SHIMPO

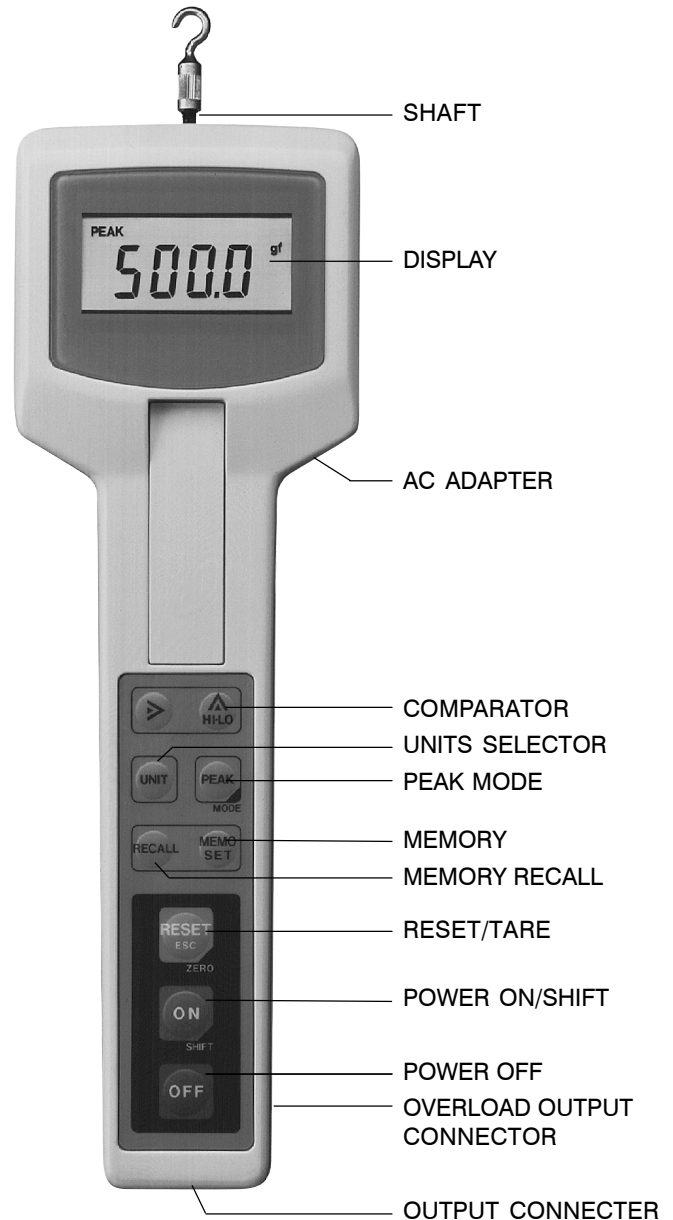# Digital Force Gauge
Models DFS — 0.5, 1, 2, 5, 10, 20, 50, 100
DFS — 0.5R, 1R, 2R, 5R, 10R, 20R, 50R, 100R

Instruction Manual

Contents

SHAFT

DISPLAY

PEAK

500.0 gf

AC ADAPTER

COMPARATOR

UNITS SELECTOR

PEAK MODE

MEMORY

MEMORY RECALL

RESET/TARE

POWER ON/SHIFT

POWER OFF

OVERLOAD OUTPUT
CONNECTOR

OUTPUT CONNECTER

Safety Precautions

1. Do not use any attachment that appears to be damaged.

2. Attachment must be properly installed. Hand tighten it. Do not use wrenches or any other tools.

3. Do not exceed attachment capacity.

4. When installing gauge on a stand make sure to use all necessary screws to secure unit.

5. Use eye protection devices when testing materials that may shatter.

Caution

1. Do not use or store unit in extreme temperatures.
   Note: Operating temperature is 0-45°C.

2. Do not use or store unit in oily, dusty or water splashing areas.

3. If display shows [$\varepsilon\varepsilon\varepsilon\varepsilon$] stop test immediately and release load. Over-load condition may damage the load cell.

4. Do not apply force at an angle and avoid twisting the shaft.

5. If gauge is not going to be used for a while, remove batteries to avoid corrosion of battery terminals.

6. Use AC adapter that comes with the unit only. Any other adapter will damage circuity.

7. Do not use any chemicals to clean outside case (including gasoline, alcohol e.t.c). Just use ordinary soapy damp cloth.

8. Do not attempt to disassemble gauge. The warranty will be voided.

Before Using

All DFS models come from the factory with the batteries not installed. Before attempting to use the gauge install the four AA batteries (provided) observing Figs. 1, 2 and 3 below.

Remove battery plate with a coin or appropriate screw driver. Install 4-AA batteries as shown in Fig. 2 observing proper polarity. Make sure lip engages properly before tighting the battery plate screw.

Note: When the AC adapter is used, the batteries act as a memory back up system <u>only.</u>
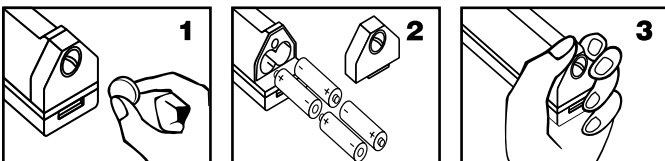
Factory Settings

Each force Gauge comes from the factory with the settings shown in the table 1 below

UNIT	lb. or oz. (Depending on capacity)		
MEASURING MODE	Average		
UPDATE TIME	0.125 seconds		
AUTO POWER OFF	3 minutes		
MEMORY MODE	on demand mode (single data input)		
OUTPUT	RS232 (EIA)	Baud Rate:	4800 bps
		Data Length:	8 bits
		Stop Bit:	2 bits
		Data End Code:	None
		Software Flow Control:	Disabled
INPUT	Tare Function		

Table 1

Fig. 1

Push Button Functions

Digit shift for comparator setting
Last Memory clear.

Comparator setting.
Comparator number check.

Unit

Measuring mode switch.
Statistics recall when in memory mode.
Shift + mode.

Memory recall

Memory store.
End key for for any setting.
Calibration.

Peak reset.
Prevent data entry.
Stop data output.
Prevent escape from
Memory recall.
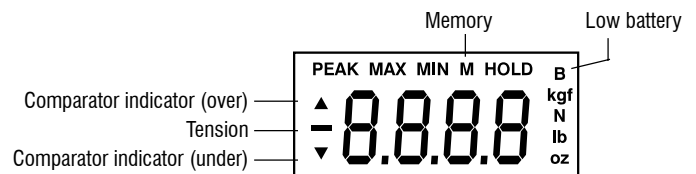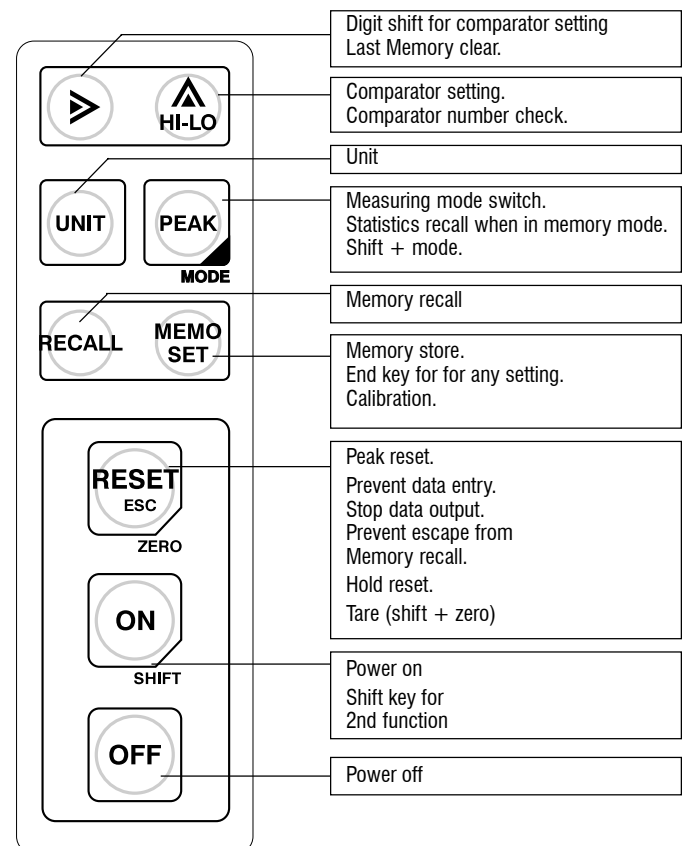Hold reset.
Tare (shift + zero)

Power on
Shift key for
2nd function

Power off

Ready to Measure

First press the ON switch to turn power ON. The display will show momentarily all the indicators shown in Fig.1 and then settle at lb (oz) and some arbitrary number with (usually but not necessarily all zeros).

