FW-CAL

PLATFORM SCALES

CALIBRATION MANUAL

HIGH RESOLUTION PLATFORM SCALES

MODELS: **FW-10KA2**
FW-15KA2
FW-31KA2
FW-60KA2
FW-100KA1
FW-150KA1
FW-300KA4
FW-600KA4
FW-600KA3
FW-1200KA3

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A&D Company, Limited

Introduction to Calibration

Attention

In territories where the FW scale is 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.

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.

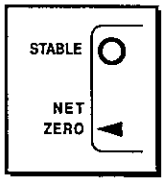
The FW series is also equipped with a gravity compensation function which means that it can be calibrated in one location and then adjusted to match the acceleration of gravity at another location. We call this "setting the value of 'g". If you wish to take advantage of this feature, please read the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

Please Note

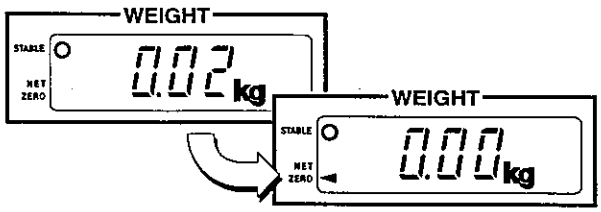
You will need to recalibrate and reset the value of "g" (if for different location use) after a memory loss, Load Cell change, or a new main circuit board.

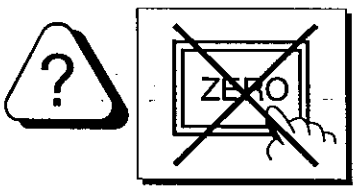
Zero Calibration

The center of zero is reset by the [ZERO] key when the weighing pan is empty, and should not be confused with the NET mode which must be cleared (or returned to zero) by using the [TARE] key which erases the tare value when the weighing pan is empty.



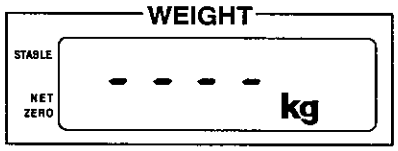
▶ When the display shows a small deviation from zero and the weighing pan is empty (and the tare function is not being used), then press the [ZERO] key to return the display to "0.00".





⚠ If the [ZERO] key will not return display to "0.00":

- Check that the scale isn't in NET mode. If it is, clear the tare before re-zeroing.
- Check that the weighing pan is empty and nothing is touching it.
- If nothing else works, try carrying out CALIBRATION.



⚠ If "----" is displayed when the power is turned on, and the [ZERO] key will not return the display to zero, then you should carry out CALIBRATION.

Calibration

The FW platform scale uses 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. FW 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

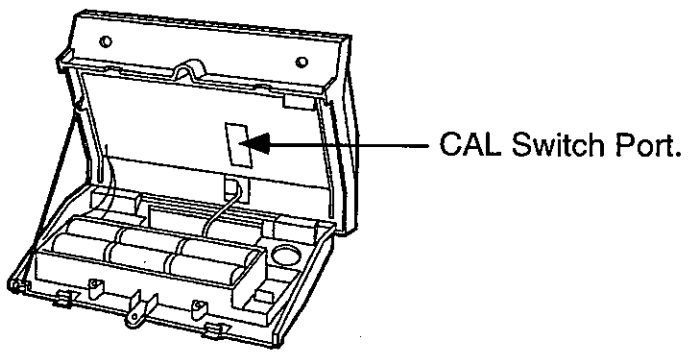
Scale	Display Pod & Load Cell	Calibraion Mass
FW-150KA1	FW-150KK1	150kg or 100kg 300lb or 200lb
FW-100KA1	FW-100KK1	100kg or 60kg 200lb or 150lb
FW-60KA2	FW-60KK2	60kg or 40kg 120lb or 80lb
FW-15KA2	FW-15KK2	15kg or 10kg 30lb or 20lb
FW-10KA2	FW-10KK2	10kg or 6kg 20lb or 15lb

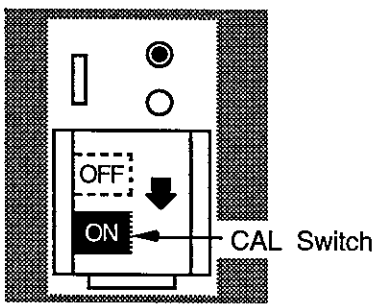
Scale	Calibraion Mass
FW-1200KA3	1200kg or 800kg 3000lb or 2000lb
FW-600KA3	600kg or 400kg 1200lb or 800lb
FW-600KA4	600kg or 400kg 1200lb or 800lb
FW-300KA4	300kg or 200kg 600lb or 400lb
FW-31KA2	30kg or 20kg 60lb or 40lb

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 3 minutes. This can be avoided by:

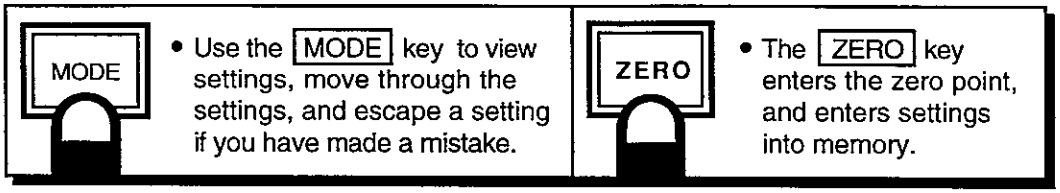
- Placing an object on the weighing pan,
- Setting the Tare function so the display shows a negative number after the container weight is set and the container removed,
- Disable the auto-off function.

