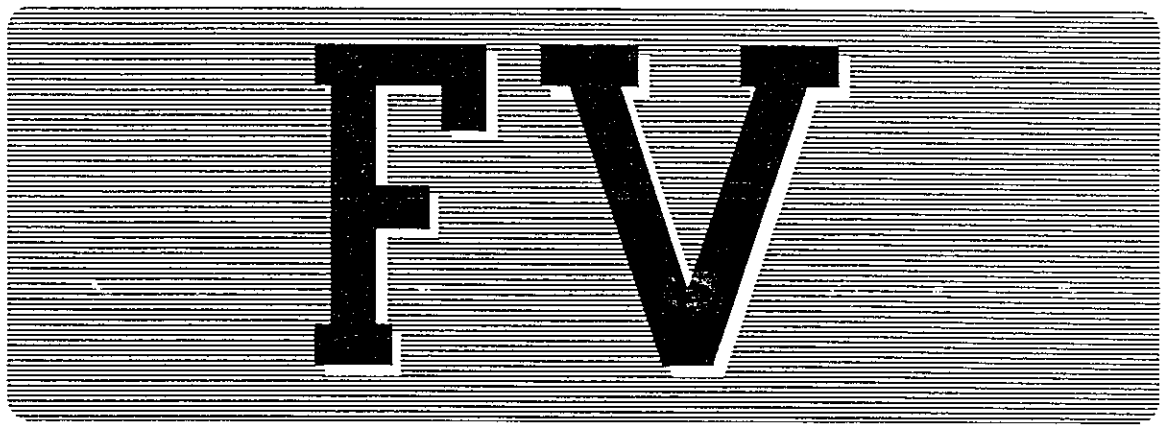


MAINTENANCE MANUAL

MODELS:

Assembled Scales:

FV-150KA1
FV-60KA1
FV-60KA2
FV-30KA2

Display Pod & Load Cell Kits:

FV-150KK1
FV-60KK1
FV-60KK2
FV-30KK2

Weighing Platform & Load Cell Kits:

FV-150KB1
FV-60KB1
FV-60KB2
FV-30KB2

A&D Company, Limited

CONTENTS

COMPLIANCE WITH FCC RULES

Please note that this equipment generates, uses and can radiate radio frequency energy. This equipment has been tested and has been found to comply with the limits of a Class A computing device pursuant to Subpart J of Part 15 of FCC rules. These rules are designed to provide reasonable protection against interference when equipment is operated in a commercial environment. If this unit is operated in a residential area it might cause some interference and under these circumstances the user would be required to take, at his own expense, whatever measures are necessary to eliminate the interference.

(FCC = Federal Communications Commission in the U.S.A.)

INTRODUCTION

This Maintenance Manual covers four models from the A&D FV series of scales:

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

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

Weighing Platform & Load Cell Kits:
- FV-150KB1
- FV-60KB1
- FV-60KB2
- FV-30KB2

• FV-150KA1:	Capacity: 150kg (300lb)	Resolution: 50g (0.1lb)	Large Weighing Pan
• FV-60KA1:	Capacity: 60kg (120lb)	Resolution: 20g (0.05lb)	Large Weighing Pan
• FV-60KA2:	Capacity: 60kg (120lb)	Resolution: 20g (0.05lb)	Small Weighing Pan
• FV-30KA2:	Capacity: 31kg (60lb)	Resolution: 10g (0.02lb)	Small Weighing Pan

The FV series of multi-function scales are the product of years of research, design, development and in-field testing. They incorporate the latest advances in electronic and mechanical engineering and offer increased features and functions all at a reduced cost.

The FV scale may be operated on six UM2 ('C' type) 1.5V dry batteries, or on rechargeable batteries of the same size (using an external charger). Continuous operation will be possible for between 100 to 150 hours on one set of batteries at 20°C/68°F. The Display Pod viewing angle is adjustable and it, along with the Display Arm, can be removed for use as a desk top, or wall mounted weighing indicator (with optional adapter kits).

Battery operation permits the scale to be operated anywhere. The weighing platform is of a rugged washdown stainless steel type, and the Display Pod enclosure also permits washdown. The scale's unit conversions are from decimal pounds to kilograms and vice versa. The tare range is from zero to maximum capacity, and ounces (avoirdupois) may be displayed. There is also a counting function for counting up to 3000 pieces. The check weighing display has "HI", "GO", and "LO" (LCD type annunciators), with two setpoints available for setting "HI" and "LO" limits. When the optional RS-232C Interface is installed a comparator buzzer can be heard and relay output control becomes possible via the 1st, 4th and 6th pins of the 7 pin DIN output connector, with the 2nd being common. The A/D converter is highly accurate and there is complete RFI shielding for the analogue section.

Options include:

- OP-01 ... Wall Mounting Kit.*
- OP-02 ... Display Pod extension cable.
- OP-03 ... RS-232C Interface and comparator buzzer and relay.
- OP-04 ... AD-8116 Compact Printer cable and Display Pod mounting attachment.†
- OP-05 ... AC adaptor AC100~120V/A.
- OP-06 ... AC adaptor AC200~240V/C.
- OP-07 ... AC adaptor AC200~240V/BF.
- OP-08 ... AC adaptor AC200~240V/without plug.

*Option OP-01 Wall Mounting Kit has the same tilting mechanism found on the display arm bracket. It can be used in conjunction with the printer mounting attachment and 5m (16.4ft) display pod extension cable.

†Option OP-04 includes: the AD-8116 Compact Printer cable, and Display Pod mounting attachment. This option allows connection of the AD-8116 Compact Printer to the FV via the optional RS-232C output board (OP-03, which also contains the comparator buzzer/relay board), and holds the Compact Printer safely next to the scale's display pod. Printer, Wall Mounting bracket (if desired) and interface sold separately. The printer is not waterproof.

USING THIS MANUAL

Every care has been taken during the manufacturing process of this scale to ensure that it will perform accurately and reliably for many years. The intent of this Maintenance Manual is to make that as easy as possible for you with a step-by-step guide through the in's and out's of an FV Scale, or related product. Please let us know if it has accomplished the just stated goal - what works, what doesn't, and what we might have left out.

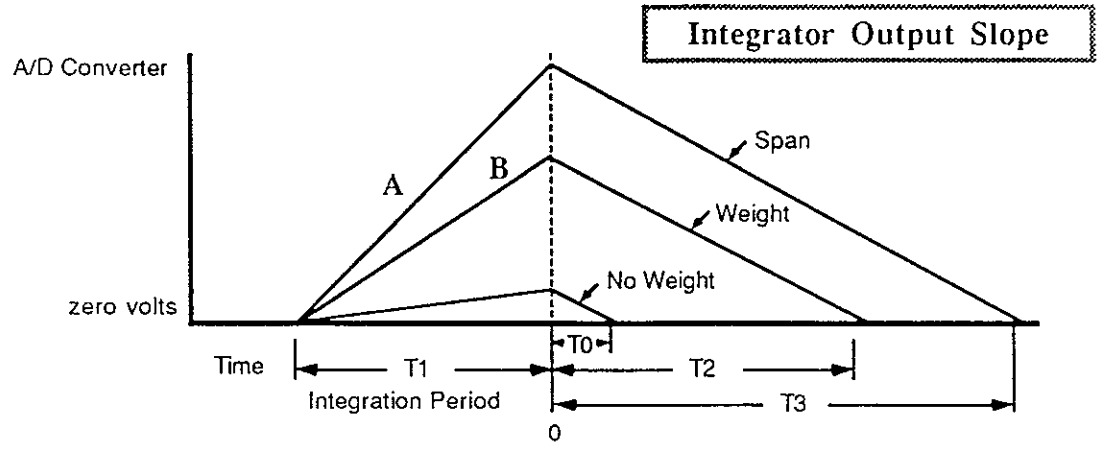
Along with every other manufacturer in the world, we ask that you read through the entire owner's INSTRUCTION MANUAL, and this MAINTENANCE MANUAL before starting any work. Of particular interest to dealers should be the CALIBRATION section page 9, and UPDATES section, page 38. When a customer has a problem, make sure that: the BEST CONDITIONS FOR WEIGHING, page 6, have been met, the scale has been calibrated and adjusted correctly, and the power is connected correctly. Next, look at the FAULT FINDING section, page 21, and the various flow charts. Keep your work area clean, remember how something came apart, and, always calibrate the scale after you have worked on it. Please enjoy yourself.

PRINCIPLES OF OPERATION

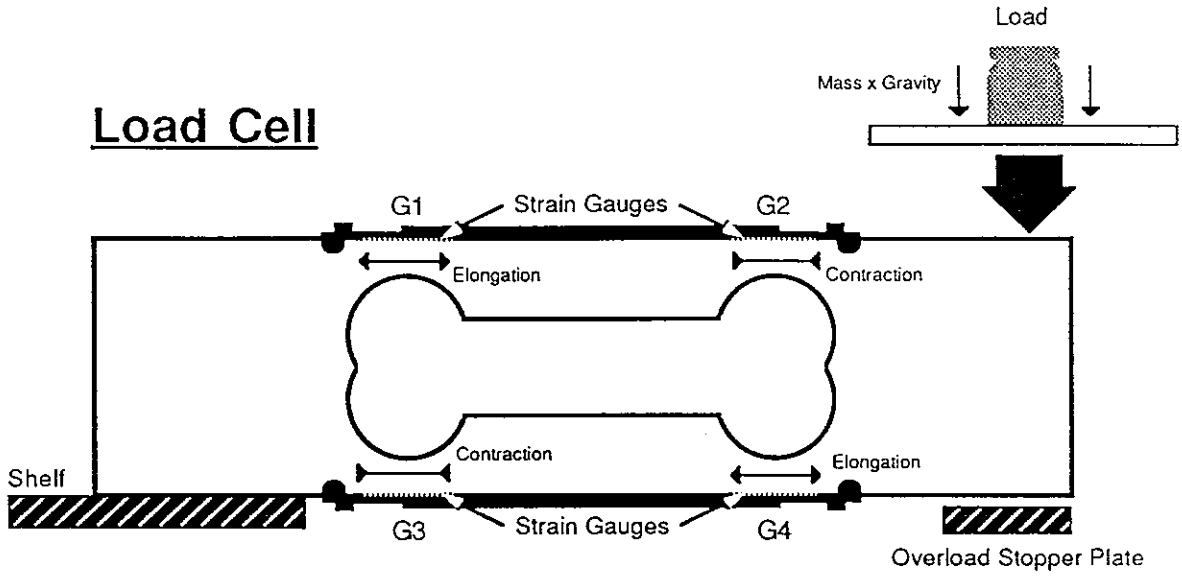
The FV scales operate using a highly accurate and sensitive Load Cell (Please refer to the LOAD CELL BLOCK DIAGRAM on the following page). When you put an object on the weighing pan it is pulled downwards under the action of gravity. We will call the object a "mass" and the measurement of its massiveness on Earth its "weight" (Weight = Mass x Acceleration due to Gravity - "g").

