NEXTECH

DFT Series User's Manual

(5N-1000N Capacity)

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Introduction

Thank you for choosing Nextech DFT series instrument. With correct use and regular re-calibration, it can provide many years of accurate and reliable service.

The DFT, being simple to operate, can measure tensile and compressive forces accurately.

Software and accessories are included to make your force gauge even more versatile.

Before Use

Warning: Please read the entire manual carefully before using the Nextech gauge. Make certain that any person using or having access to the gauge reads and understands the entire manual beforehand. Improper use of the gauge could cause damage and/or void its warranty.

Never attempt to remove the rear cover nor repair the gauge yourself.

Do not overload the load sensor. Whether the DFT is powered ON or OFF, overloading the sensor will cause irreparable damage. When powered ON, forces greater than 120% of full capacity will produce an audible beep and an OL symbol will blink on the display until the load is released and the RESET key is pressed.

Operation Overview

Nextech DFT has been designed to give the user easy access to its commonly used features.

Listed below is a brief overview of some key features and their corresponding keypresses, located on the front panel. If desired, this page can be printed out as 'Quick Reference Guide'. However, as previously stated, be sure to read the entire manual before using the DFT.

More detailed information on these features can be found throughout the manual.

BUTTON KEY	Effect
POWER	1. Powering ON and OFF the DFT instrument 2. Invert the display (Pressing MENU + POWER simultaneously)
ZERO	Set the starting point, taring-out the weight of attachments*
RESET	Revert to the starting point that was set with the ZERO function
UNIT	Cycle through Units of measurement (Grams, ounces, newtons etc.)
MODE	Cycle through the types of applied load force (Push, Pull and Tracking)
ENTER	1. Record a measurement to the internal memory 2. Select the highlighted option from within a menu
PRINT	Print the memory contents to the serial port
MENU / ESC	1. Enter the Main Menu system to allow configuration of the DFT gauge 2. A mean of escaping the menu system one level per button press

* "Taring" deducts the weight of an attached accessory from the gross weight in order to display only the weight that users are interested in measuring

Powering the DFT for the First Time

The DFT is supplied with a set of 4 Nickel Metal Hydride AAA rechargeable batteries. For safety reasons, the batteries are discharged during transportation.

To obtain maximum battery life, we recommend that you charge them with the charger/ adaptor supplied for at least 14–16 hours when you first receive the instrument. When subsequent recharges are necessary, it is recommended that the DFT is charged for 8 hours.

Battery Indicator


Battery Levell is at full capacity


Battery level is at 75% of capacity


Battery level is at 50% of capacity


Battery level is at 25% of capacity


Battery level is less than 5% of capacity

If battery level is 0 %, the “battery empty” message will be displayed, and the gauge will power down automatically.

When plug in the charger, after few minutes, the battery level will show battery capacity full. Actual remaining battery capacity can be view only when charger is not connected.

***Important** Only use the adaptor/charger supplied

Using the DFT

Fitting Accessories

Couple DFT fitting directly to the load cell stem. The threads are M6 and have capacities up to 1000N.

Ensure that anything coupled to the gauge is screwed finger-tight only. Excessive torque can damage the load cell and is not covered by warranty.

Mounting to Test Stand

To secure the DFT to a suitable mounting plate, use the two M5 threaded holes. The distance between the holes is 2.5 inches. Alternatively, four 3mm thread holes on the rear of the gauge can also be used to mount the gauge.

An appropriate mounting plate must be used to ensure that the fixture does not directly contact the force gauge case. An optional versatile mounting plate is available to couple the force gauge to many brands of test stands.

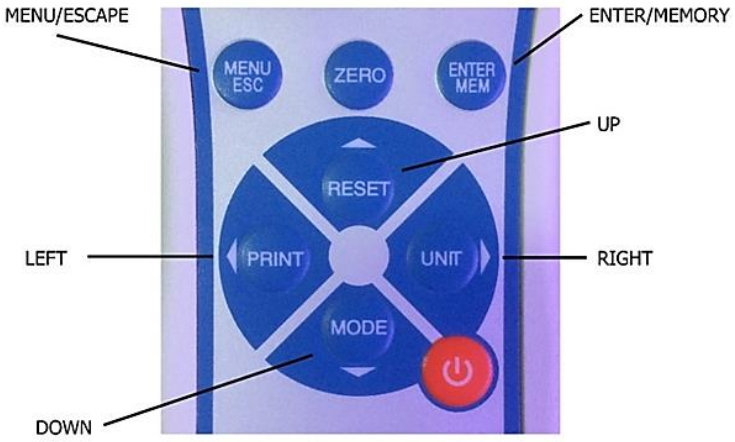


Figure 1 DFT Control Panel

Powering Up

The control panel has eight keys, as shown in figure 1.

To power up the gauge, press the ON/OFF key located at the lower right of the keypad. A short self-test will begin, during which the display will show the maximum capacity in Newtons.

After completing the self-test, providing no load has been applied to the instrument, the display will show all zeroes. This is because the gauge re-zeroes itself during the self-test routine.

* If a force is applied via the load cell probe (threaded stem at bottom of the DFT), the reading on display will register the applied force.

* Forces may not show zero if the DFT is moved, or weight/force applied during the self-test routine. Once it is properly mounted in either vertical or horizontal position and zeroed, the reading will be stable.

To power down the gauge, press the ON/OFF key.

* All of the current DFT settings are saved when the gauge is turned off and the gauge will function in the same mode when powered up again.

Basic Functions

Tensile forces are displayed on the DFT and recognized by the symbol ▲, Compressive forces are displayed on the DFT and recognized by the symbol ▼

Display of Tension/Compression

Figure 2a Tension and compression displays

Figure 2b Tension and compression displays

The "Load Indicator Bar" alerts the operator of how much load has been applied to the load sensor. (Note that this bar indicates the tared weight and does not reflect any accessories that have been "Zeroed" out.)

