or Compression Peak

4.0 TECHNICAL REFERENCE

4.1 SPECIFICATIONS

Accuracy
DFA ±0.15% of Full Scale
DFA-R ±0.15% of Full Scale
DFA-R-ND ±0.30% of Full Scale

DataStorage
Stores up to 1000 data values in 99 different batches

Sampling Rate
10,000 samples per second

Deflection
0.010-inch (0.254mm) maximum for full load

Safe Overload
Gauge will display "OVERLOAD" when the force applied exceeds 116% of the gauge's capacity

Overload
Maximum overload is 150%. Load Cell deformation may occur when overload exceeds 150%. Contact your local AMETEK Representative if you experienced an overload beyond 150%.
Note: Gauge reading will not exceed 121% of Full Capacity.

Display Update
Four updates per second (250mS refresh) in Normal or Peak Mode

Data Collect Mode
100 samples per second

Tare Capacity
10% in order to utilize Full Scale (in lb Mode); can tare more than 10%, however user will not have use of gauge's Full Scale capacity during testing

Temperature Range
Operating: 40 to 110°F (5 to 45°C)
Storage: 0 to 120 °F (-20 to 50°C)

Temperature Stability
0.03% per °F

Relative Humidity
95% R.H. Non-condensing

Power
120Vac, 50-60Hz (7.25Vdc @ 100mA)
230Vac, 50-60Hz (7.25Vdc @ 100mA)