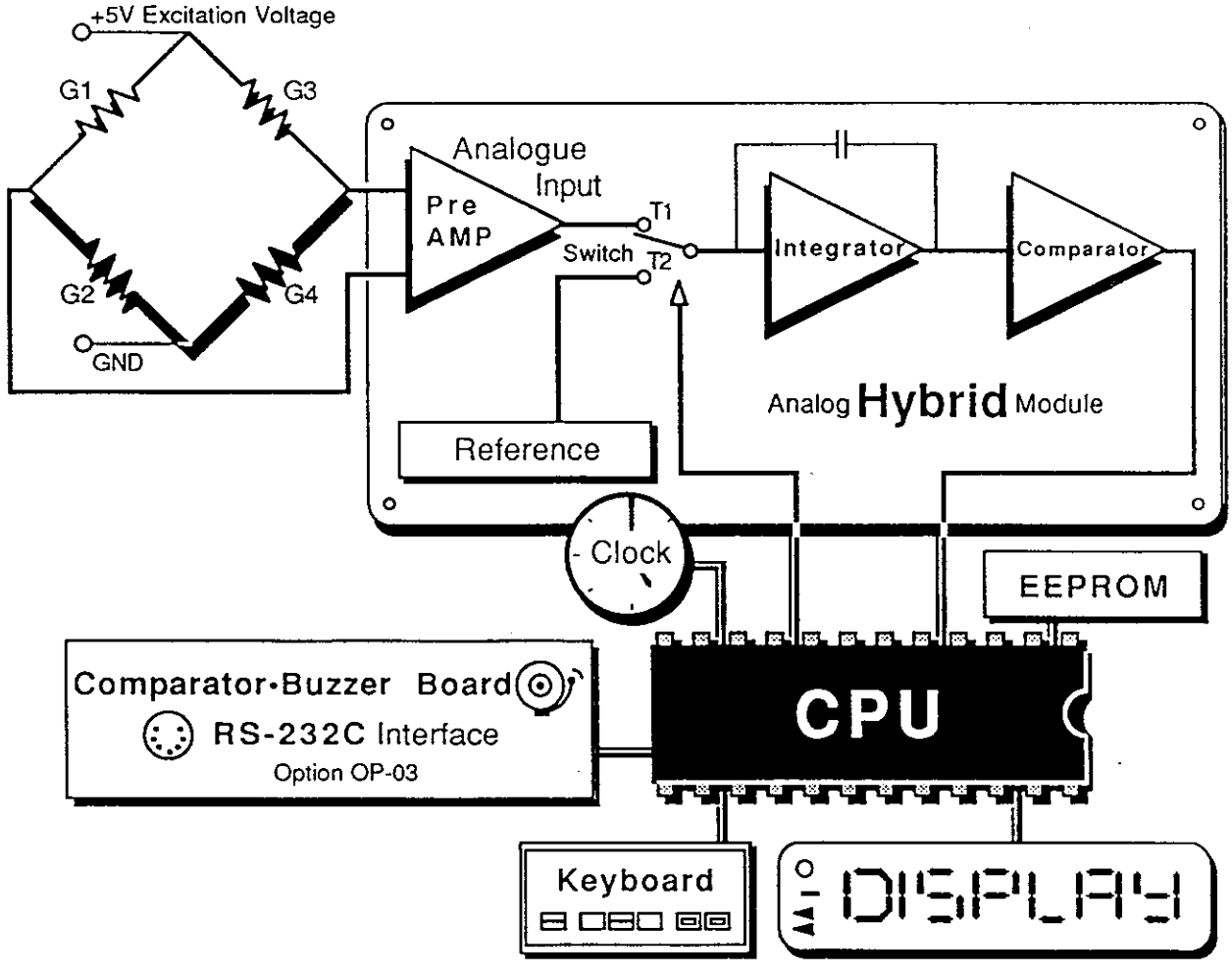
Load Cells work by detecting stress in the cell (a carefully hollowed aluminum bar, forming a Roberval's structure) by means of strain gauge transducers bonded to the upper and lower surfaces. When a mass is placed on the weighing pan, the force causes the Load Cell to bend, causing a elongation-contration relationship (Hooke's law). As the strain gauges detect change, the analog output signal from the strain gauge varies. This signal is amplified and used as the input signal for an analog to digital converter. The final digital signal is used to calculate the weight for the display.

The integrator output slope is constant with respect to time. The dual-slope converter measures time taken for output to reach zero volts. Small input B=Short T2, Large input A=Long T3 time. BV_{in}=T2÷T1x(V_{ref}). In simpler terms, the integration period (T1) is alway the same, the length of the resulting slope depends on the weight. The HYBRID module knows the zero point from zero volts, with an empty weighing pan from RE-ZEROing the scale (T0), full weight from span calibration (T3), and the output slope of an object (T2) with respect to time from the clock (how long the slope took to return to zero volts). The weight is then the offset distance of the object to that of an empty pan.



LOAD CELL BLOCK DIAGRAM





FV SPECIFICATIONS

Model	FV-150KA1	FV-60KA1	FV-60KA2	FV-30KA2
Capacity kg	150kg	60kg	60kg	31kg
Resolution kg	50g	20g	20g	10g
Capacity lb	300lb	120lb	120lb	60lb
Resolution lb	0.1lb	0.05lb	0.05lb	0.02lb
Capacity oz	4,800oz	1,920oz	1,920oz	960oz
Resolution oz	2oz	1oz	1oz	0.5oz
Calibration weight kg	150kg or 100kg	60kg or 40kg	60kg or 40kg	30kg or 20kg
Calibration weight lb	300lb or 200lb	120lb or 80lb	120lb or 80lb	60lb or 40lb
Pan size mm	390mm x 530mm	390mm x 530mm	326mm x 420mm	326mm x 420mm
Pan size inches	15.4in x 20.8in	15.4in x 20.8in	12.8in x 16.5in	12.8in x 16.5in
Weight	17kg/37.5lb	17kg/37.5lb	12kg/26.5lb	12kg/26.5lb
Power	9V DC from 6 x UM2/ 'C' size batteries or optional AC adaptor			
Battery life	100~150 hrs at 20°C/68°F depending of type of battery			
Operating temperature	-5°C~35°C/23°F~95°F			
Maximum count	3000 at min. unit weight (which equals display resolution)			
Sample size	5,10,20,50,100 pieces (set at 5, selectable with HI/LO key)			
Check weight	Two setpoints with "HI","GO","LO" liquid crystal annunciators			

Specifications subject to change or improvement without notice.

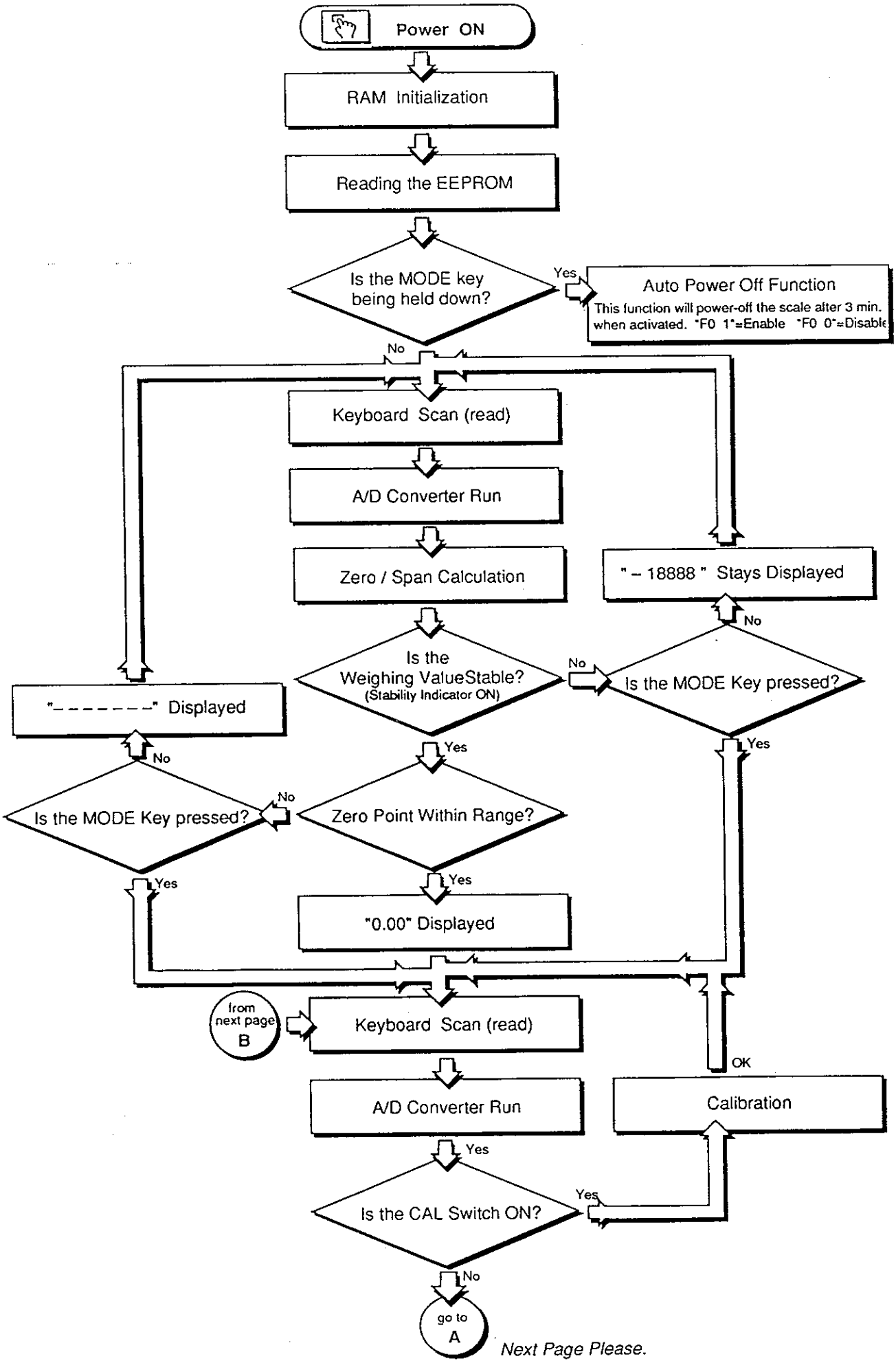
Load Cells Used

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-150KK1	FV-150KB1				❊
FV-60KA1	FV-60KK1	FV-60KB1			❊	
FV-60KA2	FV-60KK2	FV-60KB2		❊		
FV-30KA2	FV-30KK2	FV-30KB2	❊			