Assuming that the proper attachment is installed and the unit is positioned as desired, press the ZERO and ON switches simultaneously. The display should show all zeros, which means that the gauge is "TARED".

The gauge is now ready to measure force according to the factory settings shown in Table 1.

After measurements are finished, press the OFF switch to turn unit off.

Note: The gauge will power off automatically in 3 minutes if the OFF switch is not pressed. If the AC adapter is in use, the AUTO-POWER-OFF function is inoperative.

How to Change Units

After the power is turned ON and gauge is "TARED", by pressing the UNIT switch the instrument will change from lb(oz) to kg(g) to N and the cycle is repeated.

Caution: The gauge will default to lb (oz) (initial setting) after power OFF regardless of what unit was previously selected. To avoid above situation, see page 7.

Change of Measuring Mode

As was mentioned in previous pages the gauge is set from the factory in the average mode. The sampling rates for the average mode are 0.125, 0.25, 1 and 2 seconds (selectable). In the PEAK mode if the sampling rate is set for 1/1000 sec., the actual peak force is captured. If another sampling rate is chosen the maximum average force is captured. To change from average to peak mode press the PEAK switch once. The display will show a negative sign in front of the digits. This means that the gauge is ready to measure tension. If the PEAK switch is pressed one more time the negative sign will disappear and the gauge is ready to measure compression. One more press of the PEAK switch will bring the unit back to average mode.

The gauge is able to measure average, peak tension, and peak compression in one operation. When in the average mode, push on the shaft for a period of time and then pull the shaft and release. When you press the PEAK switch the peak tension appears on the display. One more push of the peak switch and the display will show the peak compression. To cancel the peak value from the memory press the RESET switch.

The gauge is set to go to the average mode when the power is turned on. To change this condition (go to peak on POWER ON) see page 7.
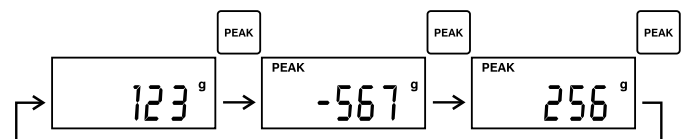
Memory Modes

The memory of the DFS series operates in three distinct modes:

1. On-demand memory mode (single)
2. Continuous memory mode
3. Standard memory mode

ON-DEMAND MEMORY MODE (SINGLE)

The unit comes from the factory set on the on-demand mode. One hundred data can be stored in memory by pressing the MEMO SET switch. If more than one hundred data are forced into memory, the word FULL will appear on the display. To recall the data in the memory press the RECALL switch. The last data and memory position show up on the display first. Any subsequent switch pressing will decrement the data and memory position

By pressing the ≫ key, the last data in memory will be erased. If unit is allowed to go OFF and then ON again, the last data cannot be erased by pressing the ≫ key. To clear the memory press RESET and ON switch at the same time.

The display will show ⎣CCCC⎦ momentarily and then go to all zeros. If RECALL is pressed, the display will show ⎣nonE⎦ momentarily.
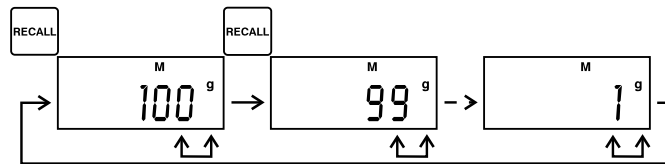

STATISTICS

After the desired data has been stored in memory, set the gauge in the RECALL mode and press the PEAK mode switch. The last memory position will be displayed and also the data in that position.

Subsequent manipulations of the peak switch will bring up maximum, minimum, average data, and standard deviation. See diagram below:

After standard deviation, by pressing peak again the unit goes to maximum. To escape from statistics press the RECALL switch. To escape from RECALL press the RESET(ESC) switch.
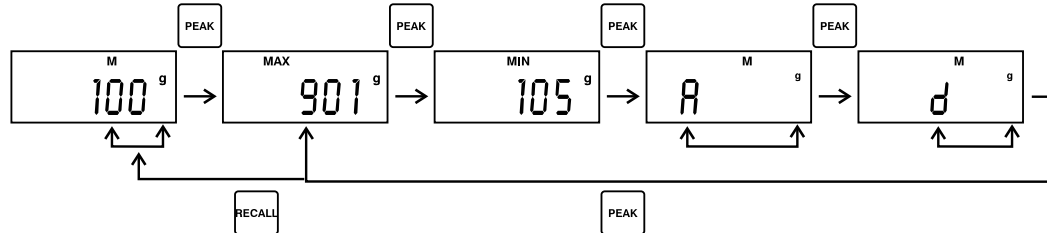
TO CLEAR MEMORY

To clear memory from all data, press RECALL switch first and then press simultaneously the ON and RESET switches.

The display will show ⎣CCCC⎦ momentarily and everything will default to MEASURE (ready) state.

Note: If the "UNIT" switch is pressed after a set of data has entered the memory and new data is attempted to enter the memory in different "units", the display will show ⎣Er07⎦ which means that this action should be avoided. You cannot change units during the process of entering data into memory.

CONTINUOUS MEMORY MODE

If the continuous memory mode must be used, do the following to change from the ON-DEMAND mode to continuous mode.

1. Press ON & PEAK at the same time. Display will show `· dSPt`.

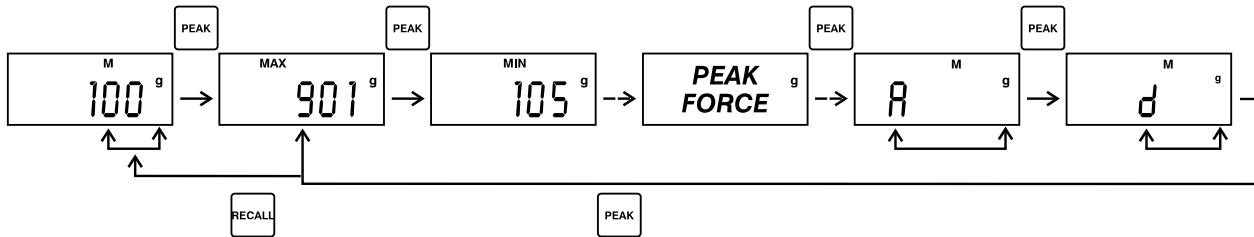2. Press PEAK. Display will show `· PFSt`.

3. Press PEAK 5 times. Display will show `· LoG`.

4. Press MEMO SET. Display will show `Si nG`.

5. Press PEAK. Display will show `nonE`.

6. Press PEAK. Display will show `Cont`.

7. Press MEMO SET. Display will show `· dSPt`.

8. Press RESET. Now you are in the continuous memory mode.

You can enter 100 measurements at once in this mode.

While force is applied on the shaft, press MEMO SET.

The display will be changing according to force applied and the letter M will be blinking on top of the numbers. When 100 measurements have entered the memory, the M letter will disappear momentarily and the word FULL will appear on the display momentarily and the letter M will reappear solid. You can recall each measurement by pressing the RECALL switch. To clear the memory press RECALL, then RESET and ON at the same time and the cycle can be repeated.

Statistics can be performed in this mode as previously described. If the `· PFSt` is OFF, statistics can be performed as described in previous pages. If the `· PFSt` is ON, then the PEAK force will show up between MIN and A (minimum and average).

STANDARD MEMORY MODE

Follow the same procedure as the one described above to select the standard memory mode. The display will show nonE. Proceed with steps 7 and 8 described above to stay in the standard mode. In this mode the maximum and minimum force (tension and compression) and last measurement are

stored in memory in a selected period of time and can be recalled later. If the selected period falls between a continuous compression and tension measurement, then the maximum compression and tension force will be stored and the minimum will be zero for both.

MEMORY BACK UP

When power is off, memory back up is provided by the batteries. If batteries are getting low, before a new set is installed it is important to use the AC adapter and leave

power ON before removing old batteries otherwise data in memory will be lost. When the AC adapter is used the batteries are used as a memory back up system <u>only.</u>

COMPARATOR

Two set points are available HI and LO.

Note: When the Digimatic output is selected, the comparator output is not available. HI point is defined as follows:
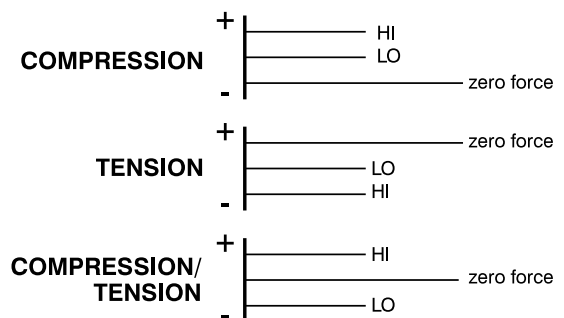
HI < DATA (display)

OK or GO is defined as follows:
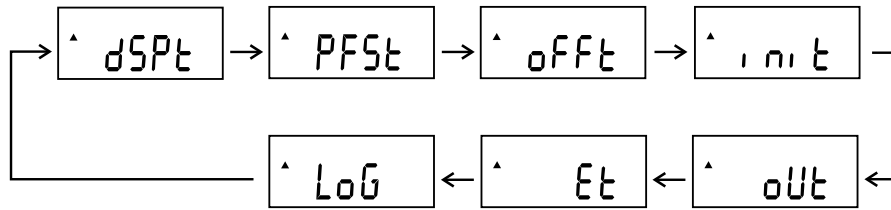
LO ≤ DATA ≤ HI

LO is defined as follows:

LO > DATA (display)

When setting the HI and LO limits, see adjacent diagrams.

