FV & FV-WP

FV & FV-WP CALIBRATION INSTRUCTIONS

MODELS:

Assembled Scales:
FV-150KA1
FV-60KA1
FV-60KA2
FV-30KA2

Assembled Scales:
FV-150KWP
FV-60KWP
FV-30KWP

Display Pod &
Load Cell Kits:
FV-150KK1
FV-60KK1
FV-60KK2
FV-30KK2

CALIBRATION

Attention

In territories where the FV & FV-WP scales are registered for commercial use, the end-user should not be given this information, as he will not be permitted to break the seals to carry out span calibration for himself. In this case, calibration would be carried out by the responsible authorities, and the calibration settings would then be sealed. Also, the comparator buzzer dip-switch settings on the optional RS-232C output board must also be set by the dealer/authorities. The scale must be shipped to the end-user in a fully assembled form for commercial use.

abc Calibration Introduction

Calibration of the scale is required when it is initially installed, if the scale is moved a substantial distance, or in accordance with local regulations. It is necessary because the weight of a mass in one location is not necessarily the same in another location. Also, with time and use, mechanical deviations can occur. "Weight" equals mass times acceleration due to Earth's field of gravity. The internationally adopted value for gravitational acceleration is $9.80665 \, m/s^2$ ($32.174 \, ft/s^2$) in a vacuum. However, this varies by about ±0.3 percent depending on how far you are from the Earth's center of mass. Mass distorts space in such a way that the gravitational power of attraction is inversely proportional to the square of the distance between material objects (if non-gravitational forces are ignored). So, gravitational acceleration is greatest at the poles, least at the equator and decreases with altitude.

When we weigh a mass we are trying to find its weight expressed as pounds or kilograms. Because "g" and other factors vary from location to location, we must calibrate the scale whenever we move it otherwise a mass of 30kg might display 30.00kg in one location and 30.08kg in another (ie: "g" may have changed by +0.267%. w=m X g). This would be an error but it can be prevented by placing an accurate mass on the scale (say 30kg) and then telling the scale, in effect, "this is what 30kg weighs at this location so please display 30.00kg"..... this is calibration.

The FV & FV-WP series are also equipped with a gravity compensation function which means that it can be calibrated in one location and then adjusted to match the acceleration of gravity at another location. We call this "setting the value of 'g". If you wish to take advantage of this feature, please read the GRAVITY COMPENSATION FUNCTION section.

Please Note

You will need to recalibrate and reset the value of "g" (if for different location use) after a memory loss, Load Cell change, or a new main circuit board.

Simple Zero Calibration
For the End User - See Page 8, User's Instruction Manual v.1

Although the end user may not be permitted to carry out span calibration, he may carry out zero calibration by following the procedure below.

WHEN   Zero calibration is needed if "----" is displayed when the power is turned on, or when the ZERO key will not set the display to zero.

Step 1.   Remove all objects from the Weighing Pan and turn the display ON.

Step 2.   Press the MODE key and ZERO key simultaneously.

DISPLAY   "CAL 0" will be displayed.

Step 3.   Press the ZERO key and the zero point will be entered.

DISPLAY   The display will then return to normal weighing mode.

END   End of SIMPLE ZERO CALIBRATION procedure, continue with normal weighing.

Zero and Span Calibration

The FV & FV-WP platform scales use a calibration system called "FDC™" for Full Digital Calibration. This means that the zero point and maximum capacity points are entered digitally through the keyboard, and it makes the calibration method very easy to remember. FV & FV-WP scales can be calibrated using "lb" (pound avoirdupois) or "kg" (kilogram) calibration weights at maximum capacity or at $2/3$ of maximum capacity. Maximum capacity calibration is preferred, if possible, to reduce the risk of span errors at weights above $2/3$ of the full scale point.
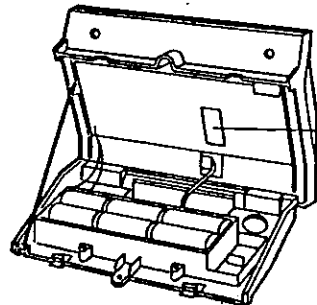
Table A. Calibration Masses Required