BEST CONDITIONS FOR WEIGHING

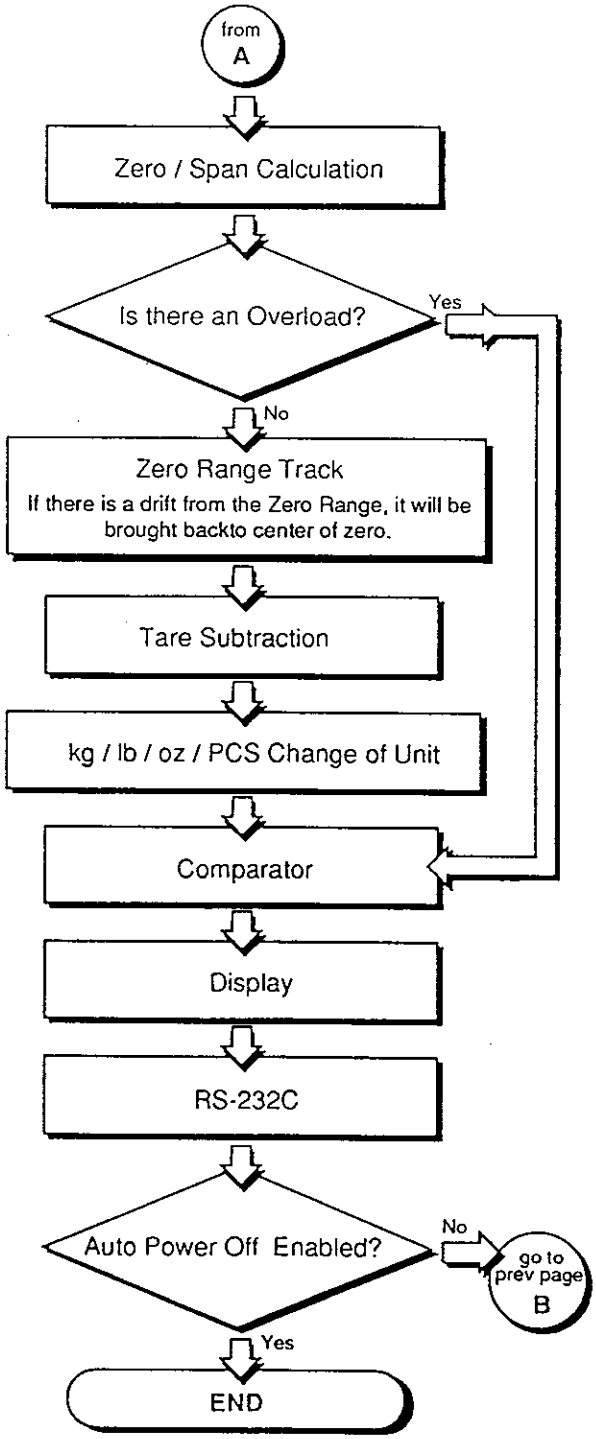
- ✔ The scale must be level (check the bubble level under the Weighing Pan).
- ✔ Best temperature is about 20°C (68°F), at about 50% Relative Humidity.
- ✔ The weighing table should be of a solid construction.
- ✔ Corners of rooms are best, as they are less prone to vibrations.
- ✔ Don't install the scale in direct sunshine.
- ✔ Try to ensure a stable AC power supply when using an adaptor.
- ✔ Clean the scale with mild soap and water (don't use solvents).

SOFTWARE FLOW CHART



Next Page Please.

SOFTWARE FLOW CHART *continued from previous page.*



CALIBRATION

Attention

In territories where the FV 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.

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 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, page 11.

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

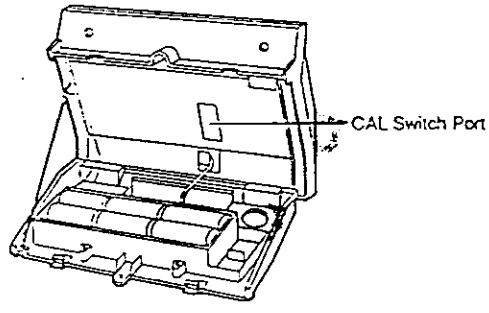
The FV platform scale uses a calibration system called "**FDC™**" for Full Digital Calibration. This means that the zero point and maximum capacity points are entered digitally through the keyboard, and it makes the calibration method very easy to remember. FV scales can be calibrated using "lb" (pound 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.

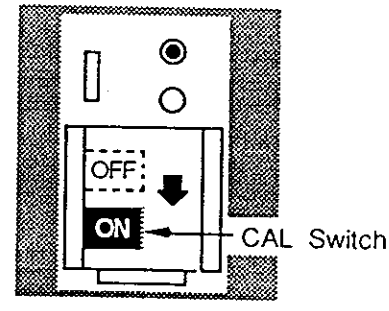
Table A. Calibration Masses Required

Scale	Display Pod & Load Cell	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-150KK1	FV-150KB1				150kg or 100kg 300lb or 200lb
FV-60KA1	FV-60KK1	FV-60KB1			60kg or 40kg 120lb or 80lb	
FV-60KA2	FV-60KK2	FV-60KB2		60kg or 40kg 120lb or 80lb		
FV-30KA2	FV-30KK2	FV-30KB2	30kg or 20kg 60lb or 40lb			

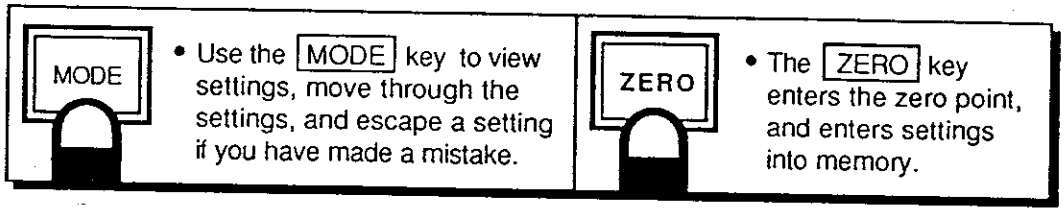
Step 1. Warm up the scale for at least 10 minutes before making adjustments. You must be careful of the auto-off function, which turns off the display after three minutes. This can be avoided by:
- Placing an object on the weighing pan,
- Setting the Tare function so the display shows a negative number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





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 **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, page 12.

Please Note *Before customer delivery:*

In areas where the FV 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 in a fully assembled form for commercial use.

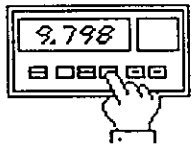
END End of ZERO AND SPAN CALIBRATION procedure.

abc Gravity Compensation Function

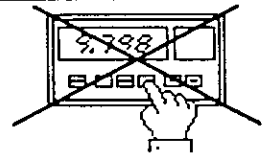
This scale is equipped with a gravity compensation function which means that it can be calibrated in one location and then adjusted to match the acceleration of gravity at another location.

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 not intended, or needed for local or on-sight calibration.

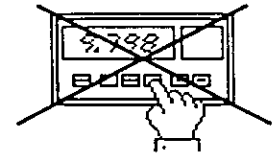
Gravity Compensation Function: Setting the Value of "g"



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 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.

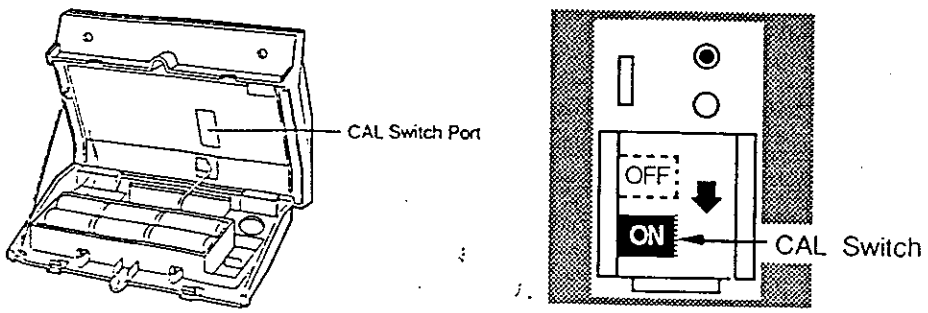
- Alternatively, please refer to the attached table for the value of "g" at various world wide locations or plot the end-user's position in terms of latitude and altitude on the enclosed graph (see pages 14,15).

Setting the Value of "g"

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

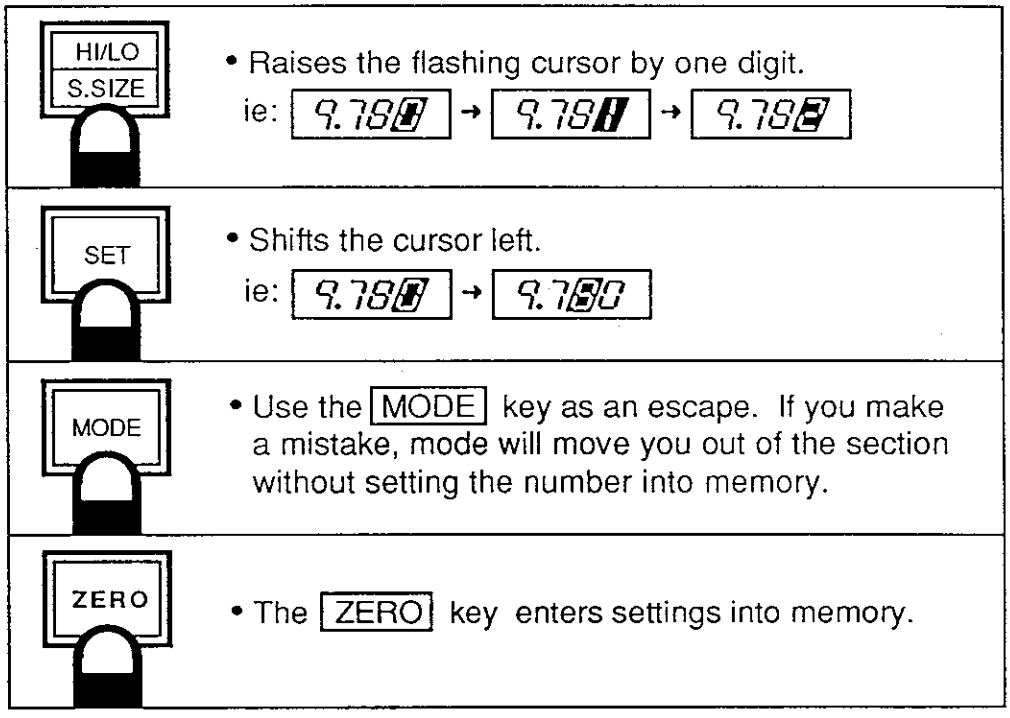
Step 1. Warm up the scale for at least 10 minutes before making adjustments. You must be careful of the auto-off function, which turns off the display after three minutes. This can be avoided by:
- Placing an object on the weighing pan,
- Setting the Tare function so the display shows a negative number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



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 $9.798 m/s^2$, 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.