Zeroing the gauge: During the operation of the gauge, it is often necessary to zero the display, for example, when you wish to tare out the weight of a grip, so it does not become part of the measured reading, or when you change the position of the gauge from horizontal to vertical and vice-versa. Press and release the ZERO key.

Changing the unit of measurement: You can choose from the following units of measure depending on the capacity of your gauge: millinewtons, Kilonewtons, newtons, gram-force, kilogram-force, ounce-force, or pound-force.

To cycle through the available units-of-measure, press the UNITS key. Each successive key press will select the next available unit of measurement until the gauge returns to its original setting. The DFT automatically converts the displayed readings DFT as new units of measure are selected.

Note:
· *Available units-of-measure are limited by model type. See table on page 30 to find out which units are available on each model.*

Changing the mode of measurement: You can choose from the following modes of measurement: Track, Peak-Tension and Peak-Compression.

To cycle through the available mode, press MODE key. Each successive key press will select the next available mode until the gauge returns to its original setting.

Track mode

Press the MODE key until the TRACK appears on the display. The display will now indicate forces applied in both directions as they are applied to the load sensor in real time. See Figure 3a.

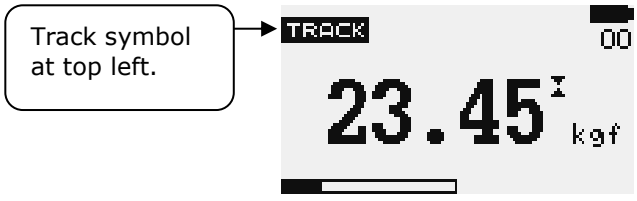


Figure 3a Track

Peak-Tension mode

Press the MODE key until the PEAK appears on the display. The display will show the maximum tensile force that has been applied to the sensor. See Figure 3b (Again, do not exceed the gross maximum capacity of the DFT model that you are using.)

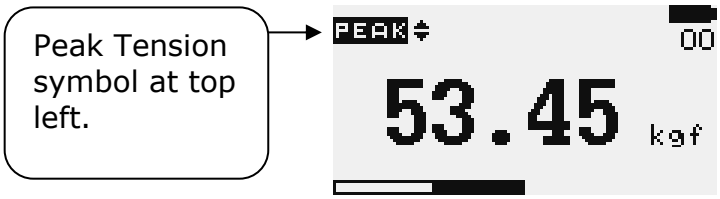


Figure 3b Peak Tension

Peak-Compression mode

Press the MODE key until the PEAK appears on the display. The display will show the maximum compressive forced that has been applied to the sensor. See Figure 3c

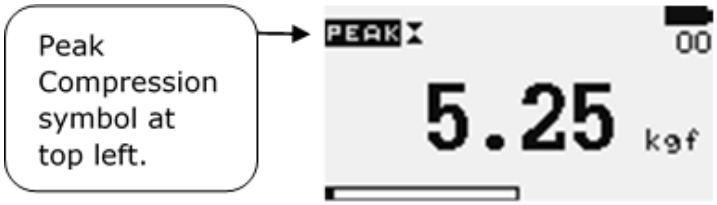


Figure 3c Peak Compression

Dual-Peak mode

Press the mode key until the PEAK ⇕ appeared on the display. The display will show the highest tensile forced and the highest compressive force. The current load being applied to the load sensor is also displayed. See Figured 3d

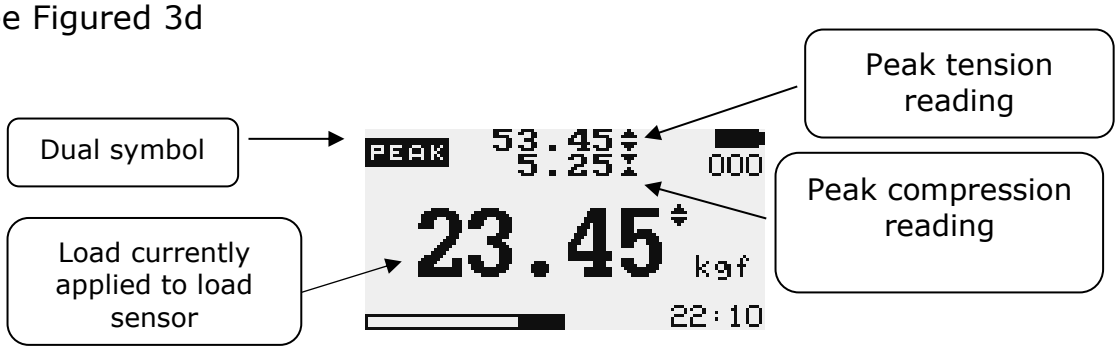


Figure 3d Dual Peak

Resetting the gauge Press the RESET key to clear the current reading and prepare the DFT for the next test.

Backlit Display When you press any key or apply forces to the load sensor greater than 0.5% of full scale, the backlight will be active for 60 seconds.

Invert Display The display may be inverted or "reversed", so that the operator can read it more comfortably. Press and hold the MENU key while powering up the DFT to invert the display. This feature is remembered after powering down. Perform the same steps again to restore the display to the opposite direction.

Saving readings to memory Any reading can be saved any time by pressing the MEM/ENTER key. A total of 500 readings can be stored to the unit's internal memory.

Display Date and Time The lower right corner of the display will alternate between date (1sec) and timed (3sec). Time is shown in 24 hour format.

Output signals The displayed reading may be transmitted to a PC by pressing the PRINT key or sending a request command from a PC to the gauge. The command can be through USB or R232 Port.

