Chatillon®
DFS Series Digital Force Gauge

Operator's Manual

View Saved Values

PASS **10·26** C-PK LBF
1 of 4 Saved

T [ ] C
View   Clear   More

Units   Zero

Home   Enter

i

DFS
AMETEK®

Chatillon)(
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Section Contents

IMPORTANT

The sensor used in your DF Series gauge is temperature sensitive. The gauge should be turned ON and allowed to acclimate to ambient temperature before normal use and before being calibrated.

A 7 minute "warm-up" period is recommended.

Getting Started

Introduction

The CHATILLON® DF Series digital force gauges are battery powered precision instruments used to measure axial tensile or compressive forces.

DF Series Force Gauges

The following models represent the DF Series force gauges:

❑ DFE Series (No Outputs)
❑ E-DFE Series (With Outputs)
❑ DFS Series (Integral Loadcell)
❑ DFS-R Series (Dedicated Remote Loadcell)
❑ DFS-R-ND Series (Interchangeable Sensor)
   - SLC Series (Loadcell Sensor)
   - STS Series (Torque Sensor)

Capacity x Resolution				
ozf	gf	lbf	kgf	N
DFS-250G	8 x 0.002	250 x 0.05	0.5 x 0.0001	0.25 x 0.0001	2.5 x 0.0005
DFS-002	32 x 0.005	1000 x 0.1	2 x 0.0002	1 x 0.0001	10 x 0.001
DFS-010	160 x 0.02	5000 x 0.5	10 x 0.001	5 x 0.0005	50 x 0.005
DFS-025	400 x 0.05	10,000 x 1	25 x 0.002	10 x 0.001	100 x 0.01
DFS-050	800 x 0.1	25,000 x 2	50 x 0.005	25 x 0.002	250 x 0.02
DFS-100	1600 x 0.2	50,000 x 5	100 x 0.01	50 x 0.005	500 x 0.05
DFS-200	-		200 x 0.02	100 x 0.01	1000 x 0.1
DFS-500	-		500 x 0.05	250 x 0.02	2500 x 0.2

Shown (left to right): DFS-R-ND with STS Torque Sensor, DFS Series, DFE Series, DFS-R with dedicated SLC loadcell.

Getting Started

Please read this operating manual thoroughly before attempting to operate your gauge.

The tables below identify the standard accessories that were supplied with your DF Series digital force gauge.

DF Series Standard Accessories by Model

DFE Series	
Carrying Case	SPK-DF-118
Flat Adapter[1]	SPK-FMG-011A
	SPK-FMG-011B
Hook[1]	SPK-FMG-012A
	SPK-FMG-012B
	SPK-FMG-012C
Charger[1]	SPK-DF-120US
	SPK-DF-230EU
	SPK-DF-230UK
Calibration Certificate	

E-DFE Series	
Carrying Case	SPK-DF-118
Flat Adapter[1]	SPK-FMG-011A
	SPK-FMG-011B
Hook[1]	SPK-FMG-012A
	SPK-FMG-012B
	SPK-FMG-012C
Chisel Point[1]	SPK-FMG-008A
	SPK-FMG-008B
Point[1]	SPK-FMG-009A
	SPK-FMG-009B
Notch Adapter[1]	SPK-FMG-010A
	SPK-FMG-010B
Extension Rod[1]	SPK-FMG-013A
	SPK-FMG-013B
Charger[1]	SPK-DF-120US
	SPK-DF-230EU
	SPK-DF-230UK
RS232 Cable	SPK-DF-RS232
Calibration Certificate	

DFS Series	
Carrying Case	SPK-DF-118
Flat Adapter[1]	SPK-FMG-011A
	SPK-FMG-011B
Hook[1]	SPK-FMG-012A
	SPK-FMG-012B
	SPK-FMG-012C
Chisel Point[1]	SPK-FMG-008A
	SPK-FMG-008B
Point[1]	SPK-FMG-009A
	SPK-FMG-009B
Notch Adapter[1]	SPK-FMG-010A
	SPK-FMG-010B
Extension Rod[1]	SPK-FMG-013A
	SPK-FMG-013B
Charger[1]	SPK-DF-120US
	SPK-DF-230EU
	SPK-DF-230UK
RS232 Cable	SPK-DF-RS232
Calibration Certificate	

DFS-R Series	
Carrying Case	SPK-DF-118
Flat Adapter[1]	SPK-FMG-011A
	SPK-FMG-011B
Hook[1]	SPK-FMG-012A
	SPK-FMG-012B
	SPK-FMG-012C
Charger[1]	SPK-DF-120US
	SPK-DF-230EU
	SPK-DF-230UK
RS232 Cable	SPK-DF-RS232
Calibration Certificate	

DFS-R-ND Series	
Carrying Case	SPK-DF-118
Charger[1]	SPK-DF-120US
	SPK-DF-230EU
	SPK-DF-230UK
RS232 Cable	SPK-DF-RS232
Calibration Certificate	

SLC Series	
Carrying Case	SPK-DF-118
Flat Adapter[1]	SPK-FMG-011A
	SPK-FMG-011B
Hook[1]	SPK-FMG-012A
	SPK-FMG-012B
	SPK-FMG-012C
Male Adapter	NC000296
Calibration Certificate	

STS Series	
Carrying Case	SPK-DF-118
Hex Blade	SPK-DTG-040
Hex Drive 1/4	SPK-DTG-037[3]
Hex Drive 3/8	SPK-DTG-038[3]
Hex Drive 1/2	SPK-DTG-039
Calibration Certificate	

NOTE:

[1] The Charger/Adapter is determined by the gauge type ordered.

[2] Accessories are capacity dependent. Accessories used with capacities below 110 lbf (500N) will generally have a #10-32 thread. Accessories for higher capacities generally have a 5/16-18 thread.

[3] Accessories are capacity dependent. Accessories used with low torque capacity (3-50 in-lb) will receive 1/4 and 3/8 Hex Drive. Larger capacities receive 3/8 and 1/2 Drives.

1.800.561.8187   www.itm.com   information@itm.com

Test Stand Adapters

The following tables show the proper adapters required when mounting your DF Series force gauge to a CHATILLON force tester.

Low Capacity
110 lbf (500N) and below

DF Series	
MT150	SPK-MT-0001
MT500	SPK-MT-0001
LTCM-100	Direct Connect
TCM201	SPK-FM200-019
TCD200	SPK-FM200-019
TCD500	SPK-DF-TCD5K
TT Tester	NC002582

High Capacity
Above 110 lbf (500N)

DF Series	
MT150	SPK-MT-0004
MT500	SPK-MT-0004
LTCM-100	Direct Connect
TCM201	SPK-FM200-018
TCD200	SPK-FM200-018
TCD500	SPK-DF-TCD5K
TT Tester	NC002582

Powering Gauge On/Off

The DF Series gauge has a dedicated power key. Depress the key to turn the gauge On or Off.

When the gauge is turned on, the Chatillon Splash Screen is displayed for approximately 5 seconds. This display shows the gauge model and capacity, firmware revision level, revision date and website address for downloads.

| Model	DFE-100
Rev. No.	1.00
Rev Date	dd/mm/yyyy

Chatillon

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Turn Gauge On/Off
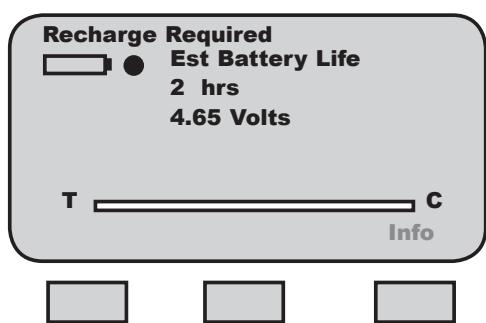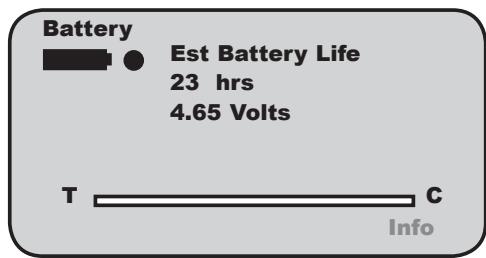
Connect Stereo Connector to top of gauge.

Charging Your Gauge

The DF Series contains a Nickle Metal Hydride (NiMh) Battery Pack that can provide up to 30 hours of continuous use on a single charge.

A Battery icon appears on the main operating display and operates like a bar graph. When the gauge has a full charge, the Battery icon appears full. As battery power diminishes, the Battery icon will "open".

You may view battery life remaining, by depressing the "i" key. The gauge will display the estimated battery life based on current usage in hours.

The DF Series gauge will alert you when the battery requires charging. The gauge will display "Recharge Required" and the battery icon will show as "opened".

It is best to completely drain your battery before re-

charging. To recharge, plug the stereo jack connector into the top housing. Plug the charger/adapter into your source power. Charge for 15-20 hrs to achieve maximum performance. A thermistor is used to prevent excessive heat from damaging the battery pack.

The DF Series has a universal 120/230V power supply. There are three available chargers distinguished by their plug types:

- ❑ SPK-DF-120US (USA Plug)
- ❑ SPK-DF-230EU (EU Plug)
- ❑ SPK-DF-230UK (UK Plug)

> ### CAUTION
> Do not attempt to charge your DF Series gauge with any charger other than the one supplied with your gauge.

Discharge Characteristics

NiMH batteries characteristically have a fast initial discharge rate. They then show a very constant and slow discharge rate. They rate is again, very rapid as the battery is exhausted.
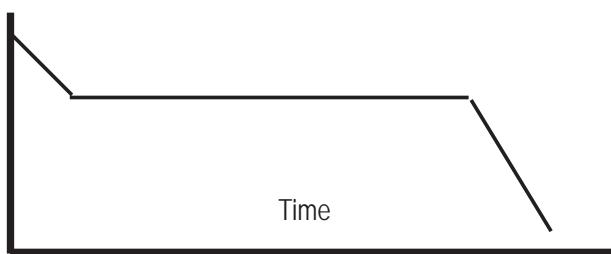
> ### HELP
> New NiMh batteries need to be charged 3-5 times before they will hold a full charge. This doesn't mean charged 3-5 times in a row, but rather, charged 3-5 cycles under normal use.

Time

Keypad Operation

The DF Series gauge has nine (9) keys and a navigation pod.

Function Keys

There are three (3) function keys located immediately below the gauge display. These keys are mapped to the display prompt above it. Key functions change based on the gauge's current status or operating mode. If no prompt appears above the key, the key is inactive.
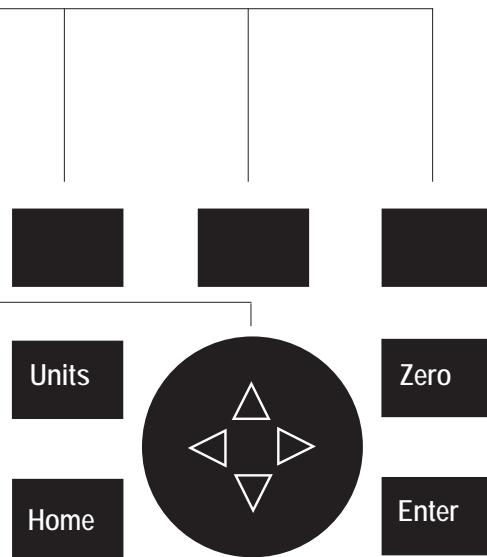
Navigation Pod

The navigation pod is primarily used during setup. This circular pod contains four (4) directional arrows that correspond to certain gauge functions. The UP and RIGHT arrows are used to increment numbers or to navigate in an upward direction or to the right. The DOWN and LEFT arrows are used to decrement numbers or to navigate in a downward direction or to the left.
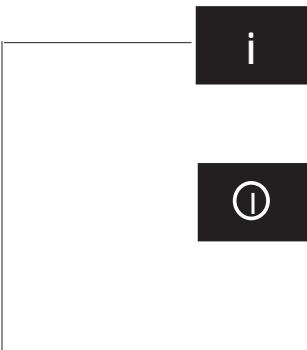
UNITS Key

A dedicated UNITS key is used to change the units of measure.

ZERO Key

A dedicated ZERO key is used to zero a measured result or to tare the weight of attachments and fixtures prior to measuring a load.

HOME Key

A dedicated HOME key is used to return you to the main operating display.

ENTER Key

A dedicated ENTER key is used to enable a selection or to accept a result.

Power Key

A dedicated POWER key is used to turn gauge power ON or OFF.

INFO Key

The INFO key provides you with "information" about your DF Series force gauge. It is also used to review SAVED information that is stored in the gauge memory.

Depress the "i" key to access the following information:
- ❑ Gauge Capacity x Resolution
- ❑ Firmware Revision and Revision Date
- ❑ Overload History
- ❑ Battery Life
- ❑ Saved Results

Getting Started

Display Layout

The DF Series digital force gauge features a 128 x 64 graphical display. The display matrix is 8 lines by 21 characters.

Status Line
Upper Message Line
Main Display Line 1
Main Display Line 2
Main Display Line 3
Lower Message Line
T [_____] C
F1   F2   F3

Display Grid Layout

Battery Status
Auto Shutdown ON
Measured Result
Mode
Units

21.12 C-PK LBF
T [_____] C
Mode   Display   More
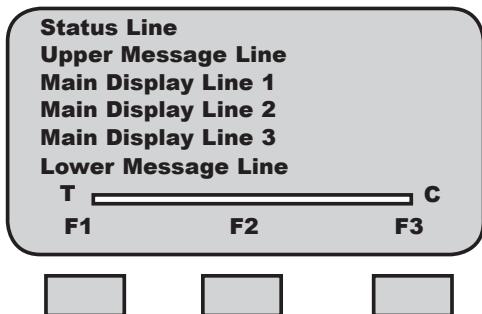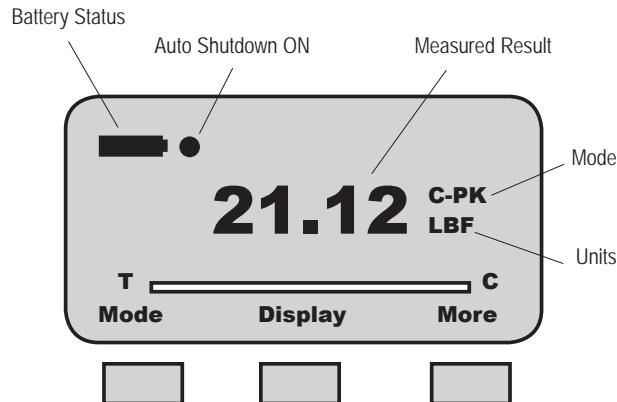
Typical Operating Display

Display Options

The DF Series gauge features the following display options designed to enhance operation and performance.

❑   Display Up or Down
❑   Display Contrast
❑   Hide Result

Display Up Down

This function operates in normal operating mode only. It allows you to display information rightside up or upside down using the navigation pod.

Display Contrast

This function operates in either normal operating mode or setup mode. It allows you to adjust the display contrast lighter or darker depending on your lighting conditions.

Hide Result

This function operates in normal operating mode only. It allows you to "hide" your results during a test. The "hide" function is useful for blind study applications. Selecting the right or left arrow on the navigation pod toggles the displayed result on/off.

To access and change display options, select the HOME key to place the gauge in normal operation. Select the F2 DISPLAY key.

21.12 C-PK LBF
T [_____] C
Mode   Display   More

Display Up or Down

Display Contrast

Hide Result
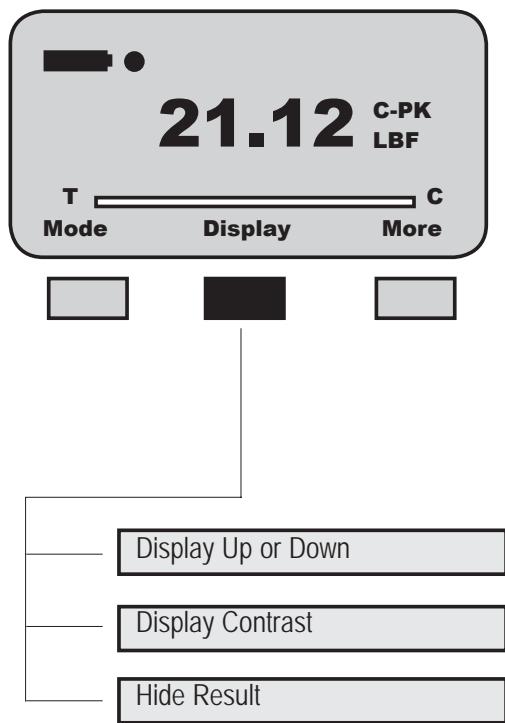
Display Options Menu

Changing Display Options

From HOME display, select F2 DISPLAY key. This places the gauge in DISPLAY SETUP MODE.

Display Up or Down Option

The Display Up or Down option allows you to change the orientation of the display.

HELP
The Display Up or Down option only functions when the gauge is in the normal operating mode. It does not operate in the setup modes.

From HOME display, select F2 DISPLAY key. The status line will read "Display Up Down". If the status line displays "ON", the "Display Up Down" option is enabled.

To change the orientation, depress the F1 key (On or OFF).

If the "Display Up Down" option is ON, displayed information is presented upside down. The function keys map to the function tags.

If the "Display Up Down" option is OFF, the feature is disabled. The gauge displays information rightside up.

Display Up/Down option is OFF.
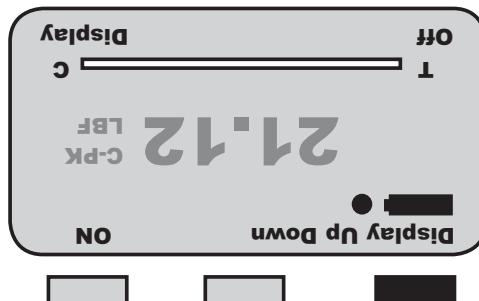
Display Up/Down option is ON.

Display Contrast Option

The Display Contrast option allows you to change the contrast of displayed information. This may be useful in low or high light ambient environments.

The DISPLAY CONTRAST is the second option in the display setup mode.

From the DISPLAY UP DOWN screen, depress the F3 DISPLAY key until "Display Contrast" appears on the status line.

Depress the F1 HIGH key or F2 LOW key to change the display contrast.

Selecting HIGH darkens the displayed information.

Selecting LOW lightens the displayed information.

Display Up Down　　　　　　**OFF**

21.12 C-PK LBF

T   C
On　　　　　　　　**Display**

Display Contrast

21.12 C-PK LBF

T   C
High　　　　**Low**　　　　**Display**
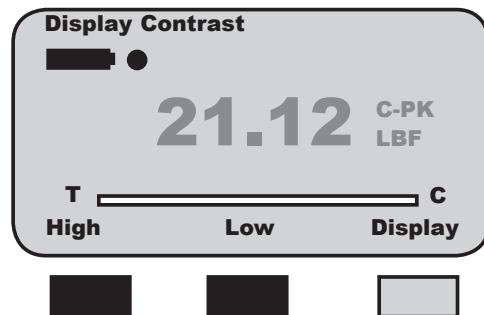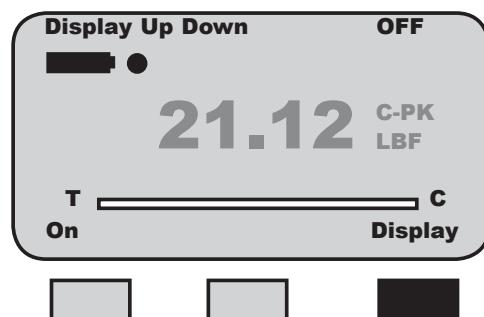
Display HIDE Option

The Display HIDE option allows you to hide your measured result during testing. This feature is useful when performing blind studies.

From the DISPLAY CONTRAST screen, depress the F3 DISPLAY key until "Hide Result" appears on the status line.

Depress the F1 (NO or Yes) key to enable the Hide Result option.

Selecting YES allows you to use the navigation pod to hide your measured result.

Use the LEFT arrow to "Hide" your force value.

Use the RIGHT arrow to "Unhide" your force value.

Selecting NO disables the Hide Result option.

Change Mode

21.12 C-PK LBF

T ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯ C
Mode   Display   More

Normal Mode

Tension Peak (T-PK)

Compression Peak (C-PK)

0.00 C-PK LBF

T ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯ C
Mode   Display   More

Units   △   Zero

◁   ▷

Home   ▽   Enter
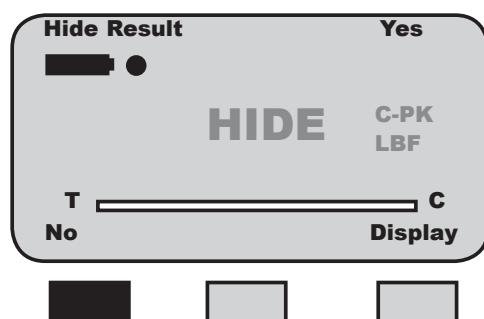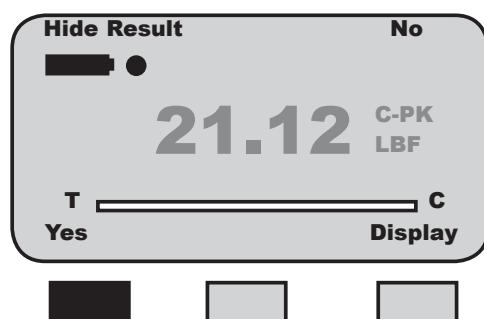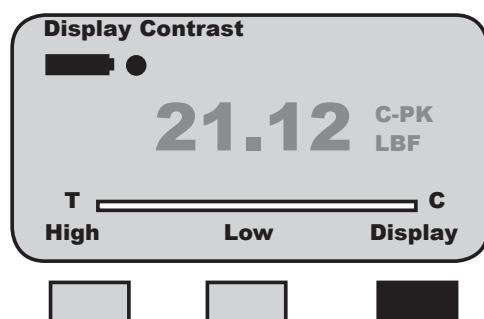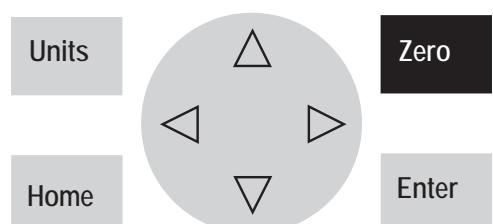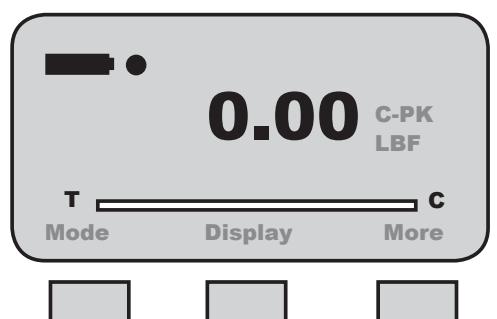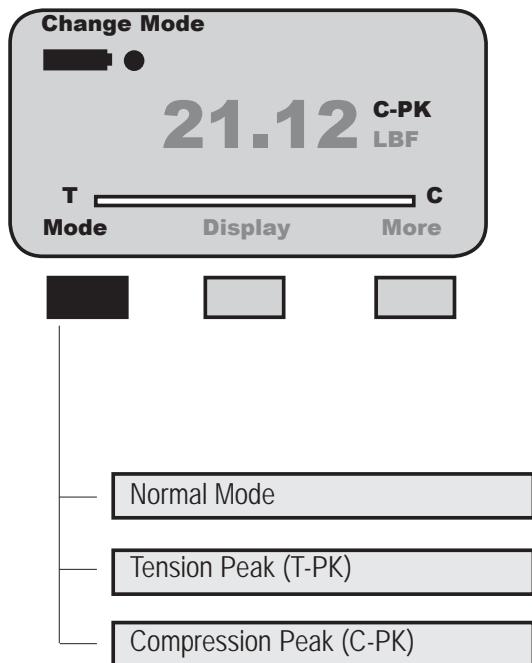
i

Changing Mode

You may change the DF Series gauge operating mode by selecting the F1 (Mode) key. From the HOME display, select F1 (Mode) for the following operating modes:

Normal Mode

When the gauge is in normal mode (NORM), the display will indicate the tensile or compressive load that is applied to the loadcell. No peak readings are displayed by the gauge when in Normal mode. Readings are filter at 625Hz (5000Hz/8 = 625Hz).