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:*

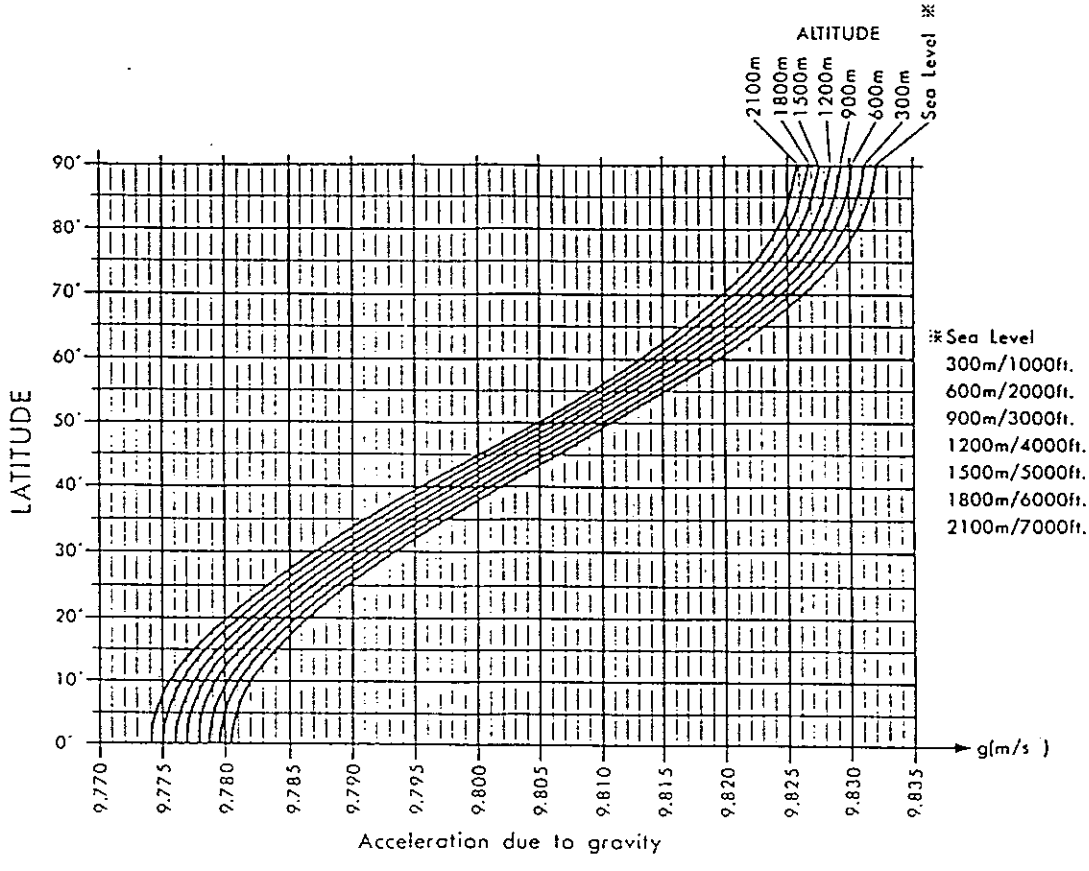
In areas where the FV scale is registered for commercial use, the calibration port cover and the load cell connector cover must be sealed (which extends to deny access to one of the screws which holds the top of the display pod on). Also, the end-user will not be permitted to remove the top of the display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

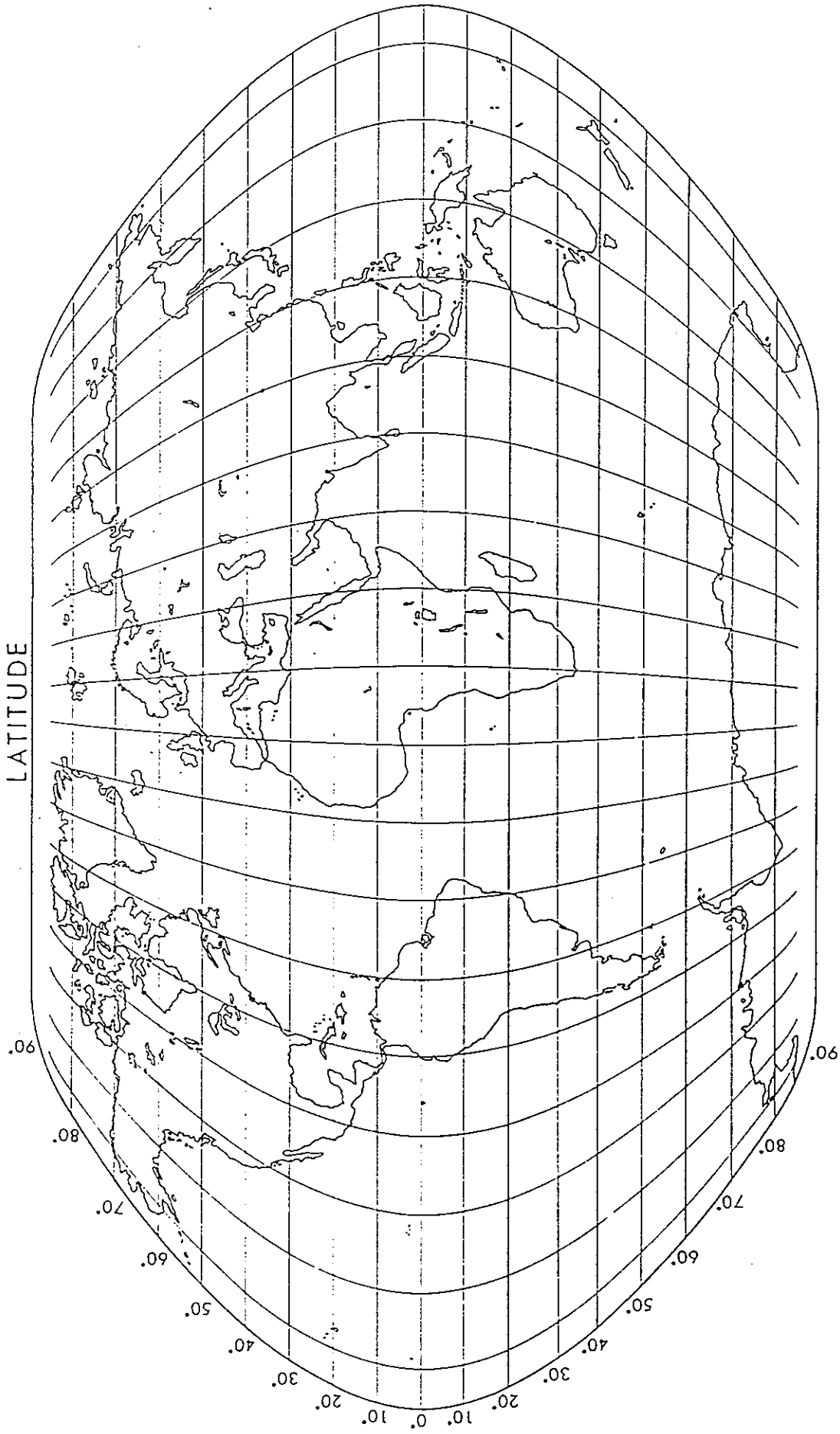
END End of SETTING THE VALUE OF "g" procedure.

THE VALUE FOR "g"

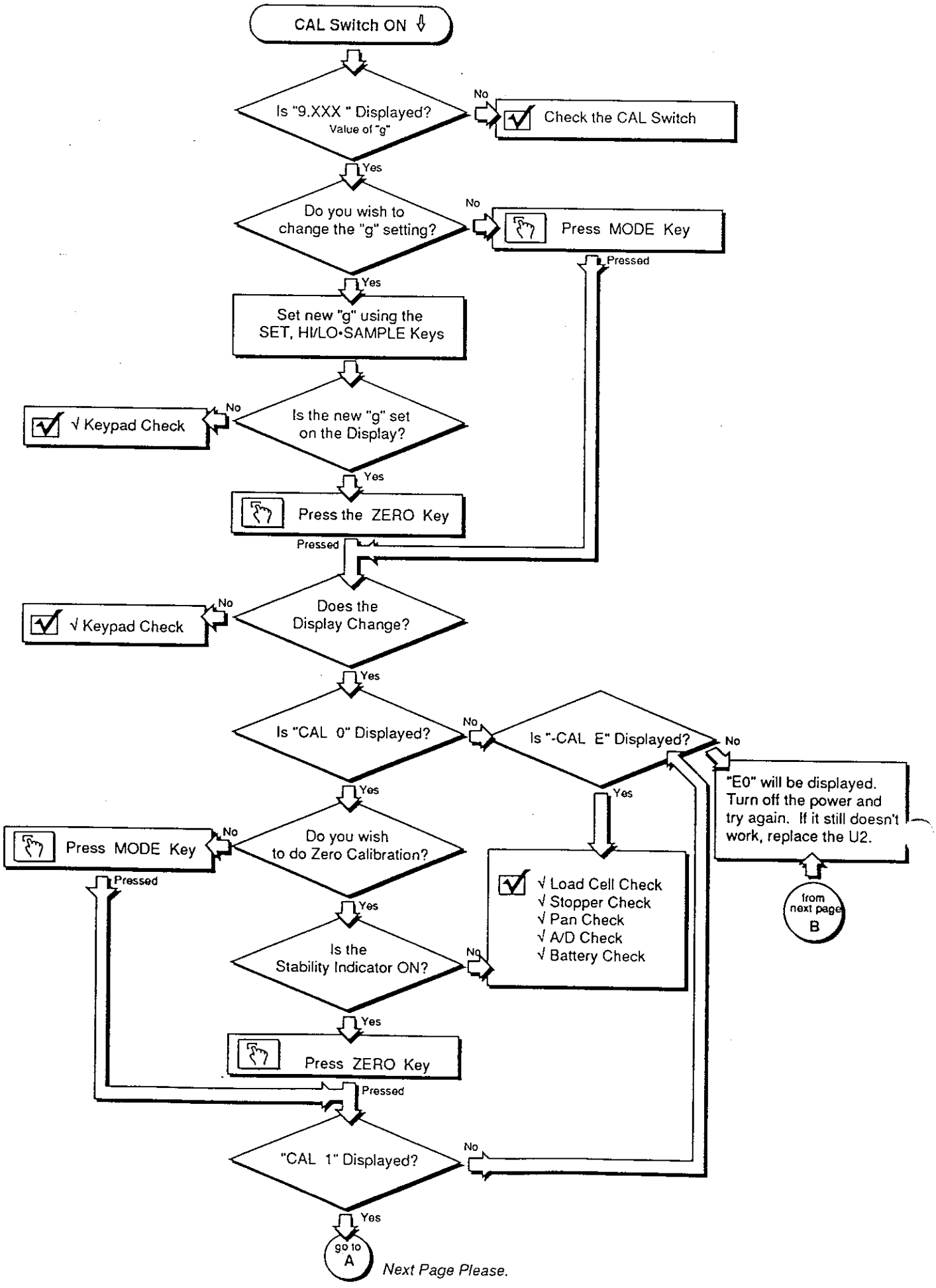
AT VARIOUS WORLD-WIDE LOCATIONS

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 (Greenwich)	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