How to Set Limits

Press △ to set upper limit. The arrow on the upper left corner of the display will blink and the display will show previous HI point (limit). Change setting by using the ▷ and △ keys. After setting HI point, press MEMO SET to transfer into memory. Unit is now ready to accept the lower point (limit). Use the same procedure to accomplish LO point setting. If it is attempted to set LO point higher than the HI point the unit defaults to the beginning of the procedure. When data exceeds these limits an arrow by the display pointing upward or downward will indicate which limit is exceeded. There are three OC NPN transistors that turn on respectively if the corresponding set points are reached, HI, GO and LO. These outputs can be used as alarms or indicators for the limits set. To erase any or both of the set points, just set them to zero. Erase HI point first.

Set the HI point to zero and press MEMO SET. Then set LO point to zero and press MEMO SET. This is the only way they can be erased from the memory. To check set points at any time press the △ switch. The gauge comes from the factory with both HI and LO points set to zero.

Parameter Setting

Many parameters can be set depending on operator's requirements. See typical parameters in the table below.

PARAMETER DESIGNATION	DISPLAY	TYPICAL VALUE
DISPLAY UPDATE (Measuring time)	˙ dSPt	0.125, 0.25, 1, 2, sec. (select one)
PEAK FAST MODE (1000 sample/sec)	˙ PFSt	ON, OFF (Select one)
AUTO POWER OFF	˙ oFFt	NONE, 3 minutes (select one)
INITIAL CONDITIONS **"Unit" when powered up.** **Measuring mode when powered up.**	˙ init	unit: kg(g), N, lb(oz) display: average, peak tension, peak compression

OUTPUT	˙ oUt	• None
		 • RS232C
		   Baud rate: 1200, 2400, 4800, 9600 (choose)
		   Data length: 7 or 8 bits
		   Stop pulse: 1 or 2 bits
		   Parity: none, even, odd
		   Data end code: CR, CR + LF
		   Software flow control: ON or OFF
		 • Digimatic

EXTERNAL
 Control input
	˙ Et	• None
		 • Tare
		 • Hold
		   Trigger: Edge, level
		   Trigger timing: contact close enable
		                 contact open enable

MEMORY MODE	˙ LoG	• Single (on-demand) • Continuous • None (standard)

How To Select Parameters

1. Press ON and PEAK switches simultaneously. The gauge will display `˙ dSPt`.

2. Press PEAK. The displaywill show `˙ PFSt`. By pressing the PEAK switch the display will show the following sequence:

```
→ ˙ dSPt → ˙ PFSt → ˙ oFFt → ˙ init ┐
                                      ↓
  └ ˙ LoG ← ˙ Et ← ˙ oUt ←───────────┘
```

3. If you choose `˙ LoG`, press the MEMO SET switch. The action will get you in the memory field (single, none or continuous).

   Note: If you press the RESET switch while you are in the memory field, the unit will default to step 2 `˙ LoG`.

4. Press PEAK to display and choose any of the three modes.

```
→ SinG → nonE → Cont ┐
└────────────────────┘
```

5. Press MEMO SET to enter your selection, like `Cont` → `˙ dSPt`. After selection is made press RESET.

Measuring Time and Peak Fast Mode

Measuring time: Select one of the four time periods 0.125, 0.25, 1, or 2 seconds. When the peak fast mode is OFF, the gauge will average the data for the selected period at the 1000/sec. rate. When the peak fast mode is ON, the gauge will capture the maximum peak value from all data for the selected time period at the 1000/sec. rate.

The table at right shows the response time of the various models. Due to mechanical limitations the table shows the 90% response time (see graph 1).

MODEL	RESPONSE TIME
DFS-0.5, 1	35 ms
DFS-2	12 ms
DFS-5, 10	8 ms
DFS-20, 50, 100	6 ms

Response times are shown with small attachments. If heavier attachments are used the response time will be slower.

Graph 1
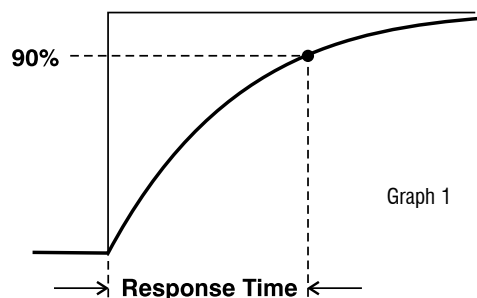
Setting Measuring Time and Peak Fast Mode

See flow chart below. Press ON and PEAK switches simultaneously. The display will show dSPt

Set measuring time and PEAK fast mode as the diagram below indicates.
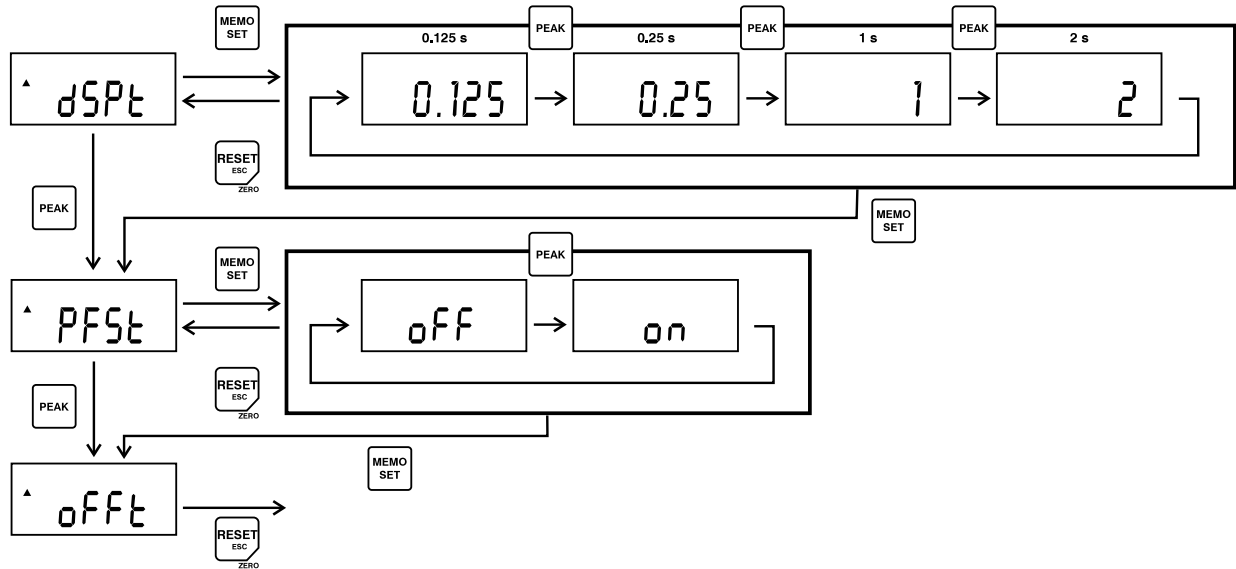

Auto - Power - Off

This option can be selected. If the auto-power-off option is selected, the power will be turned off automatically after 3 minutes if no switches are activated during that time and if no force change occurs during the 3 minute period. Force change must be less than 0.1% of gauge's capacity to be defined as no change.

The auto-power-off will not work if

a) not selected

b) unit is in the continuous memory mode and data are entering memory

c) AC adapter is in use

d) Unit is in calibration mode

Here is how to set up or cancel the auto-power-off option.
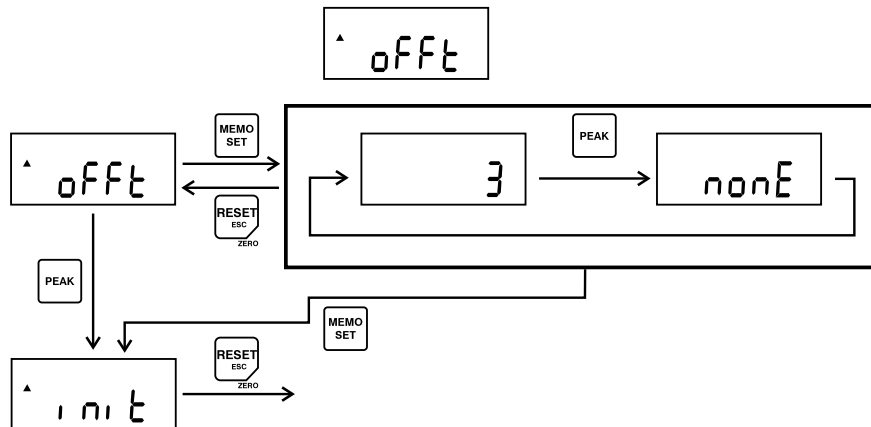
Setting of Initial Conditions

The gauge comes from the factory with the "unit" set in lbs and the "measuring mode" in average. The "unit" condition can be changed to N or Kgs by depressing the "unit" push button. If a unit is selected other than lbs., when the power is turned off and on again the gauge defaults back to initial

setting which is lbs.