Peak Tension Mode

When the gauge is in Peak Tension mode (T-PK), the gauge will display the maximum tensile load that was measured by the loadcell sensor. No filtering (5000Hz).

Peak Compression Mode

When the gauge is in Peak Compression mode (C-PK), the gauge will display the maximum compressive load that was measured by the loadcell sensor. No filtering (5000Hz).

Changing Modes

The DF Series force gauge allows you to save results to memory for the purposes of calculating statistics. Therefore, you cannot change mode if you have results saved in memory.

YOU MUST CLEAR RESULTS FROM MEMORY BEFORE YOU ARE ALLOWED TO CHANGE MODE.

Zero and Taring Gauge

The DF Series gauge has a dedicated ZERO key for zeroing the measured result or for taring out the weight of accessories, grips or fixtures attached to your gauge. Your gauge is capable of taring up to 10% of its specified capacity.

To zero a result or tare, depress the ZERO key.

To zero or CLEAR stored values in memory, please see Stored Values section.

Change Units

21.12 C-PK
LBF

T ———————————— C
Mode   Display   More
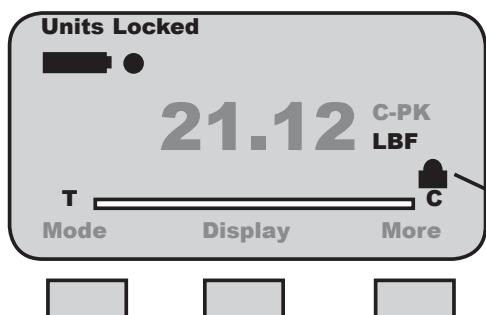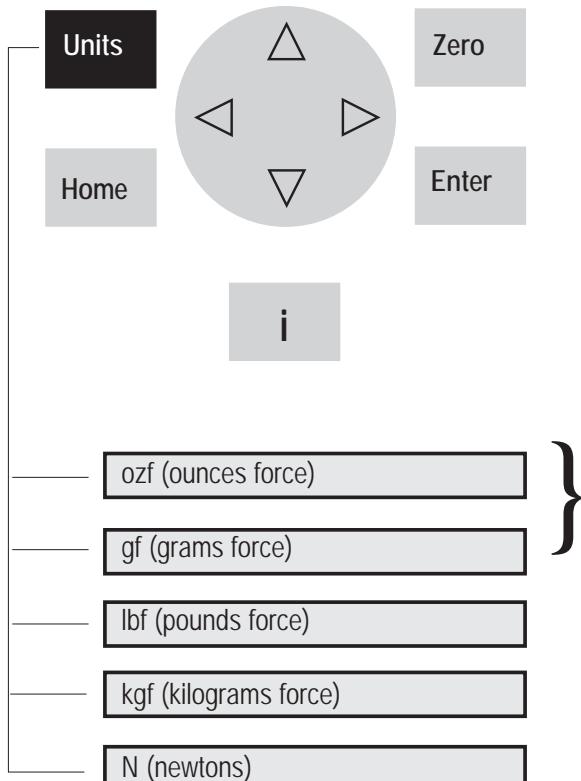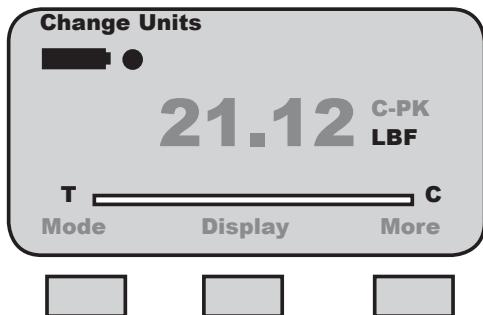
Changing Units

The DF Series gauge has a dedicated UNITS key for changing units of measure.

DF Series gauges with a capacity of 110 lbf (500N) and below can display results in the following units: ozf, gf, lbf, kgf and N.

DF Series with capacities greater than 110 lbf (500N) can display results in lbf, kgf and N.

DFS-R-ND gauges with the STS Series torque sensor can display torque in the following units: N-cm, cm-kg, oz-in, lb-in, N-m.

Units   △   Zero

◁   ▷

Home   ▽   Enter

i

ozf (ounces force)

gf (grams force)

lbf (pounds force)

kgf (kilograms force)

N (newtons)

The ozf and gf units are available on DF Series gauges with capacities of 100 lbf and below. These units are not available on 200 lbf or higher capacities.

UNITS LOCK

You may "lock" the units of measured on your DF Series gauges. This disables the UNITS key. This is found in gauges with firmware revision 2.04 and higher.

To enable the UNITS LOCK feature, from HOME, select the F3 (More) key to get to the SETUP function. From Home, depress the F3 key four times.

Select Units Lock. Select ENTER. Use the F1 key to turn the feature ON/OFF.

Units Locked

21.12 C-PK
LBF

T ———————————— C
Mode   Display   More

A "Lock Icon" appears beneath the units of measure when the Units Lock feature is ON. A message prompt also alerts the operator.

Getting Started

Load Bar Graph

The DF Series gauge features a dynamic bar graph that shows the force or torque being applied to the gauge.

The purpose of the bar graph is to provide a visual indicator to the user when they are approaching the sensor's capacity.

The bar graph has a "T" for tension and a "C" for compression to indicate direction of force. The bar graph fills from the centerline. If the DFS-R-ND uses the STS torque sensor, the bar graph will change to show "CW" for clockwise and "CCW" for counter-clockwise.

Sensor Overload Protection

CAUTION
The Bar Graph is intended to provide you with visual indication of when you are reaching the ultimate load.
Use caution when applying loads/torque.

The DF Series gauge features mechanical overload protection up to 150% of the sensor's capacity.

Mechanical overload protection is provided in the tension and compression direction for sensors with a capacity of 110 lbf (500N) and below.

Mechanical overload protection is provided in compression only for capacities higher than 110 lbf (500N).

Sensor Overload Display

When the DF Series gauge senses that the force applied is approximately 116% of the sensor capacity, the bar graph will fill and the lower message line will display "OVERLOAD".

If OVERLOAD is displayed, you may have damaged the sensor.
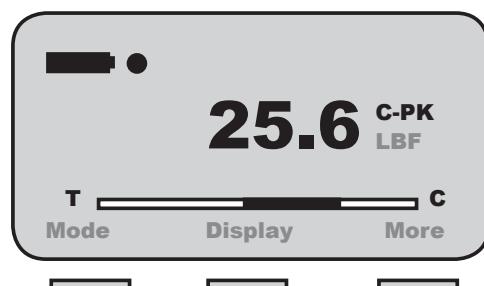
Typical Compressive Load Display
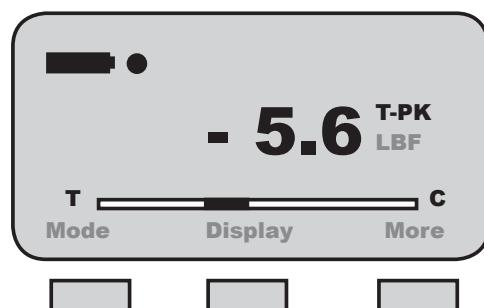
Typical Tension Load Display
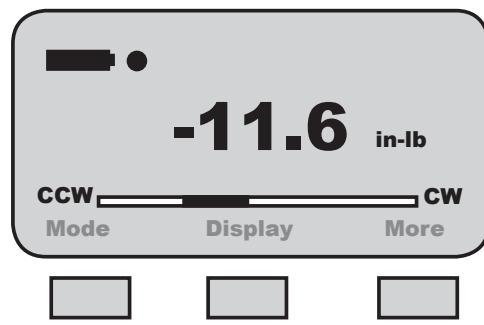
Typical Torque Display
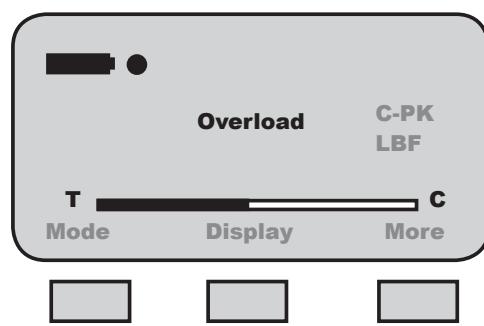
Overload Display

Section Contents

PRECAUTION

NEVER switch sensors with the power ON.

The DFS-R-ND gauge does NOT support "hot swapping" of sensors.

When changing sensors, turn the DFS-R-ND gauge OFF. Connect the new sensor. Turn the power ON.

The gauge cannot identify the sensor accept on Power Up.

Using Remote Sensors

The DFS-R-ND Series digital force gauge can be used with two different types of sensors:

❏ SLC Loadcell Sensors
❏ STS Torque Sensors

SLC Loadcell Sensors

The SLC Series loadcell sensors have been designed to work exclusively with the DFS-R-ND Series force gauges. These sensors are NOT compatible with previous Chatillon digital gauges that used interchangeable sensors. The SLC Sensor is inserted into the 15-pin connector located on the side of the DFS-R-ND gauge. The gauge will automatically recognize the sensor type and its associated capacity and resolutions.

The SLC Series sensor is available in capacities from 250gf to 1000 lbf. Multiple sensors can be used to mount to a single DFS-R-ND gauge. This can provide the user with cost savings and convenience. The disadvantage is the DFS-R-ND with remote sensors has an accuracy of better than 0.25% full scale (compared to a dedicated sensor with accuracy of better than 0.1% full scale).

The flexible cable used with the SLC sensors are ideal for applications where access to the sample under test is limited. The cable, when fully extended, reaches approximately 9 feet (3 meters).

STS Torque Sensors

The STS Series torque sensors have been designed to work exclusively with the DFS-R-ND Series force gauges. These sensors are NOT compatible with previous Chatillon digital gauges that used interchangeable sensors. The STS Sensor is inserted into the 15-pin connector located on the side of the DFS-R-ND gauge. The gauge will automatically recognize the sensor type and its associated capacity and resolutions.

The STS Series sensor is available in capacities from 3 in-lbs to 200 in-lbs. Different capacity sensors may be plugged into the DFS-R-ND depending on the application requirements. The gauge's automatic recognition eliminates the need to configure the capacities and resolution.

The STS Series sensors come with different hex fittings for attaching to the test sample. The STS sensor is turned and the gauge will indicate torque and torque direction. The cable, when fully extended, reaches approximately 9 feet (3 meters).

Specifying the Correct Sensor

The single, most-common problem when measuring load or torque is caused by the use of a sensor that is not appropriate for the application.

The sensor selected should be specified so that the expected measured results occurs within the 20% to 90% capacity for the sensor. This is particularly important when using "full scale accuracy" devices. Operating at too near either end of the sensor's capacity can lead to inaccurate measurements, and worse, a damaged sensor.

The table below indicates the recommended sensor capacities for different test applications.

Sensor Selection Guide

Expected Load	Recommended Capacity	Model
50 - 225 gf	250 gf	SLC-250G
500 gf - 1.8 lbf	2 lbf	SLC-0002
2 - 9 lbf	10 lbf	SLC-0010
10 - 22.5 lbf	25 lbf	SLC-0025
10 - 45 lbf	50 lbf	SLC-0050
20 - 90 lbf	100 lbf	SLC-0100
40 - 180 lbf	200 lbf	SLC-0200
100 - 450 lbf	500 lbf	SLC-0500
200 - 900 lbf	1000 lbf	SLC-1000
10 - 45 in-oz	3 in-lb	STS-0003
2 - 10.8 in-lb	12 in-lb	STS-0012
10 - 45 in-lb	50 in-lb	STS-0050
20 - 90 in-lb	100 in-lb	STS-0100
40 - 180 in-lb	200 in-lb	STS-0200

Understanding Full Scale Capacity

The SLC and STS Series sensors have accuracies based on "full scale". The accuracy of these sensors is based on the full scale capacity of the sensor.

If the sensor capacity is 100 lbf, and the accuracy is ±0.25% of full scale, there will be more measurement error effect at the lower end of the capacity. In some instances, if too high a capacity sensor is used, and the measurement is too near the zero (under 10%), the measured results may indeed be inaccurate, e.g. using a 100 lbf loadcell to measure a 10 lbf load.

Accuracy Error Effects

Load	Min	Max	% Error
0	0	0.25	100%
2	1.75	2.25	25%
5	4.75	5.25	10%
10	9.75	10.25	5%
25	24.75	25.25	2%
50	49.75	50.25	1%
100	99.75	100.25	0.5%

Example: Assumes a 100 lbf (500N) load sensor with an accuracy of ±0.25% full scale.
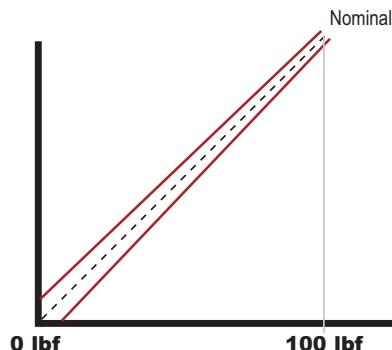
Example: The diagram shows the accuracy limits of a 100 lbf sensor with an accuracy specification of better than 0.25% full scale. The further the measured result from capacity, the more error is introduced. The effects of using an improper loadcell capacity on too low a measurement will increase the error in measured result.

Using Remote Sensors

Powering Your Gauge
The DFS-R-ND requires a sensor for it to perform as a force or torque gauge. The DFS-R-ND without a sensor attached will indicate that a sensor must be fitted.

If an SLC or STS sensor is not connected to the gauge, the gauge will display "DFS-R-ND" at powerup.

```
Model        DFS-R-ND
Rev. No.         1.00
Rev Date   01/01/2005
         Chatillon

T  _____  C
```
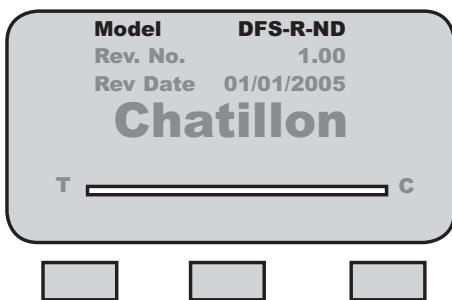
If an SLC or STS sensor is not connected to the gauge, the gauge will display "DFS-R-ND" at powerup.

Connecting a Sensor
The SLC or STS Sensor must be connected to the DFS-R-ND gauge with the power OFF. The gauge does not permit "hot swapping" of sensors, connecting new sensor with the power ON. The DFS-R-ND must go through the power ON routine with the sensor attached so that it can obtain the sensor characteristics. The sensor characteristics, e.g. sensivity, calibration data, etc. is stored on a printed circuit board in the connector for the sensor.

Power Up with SLC Sensor
When you connect a calibrated SLC Sensor to the DFS-R-ND, the gauge will display the SLC model number, representing the capacity on the power up display. The gauge will perform as a force gauge.

```
Model        SLC-0100
Rev. No.         1.00
Rev Date   01/01/2005
         Chatillon

T  _____  C
```
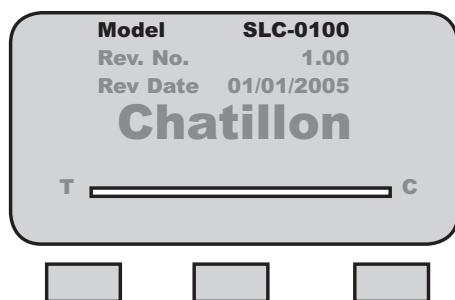
Power Up with STS Sensor
When you connect a calibrated STS Sensor to the DFS-R-ND, the gauge will display the STS model number, representing the capacity on the power up display. The gauge will perform as a torque gauge.

```
Model        STS-0050
Rev. No.         1.00
Rev Date   01/01/2005
         Chatillon

T  _____  C
```
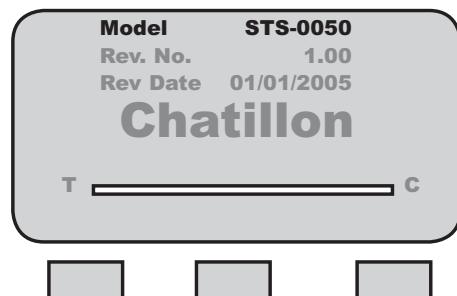
Improper Sensor Connection
If you disconnect the sensor from the gauge with power still ON, the gauge will display "No Sensor".

```
    No Sensor       Norm
                     LBF

T  _____████____  C
```
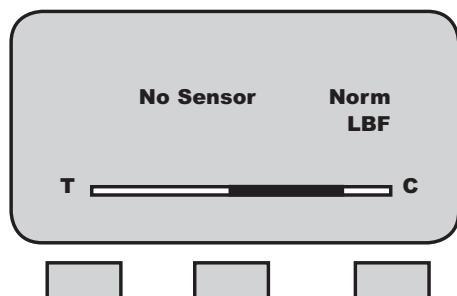
If you connect a new sensor to the DFS-R-ND with power still ON, the gauge will display the last sensor that was recognized at power up. It will not recognize the new sensor, since the sensor's characteristics are transmited to the gauge firmware at powerup. If the last sensor that was attached to the gauge before powering down was an SLC-0100, and you connect an SLC-0025 with power still ON, the gauge will perform incorrectly and act as if the SLC-0100 is connected.

About SLC Sensors

The SLC Series sensor may be used for tensile or compression testing. The "S" type sensors have one end dedicated for tension and the other end dedicated for compression. It is important, when using this type of sensor, to ensure that the proper end of the sensor is being used.

HELP

Make sure that you use the "tensile end" of the "S"-shaped SLC sensor for tension tests or the "compression end" for compression tests.

If the improper end is used, your gauge will display load when you move the cable because the weight of the cable will be recognized by the DFS-R-ND.

Inserting the SLC Sensor

The SLC Sensor mates to the DFS-R-ND using a 15-pin connector. The connector on the SLC is equipped with a PCB that helps the DFS-R-ND recognized the sensor characteristics.

With the DFS-R-ND turned OFF, insert the SLC connector making sure to properly "seat" the individual pins. Once the sensor is connected, secure the sensor by tightening the mounting screws. Do NOT over-tighten. Finger-tight torque is sufficient.

Turn the DFS-R-ND ON. The gauge will display the sensor capacity and resolutions for all available units of measure.

If no sensor is connected, if an incompatible sensor is applied, of it the sensor is damaged, the DFS-R-ND gauge will display "No Sensor".

Sensor Fitted

T   C

No Sensor

T   C
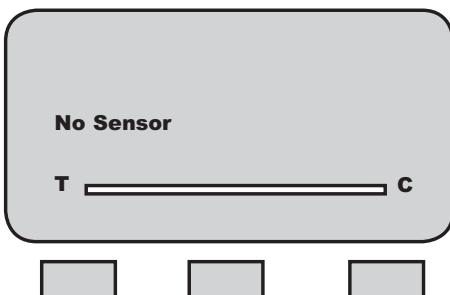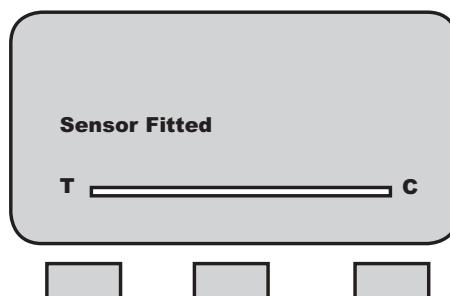
Carefully mate the connector on the SLC or STS sensor to the connector on the side of the DFS-R-ND gauge.

Model   SLC-0100
Rev. No.   1.00
Rev Date   dd/mm/yyyy

Chatillon

T   C
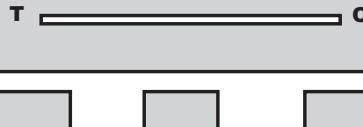
Using Remote Sensors

Handling the SLC Sensor

The SLC Sensor is a precision instrument. HANDLE WITH CARE and follow these precautions:

Precautions

❑ **Do not connect the sensor when the power to the DFS-R-ND is ON.** Make sure that power to the DFS-R-ND is OFF before connecting your sensor.

❑ **Do not disconnect the sensor by pulling on the cable.** Grasp the connector and pull the sensor from the DFS-R-ND gauge.

❑ **Do not carry the sensor using the cable.** This may damage the internal wiring of the sensor.

❑ **Make sure to use the proper end of the "S" type sensors.** One end is dedicated to "tension". One end is dedicated to "compression".