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





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.



Step 3. Press the MODE key.

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

Step 2. Press the ZERO key 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 the display.

Table B. Calibration Capacity Settings

CAL 1	Means span calibration at maximum capacity in kilograms
CAL 2	Means span calibration at 2/3 of maximum capacity in kilograms
CAL 3	Means span calibration at maximum capacity in pounds
CAL 4	Means span calibration at 2/3 of maximum capacity in pounds

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

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

NOTE: If "-CAL E" is displayed when you press the ZERO key, 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.

⚠ 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.

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

Attention *Before customer delivery:*

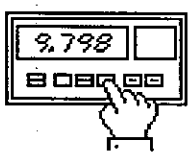
In areas where the FW scale is registered for commercial use, the calibration port cover and the load cell connector cover must be sealed (which extends to deny access to one of the screws which holds the top of the display pod on). Also, the end-user will not be permitted to remove the top of the display 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 fully assembled for commercial use.

Gravity Compensation Function

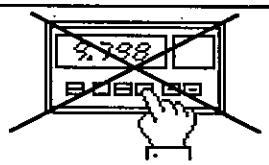
This FW is equipped with a gravity compensation function which means that it can be calibrated in one location and then adjusted to match the acceleration of gravity at another location.

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.

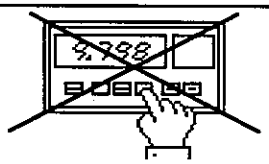
Gravity Compensation Function: Setting the Value of "g"



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 FW scale was 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. VI

Setting the Value of "g"

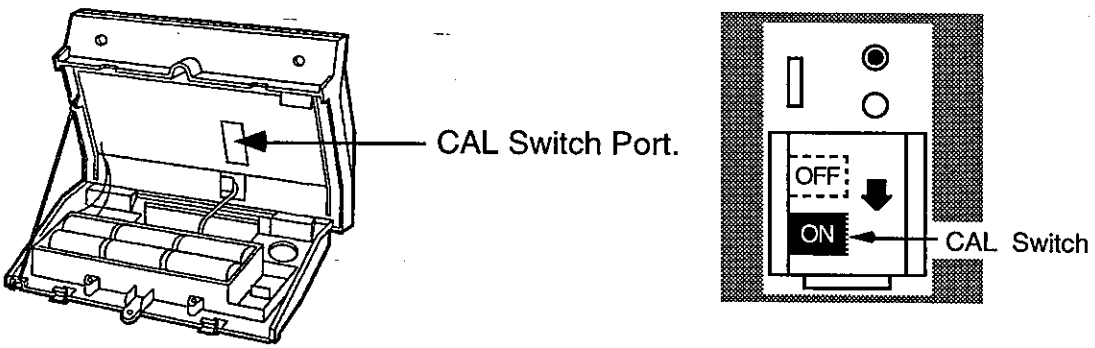
Attention

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:

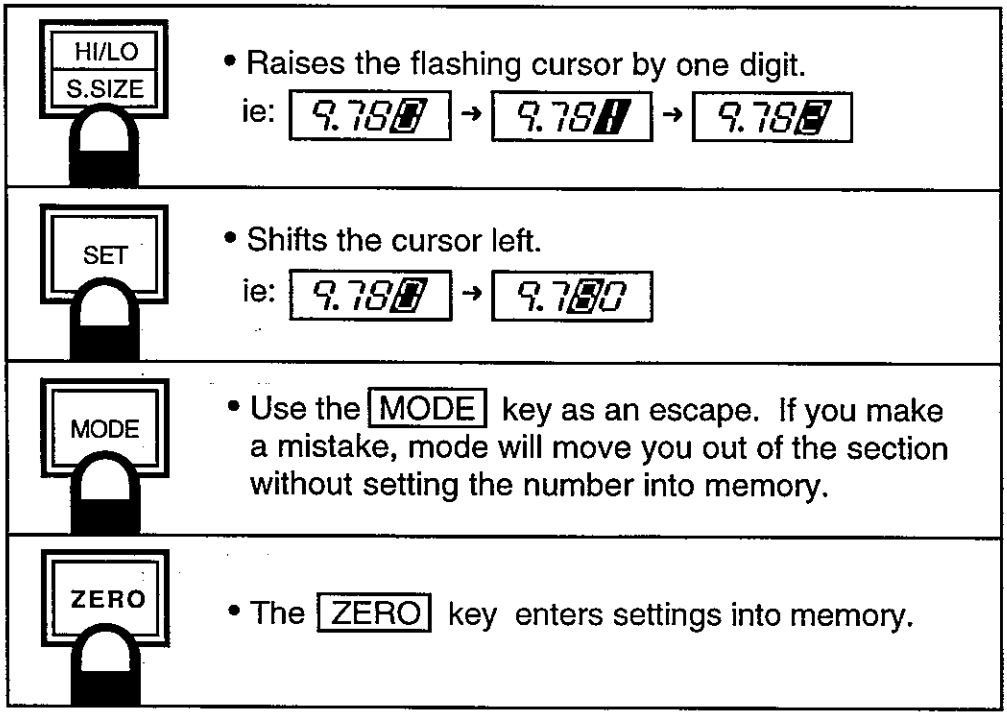
- Placing an object on the weighing pan,
- Setting the Tare function so the display shows a negative number after the container weight is set and the container removed,
- Disable the auto-off function (see AUTOMATIC POWER OFF FUNCTION).