The same holds true if the gauge is set at the auto-power-off condition.

To opt out of this condition follow the diagram below.

See page 7 to get to ⌐ init and follow diagram as shown.
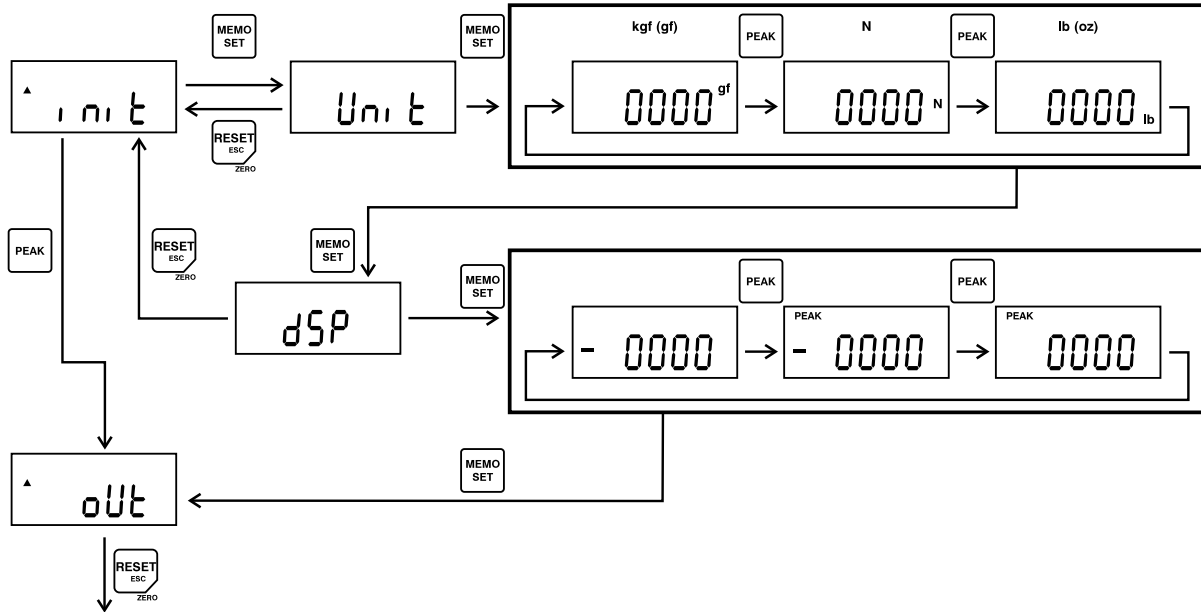
Output Selection

The operator has the option in selecting:

  a) RS232C

  b) Digimatic

  c) None

See page 7 and set the display on the ⌐ oUt

See flow chart below to select any of the outputs above.

Go to RS232C
Parameter
Settings
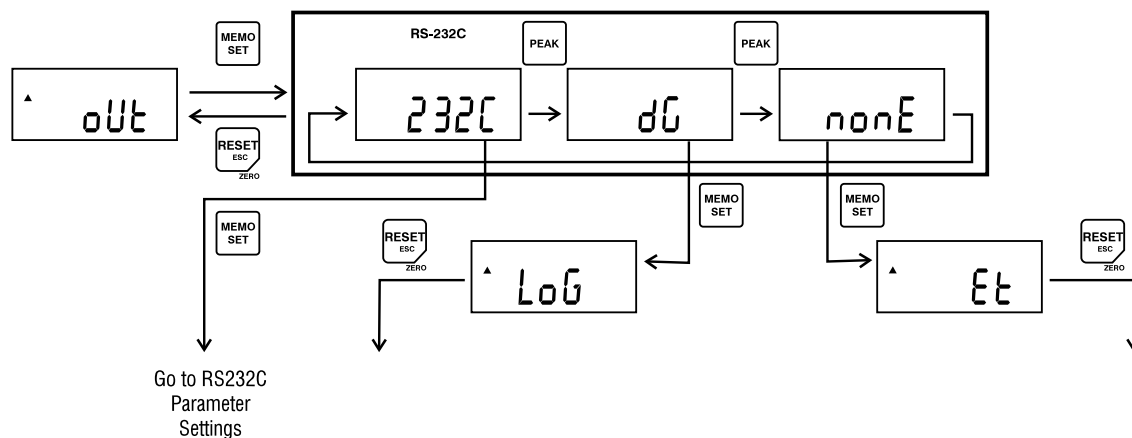
RS232C output

If the RS232C output is selected, more parameters must be chosen. See flow chart below:

		4800 bps		9600 bps		1200 bps		2400 bps
bPS	MEMO SET →	4800	PEAK →	9600	PEAK →	1200	PEAK →	2400

			PEAK	
dAtn	MEMO SET →	8	→	7

			PEAK	
StP	MEMO SET →	2	→	1

			PEAK		PEAK	1200 bps
Prt	MEMO SET →	nonE	→	E	→	o

		CR + LF	PEAK	CR
dEL	MEMO SET →	CrLF	→	Cr

			PEAK	
FLo	MEMO SET →	oFF	→	on

MEMO SET → ▲ Et   RESET ESC / ZERO
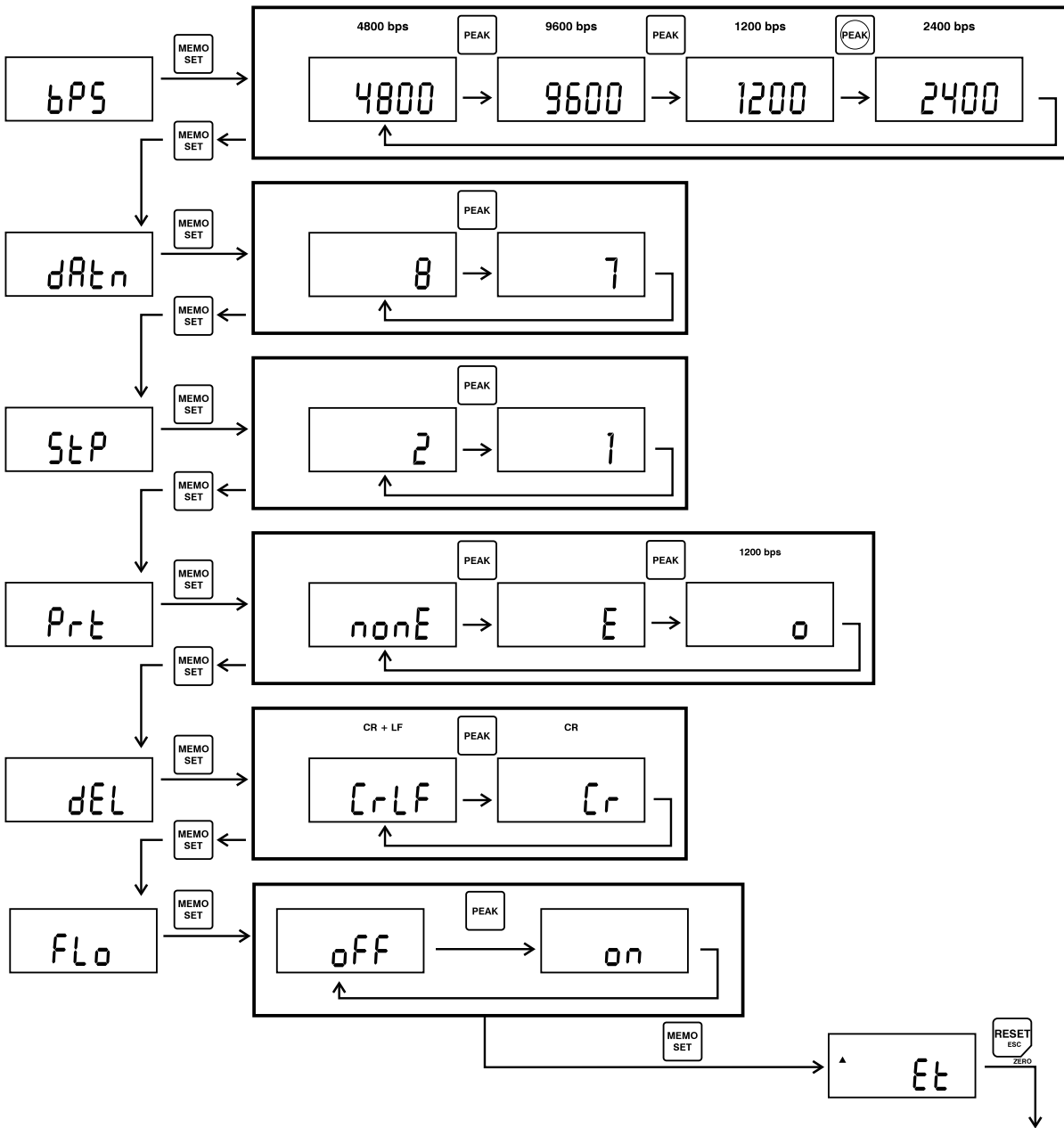
When you have entered the RS232C output field and you don't want to change the factory settings, just press RESET and you will exit this field.