LATITUDE
.06
.08
.07
.60
.50
.40
.30
.20
.10
0.
.10
.20
.30
.40
.50
.60
.07
.08
.06

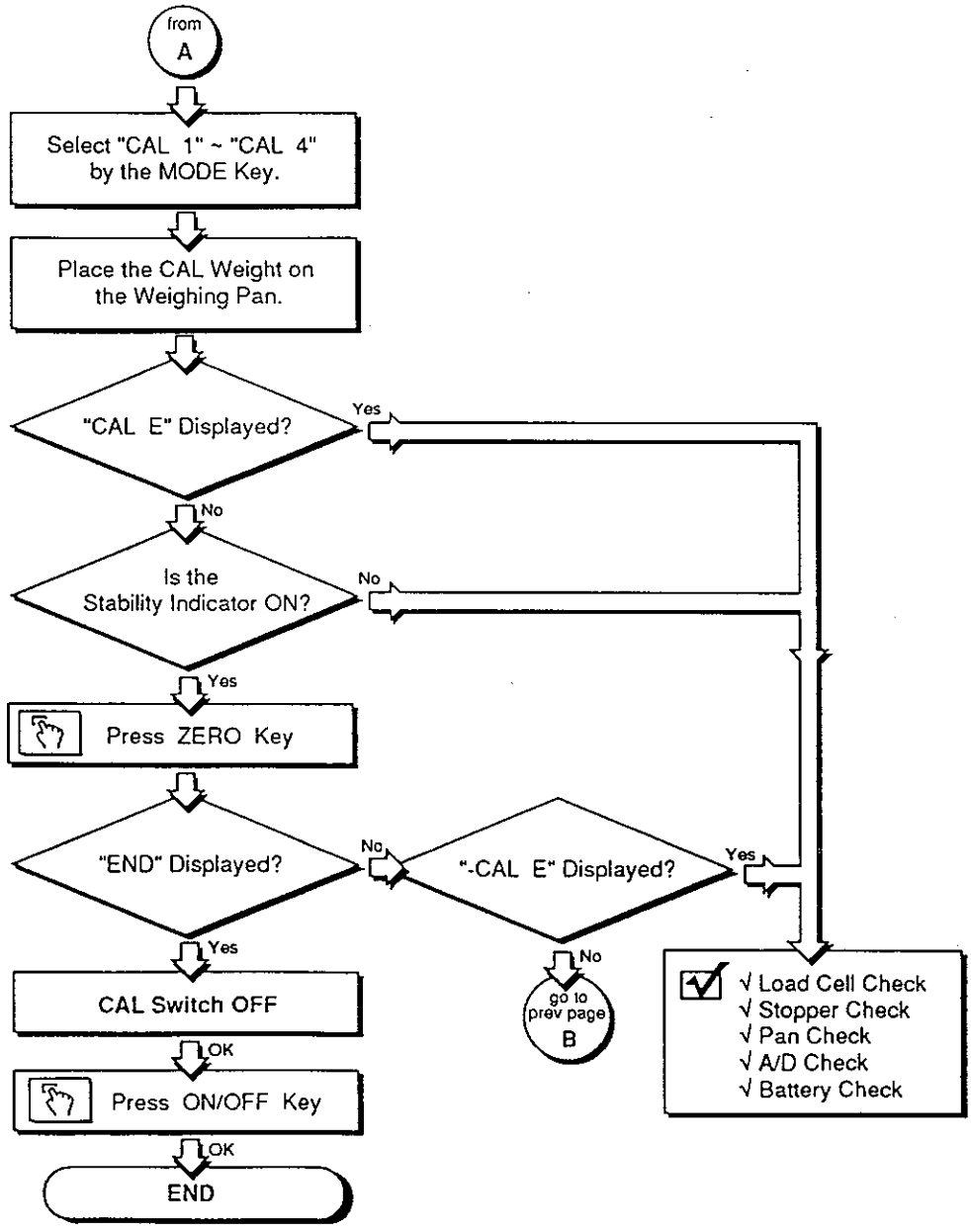
CALIBRATION FLOW CHART



Next Page Please.

CALIBRATION FLOW CHART

continued from previous page.

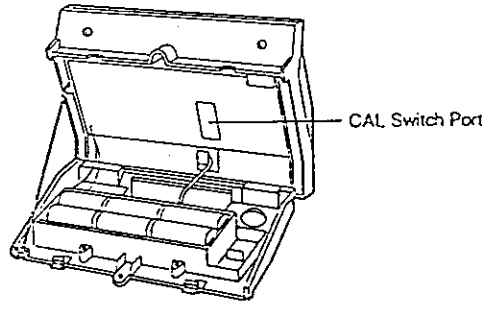


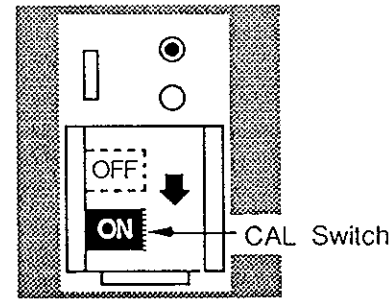
SOFTWARE PARAMETER SETTINGS

STOP CONFIDENTIAL INFORMATION STOP

This section concerns disabling and enabling functions of the FV Series of Platform Scales at a software level not described to the end user in the Instruction Manual. Because some software functions will be illegal in some countries, and other functions could be inadvertently disabled - it is important that the end users should not have access to this information. Clearly it is important to A&D and to our dealers that these scales should be functioning at their full and proper potential for the customer, and not be used in fraudulent or other criminal activity

Step 1. With the scale OFF, remove the calibration plate - Slide **CAL** switch ON⇓.

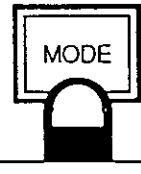




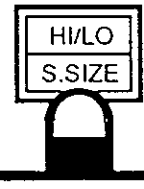
Step 2. Press and hold the **MODE** and **ZERO** keys with your right hand - while continuing to hold them, press **ON/OFF**. Release **MODE** and **ZERO** keys.

NOTE: The use of each key as you move through this procedure is listed below. Please take a moment to read each.

- The [ZERO] key enters settings into memory. "F0" thru "F1" are entered individually, "F2" - "F4" are entered together.
- At the end of the "F" cycle ("F4 2") it is used to enter, then move to "END", the completion of the cycle.



- Use the [MODE] key to view settings, move through the settings, and escape a setting if you have made a mistake.
- You cannot enter settings with the [MODE] key, it will only move you through the settings with no change.

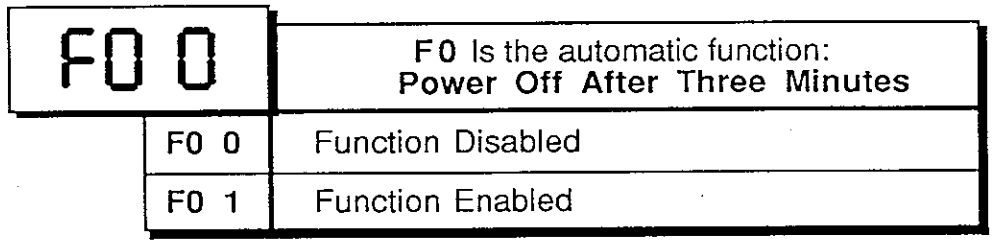


- Once in the "F" group, use this key to move incrementally through the settings available in each group, ie:

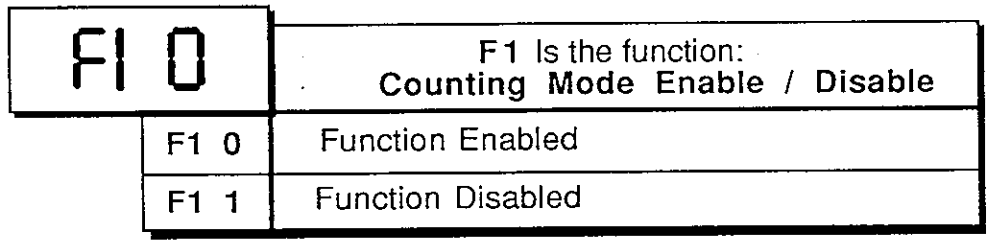
[F1 0] → [F1 1] → [F1 0]

NOTE: You are now able to just view (by only pressing the **MODE** key), or change the parameter settings (using the **ZERO** key to enter).

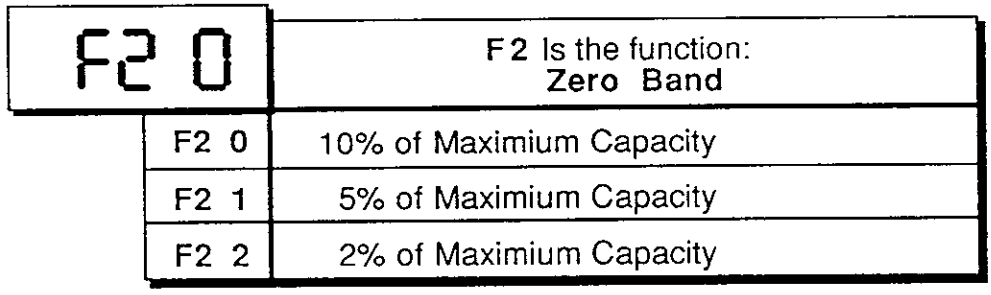
DISPLAY Display will show "F0 0" (or "F0 1").



Step 3. Use the **HI/LO** key to move incrementally between "F0 0" to "F0 1". When the desired setting is displayed, press **ZERO** to enter the setting into memory, and move to **F1**.

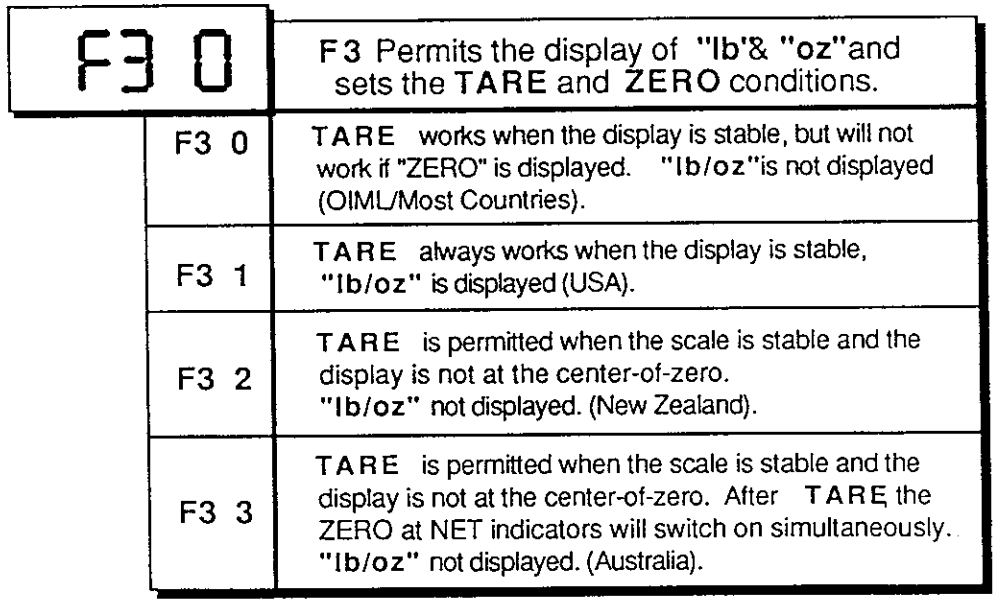


Step 4. After using the **HI/LO** key to move to the desired setting - press **ZERO** to enter the setting into memory, and move to **F2**.



Note: "F2 0" through "F4 2" are entered in as a block, in other words you will need to make any change in "F2" through "F4" - and then when you press **ZERO**, they will all be entered. If there is no change in an "F" group, then press **MODE** to move you without change.

Step 5. After using the **HI/LO** key to move to the desired setting - press **MODE** to move to **F3**.



Step 6. After using the **HI/LO** key to move to the desired setting - press **MODE** to move to **F4**.

F4 0	F4 Sets 30kg,60kg, or 150kg as the **Maximum Capacity of the Scale**
F4 0	30 kg Scale.
F4 1	60 kg Scale.
F4 2	150 kg Scale.

Step 7. After using the **HI/LO** key to move to the desired setting - press **ZERO** to enter the settings ("F2 0" through "F4 2") into memory.

NOTE: You may also go back to the beginning of the cycle "F0" by pressing **MODE**, and not **ZERO** - but, no settings will be entered into memory until **ZERO** is pressed.

DISPLAY Display will show "END".

Step 8. Slide OFF⇧ the Calibration switch while "END" is displayed.

END End of SOFTWARE PARAMETER SETTINGS procedure.

FAULT FINDING

This section can be photocopied and used as a check sheet -
Simply mark the boxes provided after each step is successfully completed.

