

DILLON



Dillon FI-90 Force Indicator User's Manual

UNITED STATES

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

CANADA

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques de la Class A prescrites dans le Reglement sur le brouillage radioelectrique que edicte par le ministere des Communications du Canada.



CAUTION

Risk of electrical shock. Do not remove cover. No user serviceable parts inside. Refer servicing to qualified service personnel.

Weigh-Tronix reserves the right to change specifications at any time.

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FI-90 Specifications

Display:	7-segment LCD, 6-1/2 digits plus sign, .5 inch high, movable decimal, with 7 annunciators	
Display Update Rate:	Two times per second	
Analog-to-Digital Conversion Rate:	60 times per second	
Resolution:	Up to 10,000 divisions standard	
Controls:	Pushbutton zero; pushbutton peak-hold; pound-, kilogram-, Newton-scroll selection; PRINT, MENU, and SELECT keys for configuration; ON / OFF switch (optional: used only on alkaline battery option); BATT / AC switch (optional: used on rechargeable battery / AC versions)	
Peak Detection Rate:	60 times per second	
Peak Detection:	Threshold 1% of capacity setting	
Accuracy :	Span: ± 5.0 ppm/C	Zero: ± 0.066 μ V/C (-10 to 40°C)
Linearity:	$\pm 0.005\%$ of capacity, maximum	
Repeatability:	$\pm 0.005\%$ of capacity, maximum	
Hysteresis:	0.005% of capacity, maximum	
Power:	Std - 117VAC +10/-15% 50/60Hz	5 watt
	Opt - 230VAC +10/-15% 50/60Hz	5 watt
	Opt - 12VDC +10/-15%	130mA max.
Load Cell Drive Capacity:	Up to four 350-ohm load cells. Up to twelve 1000-ohm load cells. (+5VDC load cell excitation voltage)	
Environment:	-10 to 40°C (14 to 104°F) 10 to 90% relative humidity	
Calibration and Programming:	All calibration and programming is done through the front panel with data stored in non-volatile memory.	
Analog Range:	-0.14 to +3.5 mV/V	
Scale Capacities:	.00001 to 999999, programmable to any number between these limits	
Scale Division Sizes:	.0001 to 20000, programmable to any division size between these limits	
Pushbutton-Zero Range:	0 to $\pm 100\%$ of capacity; programmable in any percentage of indicator capacity; independent positive and negative limits; unit will not allow zeroing beyond capacity.	
Overrange Capacity:	The indicator displays force measurements up to and including full-scale capacity	

Automatic Zero Tracking:	Window programmable from 0 to 999999 divisions; decimal entries accepted. Tracking in peak-view mode may be enabled or disabled..
AZT (Auto-Zero Tracking) Rate:	0.1 division per second; starting delay of 2 seconds
Annunciators:	Center of zero, pounds, kilograms, newtons, peak, gross, battery status
Standard Enclosure:	ABS grey plastic case with RFI coating
Enclosure Dimensions:	2.65"H x 8.36"W x 9.11"D
RFI Rejection:	Operates in the presence of moderate RFI
RS232 / 20mA Output:	Data is transmitted when PRINT button is pressed. Host computer may solicit data by sending an ENQ character. Auto print and broadcast data are also options. Format programmable. Baud rate options - 300, 600, 1200, 2400, 4800 Parity bit options - even, odd, logic 1, logic 0 Word length - 8 data bits, including parity Stop bit options - one or two
Analog Output:	Dip-switch selectable, isolated outputs: 1 to 5mA, 4 to 20mA, 10 to 50mA, 0 to +5 volts, 0 to +10 volts

Features and Options

Standard AC Version

Options: RS232 / 20mA current loop serial I/O with real-time clock
Dual cutoffs with one programmable input
Analog output
230VAC
Panel mount

AC / Lead-Acid Battery Version

Options: RS232 / 20mA current loop serial I/O with real-time clock
Panel Mount

Features: Rechargeable 6V lead-acid battery
Operates on AC or internal battery
Sleep mode to conserve battery power
26-32 hours between recharge (1 load cell, continuous)
14-16 hours between recharge (4 load cells, continuous)