❑ **Use the proper capacity for your testing.** Ideally, make sure that the expected measured load falls within the 20% to 80% range of the sensor capacity.

❑ **Never connect an incompatible sensor.** Use only SLC Series or STS Series sensors.

❑ **Store your sensor properly.** When not in use, store your SLC sensor in its origi
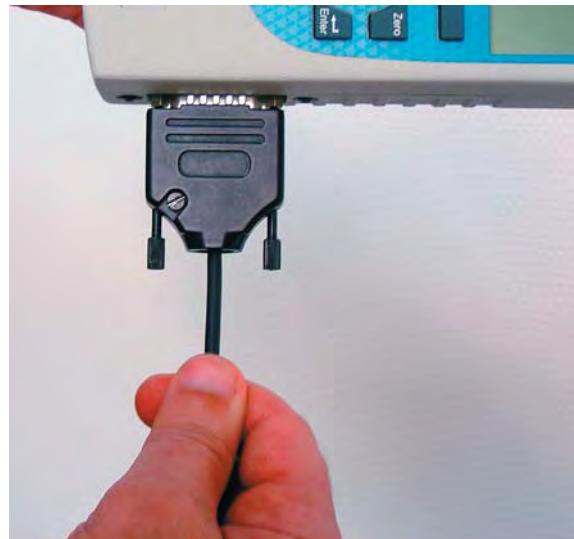
Do NOT disconnect the sensor by pulling on the cable. This may damage connections. Disconnect by grasping the connector and pulling from the connector housing.
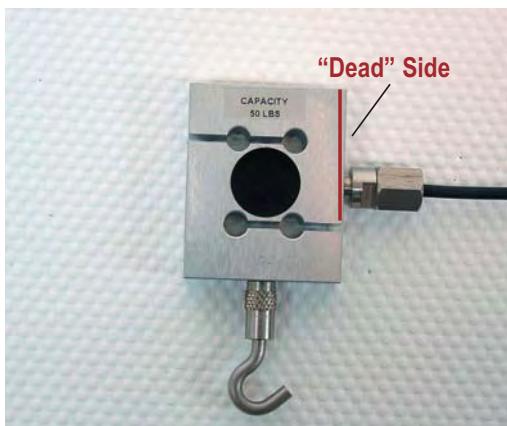
"Dead" Side

For a tensile test, fix the tensile adapter at the end opposite the "Dead Side". Connect the "Dead Side" to the tester.
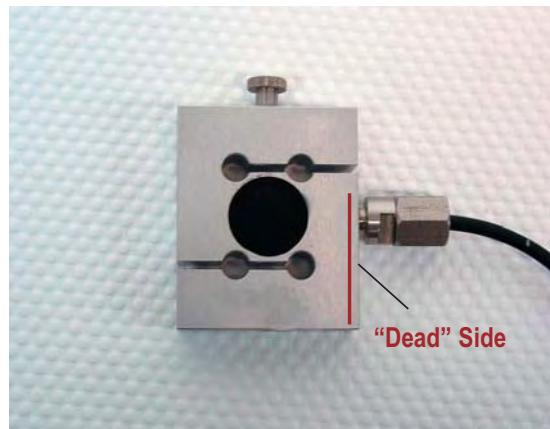
"Dead" Side

For a compression test, fix the compression adapter at the end opposite the "Dead Side". Connect the "Dead Side" to the tester.

Mounting SLC Sensor to Tester

The SLC Series loadcell sensor may be used with Chatillon force testers. A mounting adapter is required to secure the sensor to the following testers:

Tester	Adapter Part No.
MT150	SPK-MT-0001 & NC000300
MT500	SPK-MT-0004 & NC000300[1]
LTCM-100	NC000300
TCM201	NC000300
TCD200	NC000300
TCD500	NC000300[1]
TT Tester	NC002582 & NC000300[1]

Note: NC000300 <u>CANNOT</u> be used on tests requiring a capacity greater than 225 lbf (1 kN).

SLC Sensor Capacities

SLC Model	ozf	gf	lbf	kgf	N
SLC-250G	8 x 0.002	250 x 0.05	0.5 x 0.0001	0.25 x 0.0001	2.5 x 0.0005
SLC-0002	32 x 0.005	1000 x 0.1	2 x 0.0002	1 x 0.0001	10 x 0.001
SLC-0010	160 x 0.02	5000 x 0.5	10 x 0.001	5 x 0.0005	50 x 0.005
SLC-0025	400 x 0.05	10,000 x 1	25 x 0.002	10 x 0.001	100 x 0.01
SLC-0050	800 x 0.1	25,000 x 2	50 x 0.005	25 x 0.002	250 x 0.02
SLC-0100	1600 x 0.2	50,000 x 5	100 x 0.01	50 x 0.005	500 x 0.05
SLC-0200	-	-	200 x 0.02	100 x 0.01	1000 x 0.1
SLC-0500	-	-	500 x 0.05	250 x 0.02	2500 x 0.2
SLC-1000	-	-	1000 x 0.1	500 x 0.05	5000 x 0.5
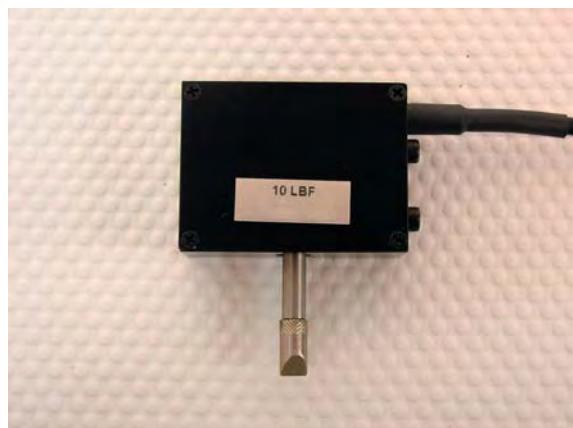
SLC Sensors with capacities of 10 lbf (5N) and less, have a "block-style" design. Higher capacity loadcell sensors have an "S-type" design.

Using Remote Sensors

STS Sensor Capacities

STS Model	oz-in	N-cm	lb-in	kg-cm	N-m
STS-0003	50 x 0.005	35 x 0.005	3 x 0.0005	3.5 x 0.0005	0.35 x 0.0001
STS-0012	192 x 0.02	125 x 0.02	12 x 0.002	12.5 x 0.002	1.25 x 0.0002
STS-0050	800 x 0.1	500 x 0.05	50 x 0.005	50 x 0.005	5 x 0.0005
STS-0100	-	1000 x 0.1	100 x 0.01	100 x 0.01	10 x 0.001
STS-0200	-	2000 x 0.2	200 x 0.02	200 x 0.02	20 x 0.002

Section Contents

Operating Your Gauge

The DF Series gauge may be used as a handheld instrument or mounted to a Chatillon tester for compression and tensile testing.

CAUTION

The gauge is designed for axial loading only.

Do not apply side loads to the load shaft. Take precautions to ensure load is applied axially.

Handheld Operation

When using the DF Series gauge for handheld testing, make sure to apply the load axially to the load shaft.

Keep the gauge perpendicular to the item being measured to ensure axial loading. Use the optional handle assembly (SPK-DF-HANDLE) for high capacity loads.

Test Stand Operation

When using the DF Series gauge with a Chatillon tester, make sure that the gauge is secured to the tester with the proper adapter if required. Adapters may be required to ensure that the gauge shaft is located axially to the sample under test. If the gauge is not secured properly, you may get faulty reading or cause damage to the loadcell.

Low Capacity *110 lbf (500N) and below*		*High Capacity* *Above 110 lbf (500N)*	
DF Series		**DF Series**	
MT150	SPK-MT-0001	MT150	SPK-MT-0004
MT500	SPK-MT-0001	MT500	SPK-MT-0004
LTCM-100	Direct Connect	LTCM-100	Direct Connect
TCM201	SPK-FM200-019	TCM201	SPK-FM200-018
TCD200	SPK-FM200-019	TCD200	SPK-FM200-018
TCD500	SPK-DF-TCD5K	TCD500	SPK-DF-TCD5K
TT Tester	NC002582	TT Tester	NC002582

Af xing Adapters & Fixtures

Adapters and test fixtures should be mated to the load shaft on the instrument. Do not use tools to secure your adapters or fixtures. Finger pressure tightness is sufficient.

CAUTION

Do not use tools to secure adapters or fixtures.

Secure adapters and fixtures with "finger-tight" pressure. Over-tightening may damage the loadcell.

Saving Results

The DF Series can save up to 10 results in the gauge memory. If your gauge is equipped with RS232, you may use our Nexygen DF software (p/n NC002867) to save infinite results and perform automation, data acquistion and detailed measurement analysis.

To save a result, apply load to the loadcell shaft. Your gauge will display the load reading.

```
 ▬● 
            0.0 C-PK
                LBF
   T _____ C
   Mode    Display    More
   [■]      [ ]        [ ]
```
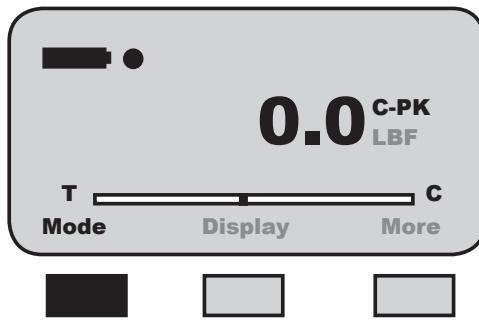
To save, select the F3 (More) key. This will take you to the View display. Select F2 (Save).

```
 ▬● 
            23.5 C-PK
                 LBF
   T _____ C
   Mode    Display    More
   [ ]      [ ]        [■]
```

```
 ▬● 
            23.5 C-PK
                 LBF
   T _____ C
   Xmit-W   Save     More
   [ ]      [■]        [ ]
```
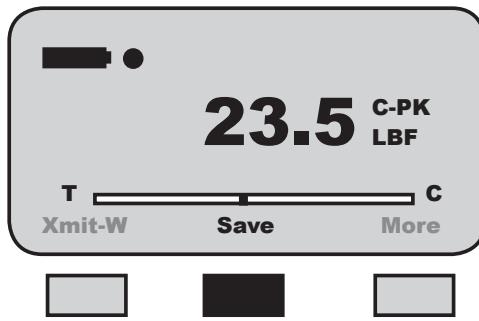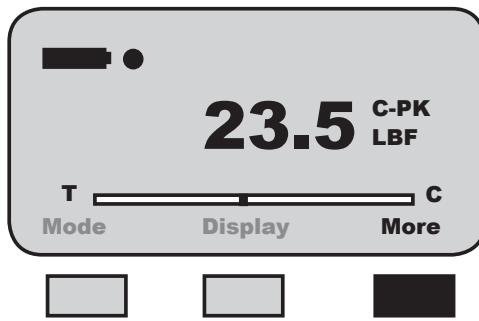
If you do not want to save a result, select the Zero key. This will zero the gauge and clear the result.

Changing Modes
The DF Series force gauge allows you to save results to memory for the purposes of calculating statistics. Therefore, you cannot change mode if you have results saved in memory.

YOU MUST CLEAR RESULTS FROM MEMORY BEFORE YOU ARE ALLOWED TO CHANGE MODE.

```
MODE 🔒 CLR SAVED DATA
 ▬● 
            0.0 C-PK
                LBF
   T _____ C
   Mode    Display    More
   [■]      [ ]        [ ]
```
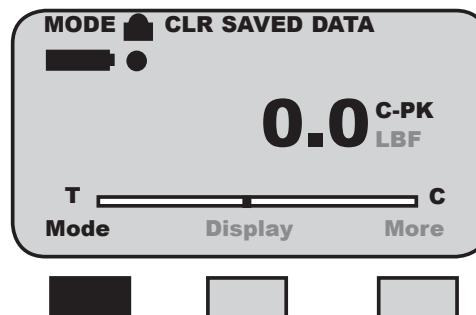
Clear Saved Data

To change MODE, you must clear all Saved Data from the gauge's memory. This is to ensure that the gauge will correctly calculate statistics, since results from different modes will cause erroneous statistics.

In DF Series gauges with firmware revision 2.04 or higher, the following message prompts the user to clear saved data:

"MODE [locked] CLR SAVED DATA"

Viewing Results

The DF Series displays results in the following formats:

- ❑ Active Measured Result
- ❑ Saved Measured Result(s)
- ❑ Pass - Fail Result
- ❑ Load Limt Result
- ❑ Load Average Result
- ❑ Break Detect Result

Viewing Active Result

The DF Series gauge will display the result in Normal, Tension Peak (T-PK) or Compression Peak (C-PK) modes.

The DF Series gauge will display the measured result, mode, units of measure, active options and battery life.

Displaying Normal Mode Result

When the DF Series gauge is in Normal mode, the gauge will indicate the measured result, units, active options and battery life. Select the F1 (Mode) key to set the gauge in Normal mode.

When in Normal mode, the gauge will display the load that is currently being applied to the load sensor. a compressive load is indicated as a "positive" result. A tensile load is indicated as a "negative" (-) result. The load bar graph will also indicate the load and direction of load that is applied to the sensor relative to the sensor's capacity. The loadcell bar graph is intended to assist you in preventing overloads. If the bar graph is nearly filled, you should stop applying a load to the sensor. See Load Bar Graph.
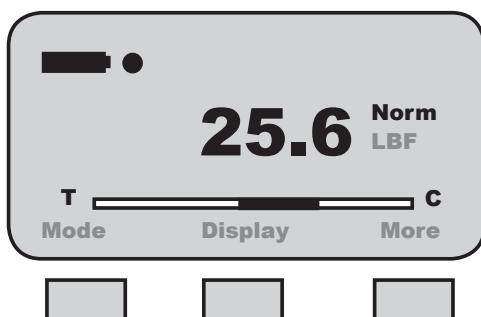
Displaying Peak Mode Result

If you want your DF Series gauge to display the peak result, you should change the gauge to either Tension Peak (T-PK) or Compression Peak (C-PK) depending on the direction you are testing.
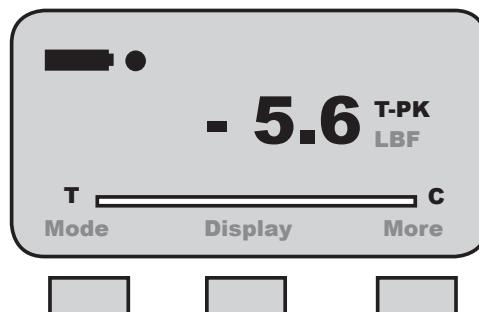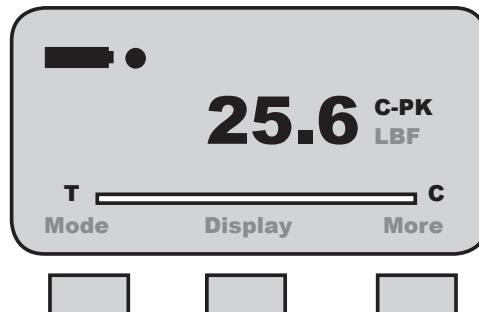
HELP
If you forget to place the gauge in Peak mode, and you ran your test in Normal mode, before you conduct another test, select F1 (Mode).

The gauge will retain the highest value obtained while in Normal mode and provide you with indication of the Peak result.

Viewing Saved Result

The DF Series gauge will save up to 10 measured results in its internal memory provided you elect to "SAVE" a result.

To view a "Saved Result", from the Home display, select F3 (More) to access the View display. Select the "INFO" key (i).

Saved results are displayed with their reference number (1 of 10, 2 of 10, etc.). The measured value, units and mode are displayed. Use the navigation pod UP and DOWN arrow to view the remaining saved results from memory.

1 of 10 Saved

- 5.6 T-PK LBF

T   C

Xmit-O   Save   More
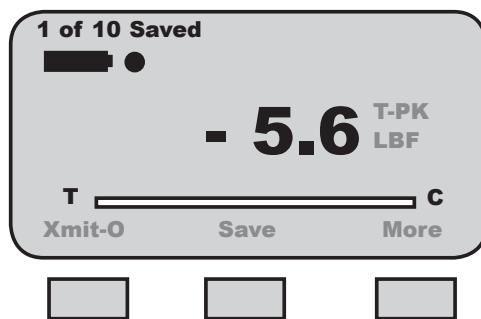
Viewing PASS-FAIL Results

Pass-Fail results are viewed from the View display. To access the View display from the Home display, select the F3 (More) key.

12.34 C-PK LBF

T   C

Mode   Display   More
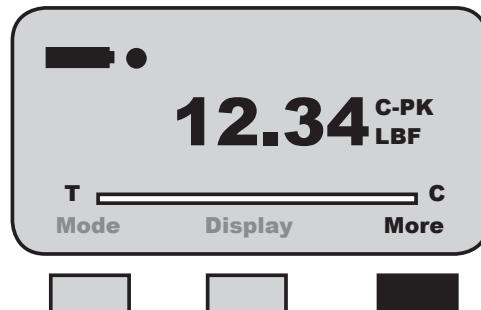
Saved results are displayed with their reference number (1 of 10, 2 of 10, etc.) and indication of "Pass" or "Fail" based on your specifications. The measured value, units and mode are displayed with a "Pass" or "Fail" tag. Use the navigation pod UP and DOWN arrow to view the remaining saved results from memory.

When "PASS-FAIL" is enabled (ON), the gauge will display a "PASS" or "FAIL" two ways:

    1. If the gauge MODE is either T-PK or C-PK;

    2. If measured results are SAVED into memory.

High   20.0

PASS   12.34 C-PK LBF

Low   10.0

T   C

Nom   Back
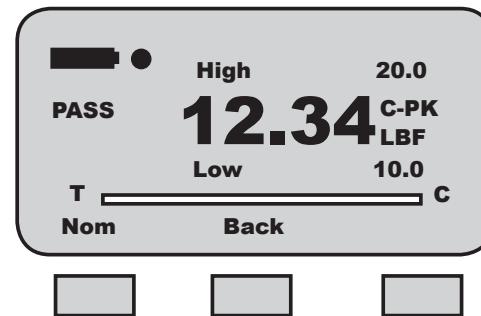
Operating Your Gauge

Viewing Pass-Fail for Peak Results

If "PASS-FAIL" is enabled (ON), the gauge will indicate a "PASS" or "FAIL" result when a peak result is displayed. The gauge will also display either the High and Low Limits or the Nominal Value and Bandwidth %. The gauge will NOT display a "PASS" or "FAIL" for normal mode results.

Viewing Pass-Fail Results from Memory

If "PASS-FAIL" is enabled (ON), the results saved in memory are tagged with either a "PASS" or a "FAIL" based on the "PASS-FAIL" setup.

```
  ▬ ●       High          20.0
PASS   12.34 C-PK
                           LBF
               Low         10.0
  T  [_____]    C
     Nom        Back
```
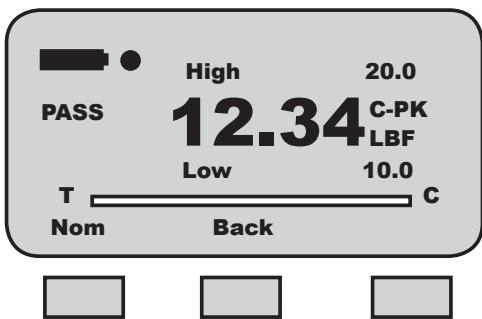
```
HELP
Before you can view "PASS-FAIL" results in memory,
you must first have enabled the "PASS-FAIL" feature
and SAVE results to memory.
```

To view "PASS-FAIL" results, start from the HOME display. Select F3 (MORE) and then the INFO key.

```
2 of 10 Saved
  ▬ ●       High          20.0
PASS   12.34 C-PK
                           LBF
               Low         10.0
  T  [_____]    C
  Xmit-W      Clear        More
```

VIEW results by using the navigation pod UP and DOWN key to scroll through the results saved in memory. If "PASS-FAIL" is enabled, each result will be tagged with a "PASS" or "FAIL".

```
HELP
You can apply PASS-FAIL to your results in memory
after they have been saved in memory.
It is not necessary to invoke PASS-FAIL
before saving results.
```

You may XMIT or CLEAR the displayed result by selecting either the XMIT (F1) key or the CLEAR (F2) key. Select the MORE (F3) key to calculate statistics.

Transmit Results

The DF Series can transmit data using its RS232, Mitutoyo or Analog output. The gauge will transmit data to whatever device is connected to the gauge through the output port.

Data transmit is used to send information to another device, e.g. personal computer or to print information to a serial or Mitutoyo printer.

To transmit information, the gauge must be in the View display.

You have two options when transmitting:

❑　Transmit Displayed Result
❑　Transmit ALL Results from Memory
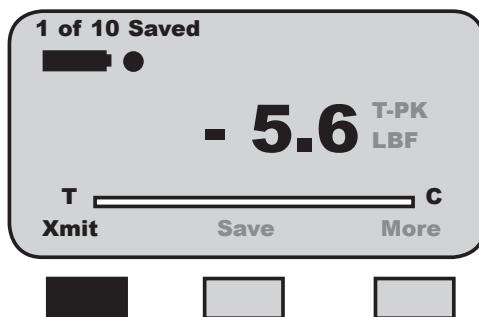
Transmit Displayed Result

You can transmit results from the View display. From Home, select F3 (More). This will access the View display.

Select F1 (Xmit) to specify what you want to transmit. You may transmit either the displayed result or all results saved in instrument memory.

Select F1 (Xmit-W or Xmit-O) to transmit the currently displayed result. If "Xmit-W" is displayed, the gauge has been setup to transmit WITH UNITS. If "Xmit-O" is displayed, the gauge has been setup to transmit the result WITHOUT UNITS. You specify the output type in the Communication Setup procedure.