Troubleshooting

- ↙ Check the Keypad to see if it's okay, replace if defective. (see KEYPAD CHECK)
- ↙ If the display remains "E", "-E", or is not stable - then do a full recalibration, including setting "g" if used (see CALIBRATION section).
- ↙ If you are unable to calibrate:
  - Zero calibration may be needed if the **ZERO** key will not set the display to zero, or if "----" is displayed when the power is turned on (see SIMPLE ZERO CALIBRATION page 9).
  - 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.
  - Check the Load Cell and the Main Board for broken leads, and the cable from the Load Cell to J1.
- ↙ If "E0" is displayed, turn off the power and try again. If that doesn't work, change either U2 of PZ945, U3, or change the whole board.*

  * Don't forget to do a full recalibration, including setting "g" (see CALIBRATION section) if you make any electronic repairs.

Load Cell Stopper Check
Mechanical

↙ If you load the weighing pan to just over full scale, does it hit the overload stopper? ☐ok

Pan Check
Mechanical

↙ Is the weighing pan touching anything? ☐ok

↙ Is the weighing pan mounted correctly? ☐ok

↙ Is the weighing pan perfectly horizontal? ☐ok

Battery Check
Electronic

- ↙ Disconnect the battery pack, and the AC adaptor (if connected). Then, reconnect the battery pack.
- ↙ Check the connection between J4 and the display. ☐ok
- ↙ Check the output of the Battery/AC adaptor to see that it is at least 6.5 volts. ☐ok
- ↙ When pressing the **ON/OFF** key, check the resistance between J4 pins 1 & 8 to see if they read less than 10KΩ. If so, then it is okay. ☐ok
  - If not, check the connection. ☐ok
  - If the resistance is correct and the problem isn't solved, try a different Keypad to make sure that the problem with the Keypad and not the Main Circuit Board. If it checks out, then change the Keypad.
- ↙ When pressing the **ON/OFF** key, check the voltage of pin 2 on U1, it should read 5V ±10% to ground. ☐ok

- ✓ When the **ON/OFF** key is ON, the output of U1 should be 5V ±10%, with the clock pulse at 4MHz, R2 at 4V, and pin 1 of U4 (RESET) at ≈5V (Hi). ❑ok
- ✓ Check to see that transistors Q1, Q2, Q3 are working. Q1 ❑ok Q2 ❑ok Q3 ❑ok

CPU Check
Electronic

- ✓ Disconnect the battery pack, and the AC adaptor (if connected). Then, reconnect the battery pack.
- ✓ Check all solder connections. ❑ok
- ✓ Check that the voltage between pin 46 & GND of U5, it should be 5V ±10%. ❑ok
- ✓ Is the the RESET at the Hi level? [pin 1 of U4 (RESET) at ≈5V (Hi)] ❑ok
- ✓ Check the following resistor's voltage levels for the LCD:

R7	≈1.1V ❑ ok	R9	≈1.1V ❑ ok
R8	≈1.1V ❑ ok	R10	≈1.7V ❑ ok

- ✓ Check that the clock pulse (slope/oscillate) is 4MHz (see #1 WAVEFORM table, page 26).
- ✓ Check the waveform for: (see WAVEFORM table, page 26)

1st ❑ ok	$\overline{1st}$ ❑ ok	2nd ❑ ok
AZ ❑ ok	CMP ❑ ok	

- ✓ Check the waveform of EEPROM (see WAVEFORM table, page 26). ❑ok

A/D HYBRID Check
Electronic

- ✓ Check the voltage of AMZ 24 at pin 10, it should be 5V ±10%. ❑ok
- ✓ Check the following voltages from the Load Cell between AMZ 24 pin and:

Should be ≈3V	Should be ≈3V	Should be 0V
Pin 1 (GND) ❑ ok	Pin 2 (Hi) ❑ ok	Pin 3 (Lo) ❑ ok

- ✓ Check the waveform for: (see WAVEFORM table, page 26)

1st ❑ ok	$\overline{1st}$ ❑ ok	2nd ❑ ok
AZ ❑ ok	CMP ❑ ok	

LCD Check
Electronic

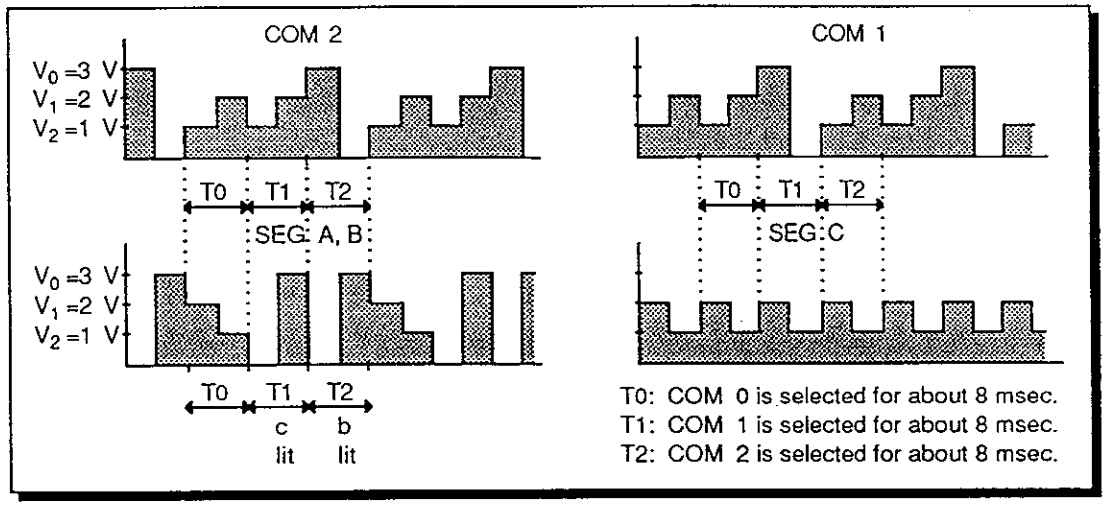
- ✓ Check the glass for cracks.
- ✓ Check the soldering for breaks, or dry solder between the CPU and the LCD.

✔ Check the following resistor's voltage levels for the LCD:

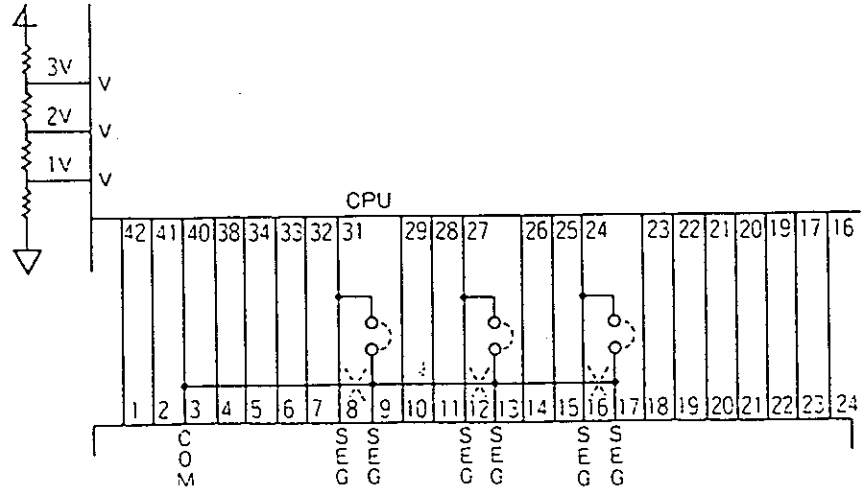
R7	≈1.1V	☐ ok	R9	≈1.1V	☐ ok
R8	≈1.1V	☐ ok	R10	≈1.7V	☐ ok

✔ Check the following waveforms for the LCD:

- Waveforms of **COM 1, COM 2** and **SEG A** given when '1' is displayed.



- Waveforms of **COM 1, COM 2** and **SEG A** given when '1' is displayed.
- The common lines output stair step waveforms with a period of about 24 msec., one third out of phase from each other. Each segment line also outputs a stair step waveform with a period of 24 msec. When lit up, the segment produces a waveform of large amplitude in opposite phase to the common; when turned off, the segment produces a waveform of small amplitude.
- 'SEG,' is used to change the shape of the decimal point from '▪' to '›'. Normally, 'SEG,' is short circuited to COM 0 and turned OFF. Sort circuiting **'SEG,'** to SEG A of each digit lights ',' as well as '▪'. [Cut the pattern indicated by crosses (X) and attach jumpers (ó ò).]
- Please see the DISPLAY SEG, COM chart, page 27 for more detail.



Load Cell Check
Electronic

✓ Check the following cable assembly - pin to wire - connections of J1:

Pin	Color	Pin	Color	Pin	Color
1	Red ☐ ok	2	Green ☐ ok	3	Blue ☐ ok
4	White ☐ ok	5	Yellow ☐ ok		

✓ Check the voltage between pins 1 & 4 of J1, it should be 5V ±10%.

✓ Check the Load Cell output of J1 between the following:

Between Pin 2 & Pin 3	No Weight: Between 0.5~2mV ☐ ok	Full Scale: Between 5~8mV ☐ ok
Between Pin 2 & GND	3V ☐ ok	
Between Pin 3 & GND	3V ☐ ok	

Keypad Check
Electronic

Key: • What should happen when pressed:

✓ **ON/OFF** • The power should go ON and OFF. ☐ok

✓ **MODE** • The display should go from "kg" to "PCS". ☐ok

✓ **SET** • In the "PCS" mode it should show "5 0 pcs". ☐ok

✓ **HI/LO** • In the Counting Mode, the sample size should move from 5 to 10 to 20, etc. ☐ok

✓ **ZERO** • It should cause the display to show zero when pressed. ☐ok

✓ **TARE** • It should cause the display to show zero when pressed. ☐ok

✓ Disconnect the battery pack, and the AC adaptor, if connected. Then, reconnect the battery pack.

✓ Check the connection between the Keypad and J4. ☐ok

✓ Check the soldering of J4. ☐ok

✓ You can also check if an individual key is working by measuring the resistance between the following pins of the J4 connector.

The resistance should be less than 10KΩ for:

- **ON/OFF** between pins 1~8 ☐ok
- **MODE** between pins 2~5 ☐ok
- **SET** between pins 2~7 ☐ok
- **ZERO** between pins 2~4 ☐ok
- **SAMPLE** between pins 2~6 ☐ok

The resistance should be less than 3KΩ for:

- **TARE** between pins 2~3 ☐ok

If the above are out of the correct resistance, try a different Keypad to make sure that the problem with the Keypad and not the Main Circuit Board. If it checks out, then change the Keypad.