Alkaline Battery Version

Options: RS232 serial I/O with real-time clock
Panel mount

Features: Long battery life - 5 weeks @ 40 hrs / week for one load cell
Sleep mode to conserve battery power

12VDC Version

Options: RS232 / 20mA current loop serial I/O with real-time clock
Panel mount

Introduction

The FI-90, a full-function force indicator, is available in four versions:

- 1) the standard AC powered version
- 2) an AC lead-acid, rechargeable battery version
- 3) an alkaline battery version
- 4) a 12 volt DC version

Operations mode provides gross force and peak force readings and allows viewing and configuration of one or more of these parameters:

- ID number
- up to two cutoff registers
- time
- date

Keyboard

The key board consists of six keys that control all gross and peak force measuring functions and provide access to configuration and system-test information. See Figure 1.



A dual function key: **UNITS** selects the operational unit of measure; **LEFT ARROW** enters data.



Enters data.



Selects menu topics.



A dual-function key: **PRINT** transmits displayed data to a printer, computer, or programmable controller; **SELECT** accepts displayed data in configuration and helps you move around in the configuration hierarchy.



A dual-function key toggles between gross mode and peak-view mode and displays gross force or peak force.



A dual-function key: In gross mode, **ZERO** established a zero reference; In peak-view mode, **CLEAR** clears the retained peak value and displays the current gross load input.

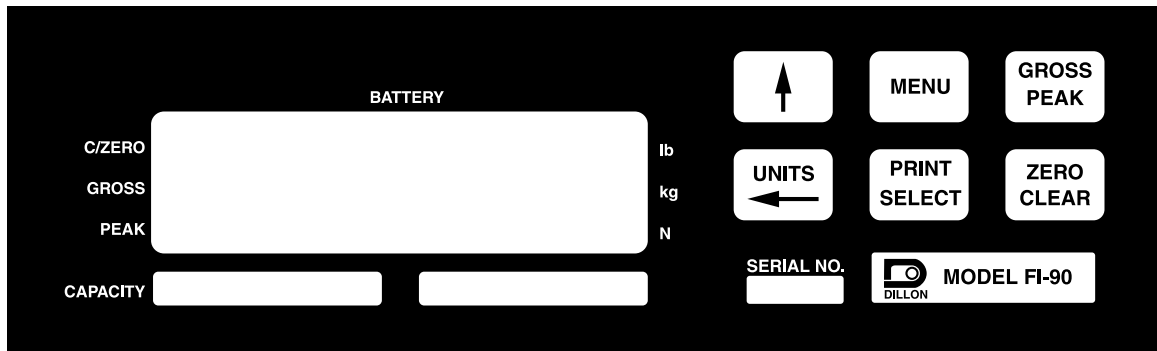


Figure 1
FI-90 Front-Panel Keyboard, Annunciators, and Display

Annunciators

Gross	illuminates when the indicator is in gross mode.
Peak	illuminates when the indicator is in peak-view mode.
lb, kg, N	illuminates to show the active unit of measure.
Battery	illuminates when the battery voltage is low. "D" cells should be replaced or a lead acid battery recharged.
C/Zero	illuminates when the indicator is within $\pm 1/4$ division of zero or the force at which the indicator was zeroed.

Display Messages

[-----]	The indicator is in a state of over capacity.
[.....]	The indicator is in a state of under capacity.
[8888888]	Appears briefly at the time of power on. The indicator is being initialized.
[Loc'd]	The A-D converter is locked up. Applied force is too high or too low.
[ASLEEP]	The indicator has gone to sleep to conserve on battery power. Make it operational again by pressing any key.

Powering Up

The method of powering up depends on the type of power supply your indicator uses. Look at the back panel of your indicator and the four back panel illustrations below and identify the one that matches your indicator. Then follow the appropriate power-up instructions on the next page.