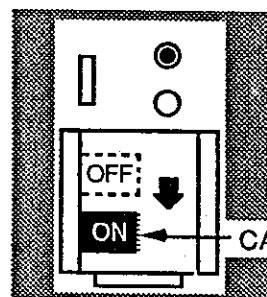| FV Scale	FV-WP Scale	Display Pod & Load Cell	Platform & Load Cell	Load Cell LC:105-30K	Load Cell LC:105-60K	Load Cell LC:106-60K	Load Cell LC:106-150K
FV-150KA1	FV-150KWP	FV-150KK1	FV-150KB1				150kg or 100kg 300lb or 200lb
FV-60KA1	FV-60KWP	FV-60KK1	FV-60KB1			60kg or 40kg 120lb or 80lb	
FV-60KA2	NA	FV-60KK2	FV-60KB2		60kg or 40kg 120lb or 80lb		
FV-30KA2	FV-30KWP	FV-30KK2	FV-30KB2	30kg or 20kg 60lb or 40lb			

Step 1. Warm up the scale for at least 10 minutes before making adjustments. You must be careful of the auto-off function, which turns off the display after three minutes. This can be avoided by:
- Placing an object on the weighing pan,
- Setting the Tare function so the display shows a negative number after the container weight is set and the container removed,
- Disable the auto-off function.

Step 2. With the display ON, remove the calibration plate - Slide **CAL** switch ON⇓.

CAL Switch Port

OFF
ON
CAL Switch

DISPLAY You will now see a display of "9.798" or "9.XXX" (X denoting any other three numbers already set into memory). This is the value of "g", or gravity.

MODE • Use the [MODE] key to view settings, move through the settings, and escape a setting if you have made a mistake.

ZERO • The [ZERO] key enters the zero point, and enters settings into memory.

Step 3. Press **MODE**.

DISPLAY You should now see a display of "CAL 0", with the circular stability indicator on, if not, please turn off the scale and restart at the beginning of this section.

Step 2. Press **ZERO** to enter the zero point.

DISPLAY You will now see a display of "CAL 1".

Step 3. Select the desired "CAL 1", "CAL 2", "CAL 3" or "CAL 4" by pressing the **MODE** key to move between them.

Table B. Calibration Capacity Settings

CAL 1	Means span calibration at maximum capacity in kilograms: 150kg, 60kg or 30kg depending on the scale.
CAL 2	Means span calibration at 2/3 of maximum capacity in kilograms: 100kg, 40kg or 20kg depending on the scale.
CAL 3	Means span calibration at maximum capacity in pounds: 300lb, 120lb or 60lb depending on the scale.
CAL 4	Means span calibration at 2/3 of maximum capacity in pounds: 200lb, 80lb or 40lb depending on the scale.

Step 4.   Place the correct calibration weight on the weighing pan.

Step 5.   After the circular stability indicator comes on, press **ZERO** to enter the setting.

NOTE: If "-CAL E" is displayed when you press **ZERO**, the scale cannot enter the maximum capacity (or $2/3$) value because the calibration mass is under-weight (minus Calibration Error). Check everything is correctly set.

DISPLAY   "End" will be displayed.

Step 6.   Slide the calibration switch OFF while "END" is displayed, and turn off the scale.

- If you are going to set the value of gravity ("g") for a customer at a different geographical location (see the GRAVITY COMPENSATION FUNCTION section), please go to Step 2., SETTING THE VALUE OF "g" section.

Please Note   *Before customer delivery:*

In areas where the FV & FV-WP scales are registered for commercial use, the calibration port cover and the load cell connector cover must be sealed (which extends to deny access to one of the screws which holds the top of the display pod on). Also, the end-user will not be permitted to remove the top of the display pod as he could thereby switch on the calibration switch. Thus, the comparator buzzer dip-switch settings on the optional RS-232C output board must also be set by the dealer/authorities. The scale must be shipped to the end-user in a fully assembled form for commercial use.
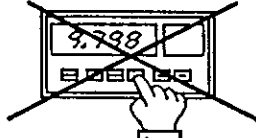
abc Gravity Compensation Function

The FV & FV-WP scales are equipped with a gravity compensation function which means that it can be calibrated in one location - then adjusted to match the acceleration of gravity at another location.