J1~4 Checks
Electronic

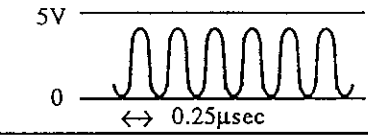
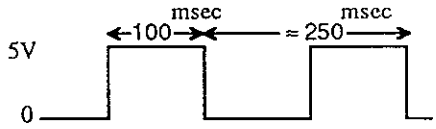
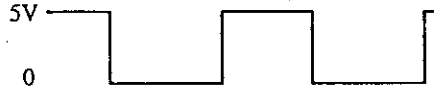
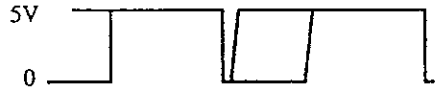
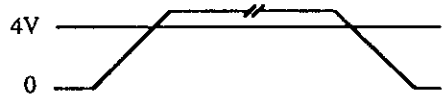
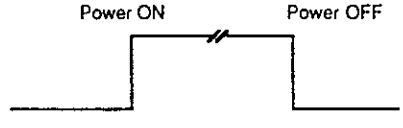
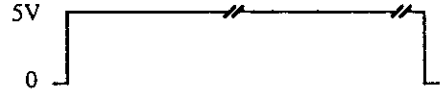
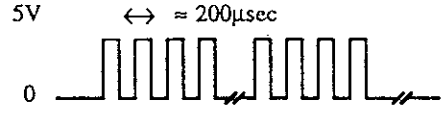
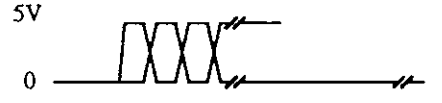
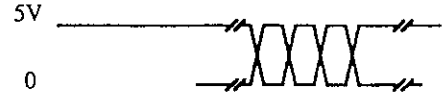
J1 Load Cell Input		
1	+5V	Excitation +
2	≈ 3V	Output Hight
3	≈ 3V	Output Low
4	GND	Excitation –
5	GND	Shield

J2 Option - 03 RS-232C, Weight Comparator Output			
1	+5V		
2	GND		
3	RS-232C Signal		
4	Not Applicable		
5	Comparator	LO	Low Active
6	Comparator	GO	Low Active
7	Comparator	HI	Low Active
8	Comparator	Stable	Low Active

J3 Power, External Switch Input		
1	Battery/AC Adapter	+9V (>6V)
2	GND	
3	External Tare Switch	= Tare Key J4 - 3 Pin
4	External Zero Switch	= Zero Key J4 - 4 Pin

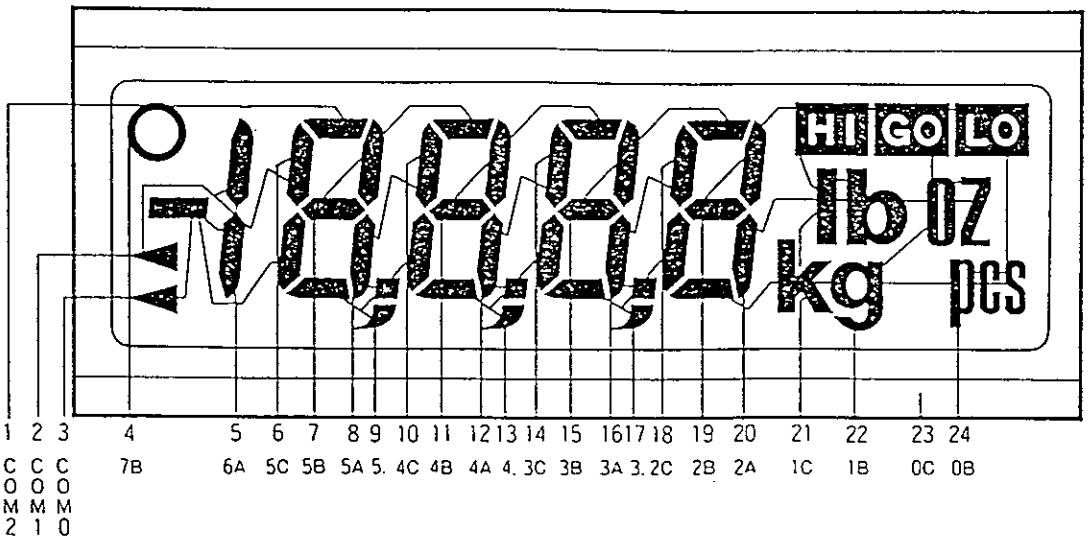
J4 Front Panel Key Switch Input			
1	Power ON/OFF Switch (1- 8 Pin)	ON ≈ 1V	OFF ≈ 9V
2	GND (Switch Common - 3 ~ 7 Pin)	ON ≈ 0V	OFF ≈ 5V
3	Tare Switch	ON ≈ 0V	OFF ≈ 5V
4	Zero Switch	ON ≈ 0V	OFF ≈ 5V
5	Mode Switch	ON ≈ 0V	OFF ≈ 5V
6	HI/LO • Sample Size Switch	ON ≈ 0V	OFF ≈ 5V
7	Set Switch	ON ≈ 0V	OFF ≈ 5V
8	Power ON/OFF Switch (1 - 8 Pin)	ON ≈ 7V	OFF = Open

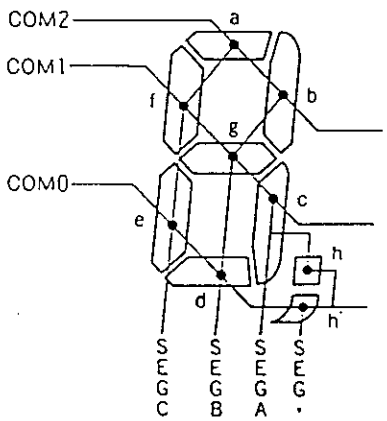
☑ Waveform Check - LOGIC WAVEFORM

No.	Signal	Test Points	Wave Form	Comments
1	X EX	XT1 (1), U5(7) ~ GND XT1 (3), U5(6)		CPU Clock 4 MHz
2	1st	U3 (6) U5 (2) ~ GND		A/D Control Input
3	$\overline{1st}$	U3 (7) U5 (3) ~ GND		
4	2nd	U3 (8) U5 (4) ~ GND		
5	AZ	U3 (9) U5 (5) ~ GND		
6	CMP	U3 (5) U5 (9) ~ GND		A/D Output
7	RESET	U4 (2) ~ GND		+5V Input
8		U4 (1) U5 (8) ~ GND		Reset Output
9*	CS	U2 (1) U5 (55) ~ GND		EEPROM Control Chip Select
10*	CK	U2 (2) U5 (56) ~ GND		Clock
11*	DI	U2 (3) U5 (57) ~ GND		Data Input
12*	DO	U2 (4) U5 (58) ~ GND		Data Output

* Waveforms 9-12 can only be observed with Power ON, normally they are flat.

DISPLAY COM, SEG

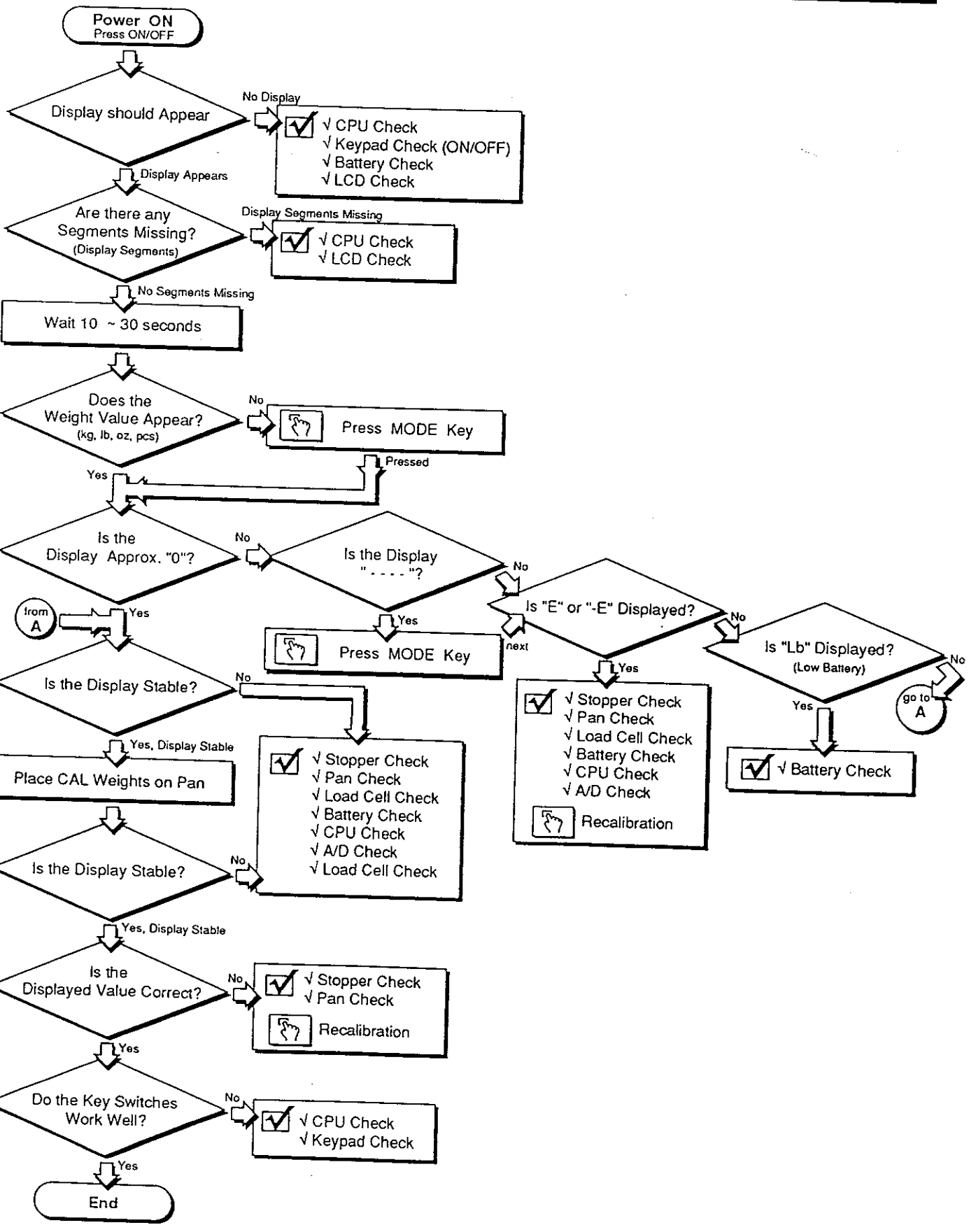




	SEG C	SEG B	SEG A
COM2	a	b	
COM1	f	g	c
COM0	e	d	h

No.	COM2	COM1	COM0	No.	COM2	COM1	COM0	No.	COM2	COM1	COM0
4	○ 7b	◁ 7g	◁ 7d	12		4c	4h	20		2c	
5		6c	6h	13			,4h'	21	HI 1a	lb 1f	k 1e
6	5a	5f	5e	14	3a	3f	3e	22	GO 1b	OZ 1g	g 1d
7	5b	5g	5d	15	3b	3g	3d	23			
8		5c	5h	16		3c	3h	24	LO 0b		pcs 0d
9			,5h'	17			,3h'				
10	4a	4f	4e	18	2a	2f	2e				
11	4b	4g	4d	19	2b	2g	2d				

MECHANICAL FAULT FINDING FLOW CHART



LOAD CELL REPLACEMENT

Please Note

- Make sure that you read fully through the entire procedure before initiating replacement work.
- In particular, read the entire step before attempting it, taking the time to look for notes in the step pertaining to the particular scale you are working on.
- Please identify the Load Cell for the assembly that you are working on before starting replacement work. In the FV series, there are four Load Cells used:

Load Cells Used

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-150KK1	FV-150KB1				❊
FV-60KA1	FV-60KK1	FV-60KB1			❊	
FV-60KA2	FV-60KK2	FV-60KB2		❊		
FV-30KA2	FV-30KK2	FV-30KB2	❊			

Disassembly

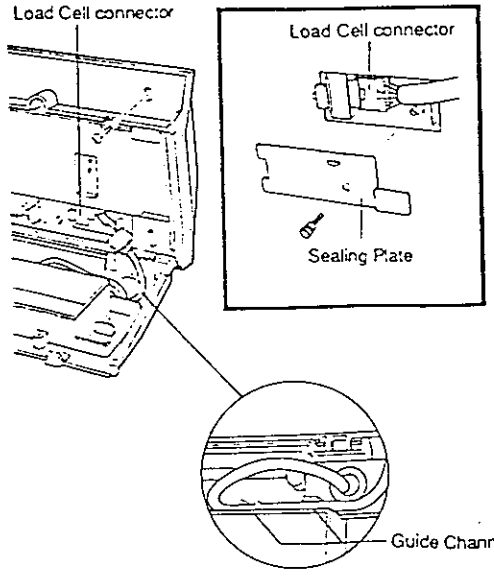
Regular Scale
- FV-150KA1
- FV-60KA1/KA2
- FV-30KA2

Weighing Platform and Load Cell
- FV-150KB1
- FV-60KB1/KB2
- FV-30KB2

NOTE: If you are working on an FV-150KB1, FV-60KB1/KB2 or FV-30KB2 (Weighing Platform and Load Cell) please disregard instructions referring to the Display Arm and Display Pod. As to the weighing indicator you are using, you will have to use the Load Cell specifications for setting information.