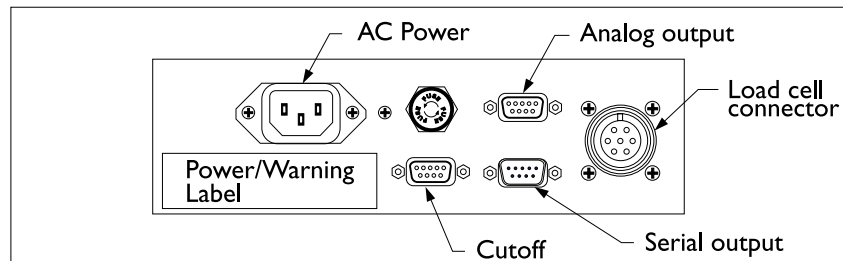


Figure 2

Back Panel of Standard AC-Powered Version

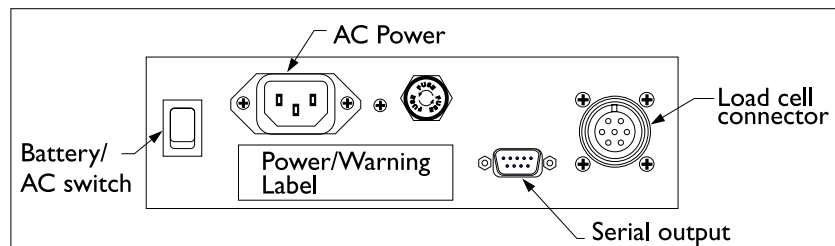


Figure 3:

Back Panel of AC / Lead-Acid, Rechargeable-Battery Version

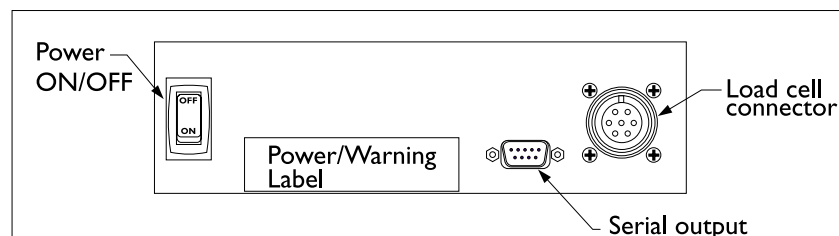


Figure 4

Back Panel of Alkaline-Battery Version

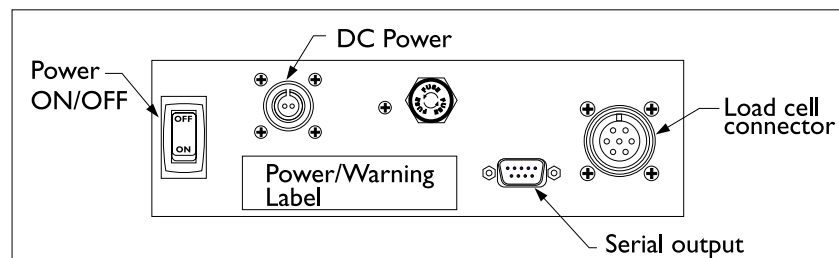


Figure 5

Back Panel of Twelve-Volt-DC Version

The FI-90 indicator powers up in the same mode it was in when power was removed.

For the standard AC version (See Figure 2): Plug the power cord into the back of the indicator and connect the cord with an external AC power source.

For the AC / lead-acid battery version (See Figure 3): The power switch controls your choice of AC power or internal lead-acid battery power. To use external AC power, depress the bottom portion of the power switch, and plug the power cord from an AC power source into the AC receptacle. To use the internal lead-acid battery, depress the top portion of the power switch.

For the alkaline battery version (See Figure 4): Press the power switch to the ON position (lower portion depressed).

For the 12-volt DC version (See Figure 5): Press the power switch to the ON position (lower portion depressed).

Getting Around in the Operations Menu

Your unit is configured to display gross force or peak force. It may also be configured to display one or more of the following functions: ID number, one or two cutoff registers, time, and date. *This manual assumes the unit is configured to allow full access to all functions.* The following flowchart and instruction procedure explains how to move around in and use the operations menu.