Select F2 (XmitAll) to transmit all currently saved results from the instrument memory. The gauge will transmit all results With or Without Units as defined by the F1 key. If the F1 key says "Xmit-W", all results will be transmitted WITH UNITS. If the F1 key says "Xmit-O", all results will be transmitted WITHOUT UNITS.
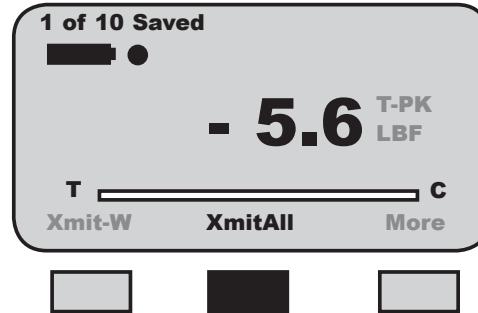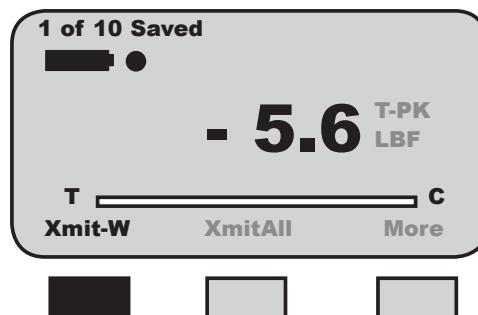
Operating Your Gauge

Transmit Format

The DF Series gauge will transmit and print results in
the following formats:

Transmit WITH UNITS (Xmit-W)   *Transmit WITHOUT UNITS (Xmit-O)*

Mode Result	Value Units
Norm 1	3.8 lb
Norm 2	3.8 lb
Norm 3	3.7 lb
Norm 4	4.3 lb
Norm 5	4.1 lb
Norm 6	3.8 lb
Norm 7	4.0 lb
Norm 8	3.5 lb
Norm 9	3.9 lb
Norm 10	4.5 lb
Mean	4.0
S-DEV	0.3
COV	7.13
Variance	0.1
% Diff	
1 v 2	0.00
2 v 3	-2.68
3 v 4	14.83
4 v 5	-4.20
5 v 6	-7.21
6 v 7	4.05
7 v 8	-12.66
8 v 9	12.64
9 v 10	13.86

Mode Result	Value
Norm 1	3.8
Norm 2	3.8
Norm 3	3.7
Norm 4	4.3
Norm 5	4.1
Norm 6	3.8
Norm 7	4.0
Norm 8	3.5
Norm 9	3.9
Norm 10	4.5
Mean	4.0
S-DEV	0.3
COV	7.13
Variance	0.1
% Diff	
1 v 2	0.00
2 v 3	-2.68
3 v 4	14.83
4 v 5	-4.20
5 v 6	-7.21
6 v 7	4.05
7 v 8	-12.66
8 v 9	12.64
9 v 10	13.86

Transmit WITH UNITS (Xmit-W)

```
1 of 10 Saved
■■■ ●
            - 5.6   T-PK
                    LBF
T [_____] C
Xmit-O    Save      More
```

Gauge will transmit result WITHOUT units.

The gauge can transmit information with or without units.

If the F1 label indicates "Xmit-O", the gauge will transmit data with<u>O</u>ut units.

Transmit WITHOUT UNITS (Xmit-O)

```
1 of 10 Saved
■■■ ●
            - 5.6   T-PK
                    LBF
T [_____] C
Xmit-W    Save      More
```

Gauge will transmit result WITH units.
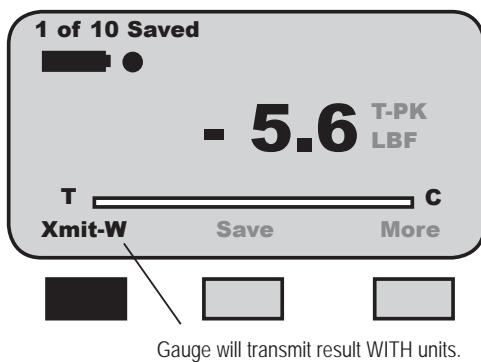
If the F1 label indicates "Xmit-W", the gauge will transmit data <u>W</u>ith units.

You can select how you want data to be transmitted at the COMMUNICATION SETUP MENU.

Transmit Using RS232

The DF Series gauge will communicate to a serial device using its RS232 output. Connect to the device using the RS-232 cable (p/n SPK-DF-RS232).

DF Series Gauge

(p/n SPK-DF-RS232)

Serial Connector - 9-Pin Male
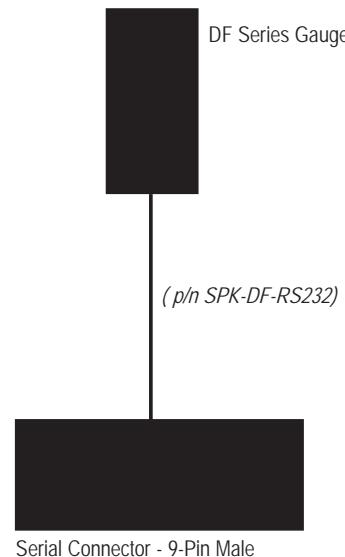
Transmit Using Mitutoyo

The DF Series gauge will communicate to a Mitutoyo device when configured with the Mitutoyo output. Connect to the device using the Mitutoyo cable (p/n NC000654).

DF Series Gauge

(p/n NC000654)

Mitutoyo Connector - 10 Pin Male
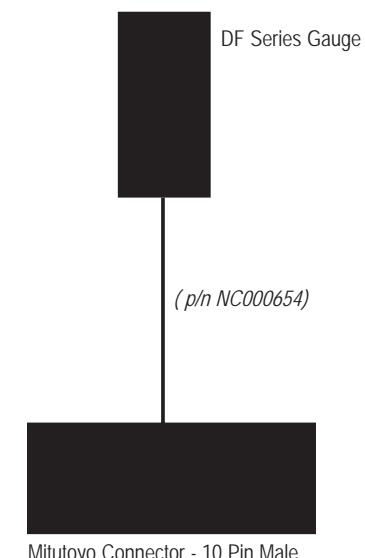
Operating Your Gauge

Analog Output

The DF Series gauge supplies a ±2Vdc (±0.015Vdc) analog output. The output is a linear signal with a 200Hz frequency. The analog output may be used to drive annunciators, recorders or other external devices.

CLEAR Result from Memory

The DF Series can store up to 10 results in instrument memory. These results may be used for later viewing or for calculating statistics.

You may clear a result using the View display.

To access the View display from the Home display, press the F3 (More) key once. This will access the View display.


```
1 of 10 Saved
                              - 5.6  T-PK
                                     LBF
  T                                  C
  Xmit-O      Save          More
```
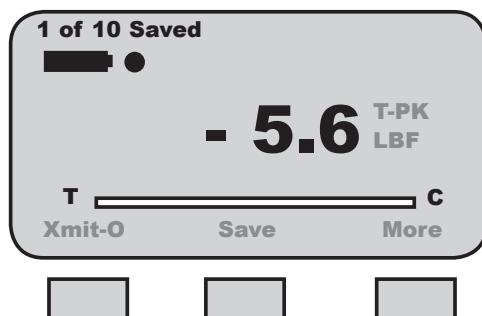
To access the CLEAR option, select the INFO key (i key). This will change the F2 (Save) key to F2 (Clear). Select F2 (Clear) to clear the displayed result. Use the UP and DOWN key to access the remaining stored results for clearing.


```
1 of 10 Saved
                              - 5.6  T-PK
                                     LBF
  T                                  C
  Xmit-O     Clear          More

                i
```

Section Contents

Using Pass-Fail Limits

The DF Series force gauge allows you to setup PASS-FAIL LIMITS based on either a Range of values or on a Nominal Value.

Pass-Fail Limit - Range

You may setup your DF Series gauge to display a PASS or FAIL message based on whether or not the measured results falls within an upper and lower setpoint range. The gauge will display PASS or FAIL depending on how the measured result compares to the setpoint range.

Example: The DF Series will display PASS if the measured result is 11.2 lbf and the upper setpoint was 12.0 lbf and the lower setpoint was 10.0 lbf.

Conversely, if the measured result was 9.8 lbf, the gauge would display FAIL.

High Setpoint

Result = Pass

Low Setpoint
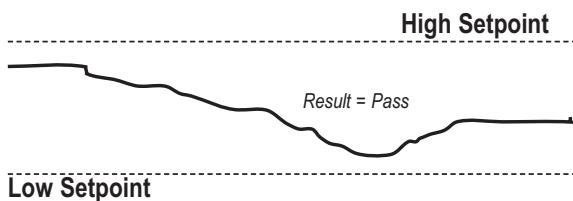
If the measured result is equal to or within the Range Limits, the result = PASS.

High Setpoint

Result = Fail

Low Setpoint
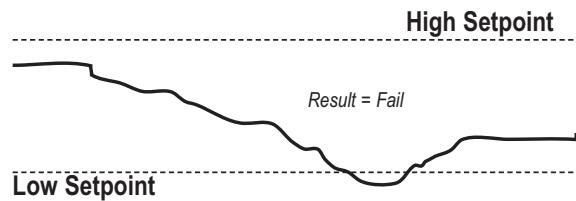
If the measured result is outside the Range Limits, the result = FAIL.

1 of 10 Saved
PASS High **11.2** 12.0 C-PK LBF Low 10.0
T ___ C
Xmit-W   Clear   More

2 of 10 Saved
FAIL High **9.8** 12.0 C-PK LBF Low 10.0
T ___ C
Xmit-W   Clear   More
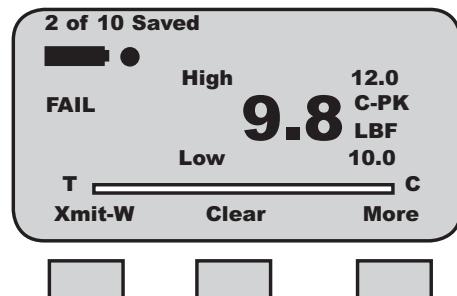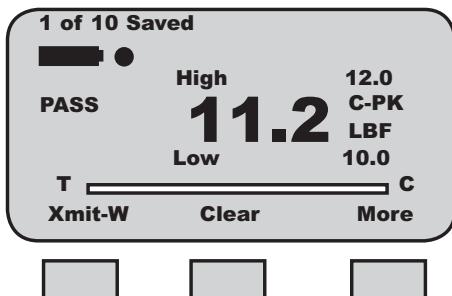
Using Pass-Fail Limits
The DFS Series allows you to setup PASS-FAIL LIMITS based on either a Range of values or on a Nominal Value.

Pass-Fail Limit - Nominal Value
You may setup your DFS Series gauge to display a PASS or FAIL message based on whether or not the measured results falls within an upper and lower setpoint range calculated using a Nominal Value and % Bandwidth. The gauge will display PASS or FAIL depending on how the measured result compares to the setpoint range.

Example: The DFS Series will display PASS if the measured result is 9.8 lbf and the Nominal Value was 10.0 lbf and the Bandwidth is 10%.

Conversely, if the measured result was 8.9 lbf, the gauge would display FAIL.

High Setpoint

Result = Pass

Nominal Value

Low Setpoint

High Setpoint

Result = Fail

Nominal Value

Low Setpoint
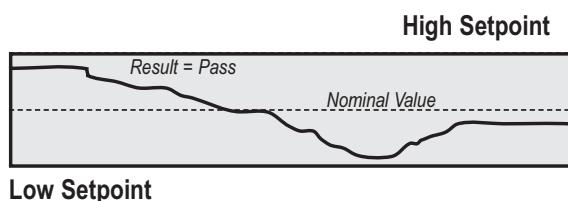
If the measured result is equal to or within the range calculated by the nominal value and user-specified bandwidth %, the result = PASS.
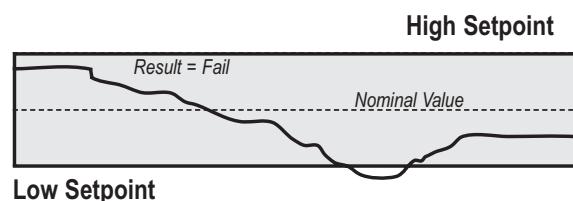
If the measured result is outside the range calculated by the nominal value and user-specified bandwidth %, the result = FAIL.

3 of 10 Saved

| PASS | High | **9.8** | 11.0 C-PK LBF |
| | Low | | 9.0 |

T — C

Xmit-W   Clear   More

4 of 10 Saved

| FAIL | High | **8.9** | 11.0 C-PK LBF |
| | Low | | 9.0 |

T — C

Xmit-W   Clear   More
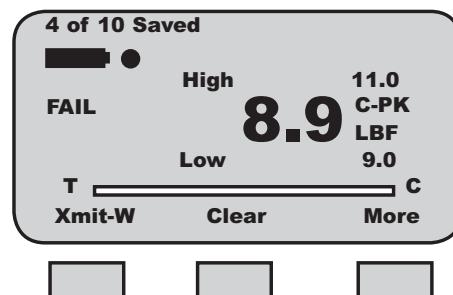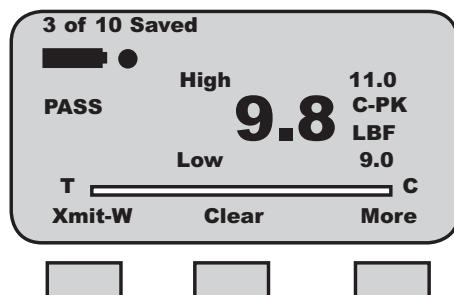
Using Pass-Fail Limits

Activating Pass-Fail Limits

You have the option of enabling or disabling Pass-Fail Limits. The factory default is Pass-Fail Limits OFF.

To enable Pass-Fail Limits, from the Home display, select F3 (More) twice. This will take you to the Main Setup Menu display.

```
Setup - Pass/Fail Limits
▬▬▬● Auto Shutdown
         Pass - Fail        <
         Load Limits
         Communications
Enter to select
 T ▭▭▭▭▭▭▭▭ C
 Back                   Service
```
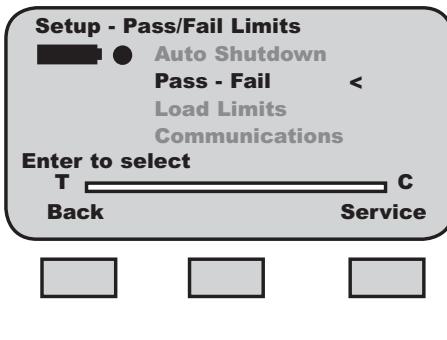
Use the navigation UP or DOWN key to position the cursor arrow next to the PASS - FAIL option. Select enter.

The Pass-Fail activation display allows you to "turn ON" or "turn OFF" the Pass-Fail feature. Select F1 to turn ON or OFF. Select enter.

```
Setup - Pass/Fail Limits
▬▬▬●
         Pass-Fail        ON
         RANGE
         NOMINAL VALUE
Enter to select
 T ▭▭▭▭▭▭▭▭ C
 Off           Back
```

```
Setup
▬▬▬●
         Pass - Fail OFF

Enter to select
 T ▭▭▭▭▭▭▭▭ C
 On           Back
```
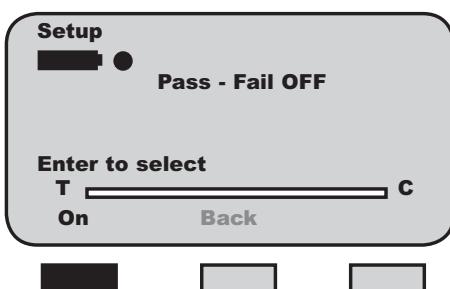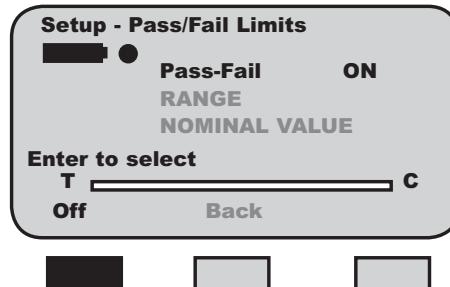
Select Pass - Fail Method

There are two Pass-Fail Methods available to choose from:

❑ Range
❑ Nominal Value

Use the navigation pod UP and DOWN key to position the cursor arrow next to the method you want to base your Pass-Fail result on. Select ENTER.

```
Setup - Pass/Fail Limits
▬▬▬●
            Pass - Fail ON
      >  RANGE
            NOMINAL VALUE
Enter to select
 T ▭▭▭▭▭▭▭▭ C
 Off           Back
```
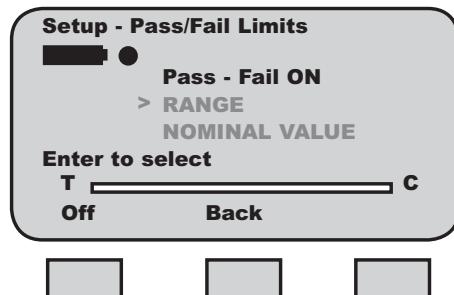
Select RANGE Method

Use the navigation pod UP and DOWN key to position the cursor arrow next to the RANGE method. Select ENTER.

```
Setup - Pass/Fail Limits
▬▬▬●
            Pass - Fail ON
      >  RANGE
            NOMINAL VALUE
Enter to select
 T ▭▭▭▭▭▭▭▭ C
 Off           Back
```

Selecting Increments

Increments are associated with the numeric values displayed by the gauge during setup. You select the increment you want to use to adjust your setup values. Increments are provided in values corresponding to the gauge capacity and units of measure. Increment values available are:

- ❑ 0.001
- ❑ 0.01
- ❑ 0.1
- ❑ 1.0
- ❑ 10.0
- ❑ 100.0

Selecting an increment of 10.0 will adjust the setup numeric value by "tens". Selecting the increment 0.1 will adjust the setup numeric value by "tenths".

You select increments using the RIGHT and LEFT arrow keys on the navigation pod. Selecting the RIGHT arrow increases the increment value. Selecting the LEFT arrow decreases the increment value.

```
Setup - Pass/Fail Range
      ● Increment       1.0

      High          100.0  LBF
   > Low             80.0  LBF
Enter to select
 T ═══════════════════ C
   Low          Back
```

Selecting HIGH Range Limit

Use the F1 key to select the HIGH RANGE Pass-Fail Limit. The cursor arrow will automatically be placed next to the HIGH Limit tag indicating that you are about to adjust this value.

```
Setup - Pass/Fail Range
      ● Increment       1.0

   > High          100.0  LBF
      Low           80.0  LBF
Enter to select
 T ═══════════════════ C
   Low          Back
```
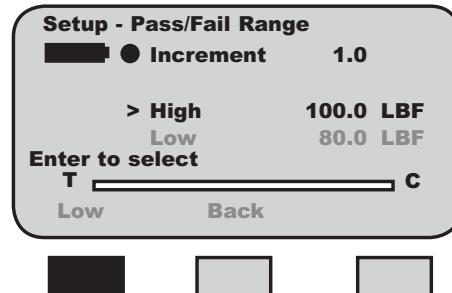
Use the UP and DOWN navigation key to increase or decrease the High Pass-Fail Limit VALUE. The value will increase by the increment selected upon each key press.

Do NOT select enter until you have adjusted both the High and Low Pass-Fail Limits to your desired setpoints.
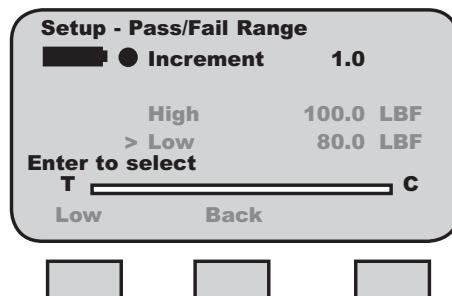
Using Pass-Fail Limits

Selecting LOW Range Limit

Use the F1 key to select the LOW RANGE Pass-Fail Limit. The cursor arrow will automatically be placed next to the LOW Limit tag indicating that you are about to adjust this value.

```
Setup - Pass/Fail Range
████▶ ●  Increment        1.0

          High        100.0  LBF
        > Low          80.0  LBF
Enter to select
   T ▭▭▭▭▭▭▭▭▭▭▭▭ C
     High          Back
```
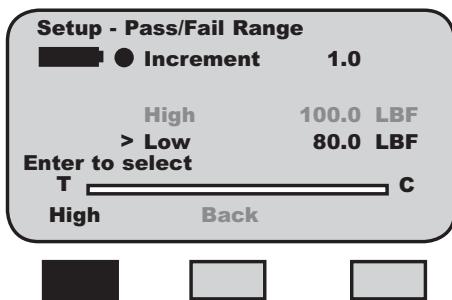
Use the UP and DOWN navigation key to increase or decrease the Low Pass-Fail Limit VALUE. The value will increase by the increment selected upon each key press.

Select enter when you have adjusted both the High and Low Pass-Fail Limits to your desired setpoints.

Select NOMINAL VALUE Method

Use the navigation pod UP and DOWN key to position the cursor arrow next to the NOMINAL VALUE method. Select ENTER.

```
Setup - Pass/Fail Limits
████▶ ●
           Pass - Fail ON
           RANGE
         > NOMINAL VALUE
Enter to select
   T ▭▭▭▭▭▭▭▭▭▭▭▭ C
     Off           Back
```
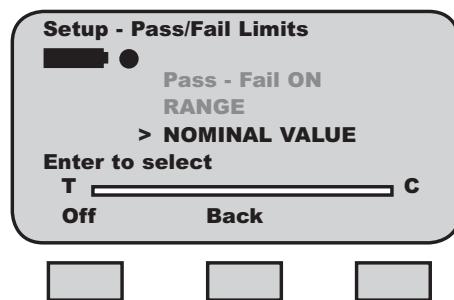
The Nominal Value method uses a specified setpoint value and bandwidth to calculate the High and Low setpoints. The DF gauge will automatically calculate and display the High and Low Limits. You only need to specify the Nominal Value and the % Bandwidth.

Selecting Increments

Increments are associated with the numeric values displayed by the gauge during setup. You select the increment you want to use to adjust your setup values. Increments are provided in values corresponding to the gauge capacity and units of measure. Increment values available are:

- ❑   0.001
- ❑   0.01
- ❑   0.1
- ❑   1.0
- ❑   10.0
- ❑   100.0

Selecting an increment of 10.0 will adjust the setup numeric value by "tens". Selecting the increment 0.1 will adjust the setup numeric value by "tenths".

You select increments using the RIGHT and LEFT arrow keys on the navigation pod. Selecting the RIGHT arrow increases the increment value. Selecting the LEFT arrow decreases the increment value.

```
Setup - Pass/Fail Nom
███▬ ●  Increment        1.0
           High        67.5  LBF
           >Nom        45.0  LBF
            Band        50.0  %
           Low         22.5  LBF
  T  ▭━━━━━━━━━━━━━━━━▭ C
  Band            Back
```

Select NOMINAL VALUE

Use the F1 key to specify the Nominal Value or the Bandwidth. When Pass-Fail is ON, the gauge will start at the Nominal Value position.