Command	Action
l	Send live reading value with unit
P	Send peak tension value with unit
C	Send peak compression value with unit
x or **pressing PRINT key**	Send live reading value with unit if current mode is track mode. Send peak tension value with unit if current mode is peak tension mode. Send peak compression value with unit if current mode is peak compression mode. Send live, peak tension and peak compression value with unit if current mode is dual peak mode.
S	Send statistics of database (Max, Min, Mean, Std Dev, Cov)
d	Send database
t	Send current date and time
!	Send information of gauge (model, capacity, serial number, firmware revision, last calibration, original offset, current offset, overload count)

Computer Control of Force Gauge A computer can control the gauge by sending commands through either USB or RS232 port

Command	Action
m	Cycle modes of measurement
u	Cycle units of measurement
z	Zero the gauge
r	Reset to previously set 'Zero'

Main Menu

Press MENU/ESC key to access the main menu. To move between the options listed on the main menu page, press UP and DOWN arrow keys to move the cursor. Press ENTER to select the sub-menus, activate features, and enter values. Within sub-menus UP, DOWN, LEFT and RIGHT arrow keys will also change numerical values. Press ESC to return to the main menu page.

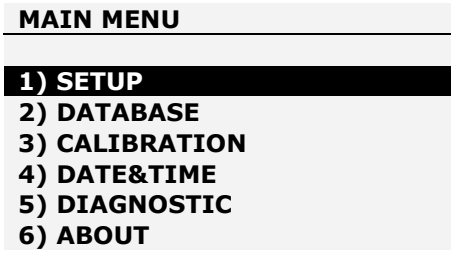
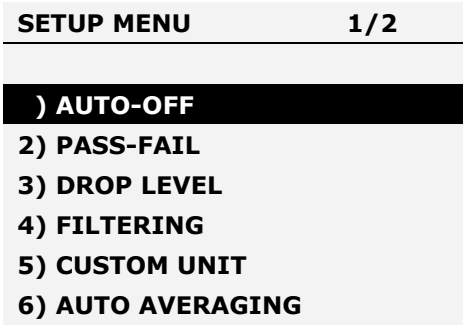


Figure 4 Main Menu

1. **SETUP** Press the MENU key; the display will show main menu page and use UP and DOWN to move the cursor point to SETUP. Press the ENTER key, the display will show the set up menu page. Press ESC key to return to the Main menu page.



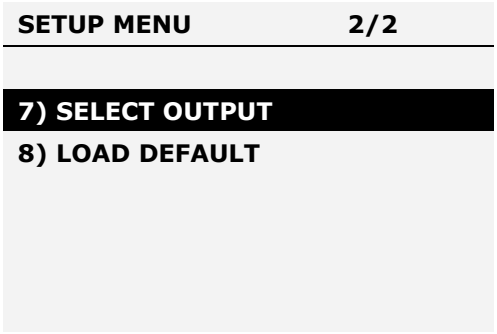


Figure 5 Setup Menu

1.1 AUTO-OFF If desired, the Auto-Off function can be enabled to conserve battery power. 'AO' will appear on the main display when this feature has been activated.

The following steps can be used to enable or disable this feature.

1. Press the MENU key, notice that the display now shows Main Menu 1/2 (indicating page 1 of 2) in the navigation bar at the top of the screen.
2. Use UP and DOWN to move the cursor to highlight AUTO-OFF
3. Press the ENTER key. Notice the AUTO-OFF Menu appears in the navigation bar.
4. From this menu, one of the available AUTO-OFF time periods can be selected and enabled or this function can be set to OFF.
5. Press the ESC key to return to the Main Menu page.

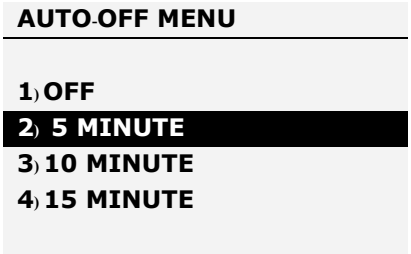


Figure 6 AUTO-OFF Menu

1.2 PASS–FAIL The Pass-Fail feature can be used to define an acceptable range of applied force.

This feature is activated by navigating to the PASS-FAIL Menu.

1. Press the MENU key to access the Main Menu.
2. Use UP and DOWN to move the cursor to highlight PASS-FAIL.
3. Press the ENTER key to access the PASS-FAIL menu
4. In this screen (Figure 7), the LEFT ARROW key will toggle the cursor between the Upper and Lower values. (Notice that the selected value is underlined)
5. The RIGHT ARROW key will cycle through the units of measure.
6. Press the UP and DOWN keys to change these values incrementally or press and hold to scroll the values.
7. When you are satisfied with each of the settings, pressing ENTER will save the values, enable the PASS-FAIL function, and return you to the Main Menu.

When the PASS-FAIL feature is active the PF symbol will appear on the main display. While using this feature, an applied load force that is outside the set range (higher or lower) will display the FAIL message. If the applied load is within this range, the display will show the PASS message.

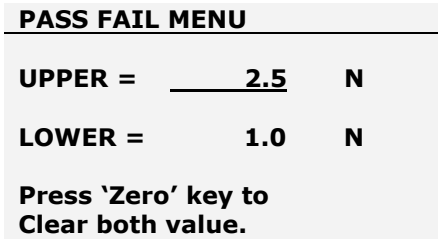


Figure 7 PASS-FAIL menu

* *The Pass-Fail feature will automatically be disabled if you set LOWER and UPPER = 0N.m*
* *The LOWER value must be less than the UPPER*

Example:

From this example we will assume that a lower threshold has been set to 2lbf and the upper threshold has been set to 5lbf:

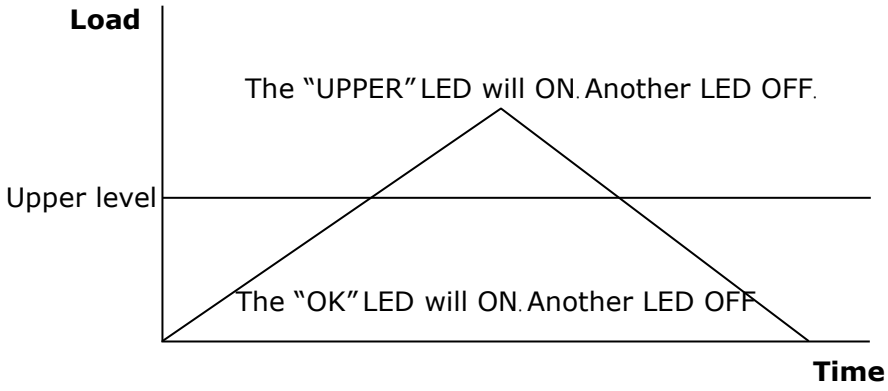
- If a load force of 1.5 lbf is applied, the yellow LED will signal that the applied load has fallen below the test range settings, resulting in a failure.

- If a load force of 6 lbf is applied, the red LED will signal that the applied load is greater than the test range settings, also resulting in a failure.

- If a load of any force between the set range values is applied, for example 4 lbf, the green LED will signal that the load has successfully fallen within the upper and lower limits, resulting in a PASS.

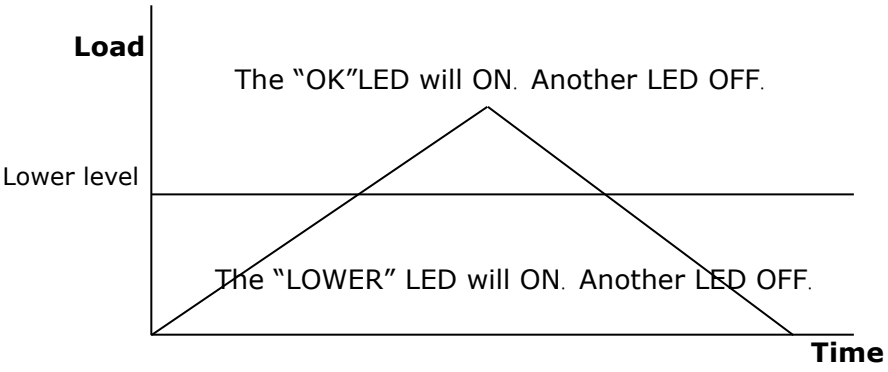
Example 1 LOWER LEVEL = 0 LBF, UPPER LEVEL = 5 LBF

Figure 8a



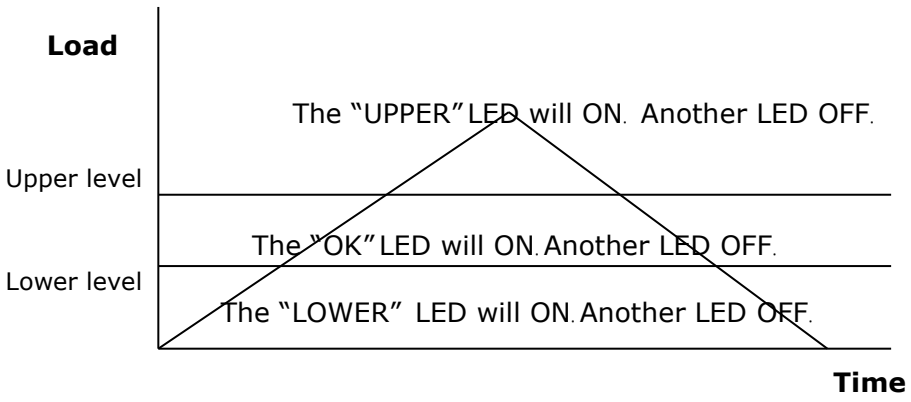
Example 2 LOWER LEVEL = 2 lbf, UPPER LEVEL = 0 lbf

Figure 8b



Example 3 LOWER LEVEL = 2 lbf, UPPER LEVEL = 5 lbf

Figure 8c



1.3 DROP Level 1st Peak facility This is used to detect the force at which a sample breaks but is not necessarily the maximum force (e.g., detecting the force at which a tablet first begins to crack) or in capturing yield point of a material.

When the featured is set ON, three addition Measure mode can be selected using the MODE key from the main display.

1st Peak Tension

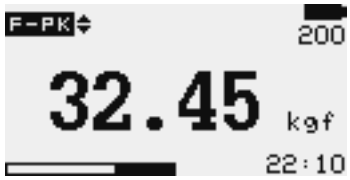


Figure 9a

1st Peak Compression

Figure 9b

Figure 9c 1st Peak Tension and Compression

To set DROP LEVEL, press UP and DOWN to move the cursor point to DROP LEVEL and press ENTER key. The display will show the Set Drop level menu page. Press ESC key to return the setup menu page.

DROP LEVEL MENU

DROP = 2.5 N

Press Zero key to Reset value.

Figure 10 Set Percent Drop Menu

Use UP and DOWN keys to change the value, press and hold to scroll values. Use RIGHT ARROW key to change unit. When the correct valued is reached press ENTER to save setting and return to setup menu page.

** 1st Peak feature will automatically be disabled if you set DROP = 0 N.*

Example

DFT 100N has drop level = 20N. If the peak load before sample break is 50 the load must drop to 30N in order for the DFT to detect a 1st peak of 50N. If the load continues to be applied above 50N (e.g., to 75N), the DFT will return 75N as PEAK and 50N as 1st peak.