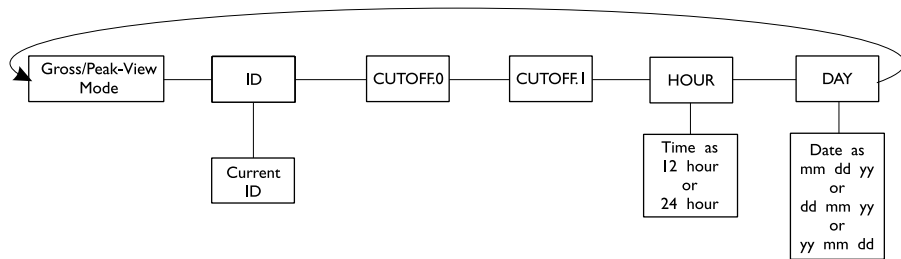


Figure 6
Operations Menu

Press **MENU** to →

Press **SELECT** to go ↑ or ↓

Press and hold **MENU** to go ←

Press **SELECT** to select new choice and go ↑

Measuring Gross Force

- | | |
|---|--|
| 1. Power up the indicator. . . | The FI-90 powers up in the same mode it was in when power was removed. |
| 2. Access the gross mode. If the gross annunciator is not illuminated, press GROSS / PEAK once. . . | The gross annunciator illuminates (See Figure 2). |
| 3. Zero the FI-90 by pressing ZERO / CLEAR (Any stable applied force up to full-rated capacity may be zeroed off). . . | 0 is displayed. Any small changes in force are zero tracked automatically and the displayed zero is maintained. |
| 4. Select unit of measure by pressing UNITS . . . | The units annunciator indicates your selected unit of measure. |
| 5. Apply force . . . | The applied gross force is displayed. |

Measuring Peak Force

This procedure allows the FI-90 to monitor a varying force and hold the peak value.

- | | |
|---|--|
| 1. With the indicator powered up in the gross mode, zero by pressing ZERO / CLEAR and apply force. . . | Gross displayed value increases to reflect increasing live force. |
| 2. Press GROSS / PEAK to access peak-view mode. . . | The peak annunciator comes on. Displayed is the <i>incrementing peak value</i> . It reflects the live gross force continuing to increase. |
| 3. Remove force, or await removal of force. . . | The force now displayed is the <i>retained peak value</i> . Retained peak is measured precisely at the maximum load sensed by the indicator before force is reduced. Retained peak value stays displayed while the live gross force drops. |

In peak load applications, removal of force occurs when maximum tension or compression strength of the material or product is met.

4. View and, if necessary, record the retained peak value. Press **PRINT / SELECT** to transmit data to a peripheral device—printer, chart recorder, or computer or other programmable controller—if interfaced via the RS232 or 20mA option.

5. Clear the last retained peak value by pressing **ZERO / CLEAR**, and re-apply force. . .

The retained peak value is released and **0** is momentarily displayed. The display increments in the peak-view mode, reflecting increasing live gross force.

6. You may view increasing force in the gross mode by pressing **GROSS / PEAK**. . .

The gross annunciator comes on and gross force is displayed. **Important:** The next peak captured (see step 8) will not be displayed with the FI-90 toggled to gross mode, but the peak will continue to be tracked and can only be viewed in the peak-view mode.

7. As desired, you may again view your last retained peak (displayed by step 4) by toggling **GROSS/PEAK**. This key allows you to toggle between peak-view mode and gross mode.

8. Repeat steps 3, 4, and 5 for each peak force measurement needed. . .

The indicator will capture the new retained peak when force goes above the last retained peak, even if it is not displayed, and you can toggle to the peak-view mode to view it as desired.

Entering or Viewing an ID Number

You may enter an identification number of up to seven digits.

1. While in gross weighing mode, press **MENU** repeatedly until. . .

ID. is displayed.

2. Press **PRINT / SELECT**. . .

The current identification number is displayed.

3. You now have two choices, A or B:
 - A. Accept the displayed ID by pressing either **GROSS / PEAK** or **PRINT / SELECT**. . . **GROSS / PEAK** takes you directly out to the gross mode. **PRINT / SELECT** displays *ID*.