Use the UP and DOWN navigation key to increase or decrease the Nominal Value. The value will increase by the increment selected upon each key press. Note that the gauge will automatically calculate the High and Low Limits based on the Nominal Value entered and the Bandwidth value.

```
Setup - Pass/Fail Nom
███▬ ●  Increment        1.0
           High        67.5  LBF
           >Nom        45.0  LBF
            Band        50.0  %
           Low         22.5  LBF
  T  ▭━━━━━━━━━━━━━━━━▭ C
  Band            Back
```
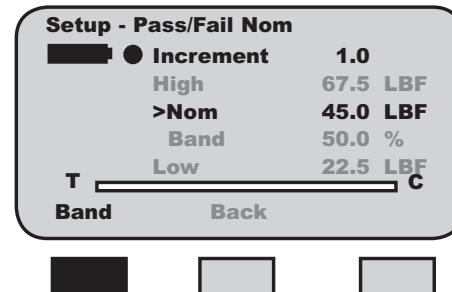
Select BANDWIDTH

Use the F1 key to specify the Bandwidth. the Bandwidth is expressed as a percentage of the Nominal Value. The maximum allowable bandwidth is 50%.

Use the UP and DOWN navigation key to increase or decrease the Bandwidth. The value will increase by the increment selected upon each key press. Note that the gauge will automatically calculate the High and Low Limits based on the Bandwidth entered and the Nominal value.

Select enter when you are satisfied with your calculated limits based on your Nominal Value and Bandwidth.

```
Setup - Pass/Fail Nom
███▬ ●  Increment        1.0
           High        67.5  LBF
            Nom        45.0  LBF
           >Band       50.0  %
           Low         22.5  LBF
  T  ▭━━━━━━━━━━━━━━━━▭ C
  Nom             Back
```

Section Contents

1.800.561.8187   www.itm.com   information@itm.com

Using Load Limits

The DF Series force gauge allows you to setup and apply LOAD LIMITS. You may setup HIGH and LOW load limits. Load Limits are useful for protecting your gauge or testing system from damage or to simply alert you that the gauge or system has exceeded a setpoint value.

L-LO High 20.0 **9.34** C-PK **BUZZ** LBF Low 10.0 T ——————— C Xmit-W Clear More	**L-HI** High 20.0 **21.24** C-PK **BUZZ** LBF Low 10.0 T ——————— C Xmit-W Clear More

Low Setpoint
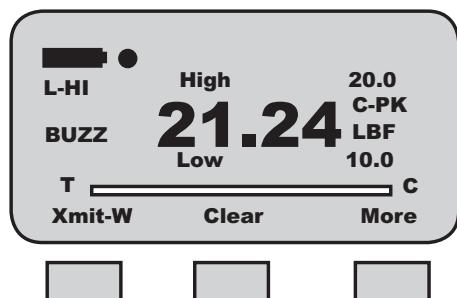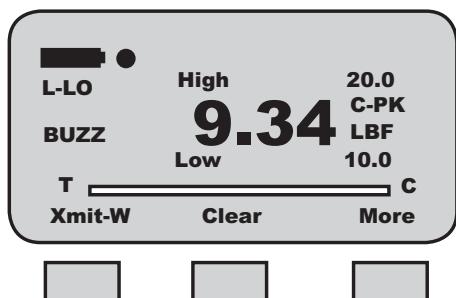
High Setpoint

If the measured result falls below the LOW setpoint, the gauge will display "L-LO" until the result is greater than the LOW setpoint value.
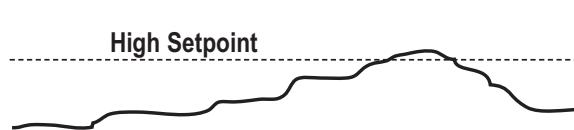
If the measured result exceeds the HIGH setpoint, the gauge will display "L-HI" until the result is less than the HIGH setpoint value.

Activating Transmit Limits

You have the option of enabling or disabling Transmit Limits. The factory default is Transmit Limits OFF.

To enable Transmit Limits, from the Home display, select F3 (More) twice. This will take you to the Main Setup Menu display.

```
Setup - RS-232
   ▬▬ ●   Auto Shutdown
           Pass - Fail
           Load Limits
           Communications <
Enter to select
   T ▭▭▭▭▭▭▭▭▭▭ C
   Back              Service
```
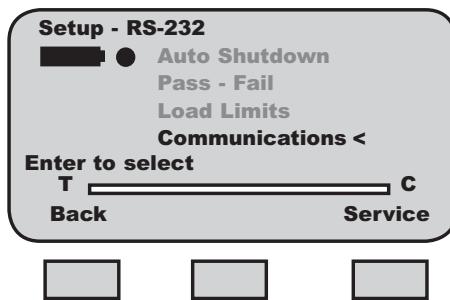
Use the navigation UP or DOWN key to position the cursor arrow next to the COMMUNICATIONS option. Select enter.

The XMIT LIMITS option is used to activate the Transmit Limits feature. Use the RIGHT arrow to activate the Transmit Limits (ON). Use the LEFT arrow to deactive the Transmit Limits (OFF).

```
Setup - RS232 Units
   ▬▬ ●   Comms      RS232
           Xmit Units     ON
           Xmit Limits  OFF
           Baud          9600
Enter to select
   T ▭▭▭▭▭▭▭▭▭▭ C
               Mit        Back
```

```
Setup - RS232 Units
   ▬▬ ●   Comms      RS232
           Xmit Units     ON
           Xmit Limits    ON
           Baud          9600
Enter to select
   T ▭▭▭▭▭▭▭▭▭▭ C
               Mit        Back
```
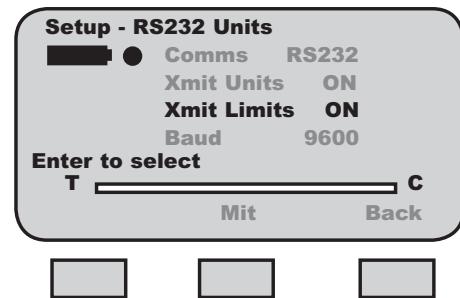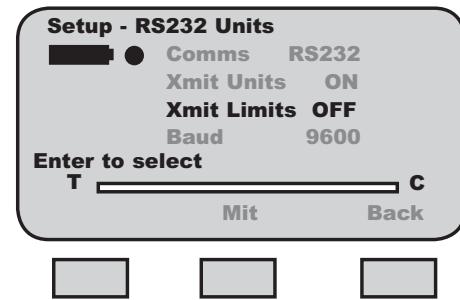
When Transmit Limits are ON, the DF Series gauge will transmit a continuous data string to the attached TCD Series tester through the RS232 port.

When a High Limit is reached, the DF Series gauge will send a continuous string of "?????" to the tester. The tester will read this string and stop the crosshead from traveling.

When a Low Limit is reached, the DF Series gauge will send a continuous string of "'''''''''" to the tester. The tester will read this string and stop the crosshead from traveling.

Activating Buzzer

You have the option of enabling or disabling the Load Limits Buzzer. If ON, the Buzzer provides you with a visual indicator and an audible indicator when the load measurement exceeds a High or Low Load Limit.

The "BUZZ" tag is displayed when this feature is turned ON.

```
   ▬▬ ●
  L-HI      High          20.0
            21.24         C-PK
  BUZZ                    LBF
            Low           10.0
   T ▭▭▭▭▭▭▭▭▭▭ C
   Xmit-W      Clear       More
```
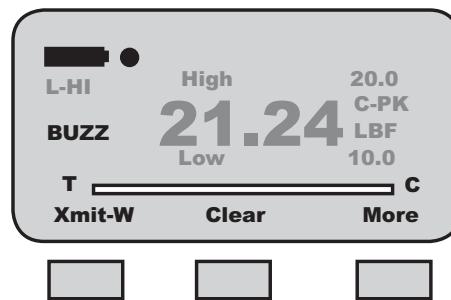
Select the F2 (B-ON) to turn the Buzzer feature ON. Or select F2 (B-OFF) to turn the Buzzer feature OFF.

```
Setup - Load Limits
   ▬▬ ●   Increment       1.0
           Buzzer          ON
           High       100.0  LBF
           Low         50.0  LBF
Enter to select
   T ▭▭▭▭▭▭▭▭▭▭ C
   Off          Back
```
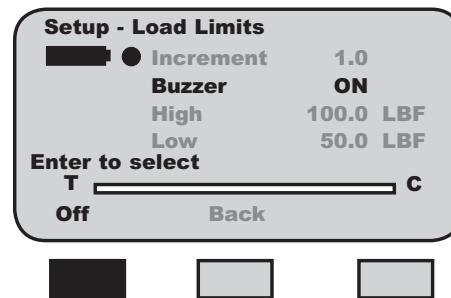
Using Load Limits

Selecting Increments

Increments are associated with the numeric values displayed by the gauge during setup. You select the increment you want to use to adjust your setup values. Increments are provided in values corresponding to the gauge capacity and units of measure. Increment values available are:

- ❑ 0.001
- ❑ 0.01
- ❑ 0.1
- ❑ 1.0
- ❑ 10.0
- ❑ 100.0

Selecting an increment of 10.0 will adjust the setup numeric value by "tens". Selecting the increment 0.1 will adjust the setup numeric value by "tenths".

You select increments using the RIGHT and LEFT arrow keys on the navigation pod. Selecting the RIGHT arrow increases the increment value. Selecting the LEFT arrow decreases the increment value.

```
Setup - Load Limits
████■ ●  Increment      1.0
           Buzzer        ON
           High        100.0  LBF
         > Low          - 50.0  LBF
Enter to select
     T ═══════════════════ C
   High          B-Off          Back
```

Selecting HIGH LIMIT Setpoint

The HIGH Limit Setpoint is the load value representing the highest COMPRESSION load value that you want your gauge to measure prior to it giving a Load Limit indication. The HIGH Load Limit is a positive number or zero.

```
                        High Limit
                       (Compression)
   ─────────────────────┼──────────────
                   0 lbf          100 lbf
```

Use the F1 key to select the HIGH Load Limit. The cursor arrow will automatically be placed next to the HIGH Load Limit tag indicating that you are about to adjust this value.

```
Setup - Load Limits
████■ ●  Increment      1.0
           Buzzer        ON
           High        100.0  LBF
         > Low          - 50.0  LBF
Enter to select
     T ═══════════════════ C
   High          B-Off          Back
```

```
Setup - Load Limits
████■ ●  Increment      1.0
           Buzzer        ON
         > High         100.0  LBF
           Low          - 50.0  LBF
Enter to select
     T ═══════════════════ C
   Low           B-Off          Back
```
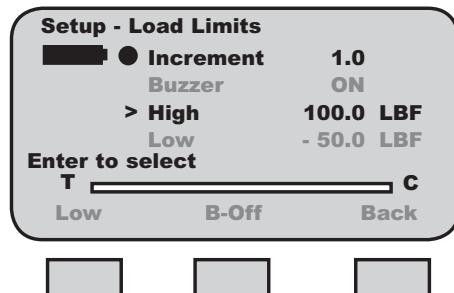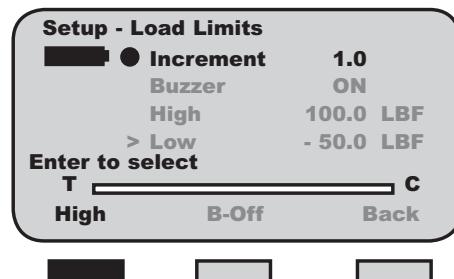
Use the UP and DOWN navigation key to increase or decrease the High Load Limit VALUE. The value will increase by the increment selected upon each key press.

Do NOT select enter until you have adjusted both the High and Low Limits to your desired setpoints.

Selecting LOW LIMIT Setpoint

The LOW Limit Setpoint is the load value representing the lowest TENSION load value that you want your gauge to measure prior to it giving a Load Limit indication. The LOW Load Limit is a negative number or zero.

Low Limit
(Tension)

-50 lbf   0 lbf

Use the F1 key to select the LOW Load Limit. The cursor arrow will automatically be placed next to the LOW Load Limit tag indicating that you are about to adjust this value.

```
Setup - Load Limits
████  ●  Increment      1.0
        Buzzer          ON
        High            100.0  LBF
      > Low             - 50.0  LBF
Enter to select
   T ▭▭▭▭▭▭▭▭▭▭ C
   Low        B-Off      Back
```
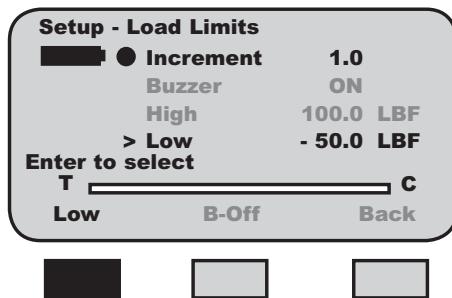
Use the UP and DOWN navigation key to increase or decrease the Low Load Limit VALUE. The value will increase by the increment selected upon each key press.

Select enter after both the High and Low Limits have been adjusted.

Viewing Load Limit Result

The DF Series gauge will display "L-LO" if a Low Load (Tension) Limit has been reached, or "L-HI" if a High Load (Compression) Limit has been reached. The Limit tag displays until the measured result falls above or below the user-specified limit.

Load Limit indications are displayed in any mode.
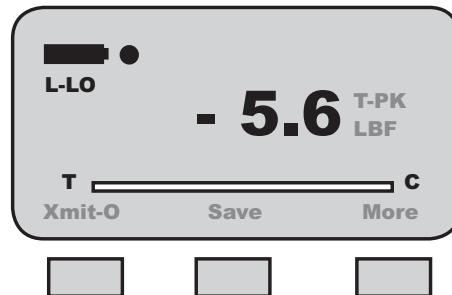
```
████  ●
L-LO
            - 5.6   T-PK
                    LBF
   T ▭▭▭▭▭▭▭▭▭▭ C
   Xmit-O      Save       More
```

Section Contents

1.800.561.8187   www.itm.com   information@itm.com

Using Automatic Shutdown

Using Auto Shutdown

The DF Series force gauge allows you to configure your gauge to automatically shut down if there has been no keypad activity or no RS232 activity for a specified period of time. The purpose of automatic shutdown is to help preserve the instrument battery. The factory default for Auto Shutdown is OFF (disabled).

If your tests involve long test periods where keypad entries are infrequent, you should take care to specify a long shutdown period to avoid losing testing results. Or, consider NOT using the automatic shutdown feature.

The DF Series gauge can be specified to automatically shutdown when there has been no keypad activity or RS232 activity from 10 minutes up to 480 minutes (8 hours).

Activating Auto Shutdown

Automatic Shutdown may be activated from the Main Setup display. From the Home display, select the F3 (More) key twice to access the Main Setup display.

```
Setup - Auto Shutdown
█████        Auto Shutdown  <
             Pass - Fail
             Load Limits
             Communications
Enter to select
   T ┌─────────────────────┐ C
     └─────────────────────┘
   Back                Service
```
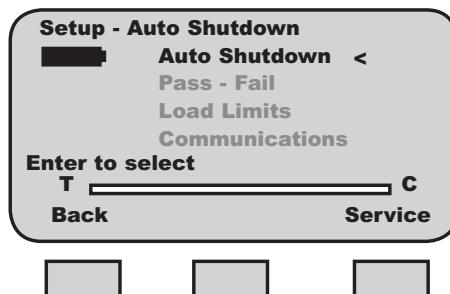
Use the UP and DOWN navigation keys to position the cursor arrow next to the Auto Shutdown tag. Select enter.

Select the F1 key to turn Auto Shutdown ON or OFF.

```
Setup - Auto Shutdown
█████


   T ┌─────────────────────┐ C
     └─────────────────────┘
   On          Back
```

```
Setup - Auto Shutdown
█████ ●
              10 MIN

   T ┌─────────────────────┐ C
     └─────────────────────┘
   Off          Back
```

Auto Shutdown Icon. Indicates that the automatic shutdown feature is activated.
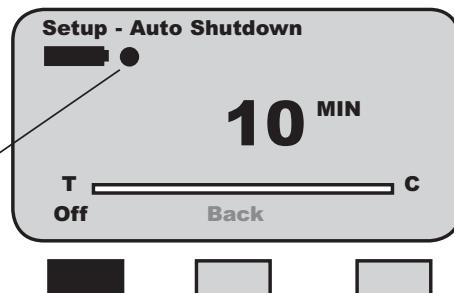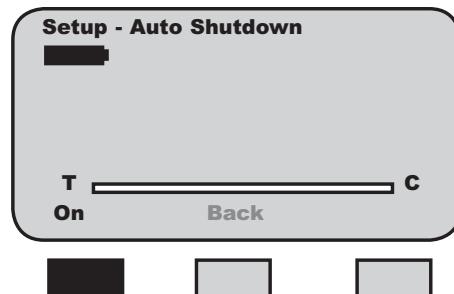
Selecting Time Period

Automatic Shutdown time is expressed in MINUTES.

Use the UP and DOWN key to select the desired time period, e.g. the amount of time in minutes that determine that the gauge will automatically shutdown when there has been no keypad activity.

Each depress of the UP or DOWN key increments the time by 10 minutes.

Section Contents

HELP

The WORD Length, STOP bits and PARITY are not adjustable. These are fixed at:

Word Length = 8 bits
Stop Bits = 1 bit
Parity = None

Only BAUD RATE and UNITS may be adjusted.

Using Outputs

About Gauge Communications

The E-DFE and DFS Series force gauges allow you to communicate to external devices using either RS232, Mitutoyo or analog outputs.

Communication is via the 12-pin output using the following Chatillon cables:

- ❑ RS232 (Cable p/n SPK-DF-RS232)
- ❑ Mitutoyo (Cable p/n NC000654)

The ±2Vdc analog output is always available via pins 11 and 12.

Setup - Communications

Communications may be setup from the Main Setup display. From the Home display, select the F3 (More) key twice to access the Main Setup display.

```
┌─────────────────────────────────┐
│ Setup - Communications          │
│   ████▌ ●    Auto Shutdown      │
│              Pass - Fail        │
│              Load Limits        │
│              Communications <   │
│ Enter to select                 │
│   T ═══════════════════════ C   │
│                                 │
│   Back                Service   │
└─────────────────────────────────┘
    ┌────┐      ┌────┐     ┌────┐
    └────┘      └────┘     └────┘
```

Use the UP and DOWN navigation keys to position the cursor arrow next to the Communications tag. Select enter.

```
┌─────────────────────────────────┐
│ Setup - RS232 Units             │
│   ████▌ ●    Comms     RS232    │
│              Xmit Units    ON   │
│              Xmit Limits   ON   │
│              Baud        9600   │
│ Enter to select                 │
│   T ═══════════════════════ C   │
│   C +ve        Mit       Back   │
└─────────────────────────────────┘
    ┌────┐      ┌────┐     ┌────┐
    └────┘      └────┘     └────┘
```

Selecting Communication Method

The DF Series allows you to transmit data using the RS232 serial data protocol or using the Mitutoyo protocol. Data can be transmitted with or without units regardless of the method selected.

Select F2 (RS232 or Mit) to specify the protocol you are using.

Select enter to activate.

```
Setup - RS232 Units
███  ●  Comms    RS232
        Xmit Units    ON
        Xmit Limits   ON
        Baud        9600
Enter to select
   T ─────────────── C
            Mit        Back
```

```
Setup - RS232 Units
███  ●  Comms    Mitutoyo


Enter to select
   T ─────────────── C
   C +ve    RS232     Back
```
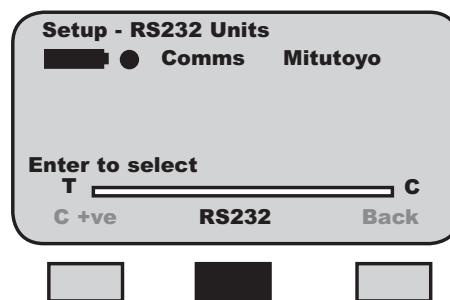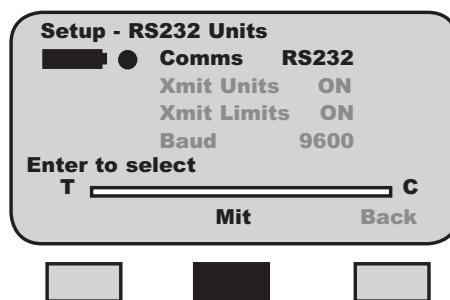
Selecting UNITS (RS232)

The DF Series allows you to transmit using RS232, data with our without units from the View display. If the tag displays as "Xmit-W", data is transmitted WITH UNITS.

If the tag displays as "Xmit-O", data is transmitted WITHOUT UNITS.

To specify how data is to be transmitted (with or without units), select F1 (On or Off).

```
Setup - RS232 Units
███  ●  Comms    RS232
        Xmit Units    ON
        Xmit Limits   ON
        Baud        9600
Enter to select
   T ─────────────── C
   C +ve    Mit        Back
```

```
Setup - RS232 Units
███  ●  Comms    RS232
        Xmit Units    OFF
        Xmit Limits   ON
        Baud        9600
Enter to select
   T ─────────────── C
   C +ve    Mit        Back
```
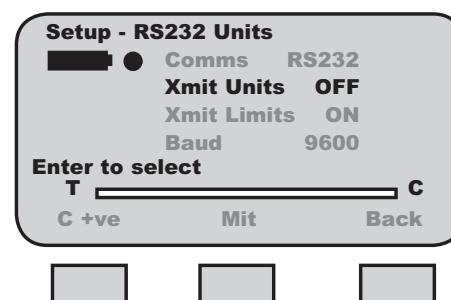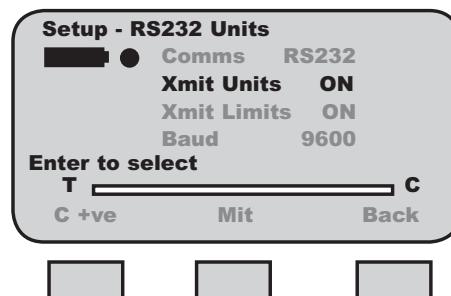
Using Outputs

Selecting LIMITS (RS232)

The DF Series allows you to transmit an ASCII signal when a Load Limit has been met. This signal is used to stop crosshead movement on a TCD Series tester.