Dealers and Weights & Measures authorities may find this function useful as it will save them having to transport up to 300lb or 150kg in calibration weights to the end-user's location during scale installation. It is solely for this use (when the scale is to be transported to a different geographical area), and it is not intended, nor needed for local or on-sight calibration.
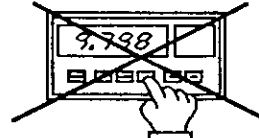
Gravity Compensation Function: Setting the Value of "g"
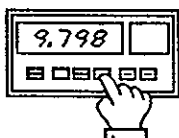
A dealer, or weights & measures authority, can calibrate the scale, then set the value of gravity ("g") - so, that after shipping, the calibration is good at the customer's location.	The dealer does not need to use "Setting the Value of 'g" if the scale is being calibrated for use locally - just use "Zero and Span Calibration".	Once at the user's location, the value of gravity ("g") does not need to be reset when calibrating. Only if the scale is to change geographical location after calibration is resetting "g" necessary.

- The FV & FV-WP scales were calibrated in Tokyo before shipping so, if you do not wish to calibrate the scale again, you can simply set the known acceleration rate (SETTING THE VALUE OF "g") for your customer's location (or your own if it is to be used locally).

- Otherwise, you must complete Zero and Span Calibration, and you will be overriding the "g" function.

- If you are going to use the gravity compensation function (SETTING THE VALUE OF "g"), then you must:
  1. Carry out Zero and Span Calibration. (Not necessary if the scale is fresh out of the box from Tokyo).
  2. Then, set the value of "g" at the end-user's location.
  3. Ship to the end user; the scale will not be accurate in your local area.

- It is best to set the "g" with the actual value of gravity, measured at the location. This can be found in reference tables for the country (or area), or sometimes from a physics laboratory at a local academic institution. Also, if you know the latitude and altitude, you can use the following formula:

Helmert's formula can be used to find the value of "g", the acceleration due to terrestrial gravity, for a given latitude and altitude:

$$g = 9.806\ 16 - 0.025\ 928\ \cos 2\lambda + 0.000\ 069 \cos^2 2\lambda - 0.000\ 003\ 086H$$

"g" is in m/s^2, "λ" means latitude and "H" is meters above sea level.

- Alternatively, please refer to the attached table for the value of "g" at various world wide locations or plot the end-user's position in terms of latitude and altitude on the enclosed graph.
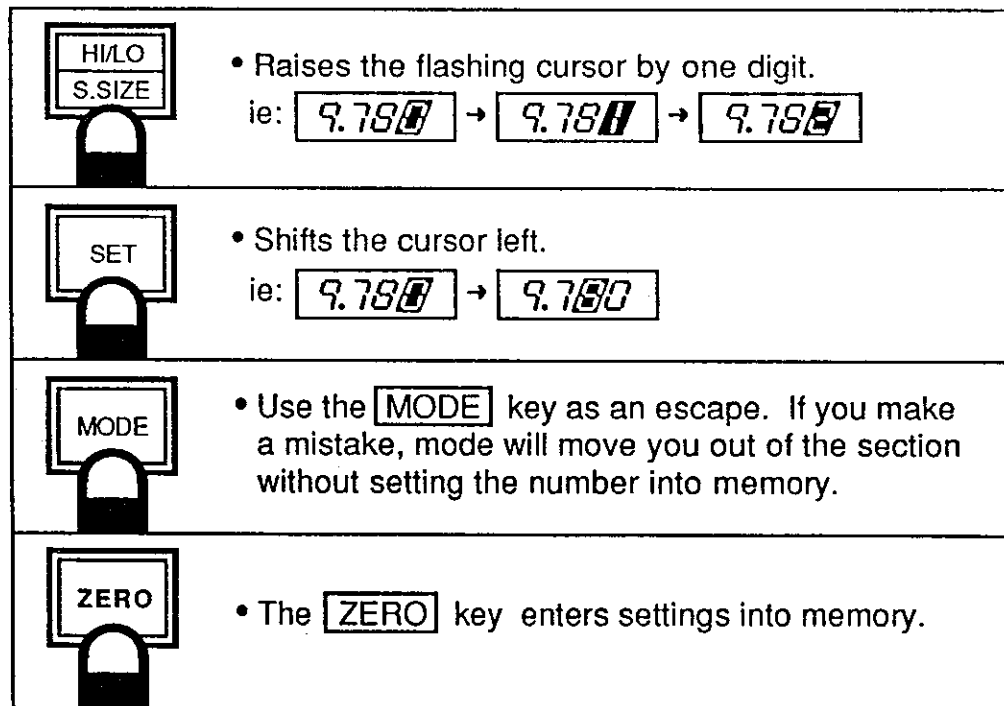
Setting the Value of "g"

Please read the GRAVITY COMPENSATION FUNCTION section before starting this procedure!