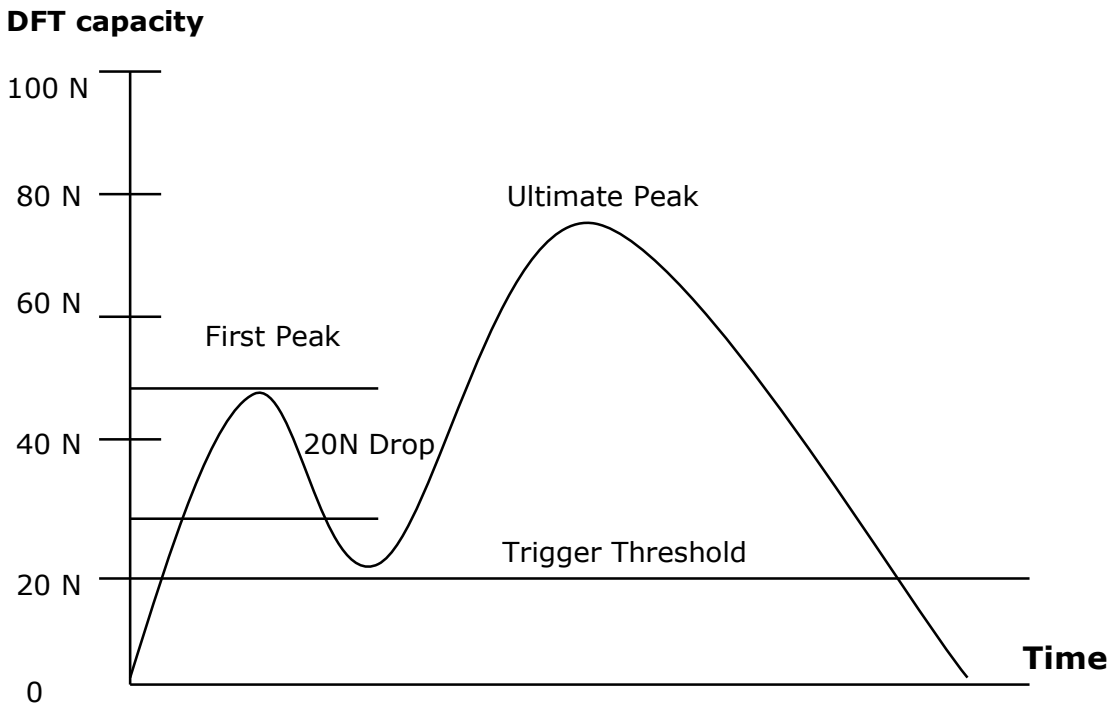


Figure 10a

1.4 Filtering This function selects the display throughput rate i.e., the amount of averaging performed by the internal electronics before the load reading is displayed. There are two levels HIGH and LOW

LOW Display update every 100 ms with a little data averaging

HIGH Display update every 200 ms with a maximum data averaging

To set FILTERING, press UP and DOWN to move the cursor point to FILTERING and press ENTER key the display will show Filtering menu page. Press ESC key to return the setup menu page.

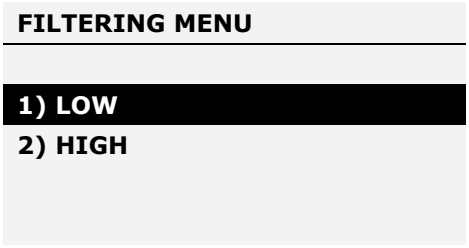


Figure 11 Filtering Menu

Using UP and DOWN keys to select the relevant level and press ENTER key to save setting and return to setup menu page.

1.5 CUSTOM UNIT A custom unit can be applied to load values in the main display. This is useful for applications where you wish to convert the load reading into a non-standard unit of measurement.

To set CUSTOM UNIT, press UP and DOWN to move the cursor point to CUSTOM UNIT and press ENTER key, the display will show Custom unit menu page. Press ESC key to return the setup menu page.

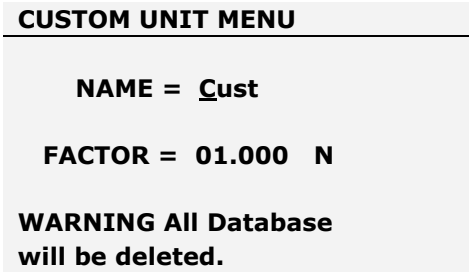


Figure 12 Custom unit Menu

To set the name, use LEFT Arrow key to move the cursor point to NAME. Use UP and DOWN keys to change the character, press and hold to scroll change.

To set the constant factor, use LEFT Arrow key to move the cursor point to FACTOR constant. Use UP and DOWN keys to change the value, press and hold to scroll values.

To set the unit factor, use RIGHT Arrow key to change the unit, press and hold to scroll change.

Press ENTER to save setting and return to setup menu page

* *All Data in Database will be deleted if you change setting.*

1.6 AUTO AVERAGING This function allows the average load reading to be displayed. The average starts being calculated when the start trigger condition occur and stops when the stop trigger condition occur. When this feature is Enabled, one addition Measure mode can be selected using the MODE key from the main display.

Figure 13 Auto Averaging mode

**In this mode save database by press ENTER key for 0.5 sec*

To access *AUTO AVERAGING* menu, Press UP and DOWN to move the cursor point to *AUTO AVERAGING* and press the ENTER key, the display will show the Auto Averaging menu page. Press ESC key to return the setup menu page.

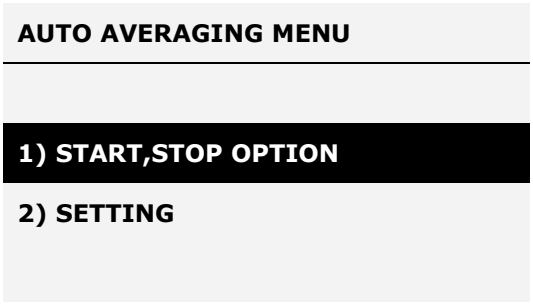


Figure 14 Auto Averaging Menu

1.6.1 START, STOP OPTION This function selects the Auto Averaging start and stop option.

To access START, STOP OPTION menu, press UP and DOWN to move the cursor point to START, STOP OPTION and press ENTER key, the display will show Start, Stop option menu page. Press ESC to return the auto averaging menu page.