A HIGH LIMIT sends the following ASCII string:
!??????????!

A LOW LIMIT sends the following ASCII string:
!""""""""""!

To enable XMIT LIMITS, position the arrow next to the XMIT LIMITS tag. Select the RIGHT arrow on the navigation key to enable this feature (ON). Select the LEFT arrow on the navigation key to disable this feature (OFF). Select ENTER.
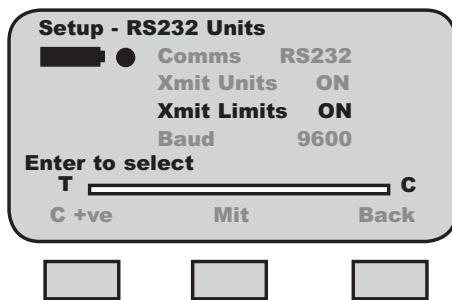
Selecting Baud Rate (RS232)

The DF Series allows you to select the required baud rate when in RS232 mode.

Position the arrow next to the BAUD tag. Use the UP and DOWN arrow to specify any of the following baud rates:

- 4800
- 9600
- 19200
- 28800
- 38400
- 57600
- 115200

Select ENTER to enable.

Setup - RS232 Units
Comms   RS232
Xmit Units   ON
Xmit Limits   ON
Baud   9600
Enter to select
T   C
C +ve   Mit   Back

Setup - RS232 Units
Comms   RS232
Xmit Units   ON
Xmit Limits OFF
Baud   9600
Enter to select
T   C
C +ve   Mit   Back

Setup - RS232 Units
Comms   RS232
Xmit Units   ON
Xmit Limits OFF
Baud   9600
Enter to select
T   C
C +ve   Mit   Back
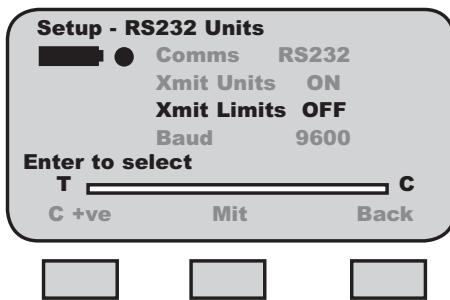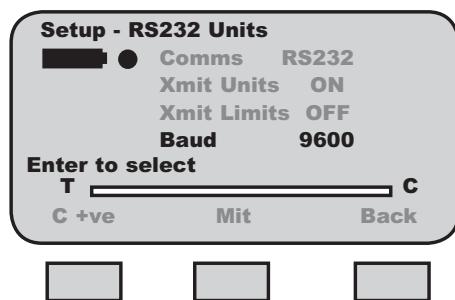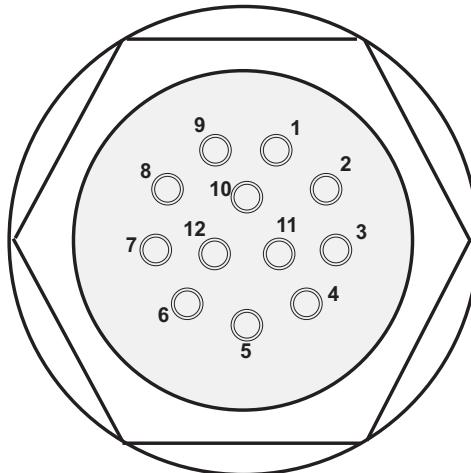
Pinouts

The DF Series is supplied with a 12-pin female connector to provide RS232, Mitutoyo and analog outputs. 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

Using Outputs

Using Hyperterminal Commands

The *DF Series* can accept and execute commands through the RS-232 serial port using Hyperterminal. 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:

Command	Response	Description
F		Toggles between Normal and Data Collect 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>	Sends currently selected mode: Normal, Tension Peak, Compression Peak, Data Collect
U		Steps through Units
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> overload.	Sends data on display with the position of the decimal place the same as on display. If "Transmit Limits" is set to transmit without units ^ is replaced by ^^. Response during force
Y		Opens RS232 output and sends continuous data stream when in Data Collect mode.
Z		Zeroes the currently selected mode: Normal, Tension Peak or Compression Peak

Changing Gauge Polarity

The *DF Series* will normally display TENSION measurements as a NEGATIVE number, while displaying COMPRESSION measurements as a POSITIVE number.

However, you may change the gauge so that it displays tensile results as POSITIVE number and compression results as a NEGATIVE.

Setup - Polarity

Polarity may be setup from the Main Setup display. From the Home display, select the F3 (More) key twice to access the Main Setup display.

Setup - Communications
- Auto Shutdown
- Pass - Fail
- Load Limits
- Communications <

Enter to select

T ———————— C

Back   Service

Use the UP and DOWN navigation keys to position the cursor arrow next to the Communications tag. Select enter.

Setup - RS232 Units
- Comms   RS232
- Xmit Units   ON
- Xmit Limits   ON
- Baud   9600

Enter to select

T ———————— C

C +ve   Mit   Back
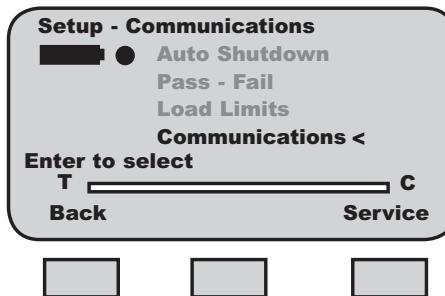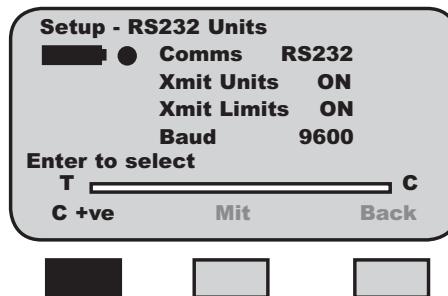
The F1 key indicates the current polarify for the gauge results:

C +ve means the compression result with display as a POSITIVE number (ve = voltage excitation). This is the gauge default setting

T +ve means the tension result will display as a POSITIVE number.

Setup - RS232 Units
- Comms   RS232
- Xmit Units   ON
- Xmit Limits   ON
- Baud   9600

Enter to select

T ———————— C

C +ve   Mit   Back
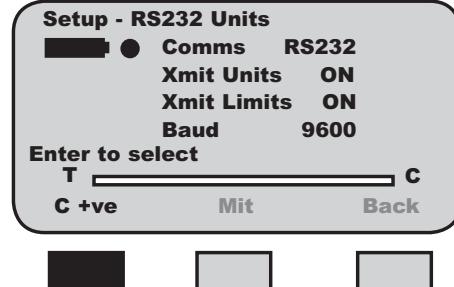
To change the polarity, depress the F1 key. Select ENTER.
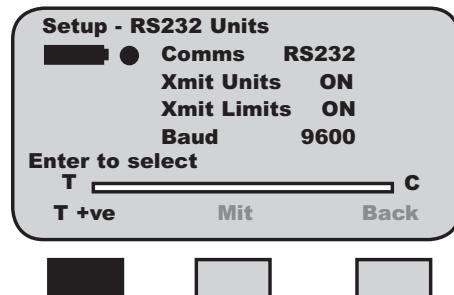
Setup - RS232 Units
- Comms   RS232
- Xmit Units   ON
- Xmit Limits   ON
- Baud   9600

Enter to select

T ———————— C

T +ve   Mit   Back

Section Contents

Connecting Printers

Connecting a Printer
The DF Series force gauge can transmit information to a serial data printer or Mitutoyo printer. Printing is performed from the View display using the TRANSMIT function.

From the Home display, select F3 (More) to access the View Display.

Select F1 (Xmit) to access the Transmit display. From this display, you have the options of transmitting the current displayed result, or transmitting all results saved in the instrument memory. Selecting the Xmit keys will send data through the gauge's output, in the configured format, to the external device.

See Communications for the output setup options.

Communication Cables
The E-DFE and DFS Series gauges are supplied standard with an RS-232 serial data cable (p/n SPK-DF-RS232). You may also use the outputs on these gauges to communicate with Mitutoyo devices.

Connect to	Cable
Serial Device	SPK-DF-RS232[1]
Mitutoyo Device	NC000654

Notes:
[1] Cable supplied standard with the E-DFE or DFS Series gauge.
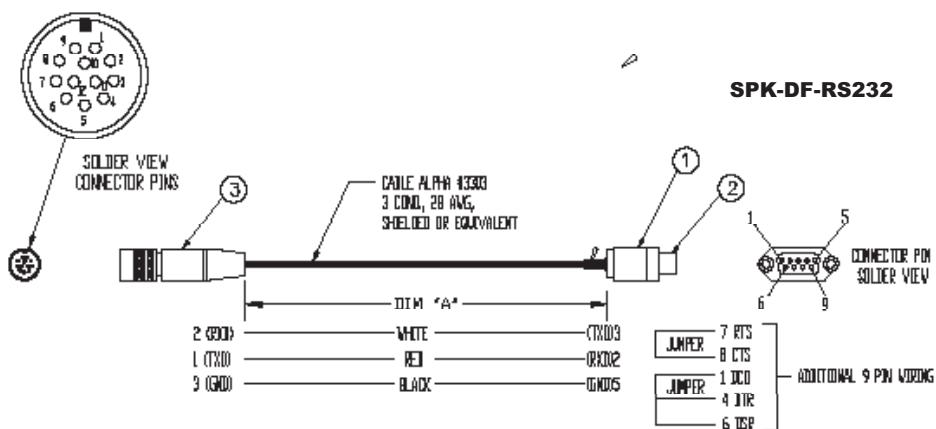
SPK-DF-RS232

Connecting a Serial Printer

Connect the DF Series gauge to the serial printer using the gauge output connector and the serial cable provided with the gauge (p/n SPK-DF-RS232). The serial data cable has a Hirose connector for the gauge and a D-Type 9-Pin male connector for the printer.

Configure the gauge outputs (See Using Outputs) and match the baud rate in the gauge to the baud rate for the printer.

Connecting a Mitutoyo Printer

Connect the DF Series gauge to a Mitutoyo printer using the optional Mitutoyo cable (p/n NC000654). The Mitutoyo cable is a 10-pin connector cable with a Hirose connector for the gauge and a 10-pin male connector for the printer.

Configure the gauge output type to MITUTOYO. The gauge will transmit data with units to the Mitutoyo printer.

Read the manual that came with the Mitutoyo printer to determine the printer setup requirements.

Section Contents

Using Load Averaging

The DFS Series force gauge allows you to perform two different types of Load Averaging tests:

- ❑   Load Average Force-Based
- ❑   Load Average Time-Based

Load Average Force-Based

This load averaging test allows you to set a preload limit value or load threshold. This gauge mode is represented and displayed as "LAVf". The preload value represents the "Start" and "End" point for your averaging function. The gauge will begin to collect and average the measured values once the "Preload Value" has been sensed. The gauge will continue to average until the measured load drops below the preload value. When the test is completed, the gauge will display the "Average Load". You can also display the peak load for the averaging period by selecting the F1 mode key.

Load Average Time-Based

This load averaging test works identical to the Force-Based method except it adds "Time" as a factor. You may set the "Time Value" from 1 second to 999 seconds. This gauge mode is represented and displayed as "LAVt".

The gauge will begin to collect and average the measured values once the "Preload Value" has been sensed. The gauge will continue to average until the measured load drops below the preload value OR until the specified time has expired. When the test is completed, the gauge will display the "Average Load". You can also display the peak load for the averaging period by selecting the F1 mode key.
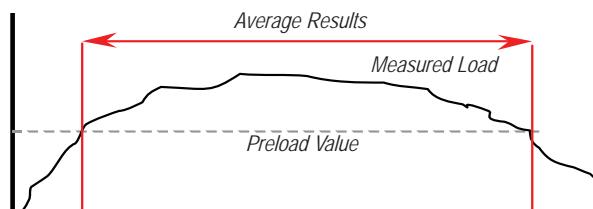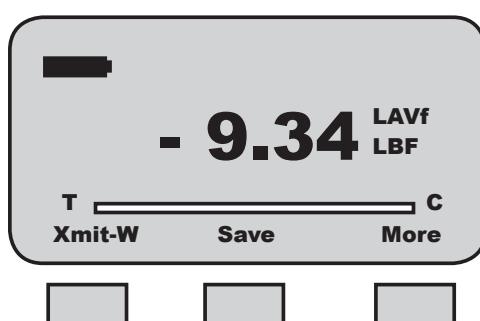
The gauge will begin to average once the preload value is reached. The gauge will continue to average until the measured load drops below the preload value.
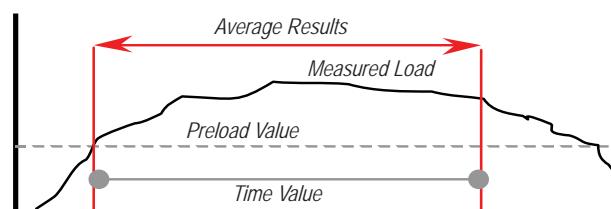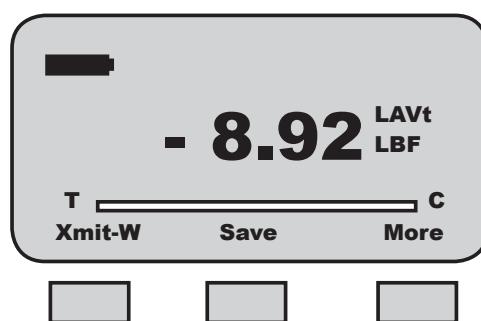
The gauge will begin to average once the preload value is reached. The gauge will continue to average until the measured load drops below the preload value or when the time has expired.

Load Average Setup

To setup the Load Average function, from the Home display depress F3 (More) three times. Use the navigation key to position the arrow at the "Load Average" function. Press enter.

```
Setup - Load Average
████▌ ●   Load Average    <
          Break Detect
          Filters
          Load Compare
Enter to select
   T ═══════════════════ C
Back
```
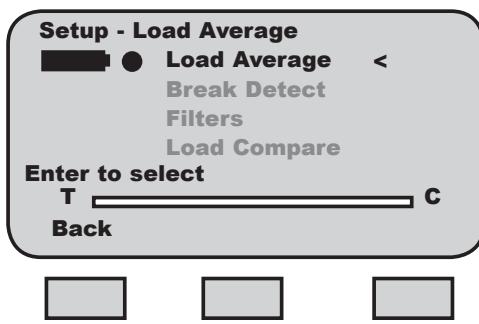
Load Average - Select Type

The DFS load average default type is Load Average Force-Based. The setup menu will display the current Preload Value (PreL).

To change the Load Average type to Time-based, select the F1 (T-ON) key. The gauge will now display "Time". A cursor will appear next to the "Preload" value. Use the F1 key to toggle between the two available Load Average Types.

```
Setup - Preload
████▌ ●   Increment   1.0

          PreL     5.00LBF

Enter to select
   T ═══════════════════ C
T-ON                     Back
```

```
Setup - Preload
████▌ ●   Increment   1.0

        > PreL     5.00LBF
          Time     60SEC
Enter to select
   T ═══════════════════ C
T-OFF        Time        Back
```

Selecting Increments

Increments are associated with the numeric values displayed by the gauge during setup. You select the increment you want to use to adjust your setup values. Increments are provided in values corresponding to the gauge capacity and units of measure. Increment values available are:

- ❑ 0.001
- ❑ 0.01
- ❑ 0.1
- ❑ 1.0
- ❑ 10.0
- ❑ 100.0

Selecting an increment of 10.0 will adjust the setup numeric value by "tens". Selecting the increment 0.1 will adjust the setup numeric value by "tenths".

You select increments using the RIGHT and LEFT arrow keys on the navigation pod. Selecting the RIGHT arrow increases the increment value. Selecting the LEFT arrow decreases the increment value.

```
Setup - Preload
████▌ ●   Increment   1.0

          PreL     5.00LBF

Enter to select
   T ═══════════════════ C
T-ON                     Back
```

```
Setup - Time
████▌ ●   Increment   1.0

          PreL     5.00LBF
        > Time     60SEC
Enter to select
   T ═══════════════════ C
T-OFF        Time        Back
```

Using Load Averaging

Selecting Preload Limit

The "Preload Value" is the threshold value or "trigger point" that defines the "Start" and "End" of the average function.

If the Preload Value is 5.00 lbf, the gauge will start to average once the load sensor has detected a 5.00 lbf load. The gauge will continue to average the load that is applied to the load sensor until the applied load drops below 5.00 lbf. Once the load drops below the preload value, the test is ended. The average is calculated and displayed.

Select the Preload Limit value by first adjusting your increments. Use the UP or DOWN navigation key to set the Preload Limit value. Depressing the DOWN key will decrease the displayed value. Depressing the UP key will increase the displayed value. Depress ENTER to select.

```
Setup - Preload
████▌●   Increment      1.0

           PreL      5.00LBF

Enter to select
   T ─────────────────── C
   T-ON                Back
```
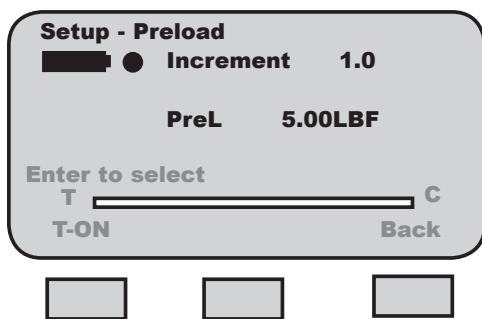
Selecting Time Limit

The "Time Value" functions with the "Preload Value". It represents the operand "OR" when selected. The gauge will "start" to average once the preload value is acheived. The gauge will continue to average until the load applied to the sensor drops below the preload value, OR, until the time period specified expires.

To select Time, you must first active the time function by pressing the F1 (T-ON) key. This enables the time function. When in the time function, you may disable by depressing the F1 (T-OFF) key.

```
Setup - Preload
████▌●   Increment      1.0

           PreL      5.00LBF

Enter to select
   T ─────────────────── C
   T-ON                Back
```

```
Setup - Time
████▌●   Increment      1.0

         > PreL      5.00LBF
           Time       60SEC
Enter to select
   T ─────────────────── C
   T-OFF      Time      Back
```
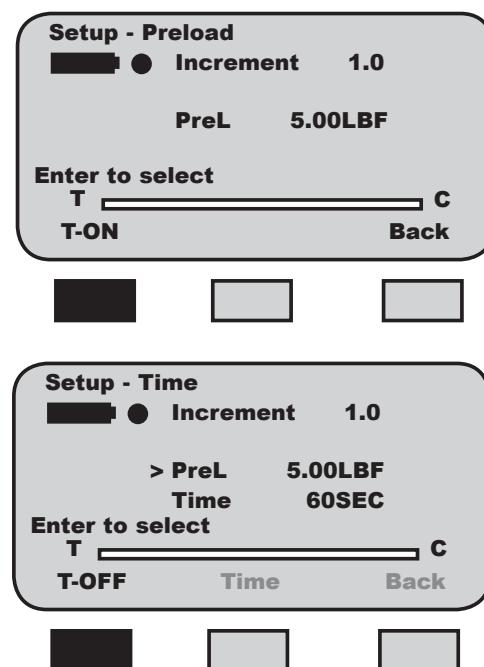
Select the F2 (Time) key. This will reposition the cursor arrow next to the Time label.

```
Setup - Time
████▌●   Increment       10

           PreL      5.00LBF
         > Time       60SEC
Enter to select
   T ─────────────────── C
   T-OFF      Time      Back
```

Select the increment value using the LEFT or RIGHT navigation key. Increments for time may be either 1, 10 or 100 and represent seconds. Time is only displayed in seconds. If you are using minutes, you must convert to seconds. The maximum time allowable is 999 seconds (16.56 minutes).

Select the desired time interval using the UP and DOWN navigation keys. Use the UP key to increase the time value. Use the DOWN key to decrease the time value. Select ENTER.

```
Setup - Time
   ████   ●   Increment    10

             PreL      5.00LBF
          > Time        60SEC
Enter to select
   T ═══════════════════ C
      T-OFF      Preload      Back
```
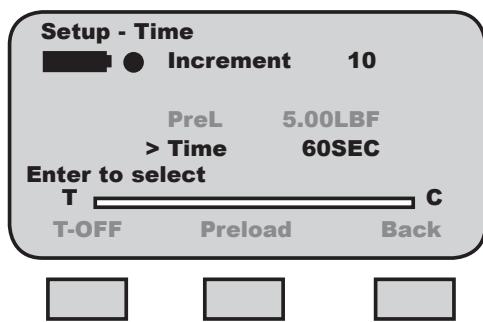
Select the F1 (T-OFF) key to disable the Time function.

Select F2 (Preload) to reposition the cursor arrow to the "PreL" preload label, allowing you to adjust the preload value.

Select F3 (Back) to return to the Setup menu.