Choosing Memory Mode

See page 7 to get to ⌐ LoG . Choose one of the memory
modes according to the diagram shown below:
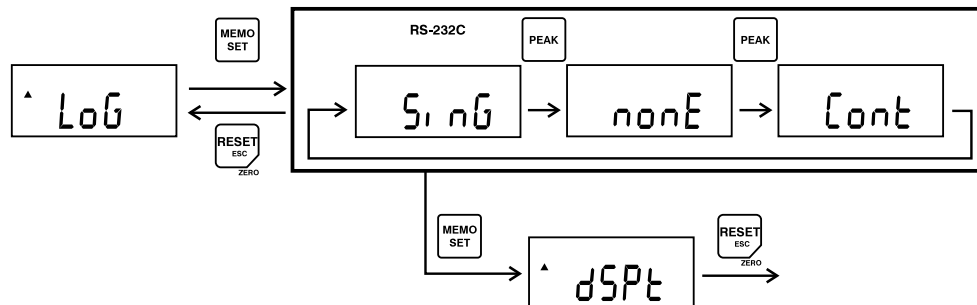
Error Codes

If any of the error codes show up in the display,
turn power off and then on. If the error code
remains, see table below:

DISPLAY	CONDITION	ACTION
Er01	E PROM [2] reading error	Press RESET. Unit should go to factory settings
Er02	Temperature compensation error	Bad temperature compensating ckt. Send unit for repair. Unit may be used if temperature is not a problem. Press RESET.
Er03	Calibration error	Unit needs repair and recalibration
Er04	D/A converter error	Analog output will not tare. When tare is pressed the voltage will not go to zero. All else is OK. Repair is needed. Press RESET.
Er06	RS232C communications error	Check connections and all RS232C parameters
Er07	Memory unit error	This occurs if "units" are changed during memory data entering. Some data in lbs, then some in kgs, etc. Change units or clear memory
EEEE	Overload condition or load cell damaged	• Use proper load • Repair unit by changing load cell

Low Battery Indication

When the letter B shows on the display, it means that the
batteries have to be changed. **Note:** Memory back up is
accomplished thru the batteries. Before changing batteries,
in order not to lose data in memory, plug in AC adapter and
turn gauge on.

External Control Input

TARE and data display HOLD can be externally controlled.

The Digimatic output shares the same wires as the external control input. Make sure to use the RS232C output or no output when the external control input function is used.

The external input cable looks like the one below:

Input: 5VDC, 0.3mA
Pulse width: >25ms
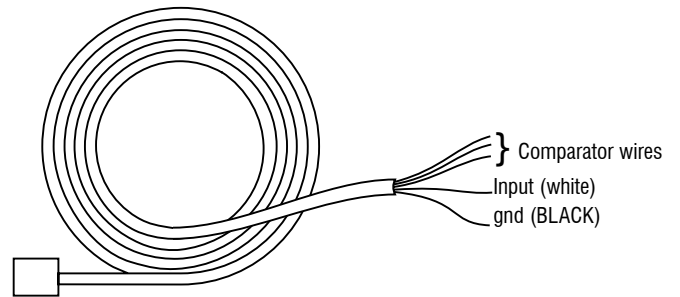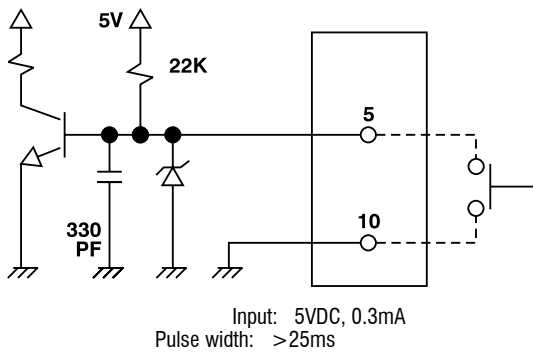
External TARE

To tare, short pins 5 and 10 for at least 25 ms.

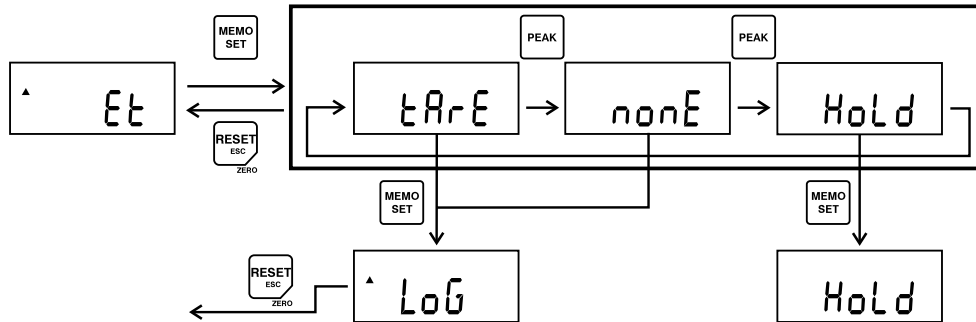## External HOLD

Choose edge or level trigger and also OPEN or CLOSED condition.

1. Level trigger: OPEN
   Display holds present value when switch opens.

2. Level trigger: CLOSED
   Display holds present value when switch closes.

3. Edge trigger: OPEN
   Display holds present value after switch opens until it is reset.

4. Edge trigger: CLOSED
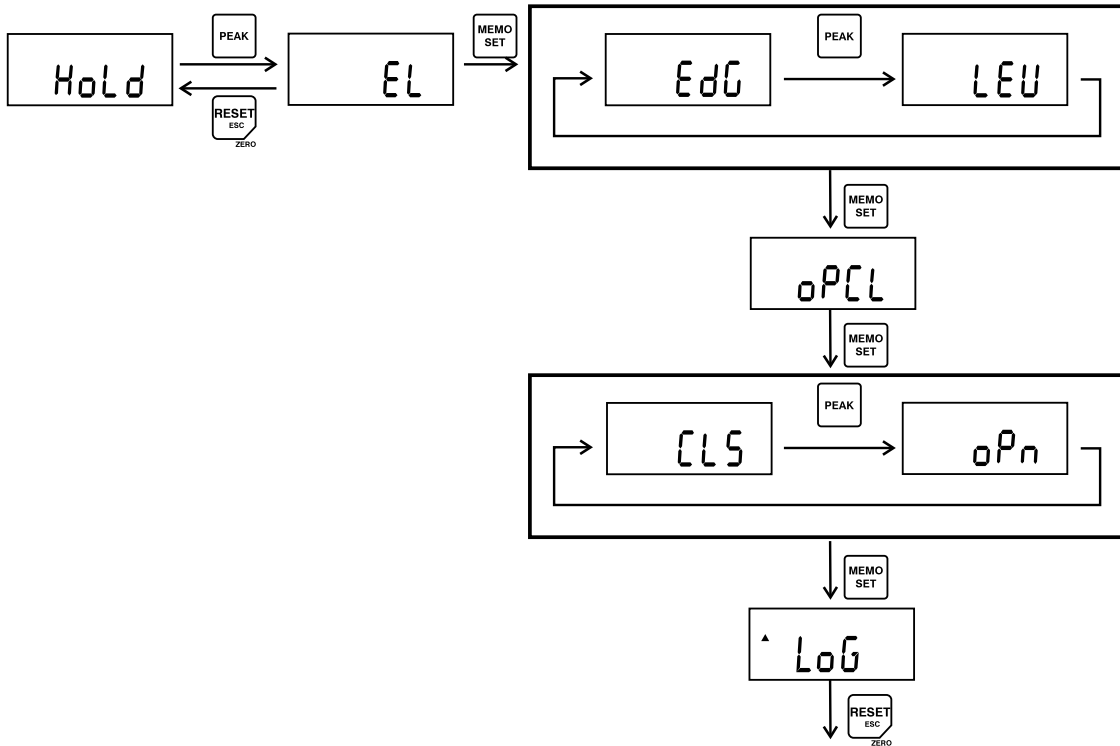   Display holds present value after switch closes unitl it is reset.
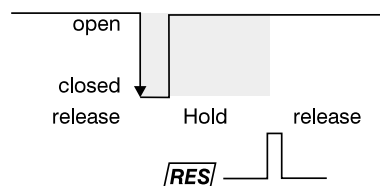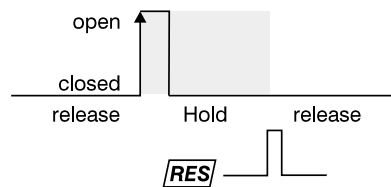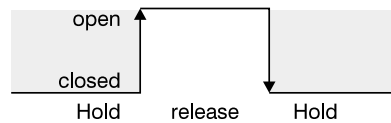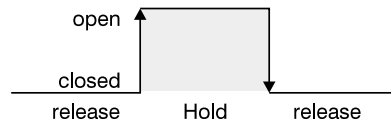
HOLD cannot be released from an external source in the edge trigger mode. To release it press RESET. Level mode can be released externally.