Battery Life
8-10 hours of continuous operation between charges

Analog Output
-2.0 to 2.0V ±0.015V

Digital Output
RS-232 and MITUTOYO

Software Revision Control
Capability to download future revisions using software

4.2 MENU STRUCTURE

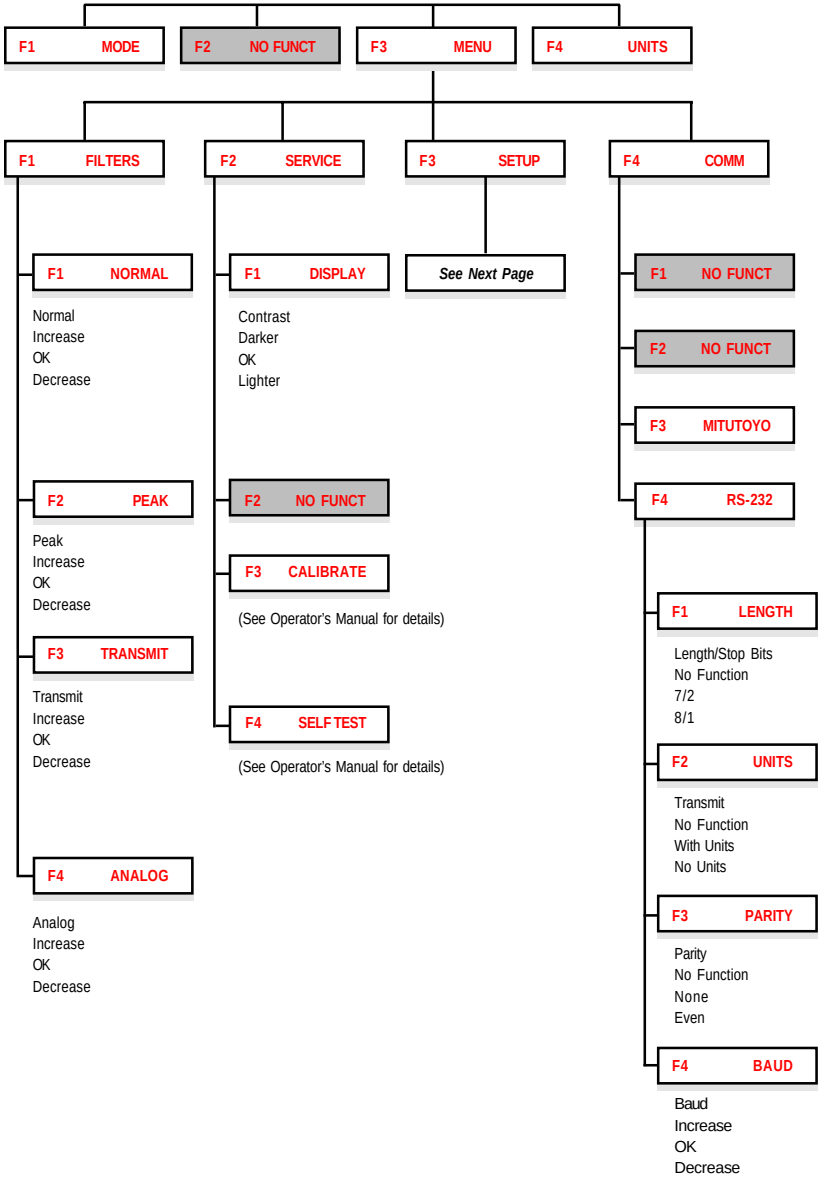


Figure 4.1 Display Menu Hierarchy

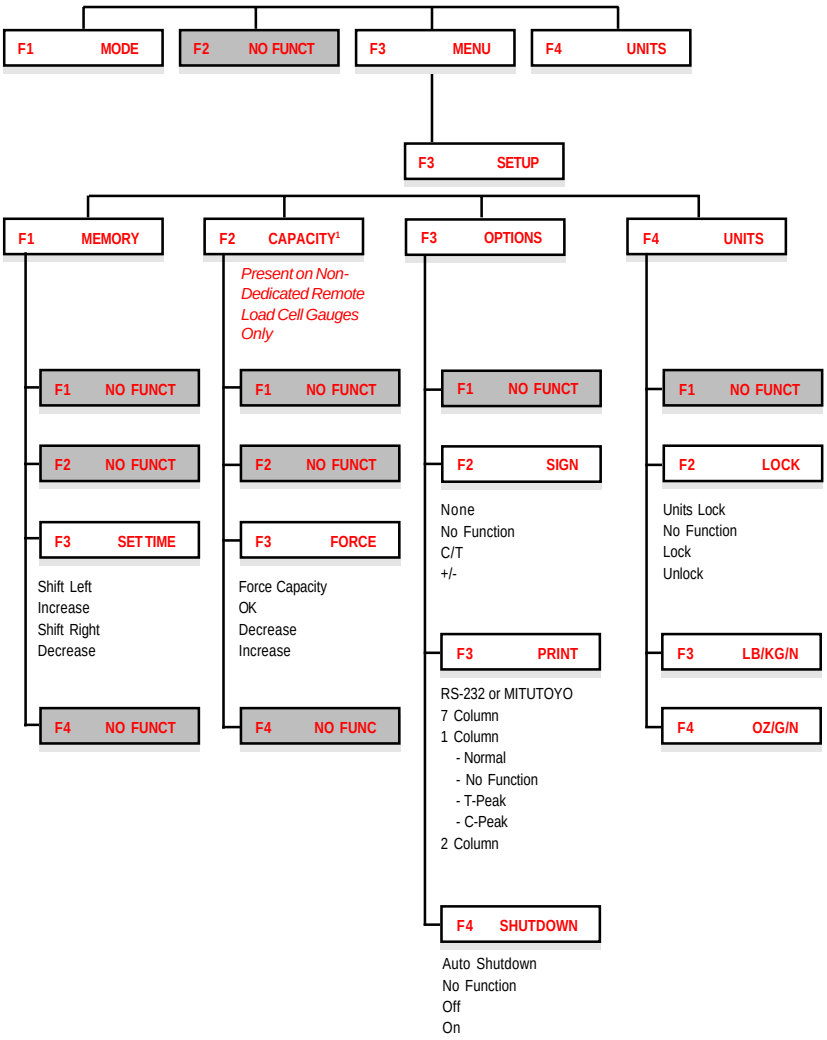


Figure 4.2 Setup Menu Hierarchy

4.3 REMOTE LOAD CELL CONNECTION

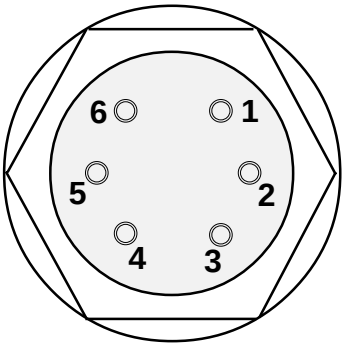


Figure 4.3 Remote Load Cell Connector
(View from Solder End)

The DFA-R and DFA-R-ND *gauges* use remote load cells that connect via a 6-pin male connector. The mating connector is a 6-pin male, Hirose P/N HR10 7P-6P (AMETEK P/N NC000110) (see Figure 7). The wiring is given in the table below.