Or

- B. Enter a new ID of up to seven digits. Use the data entry procedure shown in the section, *Entering Data with Arrow Keys*. Then press **PRINT / SELECT**. . . The new ID number is accepted and *ID* is displayed.

Entering Data with Arrow Keys

Introduction

The arrow keys are used to enter data for the ID number, cutoff numbers, time, and date. Refer to this section whenever the manual instructs you to *enter data* for one of those parameters.

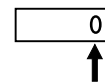
Entering data is all done through a single edit character position on the display. The **UP ARROW** key increments the digit displayed in the edit-character position up to the value needed, and the **LEFT ARROW** key moves the configured digits to the left, out of the way, and brings up a new zero digit in the edit-character position. The FI-90 allows you to enter up to seven character positions of data.

ID Number as an Example

If at any time you enter an incorrect character, press ZERO / CLEAR to backspace and delete the wrong character, then re-key.

To teach the procedure, we'll show you how to enter the three-digit ID number, 603. The same keying principles generically apply to your entry of ID, cutoffs, time, and date.

1. Starting from a display of the current identification number (the outcome of step 2 under *Entering or Viewing an ID Number*), press the **UP ARROW** key. . .



First, a zero is displayed in the edit character position, indicated here by an arrow. Only in the edit-character position can you edit the numeric value of a digit upward or downward.

2. Start with the left-most digit (in our example, a 6). Pressing **UP ARROW** one depression for each whole number, increment the displayed number up to the desired value. . .

6
↑

3. Then press **LEFT ARROW** to bump the 6 a single space to the left and display a 0 in the edit-character position. . .

60
↑

4. The 0 in the edit-character position is acceptable for our example's second digit, so no depressions of **UP ARROW** are required for it. Instead, press **LEFT ARROW** again to bump the 60 a single space to the left and again display a 0 in the edit-character position. . .

600
↑

5. Press **UP ARROW**, as necessary, to increment the edit character to the desired value, a 3 in our 603 example. . .

Entry of ID #603 is complete.

603
↑

*A data field of more than the three digits entered in our example ID number would require one additional combination of **LEFT ARROW** and **UP ARROW** keyings for each additional digit.*

Viewing and Entering Setpoints (Cutoffs)

A setpoint cutoff is a force-load value at which an internal electrical connection is broken, causing an external relay to de-energize. Additional relay configurations can turn on or shut off another electrical device.

You may configure the FI-90 to accept either one of two types of cutoff: (1) a gross-based setpoint or (2) an increment-based setpoint. A gross-based setpoint is called, simply, a setpoint. With this type of setpoint, activation of a cutoff is signaled by a specified *gross* applied force. You specify, through the front-panel keypad, the gross force-load setpoint that will activate each cutoff. For example, suppose your first cutoff requires 100 pounds of force, and your second cutoff requires 200 pounds of force; you would set the first setpoint at 100 pounds of force and the second setpoint at 300 pounds of force, because those values will represent gross force load when the cutoffs activate.

With the increment-based setpoint, activation of a cutoff is signaled by a specified amount of *net* force. You tell the indicator the net amount of force required to activate each of the cutoffs. Suppose your first cutoff requires 100 pounds of force, and your second cutoff requires 100 pounds of force; you would enter 100 for setpoint #0 and 100 for setpoint #1.

You can view the type of setpoint that has been configured in your indicator by looking at the cutoff display in the operations menu. A decimal point following the word *cutoff* indicates configuration of gross-based setpoints. If no decimal point appears after *cutoff*, the FI-90 is configured for increment-based setpoints.

The two setpoint registers are numbered #0 and #1.

1. Starting from either gross mode or peak-view mode, press **MENU** twice to access. . .

CutOFF.0 The decimal after *CutOFF* says this is a gross-based setpoint.

Then press **PRINT / SELECT**. . .

nn.n is displayed. The *n*'s represent the current value in register 0.