Step 1.   Warm up the scale for at least 10 minutes before making adjustments. You must be careful of the auto-off function, which turns off the display after three minutes. This can be avoided by:
- Placing an object on the weighing pan,
- Setting the Tare function so the display shows a negative number after the container weight is set and the container removed,
- Disable the auto-off function (see AUTOMATIC POWER OFF FUNCTION).

Step 2.   With the display ON, remove the calibration plate - Slide the **CAL** switch ON⇩.
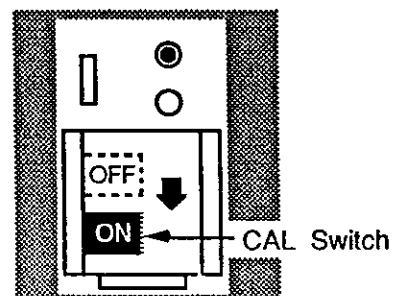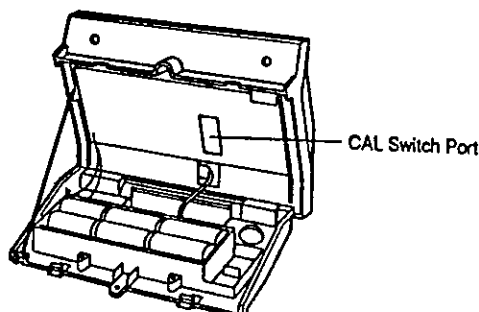
CAL Switch Port

OFF

ON

CAL Switch

DISPLAY   You will now see a display of "9.798" or "9.*XXX*" (*X* denoting any other three numbers already set into memory). This is the value of "g", or gravity. The display "9.798" stands for 9.798m/s^2, which is the approximate acceleration of gravity in Tokyo, Japan (sea level at 36° latitude). Acceleration due to gravity changes with latitude because the North and South poles are closer to the center of the planet earth than the equator.

- To set the value of "g", the function keys are used in the following manner.

HI/LO / **S.SIZE**	• Raises the flashing cursor by one digit. ie: `9.780` → `9.781` → `9.782`
SET	• Shifts the cursor left. ie: `9.780` → `9.700`
MODE	• Use the MODE key as an escape. If you make a mistake, mode will move you out of the section without setting the number into memory.
ZERO	• The ZERO key enters settings into memory.

Step 2.   Use the **HI/LO** key to increase the digit that is flashing incrementally by one, (ie: 1→2→3).

Step 3.   After the desired digit is displayed, use the **SET** key to shift the cursor left to the next digit.

Step 4.   After the desired number is displayed, press **ZERO** to enter the setting into memory and proceed to the ZERO AND SPAN CALIBRATION section.

Step 5.   Switch off the calibration switch and seal the calibration port cover and the load cell connector cover (which extends to deny access to one of the screws which holds the top of the display pod on).