1	Excitation (+)	3	Output Signal (+)	5	Shield
2	Excitation (-)	4	Output Signal (-)	6	Unused

Table 4.1 Remote Load Cell Pinout

4.4 OUTPUT PORT SPECIFICATIONS

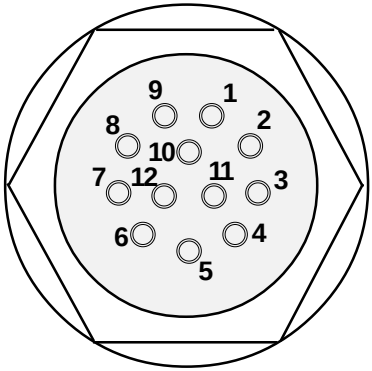


Figure 4.4 I/O Connector
(View from Solder End)

The DFA Series is supplied with a 12-pin female connector to provide both digital and analog outputs. AMETEK offers a variety of cables to handle most applications (Refer to Section 4.6). Select a cable type required to connect the DFA Series gauge to the peripheral device using the mating connector. The pinout of the connector is shown above. Pin assignments are defined in the table below.

PIN	SYMBOL	I/O	PURPOSE	DESCRIPTION
1	TXD	O	RS-232	Transmitted Data
2	RXD	I	RS-232	Received Data
3	GND	O	Ground	Digital Ground
4		O	Clock	Mitutoyo Clock
5		O	Ready	Mitutoyo Ready
6		I	Request	Mitutoyo Request
7		O	Data	Mitutoyo Data
8		I	Detect	Sense Contact Closure
9		O	Setpoint	Setpoint Output Signal
10		-	Ground	Digital Ground
11		-	Analog GND	Analog Ground
12		O	Analog SIG	Analog Output

Table 4.2 I/O Connector Pinout

4.5 DEFAULT SETTINGS

The DFA Series gauges comes configured with the following default settings from the factory.

Mode		Normal	
Units of Measure		G for Model DFA 250G	
		LB for all other Models	
Filters		Normal	20 samples per second
		Peak	10,000 samples per second
		Transmit	200 samples per second
		Analog	200 samples per second
Setup	**Memory**	Time	in EST (Eastern Standard Time)
	Options	Sign	C/T (Compression/Tension)
		Print 2 Column Format for RS-232 *(Note: For Mitutoyo, the default print format is single column with C-Peak values printing)*	
		Shutdown	Enabled
		Units Lock	Unlocked
		Units	LB/KG/N
			OZ/G/N for Model DFA 250G
	Communications	Device	RS-232
		Length/Stop Bits	8/1
		Parity	None
		Baud	9600
		Units	Transmit with Units
Limits	**Transmit Limits**	ON	
	Buzzer	ON (when the force applied exceeds limit of gauge, a buzzer will sound until the force is reduced to within the limit settings)	
	HI Limit	Represents Compression, set at 80% Full Scale e.g. 100 lb gauge set at 80 lbs	
	LO Limit	Represents Tension, set at 80% Full Scale e.g. 100 lb gauge set at 80 lbs	
Save		No Data Stored	
Batch #		Will read 01	
Samples		Will read #001	

4.6 ACCESSORIES, SPARE PARTS, MOUNTING KITS & CABLES

4.6.1 Accessories

Accessory	Spare Parts Kit Number	DFA 250G	DFA 2	DFA 10	DFA 50	DFA 100
Carrying Case	SPK-FMG-073	1	1	1	1	1
Battery Charger 110V[1]	SPK-FMG-069A	1	1	1	1	1
Battery Charger 220V[1]	SPK-FMG-069B	1	1	1	1	1
Extension Rod	SPK-FMG-013A	1	1	1	1	1
V-Notch	SPK-FMG-010A	1	1	1	1	1
Hook	SPK-FMG-012A	1	1	1	-	-
Hook with Coupling	SPK-FMG-012B	-	-	-	1	1
Flat Adapter	SPK-FMG-011A	1	1	1	1	1
Point Adapter	SPK-FMG-009A	1	1	1	1	1
Chisel Point	SPK-FMG-008A	1	1	1	1	1
Hex Wrench	SPK-FMG-015	1	1	1	1	1
Operator's Manual	SPK-DFA-081	1	1	1	1	1
Quick Reference Guide	NC002489	1	1	1	1	1

Note: [1] A Battery Charger is provided standard with your DFA Series Gauge. The type depends on the type of gauge specified.

These parts are also used on all DFA-R Remote and DFA-R-ND Nondedicated Remote Gauges.