2. Enter a new setpoint value in register #0, using the procedure presented in the section, *Entering Data with Arrow Keys*. Before you enter any numeric values, specify a negative setpoint, if appropriate for your application. To display a negative sign, "-", use **UP ARROW** to scroll through all digits and characters until the sign is displayed. Then press **LEFT ARROW** to place a new edit character in the edit position. To display a decimal point in your setpoint, scroll similarly through all digits until the decimal is displayed. Use the arrow keys to enter all digits of the new setpoint. When the correct setpoint is displayed, press **PRINT / SELECT** to accept the value and redisplay. . .

CutOFF.0

then press **MENU** to move to the next register (register #1). . .

CutOFF.1 is displayed (if the second setpoint has been configured; if not, you now see the time display). The *1* now displayed stands for setpoint register #1.

3. Press **PRINT / SELECT**. . .

nn.n is the current value in register #1.

4. Enter a new setpoint in cutoff register #1 (See #2 and *Entering Data with Arrow Keys*).

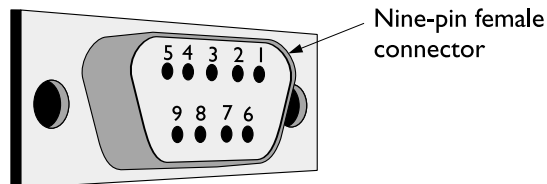
5. Press **PRINT / SELECT** to accept the value and redisplay. . .

CutOFF.1

then press **MENU** to see the clock or **GROSS / PEAK** to go back to gross or peak-view mode.

Cutoff Connections

The cutoff connector located on the bottom of the indicator is a nine-pin female connector. Figure 7 shows the pin assignments.



Signal Name	Pin Number
+12v (on 12v units)	#9
+ Relay voltage	#6
Cutoff 0	#1
Cutoff 1	#2
Logic ground	#5
Shield	#7
Remote input	#4

Figure 7
Cutoff Connection Pin Assignments

Viewing and Setting Time

*If you enter an incorrect character, press **ZERO** / **CLEAR** to backspace and delete the wrong character, then rekey.*

- From gross or peak-view mode, press **MENU** repeatedly until **Hour** is displayed, then press **PRINT / SELECT** . . .
 - Set the clock by entering data in the desired format, as shown in the outcome to step 1 (12- or 24-hour time), using the data entry procedure documented under *Entering Data with Arrow Keys*. Start by changing AM to PM or vice versa, if necessary: use **UP ARROW** to scroll through numbers to this display,
- then press **LEFT ARROW** to change A to P or P to A . . .

A 12-hour clock displays time in hours and minutes, plus A for A.M. or P for P.M: **09 40 A** . A 24-hour clock displays hours, minutes, and seconds: **09 40 38**.

. . - A or **. . - P**

. 0 P or **. 0 A**. Zero is now in the edit-character position, ready for the leftmost digit of the time data string to be entered.

3. After the clock is set, you may press **PRINT / SELECT** to start the clock and return to operations mode menu, . . .

Hour is displayed and the clock begins.

or
press **GROSS / PEAK** to return to gross or peak-view mode. . .

The clock starts at the new time setting.

Viewing and Setting the Date

*If you enter an incorrect digit, press **ZERO / CLEAR** key to clear the display one digit at a time.*

1. From gross or peak-view mode, press **MENU** repeatedly until **dAY** is displayed, then press **PRINT / SELECT**. . .

Depending on the configuration of your indicator you will see the date displayed in one of three ways:

- day-month-year **31.12.92**
- month-day-year **12.31.92**
- year-month-day **92.12.31**

2. To change the date, start by pressing **UP ARROW** to bring a *0* into the edit-character position, and continue using the procedure explained in the section, *Entering Data with Arrow Keys*. Use the same date format that you saw when you displayed the date in step 1.

3. Press **PRINT / SELECT** to return to the operations mode menu, . . .

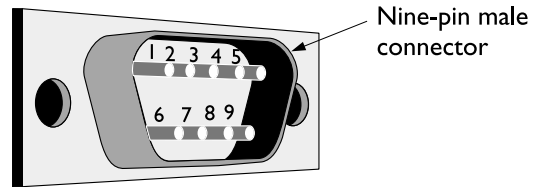
The date is accepted and **dAY** is displayed.

or
press **GROSS / PEAK** to return to gross or peak-view mode. . .