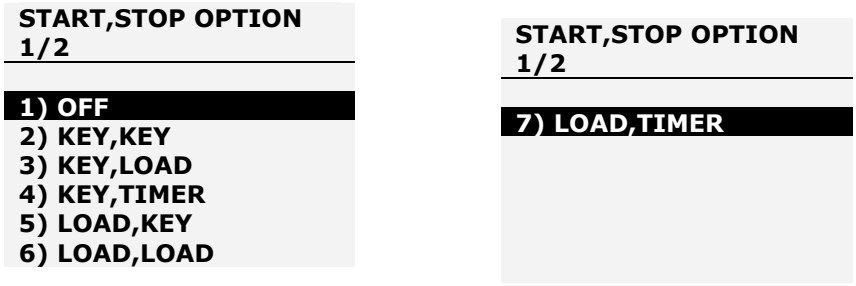


Figure 15a Start, Stop option Menu

1.6.1.1 OFF Disable the auto averaging function
1.6.1.2 KEY,KEY Start averaging and stop averaging by press ENTER key
1.6.1.3 KEY, LOAD Start averaging by press ENTER key and stop averaging by STOP LOAD threshold defined
1.6.1.4 KEY, TIMER Start averaging by press ENTER key and stop averaging by STOP TIMER defined.
1.6.1.5 LOAD, KEY Start averaging by START LOAD threshold defined and stop averaging by press ENTER key.
1.6.1.6 LOAD, LOAD Start averaging by START LOAD threshold defined and stop averaging by STOP LOAD threshold defined
1.6.1.7 LOAD,TIMER Start averaging by START LOAD threshold defined and stop averaging by STOP TIMER defined

1.6.2 SETTING This function use to define the threshold value (START LOAD, STOP LOAD, STOP TIMER)

To access SETTING menu, press UP and DOWN to move the cursor point to SETTING and press ENTER key, the display will show Setting menu page. Press ESC key to return the auto averaging menu page.

Figure 15b Setting Menu

Use LEFT Arrow keys to move cursor point to the desired value. Use UP and DOWN keys to change the value, press and hold to scroll values. Use RIGHT Arrow key to change the unit. Press ENTER to save setting and return to Setup menu page.

1.7 SELECT OUTPUT This is used to select between USB or PS/2 (R232) Output. Select one of the two available options based on connection type. The default mode of the output port is USB output.

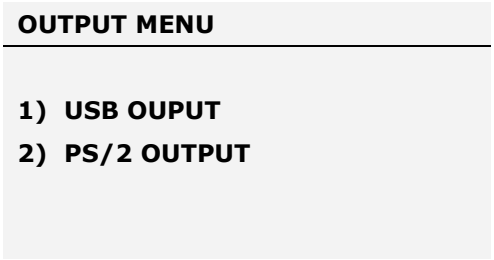


Figure 16 Output Menu

1.8 LOAD DEFAULT The DFT may be returned to its original factory default setting.

To set factory default, press UP and DOWN to move the cursor point to LOAD DEFAULT and press ENTER key, the display will show Load Default menu page. Press ESC key to return to the setup menu page.

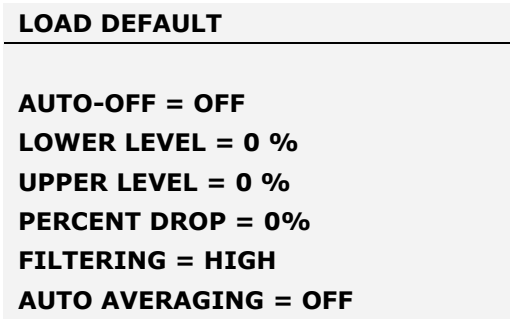


Figure 17 Load default Menu

Press ENTER key to load default setting and return to setup menu page.

2. DATABASE This use to view the saved record, deleted last record, delete all record and calculate the statistics value of saved record.

To access DATABASE menu, go to the main menu page, press up and DOWN to move the cursor point to DATABASE and press ENTER key, the display will show the Database menu page. Press ESC key to return to main menu page.

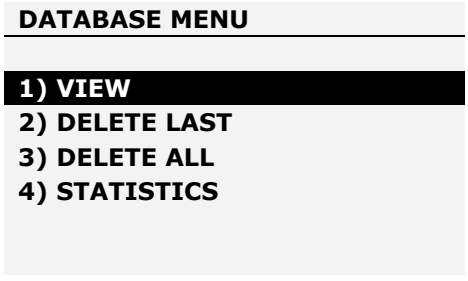


Figure 18 Database Menu

2.1 VIEW This use to view all saved record in database. The detail of each saved record consists of

- Reading and value with unit
- Direction
- Date and Time

To access VIEW menu, press UP and DOWN to move the cursor point to VIEW and press ENTER key, the display will show the view menu page. Press ESC key to return to database menu page.

Press UP and DOWN to change view page, press and hold to scroll change view page.

2.2 DELETE LAST This uses to delete last saved record. To access DELETE LAST menu, press UP and DOWN to move the cursor point to DELETE LAST and press ENTER key, the display will show delete last menu page. Press ESC key to return to database menu page.

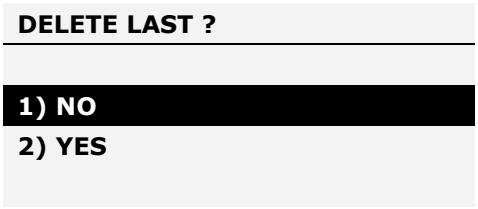
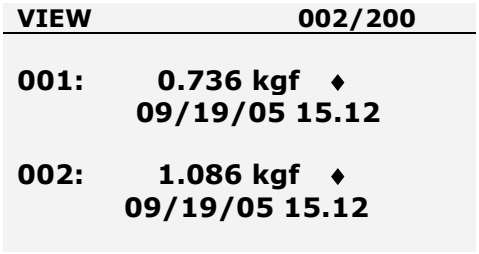


Figure 19a Delete last Menu

Press UP and DOWN to select NO and YES, If you selected NO and press ENTER key the gauge will return to database menu page. If you selected YES and Press ENTER key the gauge will delete last saved record and return to database menu page.