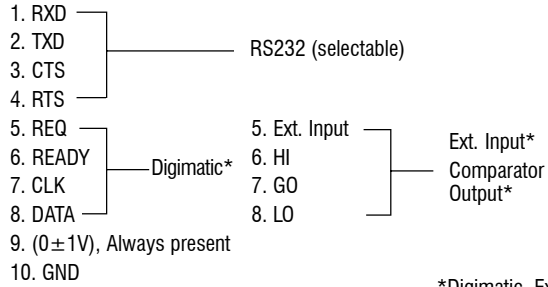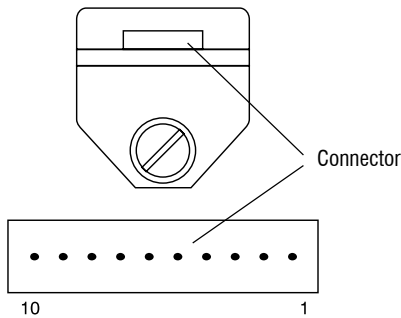# External Input Selection

From page 7 go to [` Et]

When in HOLD mode, select trigger mode as follows:

Output

There are four outputs available:

1. RS232C
2. Digimatic
3. Analog
4. Comparator

Connector

10   1

1. RXD ┐
2. TXD ├── RS232 (selectable)
3. CTS │
4. RTS ┘
5. REQ ┐
6. READY ├── Digimatic*
7. CLK │
8. DATA ┘
9. (0±1V), Always present
10. GND

5. Ext. Input ┐
6. HI ├── Ext. Input*
7. GO │   Comparator
8. LO ┘   Output*

*Digimatic, External input and
 Comparator output share wires.

I. Analog Output

The analog output is not derived from the CPU but is
generated from the load cell and amplifier. It is very linear
and has a high response time. When in TARE mode, the
analog output goes to zero volts.
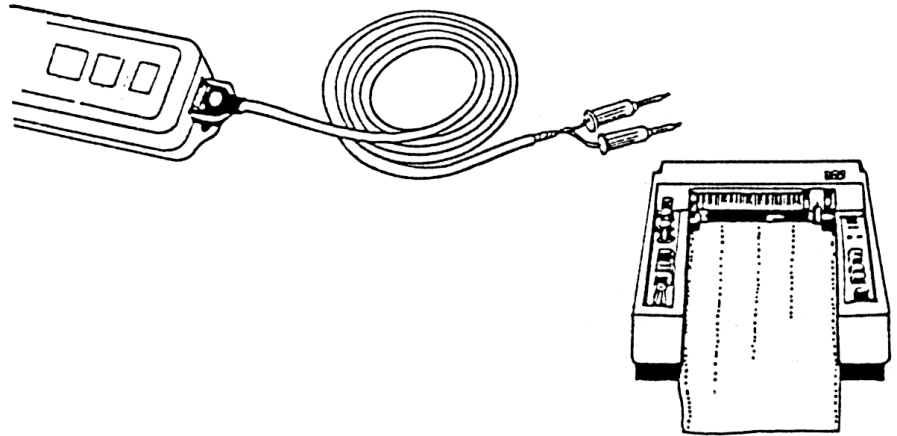
Specifications

Voltage: -1VDC ~ 0 ~ +1VDC

Load Impedance: 2K or higher

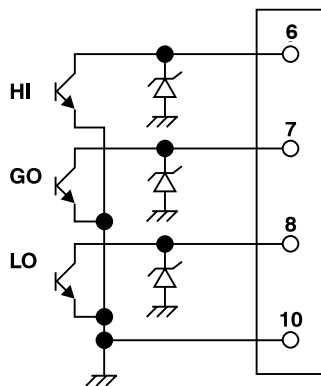Response Time: 35mS (DFS-0.5/1)

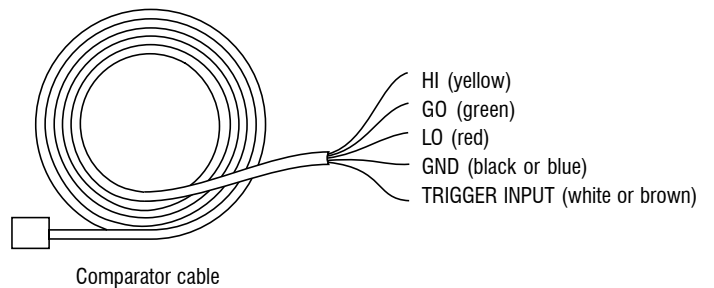12mS (DFS-2)

8mS (DFS-5/10)

6mS (DFS-20/50/100)

Comparator Output

The comparator output shares wires with Digimatic and
External input, therefore when Digimatic is selected, the
comparator output is not available.

HI

GO

LO

6

7

8

10

OC output
28 VDC, 7mA (max)

HI (yellow)
GO (green)
LO (red)
GND (black or blue)
TRIGGER INPUT (white or brown)

Comparator cable

Digimatic Output

Connect cable between gauge and Mitutoyo Model DP-1HS printer. Select Digimatic output according to previous instructions described on page 9. Press RECALL to display DATA in memory. Then press MEMO key. All data in memory will be outputed into the printer. During the transfer of DATA from unit to printer the doUt word on the display will be blinking. When all data have been transferred, the unit returns to measuring mode and the display stops blinking.

RECALL   MEMO SET

M
123 ^{g} M
100 → $doUt$ → M 123 ^{g}

Display alternates
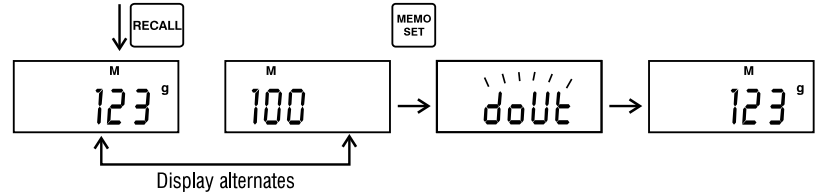
If the printer DATA key is pressed, only one measurement at a time is transferred into the printer. STATISTICS from the gauge will not be outputed because the printer has its own capability of performing all the statistical functions.
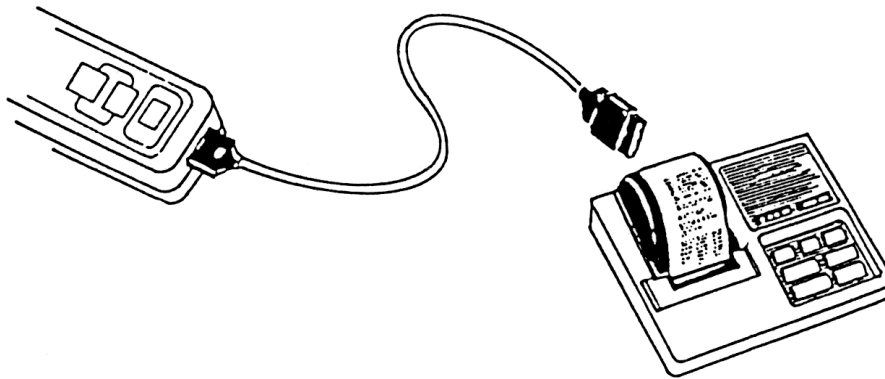
```
  98  10.006   M
  99  10.001   M
 100  10.000   M

PART NO.
................
DATE/TIME
................
NAME
................

*RESULT*
N          100
MAX   10.053   M
MIN    9.949   M
R      0.104   M
       0.01921 M
       0.01931 M
      10.00262 M
```

RS232 Communications

All communications between the gauge and the PC are possible with only one exception, the PC cannot turn the gauge ON and OFF.