The date is accepted and the display returns to gross or peak-view mode.

Transmitting Data

Your indicator requires an RS-232 / 20mA output for data transmission. The RS-232 / 20mA connector is located on the bottom of the indicator and is a 9-pin male connector. Connect a printer following the pin assignments listed in Figure 8.



RS-232	
Signal Name	Pin Number
Transmit to printer	#3
Receive from printer	#2
CTS (BUSY) from printer	#8
DTR (READY) to printer	#4
Logic ground	#5
Shield	#9

20mA	
Signal Name	Pin Number
TTY REC +	#8
TTY XMT -	#3
TTY REC -	#2
TTY XMT +	#7
Logic ground	#5
Shield	#9

Figure 8
RS-232 Connector Pin Assignments

If your indicator is configured to allow printing, from the gross or peak-view mode, press **PRINT / SELECT**. . .

Data is transmitted and the data configured to be printed will be output to the printer. See Figure 9 for a sample printout.



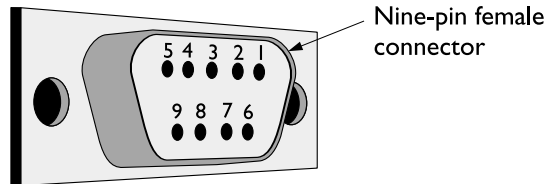
Figure 9
Sample FI-90 Printout

The default settings for serial output are:

Busy	Disabled
Baud	1200
Parity	Clear
Stops	1

Analog Output Option

An optional, isolated analog output provides dip-switch selectable output: 1-5mA, 4-20mA, 10-50mA, 0-5VDC, 0-10VDC. The analog output can be used with programmable controllers, chart recorders, etc. It uses a nine-pin female connector as shown in Figure 10.



Signal Name	Pin Number
Current return	#1
Voltage out	#4
Voltage return	#5
Current out	#6
Chassis ground	#9

Figure 10
Analog Output Pin Assignments

Using Test Mode for Indicator Diagnostics

Test mode allows you to test various functions of the FI-90. A flowchart of the test mode menu is shown in Figure 11, followed by instructions for getting around in the test mode and executing tests.