4.6.2 Firmware Upgrades

The DFA Series gauges feature a flash memory to facilitate field upgrades of the instrument's firmware. Upgrade kits will be offered by AMETEK as new features are added to the instrument. The downloading of firmware from the upgrade kits will require the DFA Series gauge to be connected to a personal computer.

The Flash Memory Upgrade Kit part number is E80-715.

4.6.3 Spare Parts

Spare Part	Spare Parts Kit Number	DFA 250G	DFA 2	DFA 10	DFA 50	DFA 100
Load Cell, 250g	SPK-DFA-077A	1				
Load Cell, 2 lb	SPK-DFA-077B		1			
Load Cell, 10 lb	SPK-DFA-077C			1		
Load Cell, 50 lb	SPK-DFA-077D				1	
Load Cell, 100 lb	SPK-DFA-077E					1
Battery Pack	SPK-DFA-078	1	1	1	1	1
Key Pad	SPK-DFA-075	1	1	1	1	1
Lens	SPK-DFA-079	1	1	1	1	1
Circuit Board	SPK-DFA-076	1	1	1	1	1
Flash Memory Upgrade Kit	E80-715	1	1	1	1	1

The following parts are for DFA Remote and DFA Non-dedicated (Interchangeable) Remote Gauges.

Spare Part	Spare Parts Kit DFA-R	Spare Parts Kit DFA-R-ND
Load Cell, 250g	SPK-DGGS-R-045A	Not Available
Load Cell, 2 lb	SPK-DFGS-R-045B	Remote-2
Load Cell, 10 lb	SPK-DFGS-R-045C	Remote-10
Load Cell, 50 lb	SPK-DFGS-R-045D	Remote-50
Load Cell, 100 lb	SPK-DFGS-R-045E	Remote-100
Load Cell, 200 lb	SPK-DFGS-R-045F	Remote-200
Load Cell, 500 lb	SPK-DFGS-R-045G	Remote-500
Load Cell, 1000 lb	SPK-DFGS-R-045H	Remote-1000
Load Cell, 2000 lb	Not Available	Remote-2000
Load Cell, 5000 lb	Not Available	Remote-5000
Load Cell, 10000 lb	Not Available	Remote-10000
Key Pad	SPK-DFA-075	SPK-DFA-075
Battery Charger, 110V	SPK-FMG-069A	SPK-FMG-069A
Battery Charger, 220V	SPK-FMG-069B	SPK-FMG-069B
Battery Pack Asembly	SPK-DFA-078	SPK-DFA-078

Note: Complete parts lists with drawings are available electronically by contacting your Chatillon Representative. DFA (PL-FM-3114), DFA-R (PL-FM-32114) and DFA-R-ND (PL-FM-3314).

4.6.4 Mounting Kits

Stand Model	DFA Integral	DFA-R or DFA-R-ND
LTS	See Note 1	NC000300[3]
LTC	See Note 1	NC000300[3]
HTC	HTCK-2[2]	NC000225[4]
TCM 201	Included with Test Stand	NC000300[3]
TCD 200	Included with Test Stand	NC000300[3]
LF PLUS	Included with Test Stand	Not Applicable

Notes:
1. Dowel pin P/N 3256 must be removed form test stand in order to mount the DFA gauge to test stand.
2. HTCK-2 must be factory-assembled without Dowel Pin (P/N 3256).
3. Includes mounting hardware for 250g through 200 lb remote load cells. The 250g - 10 lb load cells have a #10-32 female thread. The 50 - 200 lb load cells have a 1/4"-28 female thread.
4. Includes mounting hardware for 50 thru 200 lb remote load cells. These load cells have 1/4"-28 female thread attaching accessories or fixtures.

4.6.5 Cables

Cable	Description
NC000850-1	Connects DFA Gauge to a personal computer with a 9-pin RS-232 connection.
NC000652	Connects DFA Gauge to a personal computer with a 25-pin RS-232 connection.
NC000653	Connects DFA Gauge to an X-Y recorder
NC000654	Connects DFA Gauge to a Mitutoyo device with a 10-pin connection.
NC000647	Connects DFA Gauge to CHATILLON Model TCD Test Stand.
ENC0125	Connects DFA Gauge to CHATILLON Model TCM Test Stand.
NC000875	Connects a TCD or TCM Test Stand to a personal computer with a 9-pin RS-232 connection.
NC000477-1	Connects a TCD or TCM Test Stand to a personal computer with a 25-pin RS-232 connection.
ENC0157	Connects a TCM Test Stand to a Mitutoyo device with a 10-pin connection.

TEST AND CALIBRATION INSTRUMENTS

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