2.3 DELETE ALL This use to delete all saved record. To access DELETE ALL menu, press UP and DOWN to move the cursor point to DELETE ALL and press ENTER key the display will show delete all menu page. Press ESC key to return to database menu page.

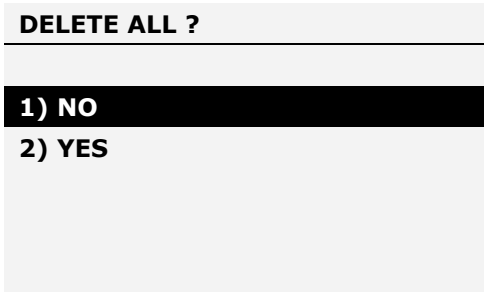


Figure 19b Delete all Menu

Press UP and DOWN to select NO and YES. If you selected NO and press ENTER key, the gauge will return to the database menu page. If you selected YES and press ENTER key, the gauge will delete all saved record and return to database menu page.

2.4 STATISTICS The DFT calculate statistics value (max, min, mean, std dev, cov, pass count, fail count, percent pass and percent fail) of up to 20 saved records. For more than 20 records, the data should be processed by computer via Nextech 's convenient statistical software.

To access STATISTICS menu, press UP and DOWN key to move the cursor to point to STATISTICS and press ENTER key, the display will show Select record menu page. Press ESC to return to Database menu page.

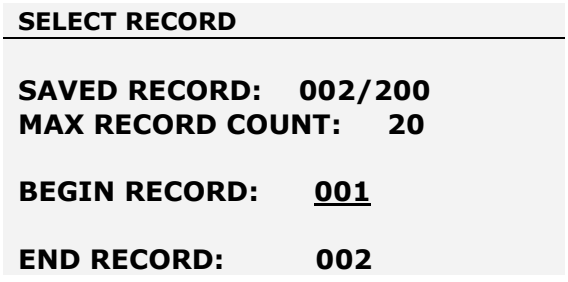


Figure 19c Select record Menu

Press UP and DOWN key to select the record, press and hold to scroll select the record. Press LEFT and RIGHT key to change cursor between BEGIN RECORD and END RECORD, press and hold to scroll change.

* *BEGIN RECORD and END RECORD must not equal 0.*
* *BEGIN RECORD must be less than END RECORD.*
* *The maximum of record for calculation must not be over 20.*
* *Measurement unit and direction of each record for calculation must be same.*

Press ENTER key to calculate the statistic values, The display will show calculation result page. Press ESC key to return to the Database menu page.

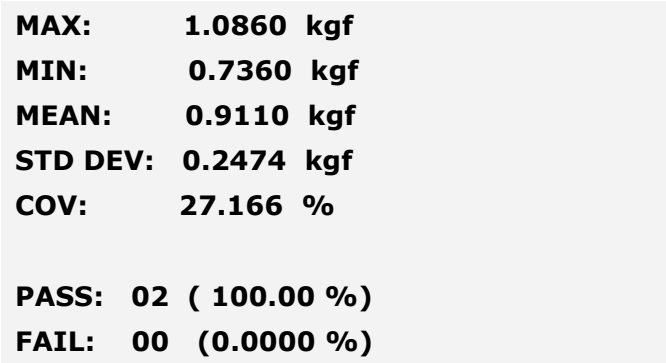


Figure 19d Statistics result Menu

**Pass and Fail count calculation depend on last setting of UPPER LEVEL and LOWER LEVEL.*

3. CALIBRATION This is used by service technicians when calibrating the gauge. Contact your Nextech distributor for details. Visit our website or contact us for the calibrate manual & password in case you are sending to calibration lab or calibrate yourself.

4. DATE&TIME This use to set date and time. To set date and time, go to main menu page and press UP and DOWN key to move cursor point to DATE&TIME and press ENTER key, the display will show Date & Time menu page. Press ENTER key the display will show Date & Time menu page. Press ESC key to return to main menu page.

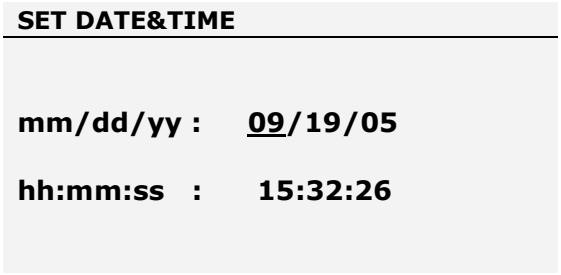


Figure 20 Date & Time Menu

Press UP and DOWN to change the value, press and hold to scroll values. Press LEFT and RIGHT key to move the cursor, press and hold to scroll move the cursor. Press ENTER key to accept the value and return to main menu page.

5. DIAGNOSTIC This is used to check status of the load cell. If you suspect that the load cell transducer has sustained an overload, it is possible to check the status of the load cell immediately.

Place the gauge horizontally on the flat level surface and go to main menu page

Use the UP and DOWN keys to move the cursor point to DIAGNOSTIC

Press the ENTER key, the display will show the DIAGNOSTIC menu

Press the ESC to return to the Main Menu page

.