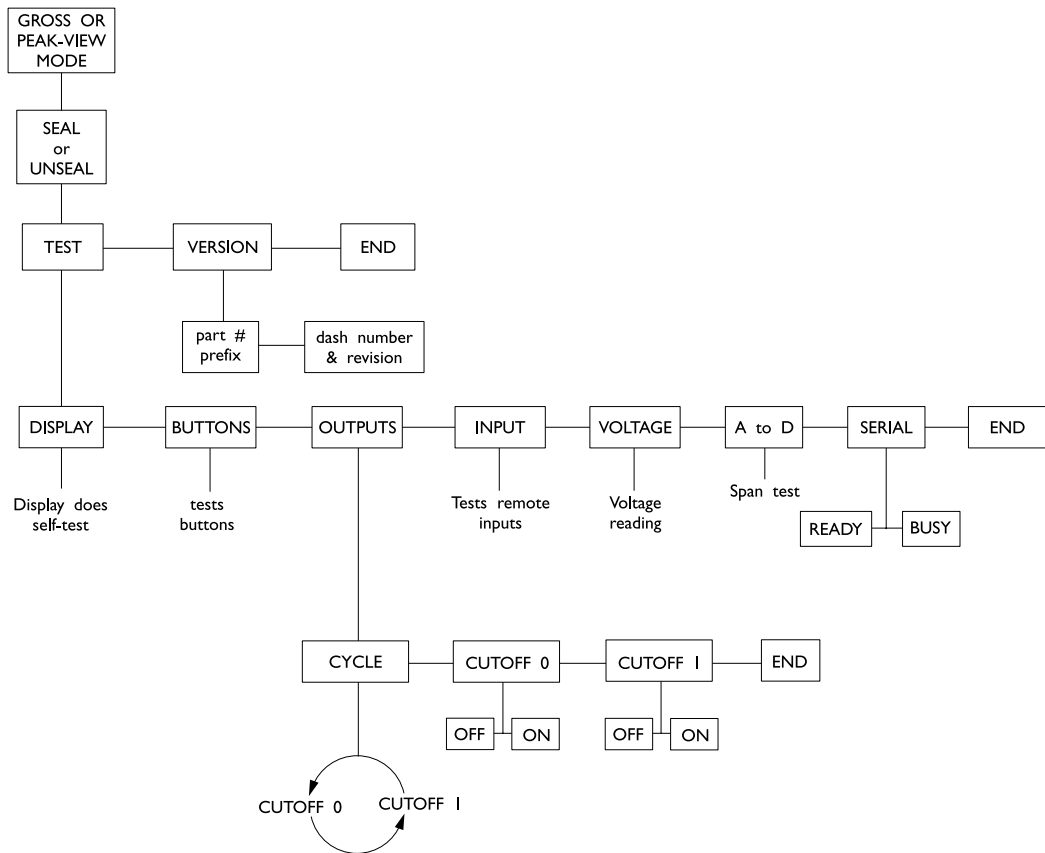


Figure 11
Flowchart of the Test Mode Menu

1. Enter the test mode from gross or peak-view mode by pressing and holding **MENU** until **tESt** is displayed. **SEAL** or **unSEAL** is displayed briefly while you hold the key.
2. Move to the right through the menu selections by briefly pressing **MENU**. Move to the left through the menu selections by pressing **MENU** for one second. Scroll continuously to the left by pressing and holding **MENU**.
3. Move down a level in the test mode hierarchy by pressing **PRINT / SELECT**. Move up a level in the hierarchy: from any display in the hierarchy, by pressing and holding **PRINT / SELECT** for approximately 1.5 seconds; or from the **End** display, by pressing **PRINT / SELECT**.
4. Press **MENU** to toggle between the options under any test parameter, such as the *ready* and *busy* options under the serial test parameter.
5. Press **GROSS / PEAK** to return to gross or peak-view mode at any time.

Descriptions and instructions follow for the tests and parameters you see in the test mode flowchart.

Main Displays Viewed in the Test Mode Menu

VERSION	version	- Under <i>version</i> are the Weigh-Tronix part number for the FI-90 force indicator, and the revision number for the software found in your unit. Weigh-Tronix part numbers are divided into two parts: a five-digit prefix and a four-digit dash number.
DISPLAY	display	- From this display: DISPLAY , press PRINT / SELECT and the top row of annunciators turns on. Press PRINT / SELECT again and a dynamic test is run. Press MENU to stop the dynamic test or consecutively press MENU to step through the display test routine. Press PRINT / SELECT when the dynamic test is active to return the display to DISPLAY .
buttonS	buttons	- With bUttOnS displayed, press PRINT / SELECT and an underscore will appear on the screen. Press any key except MENU to check for proper key functioning. After testing the keys, press MENU to return the display to bUttOnS .
OutPutS	outputs	- These tests allow you to turn the cutoffs on and off automatically in sequence, under CYCLE , or individually, under CUTOFF 1 and CUTOFF 2 . When you exit the outputs test, the cutoffs revert to their proper condition according to the applied gross force.
input	input	- This test tells you how the remote control input is configured. It may be off, or it may be configured as a remote PRINT key control, a remote GROSS / PEAK key control, or a remote ZERO / CLEAR key control. With input displayed, press PRINT / SELECT and an underscore will appear. Activate the external remote switch, and the display will print the name of the key to which the remote input is dedicated, verifying proper functioning of the connection.
VoltAgE	voltage	- The input power voltage is displayed in tenths of a volt. In the battery versions, the BATTERY annunciator comes on when the voltage reaches approximately 5.4 volts.
A to d	A to D	- Displays the analog-to-digital counts. The span is normally 20,000 counts per millivolt per volt. With a calibrator at zero millivolts per volt, the displayed value should be between -200 and +200.
SEriAL	serial	- Tells you if the serial output is ready or busy. A jumper connecting pins 4 and 8 of the serial port will cause READY to be displayed.

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