| BAUD RATE	1200, 2400, 4800, 9600
DATA	8 bits
STOP BITS	1, 2
PARITY	none, even, odd
DATA END CODE	CR, CR + LF
SOFTWARE FLOW CONTROL	(X ON, XOFF)
HARDWARE FLOW CONTROL	CTS (clear to send signal)
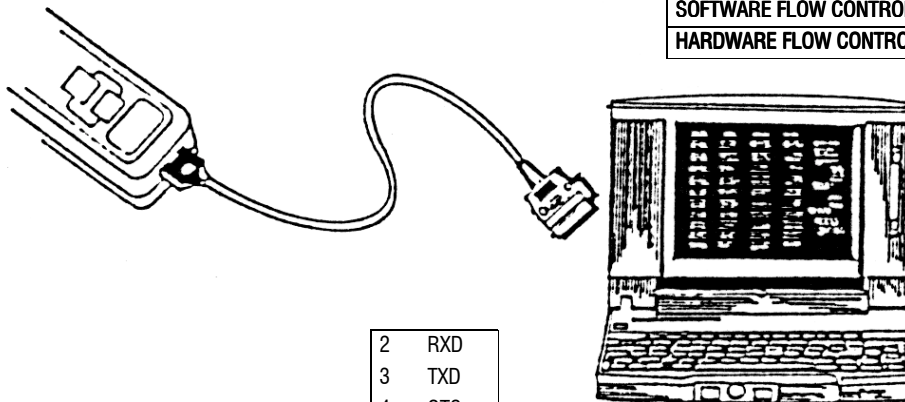
2	RXD
3	TXD
4	CTS
5	RTS*
7	GND

*RTS is always a "space"
  (+5 to +10VDC)

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Memory DATA output thru RS232C

Data can be transferred from the memory in all three modes.   Press RECALL to display memory DATA and then press MEMO SET

Display alternates
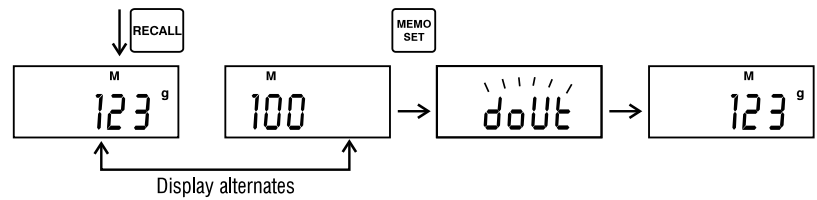
ON-DEMAND STATISTICS	CONTINUOUS STATISTICS	STANDARD Units lbs Max 98.8
Units lb	Units lb	Max - 0.0
DATA 100	DATA 100	MIN
MAX	MAX	MIN
MIN	MIN	LAST
AVG.	PKC	**END**
DEV	PKT	
HLMT	AVG	
LLMT	DEV	
	HLMT	
	LLMT	
DATA		
1 XXXX		
2 XXXX	DATA	
3 XXXX	1 XXXX	
	2 XXXX	

RS232C

Output DATA format from gauge

1	2	3	4	5	6	7	8	9	10	11	12	13
	S	T	A	T	I	S	T	I	C	S	CR	LF
CR	LF											
U	N	I	T	S					g	f	CR	LF
D	A	T	A					1	0	0	CR	LF
M	A	X			—		1	0	0	0	CR	LF
M	I	N			—				1	0	CR	LF
P	K	C								0	CR	LF
P	K	T			—		1	1	0	0	CR	LF
A	V	G			—			9	1	2	CR	LF
D	E	V						8	.	2	CR	LF
H	L	M	T		—		1	0	0	0	CR	LF
L	L	M	T		—			9	0	0	CR	LF
CR	LF											
	D	A	T	A	—			9	1	5	CR	LF
		1										
		2		L	—			8	9	5	CR	LF
	9	9		H	—		1	0	0	5	CR	LF
1	0	0						9	9	0	CR	LF
	*	*		E	N	D		*	*			

External control command

ASCII Capital Characters

COMMAND	FUNCTION	DATA
UNTG	Change units to g or kg	
UNTN	Change units to N	
UNTL	Change units to lb or oz	
DSPN	Change mode to average	
DSPT	Change mode to peak tension	
DSPC	Change mode to peak compression	
PKCL	Peak clear reset	
MEMS	Display value stored in memory	
CPST	Upper and lower limit set	±dddd±dddd
MEMC	Last data in memory clear	
MEMD	Memory data output	
MEMZ	Clear all data in memory	
MEMN	Memory location recall	
Z	Tare	
UPD	Display update	1, 2, 3, 4
APF	Auto - power - off	0, 3
EXS	External input setting	Z, H, N
HLD	Hold trigger mode	E, L O, C
LOG	Memory mode setting	S, C, N
PKF	Peak fast mode	0, 1
D	Output displayed data	
DATN	Output average mode data	
DATT	Output tension peak data	
DATC	Output compression peak data	
LIST	Gauge's present state	

External control command

ASCII Capital Characters

- UNTG, UNTN, UNTL - Change UNITS to Kg, N, lb

    UNTG CR... Kg(g)
    UNTN CR... N
    UNTL CR... lb (oz)

- DSPN, DSPT, DSPC - Change to average, peak tension, peak compression mode.

    DSPN CR... Change to average mode
    DSPT CR... Change to peak tension mode
    DSPC CR... Change to peak compression

- PKCL _____ Peak Clear

PKCL CR.... Peak reset. Same as reset from the gauge. If edge trigger is selected for HOLD, the PC can release the HOLD using this particular command.

- MEMS, MEMC, MEMD, MEMZ, MEMN
    (five control memory commands).

MEMS CR.... with this command if gauge is set in the ON-DEMAND (single) mode, it sends back to the computer the word SING. If gauge is set in the continuous or standard mode then when this command is sent and the gauge's memory starts, it sends back to PC the word STA. If memory stops, the word STP is sent back to the PC.

    MEMC CR.... Last DATA in memory to clear
    MEMD CR ....Memory DATA recall
    MEMZ CR ... Clear all DATA in memory
    MEMN CR ....Memory location recall

- CPST _____Comparator Setting

    CPST 0 0000 0 0000 CR
         SIGN UPPER SIGN LOWER
              LIMIT   LIMIT

  Example: CPST □ 1234-0123 CR
                  SPACE   need 4-digit # (fill with zeros)

- Z _____ TARE

Z CR .... To TARE. Works the same way as if it were done thru the gauge i.e SHIFT + ZERO.

- UPD _____ Display Update
    Time

    UPD □ CR, □ = 1: 0.125 sec.
                   2: 0.25 sec.
                   3: 1 sec.
                   4: 2 sec.

- APF _____ Auto-Power-Off

    APF □ CR, □ = 0: none
                  3: 3 minutes

- EXS _____External Input Setting

    EXS □ CR   □ = Z: TARE
                   H: HOLD
                   N: NONE

- HLD _____ HOLD Trigger Mode

    HLD □ CR   □ = E: Edge
                   L: Level
                   O: Open Contact
                   C: Closed Contact

- LoG _____ Memory Mode Setting

    LoG □ CR   □ = S: Single
               = C: Continuous
               = N: Standard

- PKF _____ PEAK Fast Mode

    PKF □ CR   □ = O: OFF
               = 1: ON

- D, DATN, DATT, DATC _____ Data output request
    (4 commands)

    D   CR .... Output displayed DATA
    DATN   CR .... Output average mode DATA
    DATT   CR .... Output tension PEAK DATA
    DATC   CR .... Output compression PEAK DATA

- LIST _____ Gauge's present state

    LIST   CR (Command from PC)

    MDL   DFS-0.5
    Units   g
    DSPM   Normal
    DSPT   0.125 sec
    PKFST   ON
    OFFT   3 min
    232C   4800   B8   S2
    232C   PN   CR LF   X OFF
    CP   ON
    HLMT   200.0
    LLMT   100.0
    ET   HOLD
    ET   LEVEL CLOSE
    LOG   NONE

    Typical gauge response

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■ Gauge Response

OK .... Command accepted
ERRO .... Did not recognize command*
ERR1 .... Command cannot be processed*
ERR2 .... Wrong nomenclature, i.e N,S,C*
ERR3 .... Communications error*
IN HOLD ... When in HOLD, certain commands cannot be processed.
IN MEMORY.. When in continuous memory mode or standard mode (active), certain commands can be processed.

*Check command and resend

UNITS CHANGE DISABLE .... This output is transmitted to PC when someone is trying to change UNITS while memory is accepting DATA.

■ Flow Control

Flow control can be accomplished by CTS input and software.

1. Control by CTS

When CTS is a "space" (5 ~ 10VDC), communications are enabled. When CTS is a "mark" (-5 ~ -10VDC), communications are disabled.

2. Software flow control

If software flow control is selected, communications flow control can be accomplished thru RS232C by sending XON or XOFF. XON (enable: ASCII position D_1→H11). XOFF (disable: ASCII position D_3→H13). If "disabled" is over 5 seconds, Er06 is displayed momentarily, unit defaults to measure mode and communications stop.