Perfoming a Force-Based Load Average Test

From the Home display, depress the F1 (Mode) key until the DFS displays "LAVf" for mode. The "LAVf" label indicates that the gauge is setup to perform a Load Average test based on a force only (No time).
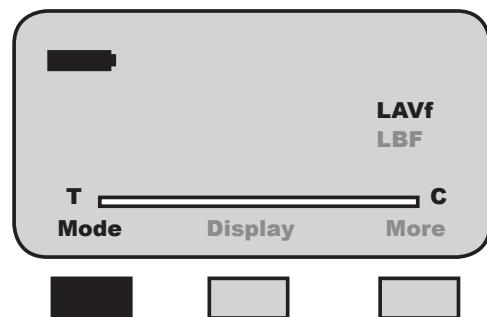
```
   ████

                              LAVf
                              LBF
   T ═══════════════════ C
   Mode      Display        More
```

Apply load to the measurement sensor. Load should be applied in one direction only (tension or compression). The gauge will begin to display the changes in applied loads. Once the measured load equals the preload value, the gauge will begin to average the applied loads. When the applied load falls below the preload value specified, the display will "freeze". The gauge will display the LAVf result when in the LAVf mode. The user may also display the peak load (the maximum load that was applied during the averaging function) be pressing the F1 key until you display "T-PK" or "C-PK". At the completion of a test you may record the following:

❑   Minimum Load (equals Preload Value)
❑   Peak Load (equals T-PK or C-PK)
❑   Average Load (equals LAVf)

You may Transmit (F1), Save (F2) or perform Statistics (F3) by depressing the associated function key.

```
   ████

              - 9.34  LAVf
                      LBF
   T ═══════════════════ C
   Xmit-W      Save        More
```
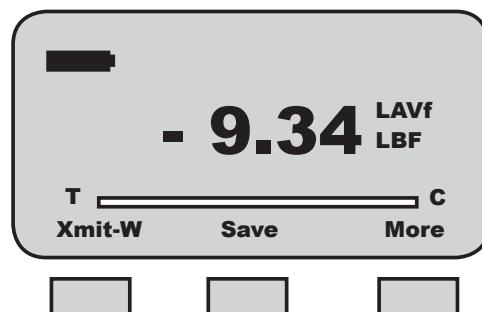
Using Load Averaging

Perfoming a Time-Based Load Average Test

From the Home display, depress the F1 (Mode) key until the DFS displays "LAVt" for mode. The "LAVt" label indicates that the gauge is setup to perform a Load Average test based on a preload limit and a time period.
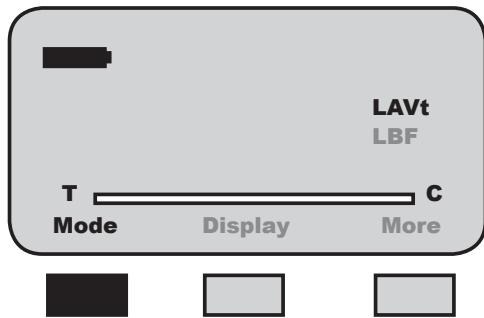
Apply load to the measurement sensor. Load should be applied in one direction only (tension or compression). The gauge will begin to display the changes in applied loads. Once the measured load equals the preload value, the gauge will begin to average the applied loads. When the applied load falls below the preload value specified, or when the time set has expired, the display will "freeze". The gauge will display the LAVt result when in the LAVt mode. The user may also display the peak load (the maximum load that was applied during the averaging function) be pressing the F1 key until you display "T-PK" or "C-PK". At the completion of a test you may record the following:

❑   Minimum Load (equals Preload Value)
❑   Peak Load (equals T-PK or C-PK)
❑   Average Load (equals LAVf)

You may Transmit (F1), Save (F2) or perform Statistics (F3) by depressing the associated function key.
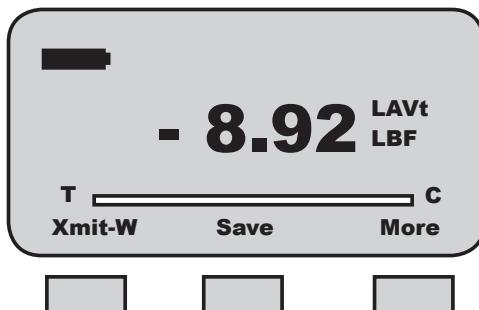
Test Annuciators

The Load Averaging feature employs three types of annunciators (gauges with firmware version 2.04 or higher) to:

1. Signal the START of your Test,
2. Signal the END of your Test,
3. Signal the FAILURE of a Test

Signal the START of a Test
A single beep will sound to signal the START of a test.

The START of a test is determine by the measured load achieving the Preload Value that you setup for the test.

Signal the END of a Test
A double beep will sound to signal the END of a test that is based on both a Preload Value and a Time Period.

When a Time-based test is being conducted, a double beep will annunciate when the time period for the test has been achieved.

Signal a FAILED Test
A rapid, triple beep will sound to alert you that the measured load dropped below the Preload Value *before* the Time Period was completed.

Section Contents

Using Break Detection

Break Detection is used when you want to capture the break load of a sample.   This function is useful especially with samples that characteristically yield before they actually break. The Break Detect function provides you with the Peak Load and the Break Load.

The DFS Series gauge will report the following as part of a Break Detect test:

❑   Break Load
❑   Break Point (Break Threshold)
❑   % Drop (used to calculate the Break Load from Maximum Load)

The Break Load is calculated as:

Break Load = (Peak Load)(% Drop)

The % Drop is a user-defined point that the gauge will use to determine the break load. The % Drop value is the percentage of the maximum load that the DFS measures that you define as the Break Load.

In some cases, the Peak Load is the Break Load. However, with samples that yield before breaking, the Break Load is often not the same as the Peak Load.

Example: If the maximum load was measured to be 100 lbf and the % Drop was setup as 80%, the gauge will define the Break Load as 80 lbf.

If the maximum load was measured to be 50 N and the % Drop was setup as 50%, the gauge will define the Break Load as 25 N (50 N x 0.5 = 25N).

The DFS Series force gauge allows you to perform two different types of Break tests:

❑   Sharp Break Test (95% Drop Fixed)
❑   Percentage Drop (% Break) Test

A Sharp Break is defined as a 95% drop in measured load from the recorded maximum load. The 95% Drop is a preset and cannot be changed by the user. When the load drops to a value equal to 95% of the maximum load, the gauge will identify this point as the Break Load.

A Percentage Drop (% Break) is a user-defined drop in measured load after the maximum load. You may select the desired % Drop to be used to calculate the Break Load.

Noisy samples, such as adhesives or peel tests should be specified with a high % Drop and with the Peak Filter set at 8Hz. Setting the % Drop too low may cause the gauge to sense a break before a break actually occurs. Conversely, samples that are rigid may use a high % Drop value. However, rigid samples typically break at a value equal to the Peak Load.

Sharp Break

The Sharp Break test looks for a 95% Drop from the maximum load. In this test, you can determine the "Break Detect Point" which is the load that must first be achieved before the DFS Series gauges begins to look for a 95% Drop in load. The "Break Detect Point" is sometimes referred to as the "load threshold" or "trigger load".

During a Sharp Break Test, the DFS gauge will look for the Peak Load value and determine a "Sharp Break" when the measured load equals 95% of the Peak Load value.

When the DFS Series gauge is in the "Sharp Break Mode" the mode indicator will display as "SCBk" for "Sharp Compressive Break". The DFS mode indicator will display "STBk" for "Sharp Tension Break".
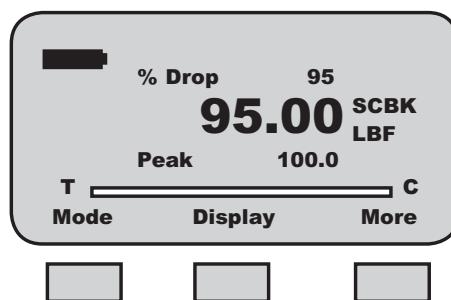
Percentage Break

The Percentage Break test allows you to specify the % Drop from the Peak Load. If you set the % Drop at 80%, the DFS gauge will determine the Break Load when the measured load is 80% of the Peak Load value.

When the DFS Series gauge is in the "% Break Mode", the mode indicator will display as "%CBk" for "% Compressive Break". The DFS mode indicator will display "%TBk" for "% Tension Break".

Left gauge display:

% Drop 95

95.00 SCBK LBF

Peak 100.0

T ▭▭▭ C

Mode Display More

Right gauge display:

% Drop 75

- 75.00 %TBK LBF

Peak -100.0

T ▭▭▭ C

Mode Display More

Left graph:

Measured Load (y-axis) vs Time (x-axis)

100 lbf - Max Load

95 lbf (95% Drop)

50 lbf Break Detect

Right graph:

Measured Load (y-axis) vs Time (x-axis)

100 lbf - Max Load

75 lbf (75% Drop)
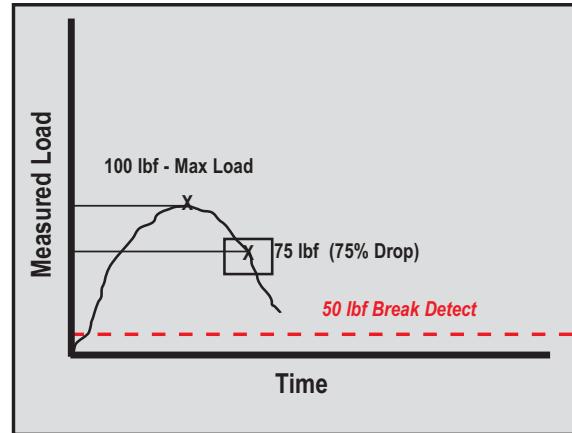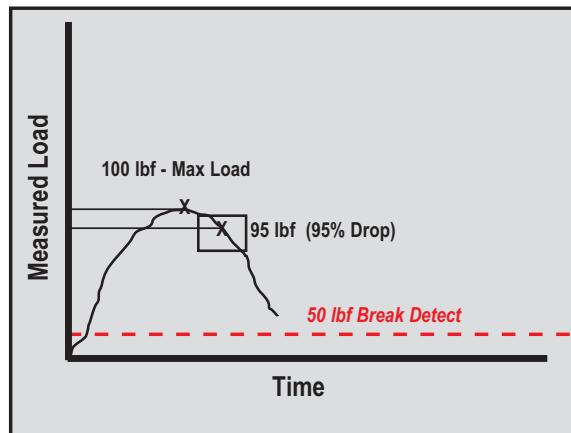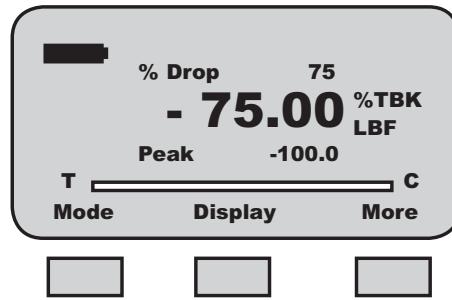
50 lbf Break Detect

Using Break Detection

Break Detection Setup

To setup the Break Detection function, from the Home display depress F3 (More) three times. Use the navigation key to position the arrow at the "Break Detect" function. Press enter.

```
Setup - Break Detect
  ▬▬● ○   Load Average
           Break Detect    <
           Filters
           Load Compare
Enter to select
  T ▭▭▭▭▭▭▭▭▭▭▭ C
  Back
```
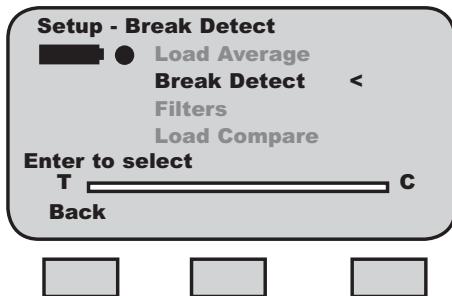
Break Detect - Select Type

The DFS break detect default type is Percentage Break. To change the break detect type to Sharp Break, select the F1 (Sharp) key.

To change from Sharp Break to Percentage Break, select F1 (% Drop).

Results are expressed with the following mode lables:

- ❑ STBk (Sharp Break Tension)
- ❑ SCBK (Sharp Break Compression)
- ❑ %TBK (% Break Tension)
- ❑ %CBK (% Break Compression)
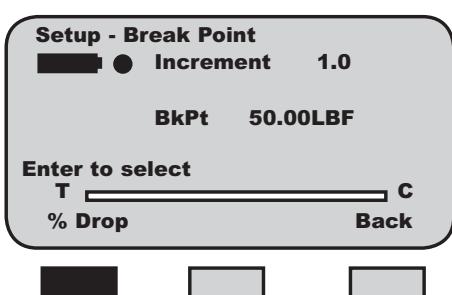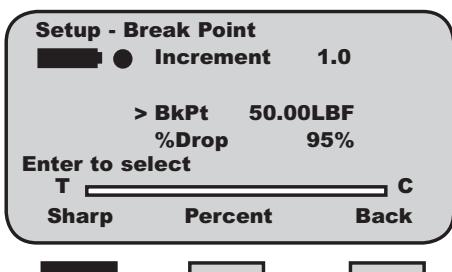
```
Setup - Break Point
  ▬▬● ○   Increment    1.0

        > BkPt    50.00LBF
          %Drop       95%
Enter to select
  T ▭▭▭▭▭▭▭▭▭▭▭ C
  Sharp      Percent      Back
```

```
Setup - Break Point
  ▬▬● ○   Increment    1.0

          BkPt    50.00LBF

Enter to select
  T ▭▭▭▭▭▭▭▭▭▭▭ C
  % Drop                Back
```

Selecting Increments

Increments are associated with the numeric values displayed by the gauge during setup. You select the increment you want to use to adjust your setup values. Increments are provided in values corresponding to the gauge capacity and units of measure. Increment values available are:

- ❑ 0.0001
- ❑ 0.001
- ❑ 0.01
- ❑ 0.1
- ❑ 1.0
- ❑ 10.0
- ❑ 100.0

Selecting an increment of 10.0 will adjust the setup numeric value by "tens". Selecting the increment 0.1 will adjust the setup numeric value by "tenths".

You select increments using the RIGHT and LEFT arrow keys on the navigation pod. Selecting the RIGHT arrow increases the increment value. Selecting the LEFT arrow decreases the increment value.

```
Setup - Break Point
  ▬▬● ○   Increment    1.0

          BkPt    50.00LBF
          %Bk          5%
Enter to select
  T ▭▭▭▭▭▭▭▭▭▭▭ C
  Sharp      Percent      Back
```

```
Setup - Break Point
  ▬▬● ○   Increment    1.0

          BkPt    50.00LBF

Enter to select
  T ▭▭▭▭▭▭▭▭▭▭▭ C
  % Drop                Back
```
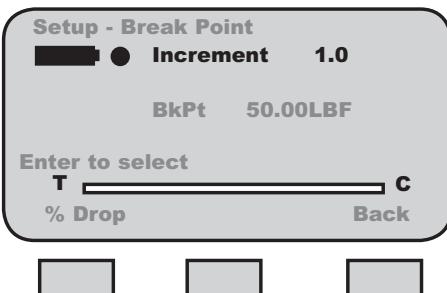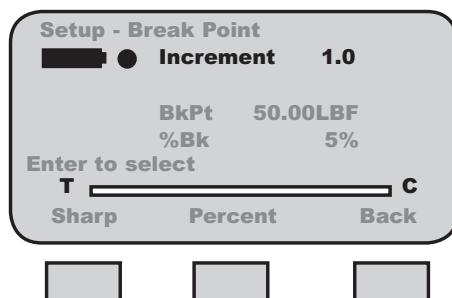
Selecting Break Point

The "Break Point" is the break detector value or the "break trigger". It is the force value that must be acheived before the gauge will look for the maximum load and the peak load.

It is important to set a correct "Break Point" based on the type of sample and the sample's break characteristics.

In a peel application, if the break point is set too low, the gauge may sense a break due to the characteristically noisy signal produced by a peel application. In a peel test, it is quite easy to have a 95% drop from a maximum load that is not representative of the true maximum load or true break load.

If the break point is set too high, the gauge may never see a break.

The best way to establish the break point is through sample testing trials.

Break Point - Sharp Break Method

To set the Break Point in a Sharp Break setup, establish the correct increment value. Use the UP navigation arrow to increase the Break Point value, and the DOWN navigation arrow to decrease the value. Select Enter once you have the desired Break Point value displayed.

```
Setup - Break Point
▬▬▬▮ ●   Increment      1.0

           BkPt      50.00LBF

Enter to select
   T ▭▭▭▭▭▭▭▭▭▭▭▭▭▭ C
   % Drop                    Back
```
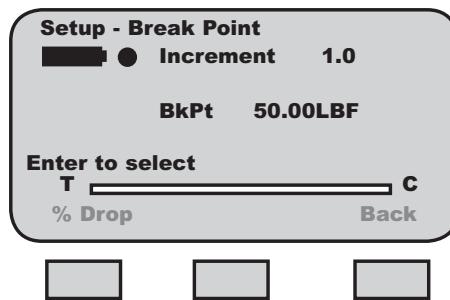
Break Point - Percentage Break Method

To set the Break Point in a Percentage Break setup, establish the correct increment value. Position the arrow cursor next to the label "BkPt".

If the cursor arrow is next to the "%Bk" label, select the F2 (BKpt) key. This will reposition the cursor arrow next to the "BkPt" label.

Use the UP navigation arrow to increase the Break Point value, and the DOWN navigation arrow to decrease the value. Select Enter once you have the desired Break Point value displayed.

```
Setup - Break Point
▬▬▬▮ ●   Increment      1.0

        >  BkPt      50.00LBF
           %Drop            5%
Enter to select
   T ▭▭▭▭▭▭▭▭▭▭▭▭▭▭ C
   Sharp       Percent       Back
```

```
Setup - Break Percent
▬▬▬▮ ●   Increment      1.0

           BkPt      50.00LBF
        >  %Drop           95%
Enter to select
   T ▭▭▭▭▭▭▭▭▭▭▭▭▭▭ C
   Sharp        BkPt         Back
```

```
Setup - Break Point
▬▬▬▮ ●   Increment      1.0

        >  BkPt      50.00LBF
           %Bk             95%
Enter to select
   T ▭▭▭▭▭▭▭▭▭▭▭▭▭▭ C
   Sharp       Percent       Back
```
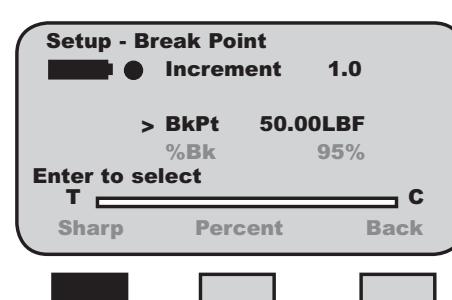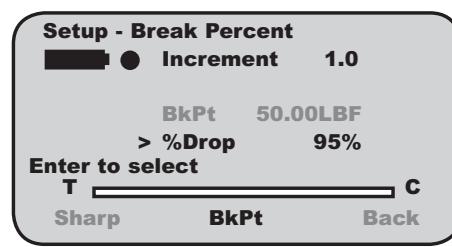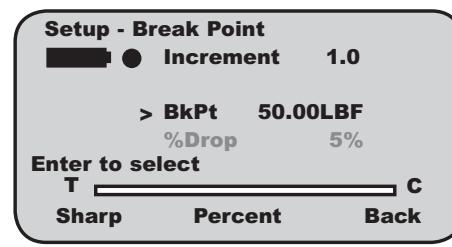
Using Break Detection

Selecting % Drop Value

The "% Drop" is the percentage drop value. This represents how much the measured load must drop from a previous maximum load for the DFS Series gauge to identify the break load.

A Sharp Break has a fixed percentage drop of 95%. It presents the 95% value from full scale. If the maximum load is 100 lbf and the % Drop is 95% (for a Sharp Break), the break load will be at 95 lbf. At 95 lbf, the DFS gauge will "end the test". If the gauge is used with a TCD tester, the gauge will signal the tester at 95 lbf to stop the test.

A Percentage Break is a user-defined percentage drop. You may specify the % Drop to be from 1% to 99%.

To change the "% Drop" value, select the F2 (Percent) key. The cursor arrow will now point to the "%Drop" label.

Select the proper increments using the LEFT and RIGHT navigation arrows. The LEFT arrow decreases the increment value. The RIGHT arrow increases the increment value.

Use the UP arrow to increase the "%Drop" value. Use the DOWN arrow to decrease the "%Drop" value. Select Enter when the required % drop value is displayed.

Setup - Break Point

■■■▮ ●   Increment   1.0

> BkPt   50.00LBF
%Drop   95%

Enter to select

T ▭▭▭▭▭▭▭ C

Sharp   Percent   Back

Setup - Break Percent

■■■▮ ●   Increment   1.0

BkPt   50.00LBF
> %Drop   95%

Enter to select

T ▭▭▭▭▭▭▭ C

Sharp   BkPt   Back
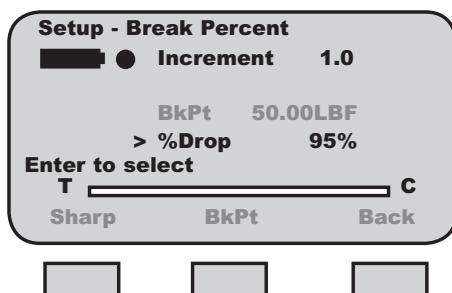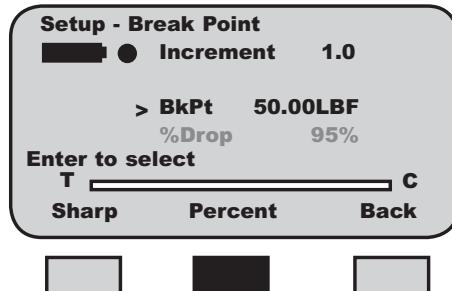
Perfoming a Sharp Break Test

Once you have setup your Break Detect, from the Home display, depress the F1 (Mode) key until the DFS displays "Norm".

Pull to Break

A pull to break test will use the mode "STBk". Affix your sample to the grip or fixture and zero the gauge. Press the Zero key to zero the load effects caused by the sample weight and fixture (tare out).

Pull the sample (manually or using a Chatillon tester). The load applied to the load sensor is displayed during the test.

When the sample breaks (physically breaks) or when the load caused by the sample being pulled drops by 95% from a maximum value, the test will end.

You may view the Peak Load by pressing the F1 (Mode) key until the mode indicator displays "T-PK". The value displayed is the Peak Tensile value for the test. This value is taken from the DFS Series gauge's Peak Register.

You may view the Break Load by depressing the F1 (Mode) key until the mode indicator displays "STBk". The DFS Series gauge will display the following results and test parameters:

- ❑ 95% Drop (Sharp Break Default value)
- ❑ Break (Break Load) expressed as "STBk"
- ❑ Max (Maximum Load)

Compress to Rupture (Break)

A compress to rupture test will use the mode "SCBk". Affix your sample to the grip or fixture and zero the gauge. Press the Zero key to zero the load effects caused by the sample weight and fixture (tare out).

Compress (Push) the sample (manually or using a Chatillon tester). The load applied to the load sensor is displayed during the test.

When the sample breaks (physically breaks) or when the load caused by the sample being pulled drops by 95% from a maximum value, the test will end.

You may view the Peak Load by pressing the F1 (Mode) key until the mode indicator displays "C-PK". The value displayed is the Peak Compression value for the test. This value is taken from the DFS Series gauge's Peak Register.