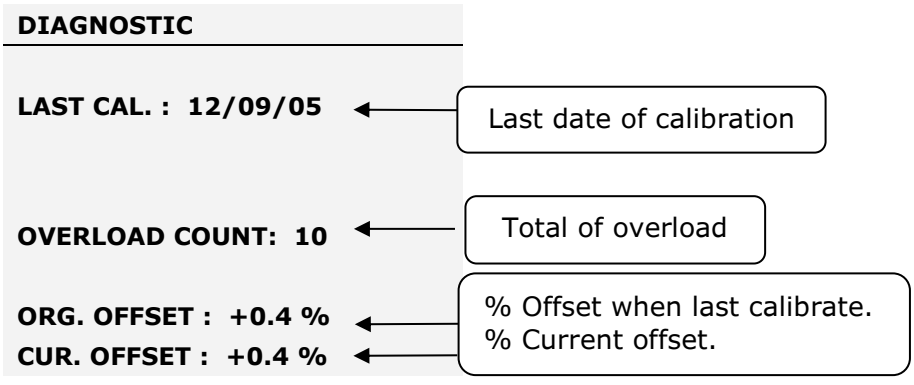


Figure 21 Diagnostic Menu

- If the % offset is between 5% - 10%, please contact your supplier to arrange a recalibration of your gauge.

- If the % offset is greater than 10%, please contact your supplier to arrange for load cell replacement.

These values are given as an indicator only. The need for calibration /repair may vary according to the individual characteristics of the load cell.

6. ABOUT This page shows information relevant to your gauge (Firmware revision, Model type, Gross maximum capacity, and Serial number)

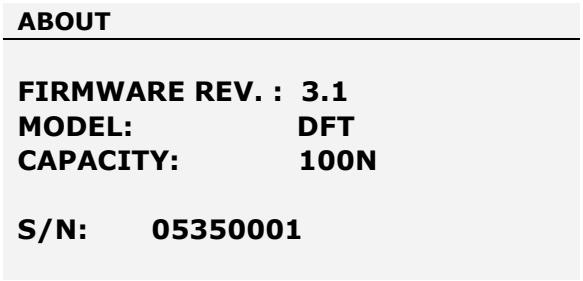


Figure 22 About Menu

Measurement Practice

For best measurement accuracy keep the compression/tension forces in line with the force gauge. Alleviate bending loads and torque loads applied to the load cell as these can adversely affect measurement performance.

Always keep the gauge below the capacity limit shown on the front of the gauge. If gauge is used above the stated capacity in either tension or compression, even for a short time, this can result in permanent load cell damage. Overload damaged is not covered by warranty.

When you tare the force gauge to zero, the amount tared is part of the total force applied. For example, if you tared 20 % of the capacity, you would have 80% maximum force left that you can apply.

For best performance and safety, use gauge with charged battery. Battery may degrade over time and result in reduce charged capacity. It is recommended that battery be replaced with genuine Nextech NiMH battery after few years in use or when re-calibration is performed. Battery NiMH type is safe and does not result in overheat when use with correct charger.

Calibration is performed from the factory and calibration certificate is provided in the plastic case. Gauge should be re-calibrated approximately every 6 months but not more than 2 years. For assistance in calibration, please contact Nextech or Nextech ’s distributors.

DFT Specifications

Capacity and Divisions

Capacity (N)	mN	N	kN	g-f	Kg-f	oz-f	lb-f
5	5000 x 1	5.000 x 0.001	-	509.8 x 0.1	0.5098 x 0.0001	17.980 x 0.005	1.1240 x 0.0002
10	10000 x 2	10.000 x 0.002	-	1019.6 x 0.2	1.0196 x 0.0002	35.96 x 0.01	2.2480 x 0.0005
20	20000 x 5	20.000 x 0.005	-	2039.0 x 0.5	2.0390 x 0.0005	71.92 x 0.02	4.496 x 0.001
50	-	50.00 x 0.01	-	5098 x 1	5.098 x 0.001	179.80 x 0.05	11.240 x 0.002
100	-	100.00 x 0.02	-	10196 x 2	10.196 x 0.002	359.6 x 0.1	22.480 x 0.005
200	-	200.00 x 0.05	-	20390 x 5	20.390 x 0.005	719.2 x 0.2	44.96 x 0.01
500	-	500.0 x 0.1	0.5000 x 0.0001	50985 x 5	50.98 x 0.01	1798.0 x 0.5	112.40 x 0.02
1000	-	1000.0 x 0.2	1.0000 x 0.0002	-	101.96 x 0.02	-	224.8 x 0.05

[x1, x2, x 0.1, x 05… is the step of resolution]

Accuracy

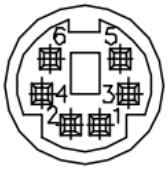
Accuracy:	± 0.1 % of rated capacity
Operating temperature:	60 ºF - 95 ºF (15 ºC - 35 ºC)
Temperature shift at zero load:	± 0.04% of full scale/ºC

Data Sampling

Display Refresh Rate:	10 Hz
ADC Sampling Rate:	2,000 Hz

Output

RS 223 or USB: 8 data bits, 1 Start bit, 1 Stop bit, no parity Baud rate: 38,400



PIN 2: Tx
PIN 3: Ground
PIN 6: Rx

Conversion Factor

Unit	mN	N	kN	g-f	kg-f	oz-f	lb-f
mN	1	0.001	1e-6	101.97e-3	101.97e-6	3.597e-3	224.81e-6
N	1000	1	0.001	101.97	101.97e-3	3.597	224.81e-3
kN	1e6	1000	1	101.97e3	101.97	3597	224.81
g-f	9.807	9.807e-3	9.807e-6	1	0.001	35.28e-3	2.205e-3
Kg-f	9807	9.807	9.807e-3	1000	1	35.28	2.205
oz-f	278.01	0.27801	278.01e-6	28.345	28.345e-3	1	0.0625
lb-f	4448.2	4.4482	4.4482e-3	453.5	0.4535	16	1

NEXTECH

For support & services, contact us at **info@nextechglobal.co.th**

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