■ Over-load output

When load exceeds approximately 120% of gauge's capacity an open collector transistor turns ON (there are two OC NPN transistors, one for tension and one for compression). The output of these transistors can be used as an alarm or to stop a process, thus protecting the gauge or the sample (material) under test.

OVERLOAD OUTPUT CONNECTOR

3 — TENSION
2 — COMPRESSION
1 — COM
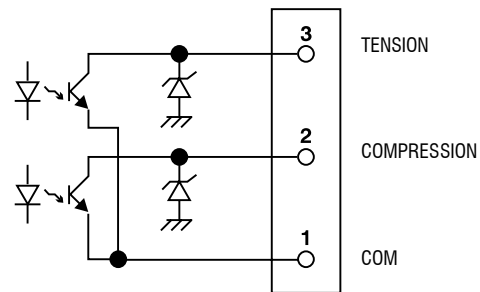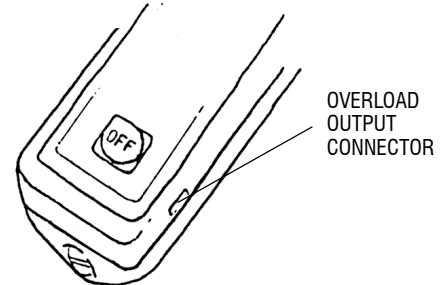
Both transistors can handle up to 28VDC, 5 mA.

■ Statistics

Statistics for up to 100 measurements can be performed using the following formulas:

$$(DATA) = n, \quad (AVE) \;\; \overline{x}=\Sigma \; \overline{x}i/n, \quad (DEV) \;\; 6= \sqrt{\Sigma(xi - \overline{x})^2 /n}$$

Note: For above calculations only absolute values are used even though algebraic signs may appear on the display.

Calibration

The DFS series is an easy series to calibrate. At the same time certain caution should be excersised not to lose the calibration data in the process.

- Before proceeding with calibration
  a) Secure a stand or some kind of fixture.
  b) Secure calibration weight
  c) Calibration weight has to be precise, full scale and in Kg/g only.
  d) Avoid vibration totally.

Note: If the analog output is used, steps 1 thru 15 must be used. If the analog output is not used, steps 1 thru 11 must be used. When steps 1 thru 11 are used, the analog zero maybe slightly off.

Calibration Procedure

1. Turn power off. Use hook attachment and mount unit on a stand or fixture up-side-down.

2. Press MEMO SET first and hold, then press ON and hold for approximately 4 seconds till display shows CAL.

3. Press MEMO SET. Display will go to hex data. Wait approximately 10 minutes for the unit to warm up.

4. Zero position calibration

   Press MEMO SET with no load. Down arrow will blink and after 6 seconds it will go on solid and display will show a hexadecimal number between 7E0 and 8C0 which has no particular meaning to the operator.
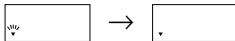
5. Hang calibration weight. Press MEMO SET. Upper arrow will blink and after 6 seconds it will go on solid. The display will show a hexadecimal number depending on the particular model under calibration. This number has no meaning to the operator.
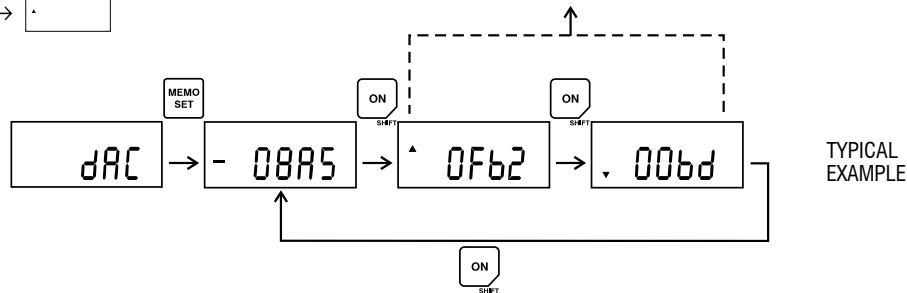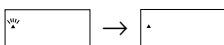
6. Now SPAN calibration is complete. Turn power off.

7. Take unit out from stand or fixture and place it in a horizontal position.

8. Press MEMO SET first and hold, then press ON and hold for approximately 4 seconds. The display will show CAL.

9. Press MEMO SET and wait approximately 30 seconds.

10. Press MEMO SET again. Arrow will blink and then go solid.

11. Calibration is now complete. Turn power off. DO NOT press MEMO SET before turning power off, otherwise you will have to start with step 2 again.

12. Keep unit in horizontal position and press RECALL and ON simultaneously and hold for approximately 4 seconds till display shows dAC .

13. Press MEMO SET. The unit will display - along with a hexadecimal number depending on the output residual analog voltage.

14. Measure analog output voltage and adjust to zero using the △ and ▷ switches. If ▷ switch is pressed, the output voltage increases. If the △ switch is pressed, the output voltage decreases.

15. Press MEMO SET and then turn power off.

Note: After step 12, be careful not to touch the ON key. If the ON key is touched accidentally, the display will go to some hexadecimal number. To default press ON key twice. The display will show the number as in step 13 above. See diagram below.

TYPICAL EXAMPLE

Specifications

MODELS	DFS-0.5 DFS-0.5R	DFS-1 DFS-1R	DFS-2 DFS-2R	DFS-5 DFS-5R	DFS-10 DFS-10R	DFS-20 DFS-20R	DFS-50 DFS-50R	DFS-100 DFS-100R
CAPACITY	8 oz 200 g 2 N	16 oz 500 g 5 N	2 lb 1000 g 10 N	5 lb 2 Kg 20 N	10 lb 5 Kg 50 N	20 lb 10 Kg 100 N	50 lb 20 Kg 200 N	100 lb 50 Kg 500 N
RESOLUTION	0.01 oz		0.001 lb		0.01 lb			0.1 lb
	0.1 g		1 g	0.001 Kg		0.01 Kg		
	0.001 N		0.01 N			0.1 N		
ACCURACY	±0.2% FS + 1/2 digit at 23°C							
DISPLAY	4-Digit LCD, 11.5 mm High with various indicators including Low Battery Indication and minus sign for Tension.							
MEASURING MODE	Average, Peak Compression, Peak Tension (selectable)							
DISPLAY UPDATE	125 ms, 250 ms, 1 sec, 2 sec (selectable)							
SAMPLING RATE	Average Mode: 125 ms, 250 ms, 1 sec, 2 sec Peak Mode: 1 ms, 125 ms, 250 ms, 1 sec, 2 sec							
TEMPERATURE COEFFICIENT	Zero: ±0.02% FS/°C (max.), Span:±0.015% of reading/°C (max.)							
OUTPUTS	1. RS232C 2. Digimatic: (works with Mitutoyo's printer model DP-1HS) 3. Analog: (±1VDC with load impedance of 2K or higher and tare function capability.)							
OVERLOAD CAPACITY	200% of FS							
COMPARATOR OUTPUT (Set Points)	Three open collector NPN transistors for HI, GO, and LO (28VDC, 7 ma max.)							
OVERLOAD OUTPUT	Two open collector NPN transistors one for Tension and one for Compression (28VDC, 5 ma max.)							
TARE & HOLD CONTROL	Relay contact (selectable)							
MEMORY	Holds 100 samples plus statistics (MAX, MIN, AVG, and Standard Deviation)							
POWER	4 - AA Alkaline batteries. Last approx. 20hrs. in continuous operation or AC Adapter for continuous use (6VDC, 200 ma)							
AUTO POWER SHUT-OFF	Selectable (3 minutes if there is no activity)							
OPERATING TEMP RANGE	32 - 113°F (0 - 45°C)							
DIMENSIONS/WEIGHT	3"W x 1.77"H x 9.72"L (76 x 45 x 247)mm /1.2 lbs. (550 g)							
ACCESSORIES (Included)	Batteries, carrying case, overload output cable, AC adapter, 6 adapters (flat head, hook, chisel, notched head, cone & extension rod)							
ACCESSORIES (Available)	Test stands, RS232C cable, Digimatic, analog and comparator output cables.							

FRONT VIEW
76 (2.99)
12 (.47)
13.4 (.53)
NOTE
000.0
80 (3.15)
233 (9.18)
153 (6.03)
37 (1.46)

LEFT SIDE VIEW
45 (1.77)
22 (.87)
40 (1.58)

REAR VIEW *
50 (1.97)
41 (1.61)
57.5 (2.26)
3-M5 DEPTH 4mm

*DFS – 0.5 to DFS – 10 models

BOTTOM VIEW
76 (2.99)
45 (1.77)
37 (1.46)

NOTE : M6 P1.0 (DFS-20 and over) M4 P0.7(DFS-10 and less)

KEY: mm (in)

SHIMPO INSTRUMENTS   1701 Glenlake Ave. Itasca, IL 60143 USA (630) 924-7138   Fax (630) 924-0342