You may view the Break Load by depressing the F1 (Mode) key until the mode indicator displays "SCBk". The DFS Series gauge will display the following results and test parameters:

- ❑ 95% Drop (Sharp Break Default value)
- ❑ Break (Break Load) expressed as "SCBk"
- ❑ Max (Maximum Load)

% Drop	95	
-95.00	STBK LBF	
Max	100.0	
T		C
Mode	Display	More

% Drop	95	
47.50	SCBK LBF	
Max	50.0	
T		C
Mode	Display	More
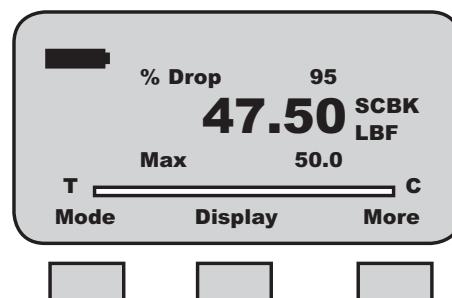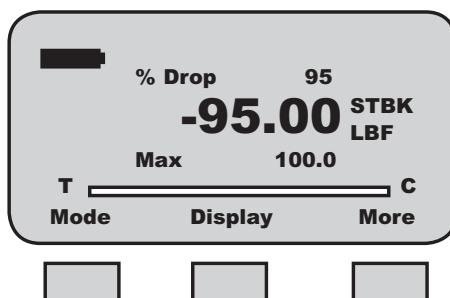
Using Break Detection

Perfoming a Percentage Break Test

Once the Percentage Break Setup is complete, from the Home display, depress the F1 (Mode) key until the DFS displays "Norm".

Pull to Break

A pull to break test will use the mode "%TBk". Affix your sample to the grip or fixture and zero the gauge. Press the Zero key to zero the load effects caused by the sample weight and fixture (tare out).

Pull the sample (manually or using a Chatillon tester). The load applied to the load sensor is displayed during the test.

When the sample breaks (physically breaks) or when the load caused by the sample being pulled drops by your specified % Drop from a maximum value, the test will end.

You may view the Peak Load by pressing the F1 (Mode) key until the mode indicator displays "T-PK". The value displayed is the Peak Tensile value for the test. This value is taken from the DFS Series gauge's Peak Register.

You may view the %Break Load by depressing the F1 (Mode) key until the mode indicator displays "%TBk". The DFS Series gauge will display the following results and test parameters:

❑   % Drop (user-defined)
❑   Break (Break Load)) expressed as "%TBk"
❑   Max (Maximum Load
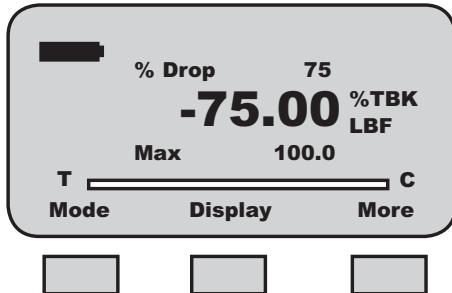
Compress to Rupture (Break)

A compress to rupture test will use the mode "%CBk". Affix your sample to the grip or fixture and zero the gauge. Press the Zero key to zero the load effects caused by the sample weight and fixture (tare out).

Compress (Push) the sample (manually or using a Chatillon tester). The load applied to the load sensor is displayed during the test.

When the sample breaks (physically breaks) or when the load caused by the sample being pulled drops by 95% from a maximum value, the test will end.

You may view the Peak Load by pressing the F1 (Mode) key until the mode indicator displays "C-PK". The value displayed is the Peak Compression value for the test. This value is taken from the DFS Series gauge's Peak Register.

You may view the Break Load by depressing the F1 (Mode) key until the mode indicator displays "%CBk". The DFS Series gauge will display the following results and test parameters:

❑   % Drop (user-defined)
❑   Break (Break Load) expressed as "%CBk"
❑   Max (Maximum Load)
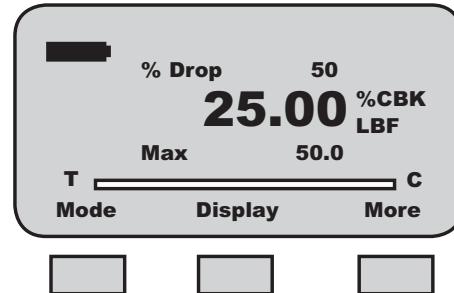
% Drop	75
-75.00	%TBK LBF
Max	100.0

T ▭ C
Mode   Display   More

% Drop	50
25.00	%CBK LBF
Max	50.0

T ▭ C
Mode   Display   More

Section Contents

Applying Filters

Using Filters

The DFS Series digital force gauge supplies two types of filtering. Filtering may be useful with applications that are "noisy" or susceptible to vibration effects, e,g, gauges measuring extremely low forces below 250gf. Filtering may be used to "dampen" the effects of these external conditions in order to provide you with a more stable display of information.

Display Filter

The Display Filter is also called the Normal Filter. The default display update rate for the DFS Series is 8Hz. The display data rate may be reduced to 2Hz (maximum data averaging before values are displayed). Adjusting the Display Filter affects the instantaneous force measurement results displayed in Normal mode.

Peak Filter

The Peak Filter affects the peak tension and compression values. The default Peak Filter is set at 5000Hz. At this rate, the gauge updates quickly with minimal averaging for peak load indication. The Peak Filter may be adjusted to 200Hz and 8Hz respecitvely.

Filter Setup

The DFS Series filters are setup from the Main Setup Menu. From the Home display, press the F3 (More) key three times.
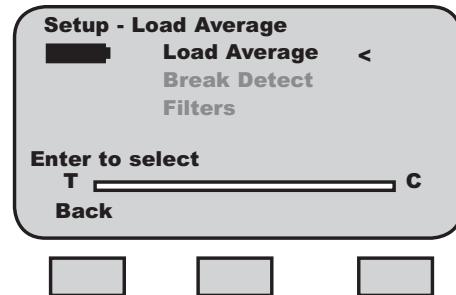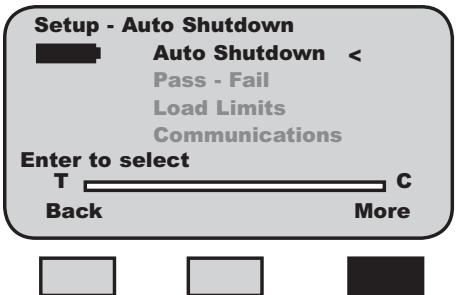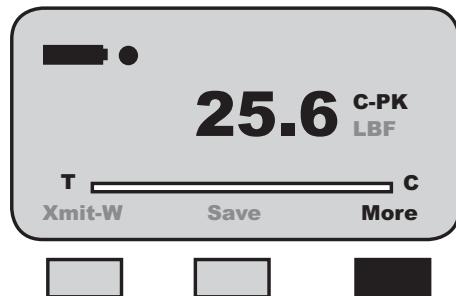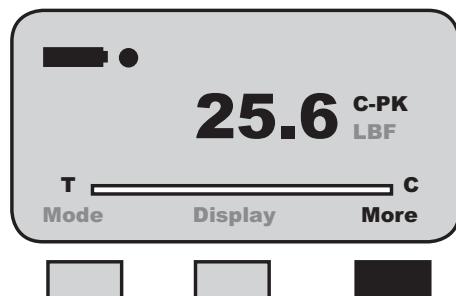
Use the UP or DOWN navigation key to position the cursor arrow next to the "Filters" option. Select Enter.

```
Setup - Load Average
  ████
         Load Average
         Break Detect
         Filters            <

Enter to select
  T ████████████████ C
  Back
```
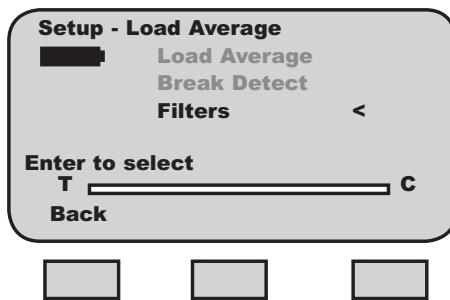
Display Filter Setup

From the Main Filter Setup display, you may set the Display and Peak filter rate. The cursor arrow will appear next to the Display filter option, "Disp 8Hz". This is the default display update rate. To change the Display Filter rate to 2Hz, depress the UP or DOWN navigation key. The display rate will change between 8Hz and 2Hz. Select Enter when the desired rate is displayed.

```
Setup - Disp Filter
  ████
           > Disp  8Hz
             Peak  5kHz

Enter to select
  T ████████████ C
  Peak              Back
```

```
Setup - Disp Filter
  ████
           > Disp  2Hz
             Peak  5kHz

Enter to select
  T ███ C
  Peak              Back
```
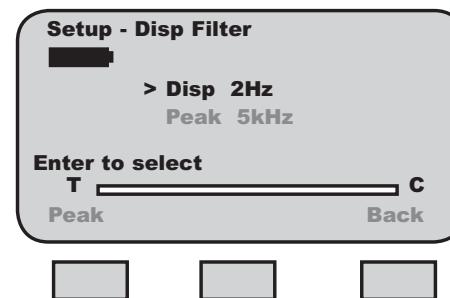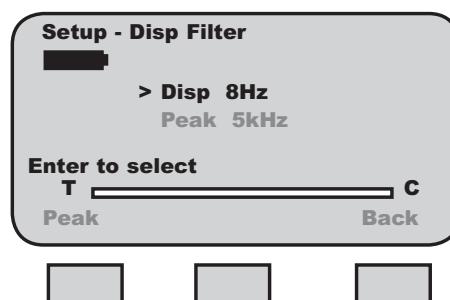
Peak Filter Setup

From the Display Filter setup, depress F1 (Peak) to change the Peak Filter setup. Selecting F1 (Peak) will position the cursor arrow next to the "Peak" label. Use the UP and DOWN arrow to adjust the peak sample rate to the desired setting. The peak sample rate default is 5000Hz (5kHz) and may be changed to 200Hz and 8Hz respectively. Select ENTER to apply filter rate.

```
Setup - Display Filter
  ████
           > Disp  8Hz
             Peak  5kHz

Enter to select
  T ████████████████ C
  Peak              Back
```

```
Setup - Disp Filter
  ███
             Disp  2Hz
           > Peak  5kHz

Enter to select
  T ████████████████ C
  Display            Back
```

```
Setup - Disp Filter
  ███
             Disp  2Hz
           > Peak  200Hz

Enter to select
  T ████████████████ C
  Display            Back
```

```
Setup - Disp Filter
  ████
             Disp  2Hz
           > Peak  8Hz

Enter to select
  T ████████████████ C
  Display            Back
```
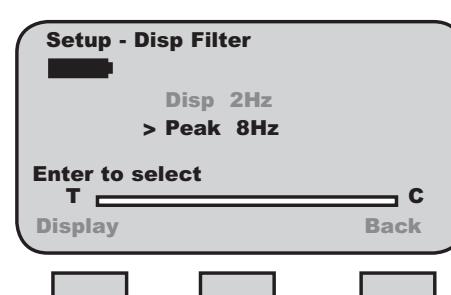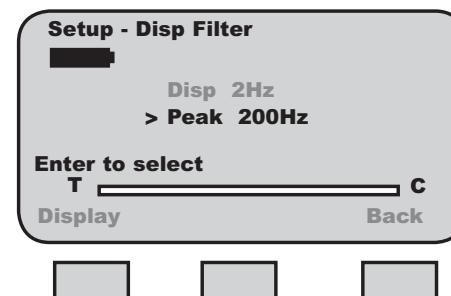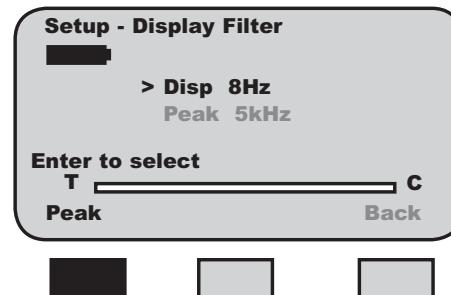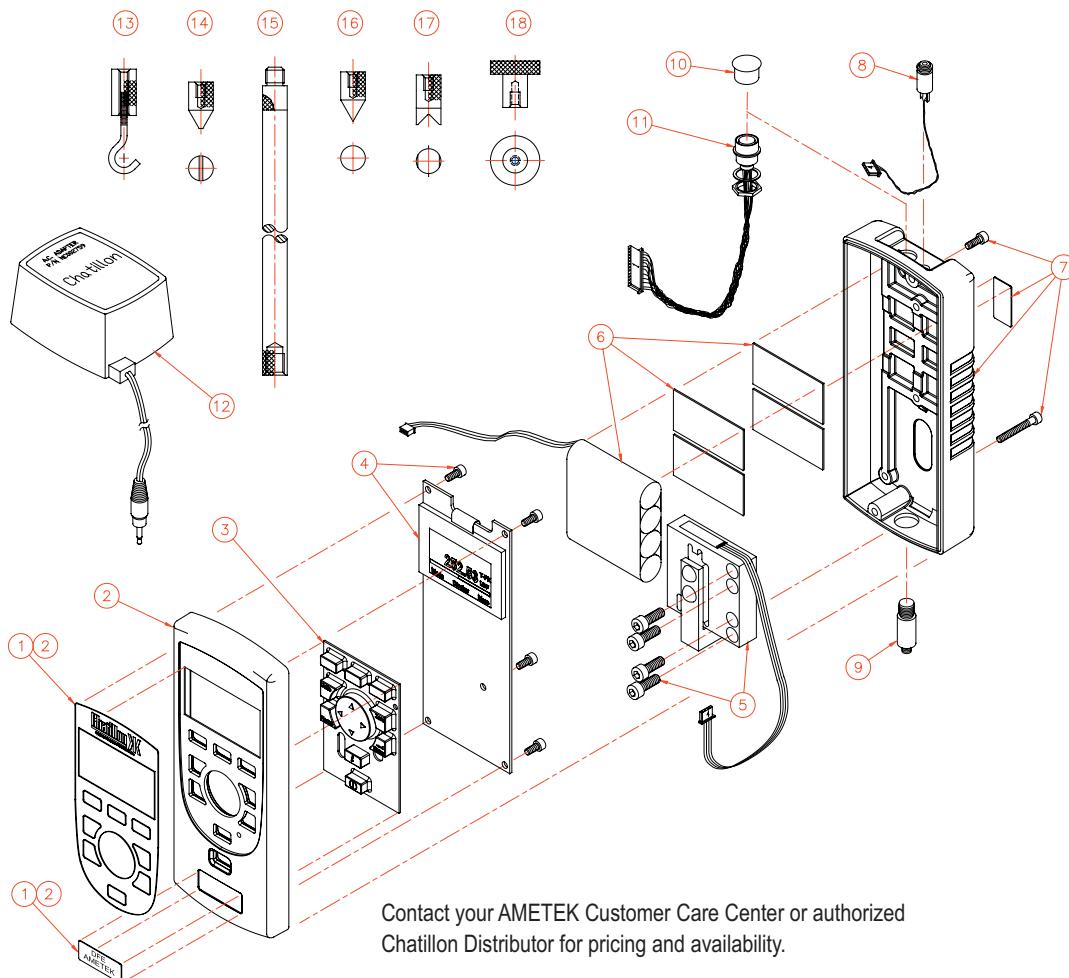
Contact your AMETEK Customer Care Center or authorized
Chatillon Distributor for pricing and availability.

Ref. No.	Part Number	Description
1	SPK-DFE-108	Label Assembly, Top Housing
2	SPK-DFE-109	Top Housing Assembly
3	SPK-DF-110	Keypad
4	SPK-DFE-111	Printed Circuit Board Assembly
5	SPK-DF-0002	Loadcell Assembly, 2 lbf
	SPK-DF-0010	Loadcell Assembly, 10 lbf
	SPK-DF-0025	Loadcell Assembly, 25 lbf
	SPK-DF-0050	Loadcell Assembly, 50 lbf
	SPK-DF-0100	Loadcell Assembly, 100 lbf
	SPK-DF-0200	Loadcell Assembly, 200 lbf
	SPK-DF-0500	Loadcell Assembly, 500 lbf
6	SPK-DF-112	Battery Pack Assembly
7	SPK-DF-113	Bottom Housing Assembly
8	SPK-DF-114	Power Jack Cable Assembly
9	SPK-DF115A	Shaft Adapter, Loadcell, 2lbf
	SPK-DF-115B	Shaft Adapter, Loadcell
	SPK-DF-115C	Shaft Adapter, Loadcell, 200/500 lbf
10	SPK-DFE-116	Hole Plug (DFE)
11	SPK-DF-117	Cable Assembly, 12 Pin

Ref. No.	Part Number	Description
12	SPK-DF-US120	Charger, 120V US Plug
	SPK-DF-EU230	Charger, 230V, EU Plug
	SPK-DF-UK230	Charger, 230V, UK Plug
13	SPK-FMG-012A	Hook, 50 lbf,
	SPK-FMG-012B	Hook, 100 lbf
	SPK-FMG-012C	Hook, 500 lbf
14	SPK-FMG-008A	Chisel Point, 100 lbf
	SPK-FMG-008B	Chisel Point, 500 lbf
15	SPK-FMG-013A	Extension Rod, 6-inch, 100 lbf
	SPK-FMG-013B	Extension Rod, 6-inch, 500 lbf
16	SPK-FMG-009A	Point, 100 lbf
	SPK-FMG-009B	Point, 500 lbf
17	SPK-FMG-010A	Notch, 100 lbf
	SPK-FMG-010B	Notch, 500 lbf
18	SPK-FMG-011A	Flat, 100 lbf
	SPK-FMG-011B	Flat, 500 lbf

Chatillon)K
A registered trademark of AMETEK Inc.

Performance Specifications

Accuracy: $\pm$0.1% of full scale

Certification: Calibration with NIST Data, IEC/ISO17025 optional

Data Sampling Rate: 5000 Hz

Peak Capture Rate: 5000 Hz

Display Update Rate: Configurable 8Hz or 2Hz

Tare Capacity: 10% full scale

Overload Protection: 150% full scale

Display Characteristics: High resolution, dot-matrix LCD, 8 lines, 40 characters, adjustable contrast, invert and "hide" capability

Automatic Shut Down: Configurable time. May be disabled.

Data Storage: 10 results, Optional NEXYGEN™ software for unlimited storage and automated testing and analysis

Test Stand Control: Compatible with Chatillon TCD Series testers.

Outputs: RS-232, Mitutoyo (Digimatic) and $\pm$2Vdc Analog

Baud Rates: 4800, 9600, 19200, 28800, 38400, 57600, 115200

Power: Battery or direct AC operation. Universal Power 120V/230V, Rechargeable Nickel Metal Hydride (supplied)

Battery Life: Approximately 30 hours, continuous use. Gauge may be operated with direct AC Power Source.

Instrument Weight: 1.5 lbs (0.7 kg)

Shipping Weights (with accessories): 4 lbs (1.8 kg)

Warranty: 2 year

Environmental Specifications

Storage Temperature: 0° to 130°F (-17° to 54°C)

Operating Temperature: 40° to 100°F (4° to 38°C)

Temperature Stability: $\pm$0.015% per ^{o}F

Relative Humidity: 20% to 80%

Conformity: This model has been accessed against the essential health and safety requirements of the Low Voltage and the EMC Directives listed below and deemed in compliance:

❑ BS EN 61010-1:2001   Safety Requirement for Electrical Equipment
❑ BS EN 50081-1:1992   EMC Generic Emissions Standard
❑ BS EN 50082-1:1992   EMC Generic Immunity Standard

Loadcell Deflection Specifications
The following are the specified loadcell deflection values at full capacity.

Capacity	Deflection
250g	0.015" $\pm$0.003"
2 lbf (10N)	0.009" $\pm$0.003"
10 lbf (50N)	0.006" $\pm$0.003"
25 lbf (125N)	0.006" $\pm$0.003"
50 lbf (250N)	0.006" $\pm$0.003"
100 lbf (500N)	0.008" $\pm$0.003"
200 lbf (1000N)	0.008" $\pm$0.003"
500 lbf (2500N)	0.008" $\pm$0.003"

2.86 [72.6 mm]

1.62 [41.1 mm]

#10-32 UNC-2B
FEMALE THREAD
6 PLACES

5.53 [140.3 mm]

2.25 [57.2 mm]

Max Screw Depth
0.4 inch - 10mm

3.00 [76.3 mm]

3.48 [88.3 mm]

6.80 [172.7 mm]

7.28 [184.8 mm]

Haskar
A Registered Trademark of AMETEK, Inc.
S/N 0008270

1.80 [45.7 mm]

0.69 [17.4 mm]

E96-354

Gauge Firmware Hierarchy

Home Display

| Mode | Display | More | | Info |

Gauge Status

Mode:
- Normal
- T-PK (Tension Peak)
- C-PK (Compression Peak)
- LAVf (Load Average Force)
- LAVt (Load Average Time)
- STBk (Sharp Break Tension)
- SCBk (Sharp Break Compression)
- %TBk (Percent Break Tension)
- %CBk (Percent Break Compression)

Display:
- Display Up/Down
- Display Contrast
- Display Hide

Info (Gauge Status):
- Capacity x Resolution
- Firmware Revision
- Overload History
- Battery Life

Transmit/Save Display

| Info | | Xmit | Save |

Xmit:
- Transmit Result
- Transmit All Results

Save:
- Save Result

View Memory/Statistics Display

| Xmit | Clear |

Xmit:
- Transmit Result
- Transmit All Results

Clear:
- Calculate Statistics
  - Mean
  - COV
  - % Difference
  - Standard Deviation

- On/Off
- Time Period

- Display Filter
  - 8Hz
  - 2Hz
- Peak Filter
  - 5000Hz
  - 200Hz
  - 8Hz

Main Setup Display

| Auto Shutdown | | | | Filters |

| Pass-Fail Limits | Load Limits | Communications | Load Average | Break Detection |

Pass-Fail Limits:
- On/Off
- Pass Fail Type
  - Range
    - High Limit
    - Low Limit
  - Nominal
    - Nominal Value
    - Bandwidth

Load Limits:
- Buzzer On/Off
- High Limit
- Low Limit

Communications:
- Transmit Method
  - With Units
  - Without Units
- Load Limits On/Off
- Comm Type
  - RS232
    - Baud Rate
    - 4800
    - 9600
    - 19200
    - 28800
    - 38400
    - 57600
    - 115200
  - Mitutoyo

Load Average:
- Force-Based (LAVf)
  - Preload
- Time-Based (LAVt)
  - Preload
  - Time

Break Detection:
- Sharp Break
  - Break Point
- Percent Break
  - % Drop
  - Break Point