Step 6.   Ship to the end user; the scale will not be accurate in the local area.
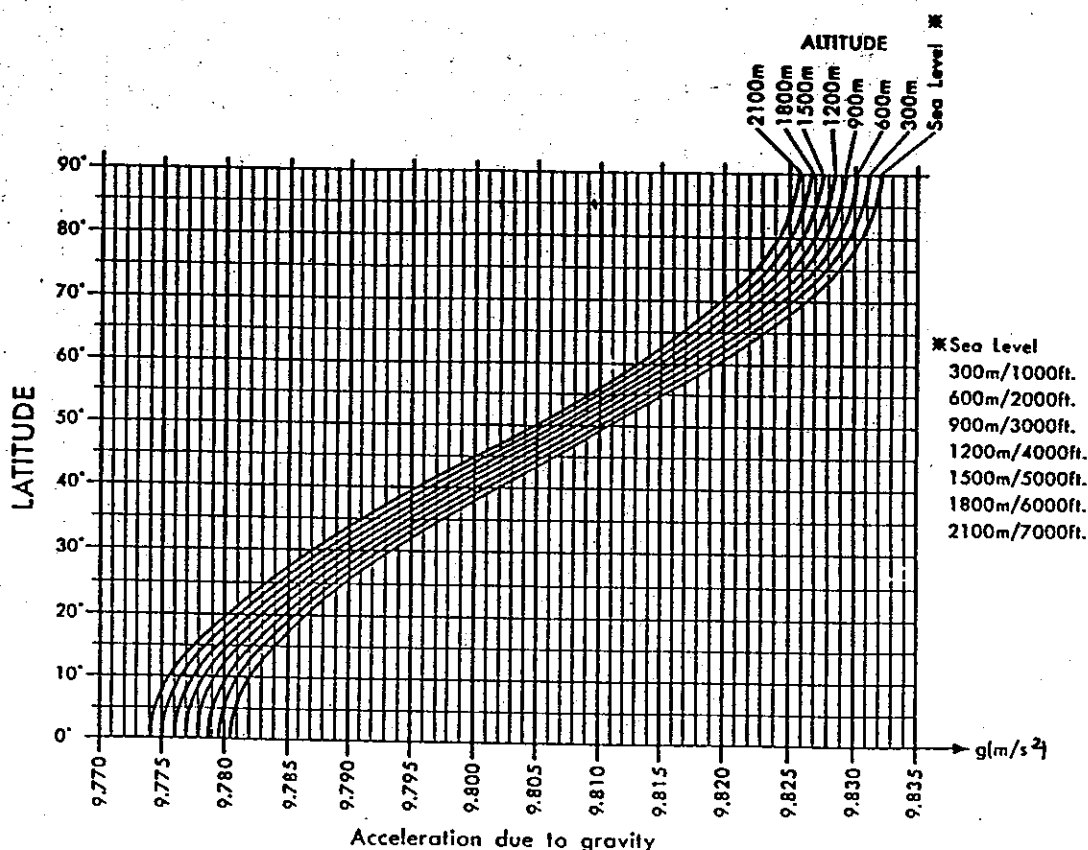
Please Note   *Before customer delivery:*

In areas where the FV & FV-WP scales are registered for commercial use, the calibration port cover and the load cell connector cover must be sealed (which extends to deny access to one of the screws which holds the top of the display pod on). The end-user will not be permitted to remove the top of the display pod as he could thereby switch on the calibration switch. Thus, the comparator buzzer dip-switch settings on the optional RS-232C output board must also be set by the dealer/authorities. The scale must be shipped to the end-user in a fully assembled form for commercial use.

END   End of SETTING THE VALUE OF "g" procedure.

THE VALUE FOR "g"
AT VARIOUS WORLD-WIDE LOCATIONS

Amsterdam	9.813	m/s^2	Manila	9.784	m/s^2
Athens	9.800	m/s^2	Melbourne	9.800	m/s^2
Auckland NZ	9.799	m/s^2	Mexico City	9.779	m/s^2
Bangkok	9.783	m/s^2	Milan	9.806	m/s^2
Birmingham	9.813	m/s^2	New York	9.802	m/s^2
Brussels	9.811	m/s^2	Oslo	9.819	m/s^2
Buenos Aires	9.797	m/s^2	Ottawa	9.806	m/s^2
Calcutta	9.788	m/s^2	Paris	9.809	m/s^2
Capetown	9.796	m/s^2	Rio de Janeiro	9.788	m/s^2
Chicago	9.803	m/s^2	Rome	9.803	m/s^2
Copenhagen	9.815	m/s^2	San Francisco	9.800	m/s^2
Cyprus	9.797	m/s^2	Singapore	9.781	m/s^2
Djakarta	9.781	m/s^2	Stockholm	9.818	m/s^2
Frankfurt	9.810	m/s^2	Sydney	9.797	m/s^2
Glasgow	9.816	m/s^2	Taichung	9.789	m/s^2
Havana	9.788	m/s^2	Tainan	9.788	m/s^2
Helsinki	9.819	m/s^2	Taipei	9.790	m/s^2
Kuwait	9.793	m/s^2	Tokyo	9.798	m/s^2
Lisbon	9.801	m/s^2	Vancouver, BC	9.809	m/s^2
London (Greenwhich)	9.812	m/s^2	Washington DC	9.801	m/s^2
Los Angeles	9.796	m/s^2	Wellington NZ	9.803	m/s^2
Madrid	9.800	m/s^2	Zurich	9.807	m/s^2

✳Sea Level
300m/1000ft.
600m/2000ft.
900m/3000ft.
1200m/4000ft.
1500m/5000ft.
1800m/6000ft.
2100m/7000ft.

Acceleration due to gravity

World map

LATITUDE