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



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": function keys are used in the following manner.



Step 2. Use the HI/LO / S.SIZE 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, the ZERO key 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.

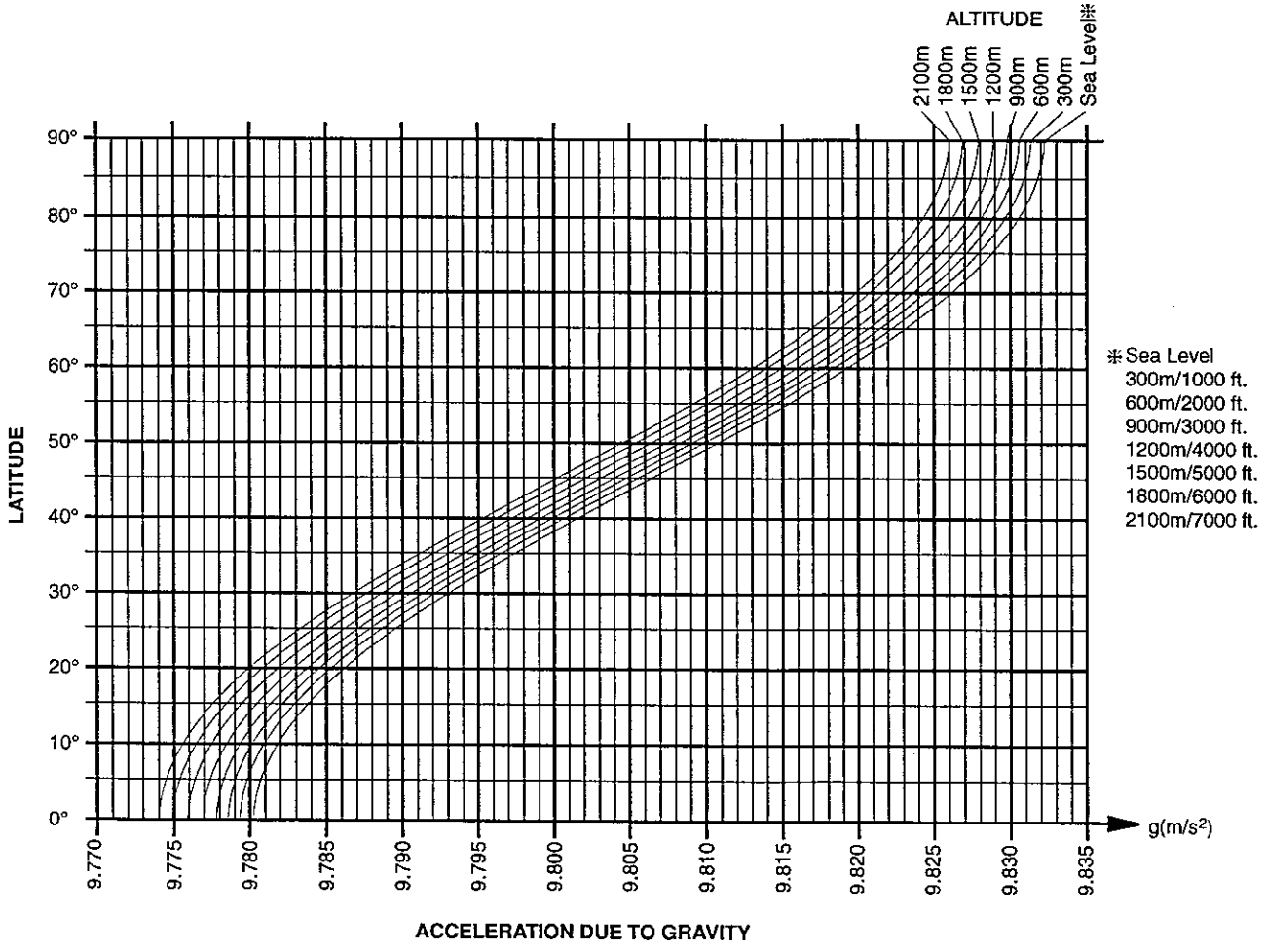
Attention *Before customer delivery:*

In areas where the FW scale is 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 fully assembled for commercial use.

Gravity values at various 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	Taiwan	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

Acceleration due to Gravity table



World Map