Step 1. Open the Display Pod, remove the sealing plate, and disconnect the Load Cell cable (the one coming through the Display Arm). Make sure that you also removed the cable from its guide channel. (Figure A).

Figure A



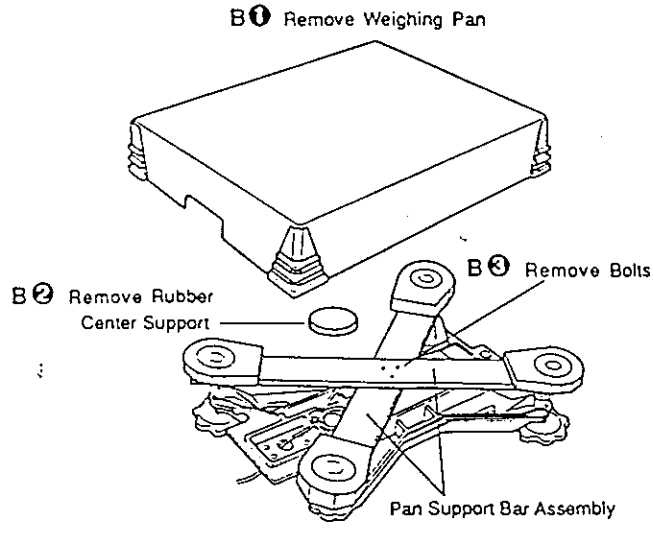


Figure B

Step 2. Remove the Weighing Pan (Figure B, B❶).

Step 3. Remove the rubber Center Support in the center of the Pan Support Bar assembly (Figure B, B❷).

Step 4. Remove the hex (•three on the FV–150/60KA1/KB1; •two on the FV-60/30KA2/KB2 and the stopper bolt with a hex nut - the bolt is needed any new Load Cell) bolts holding the Pan Support Bar assembly to the Load Cell (Figure B, B❸).

Step 5. Lift off the Pan Support Bar assembly.

- FV-150KA1/B1 FV-60KA1/B1 FV-60KA2/B2 will also have a spacer plate between the Pan Support Bar assembly and the Load Cell.
- FV-30KA2 will have a spacer plate between the Pan Support Bars and a spacer plate between the Pan Support Bar assembly and the Load Cell.

Step 6. Clip the plastic tie bands holding the Load Cell surplus cord (there may be no coil if the Display Pod has been externally mounted) and gently remove the cable from its guiding channel to the Load Cell (Figure C).

- Figure C shows the round coil of the FV–150/60KA1/KB1 (it is rectangularly wrapped on the FV-60/30KA2/KB2).
- Make sure that you leave the holders that secure the plastic tie bands to the Platform, you will need them for reassembly.

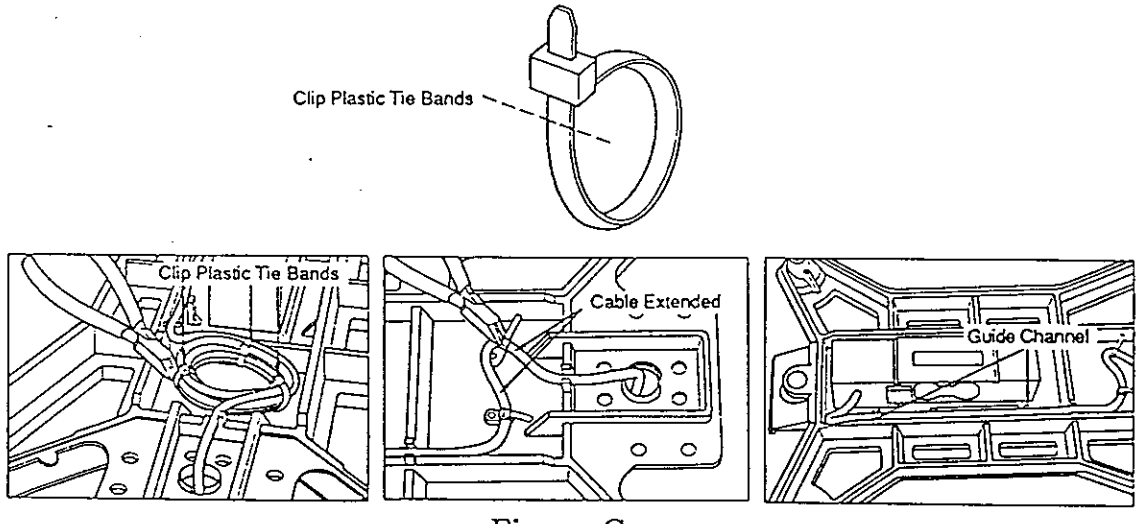


Figure C

Step 7. Turn the Platform Base on its side. Holding the Load Cell in one hand and (from the bottom of the Platform Base):

- FV-60KA1/B1, FV-150KA1/B1 Remove the four hex bolts that hold the Load Cell to the base.
- FV-30KA2/B2, FV-60KA2/B2 Remove the four hex bolts and plate that holds the Load Cell to the base.

Step 8. Set the Platform Base down, and lift out the Load Cell.

Assembly

Regular Scale	Weighing Platform and Load Cell
•FV-150KA1	•FV-150KB1
•FV-60KA1/KA2	•FV-60KB1/KB2
•FV-30KA2	•FV-30KB2

NOTE: If you are working on an FV-150KB1 or FV-60KB1 (Weighing Platform and Load Cell) please extrapolate references from the A&D Display Pod to what ever weighing indicator you are using.

Step 1. Turn the Platform Base on its side. Holding the Load Cell in one hand and (from the bottom of the Platform Base):

- First just firmly attach the hex bolts (the FV-30KA2/B2, FV-60KA2/B2 also have a plate) that hold the Load Cell to the base, then tighten them. Make sure that the convex washers are facing the correct way.
- If you are using a torque wrench:

FV-60KA1/B1, FV-150KA1/B1	Set it to **300kg•cm**.
FV-30KA2/B2, FV-60KA2/B2	Set it to **150kg•cm**.

Step 2. Set the Platform Base back down and thread the Load Cell cable through its guide channel (Figure F).

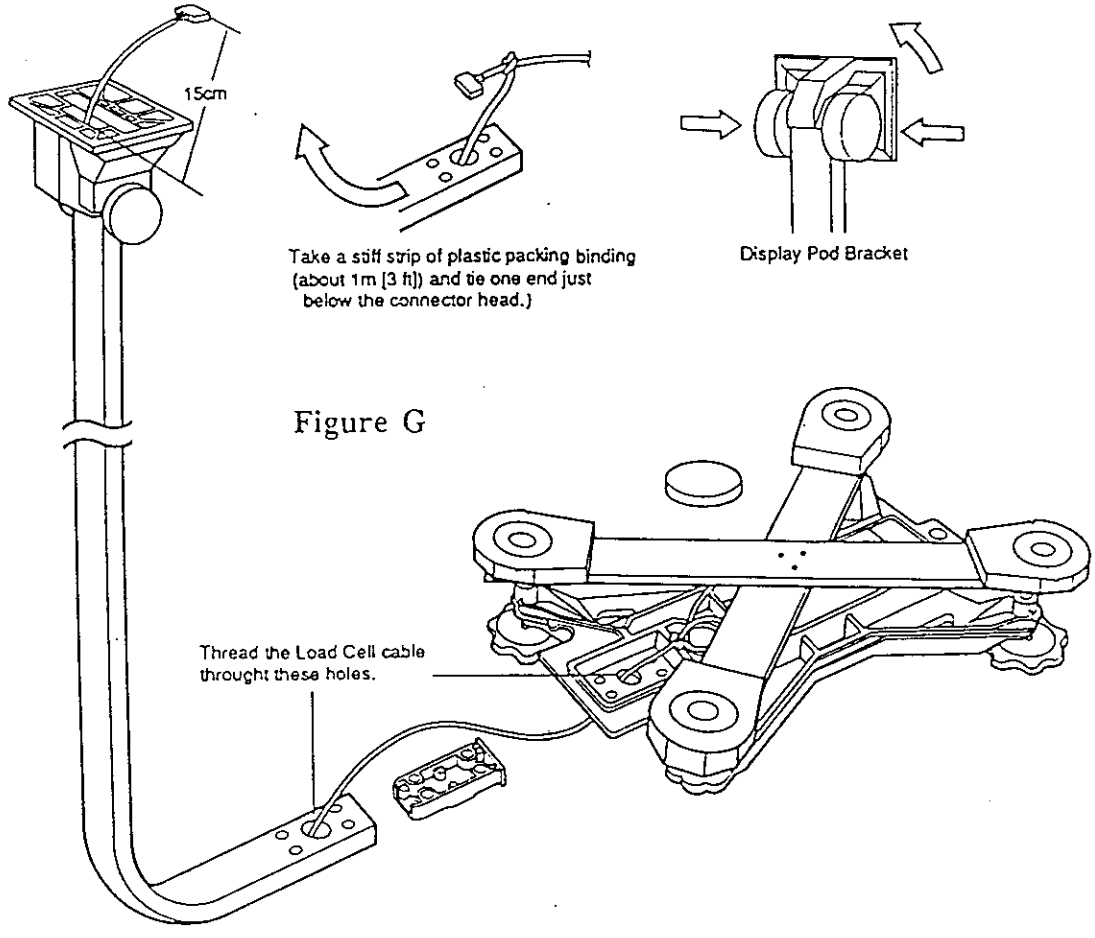


Figure G

Note: If the Display Pod is mounted externally (does not use the Display Arm), please skip to Step 6. If the Display Arm has been removed and you are going to reattach it, please see the FV ASSEMBLY INSTRUCTIONS. *Do not try to reattach the Display Arm on your own without the knowing the correct instructions, the metal brace must be installed correctly.*

Step 3. Take a stiff strip of plastic packing binding (about 1m [3 ft]) and tie one end just below the connector head (Figure G).

Step 4. Tilt the Display Pod bracket slightly forward by pressing in on the two round side clamps (until you can clearly see through the Display Pod bracket) (Figure G).

Step 5. Thread the strip of plastic packing binding through the Platform Base hole and up through the hole (from the Display Arm channel) in the Display Pod (Figure G).

Step 6. Leaving about 15cm (6 in) out at the end of the Display Arm, lay the cable in its Display Pod guide channel (Figure H).

Figure H

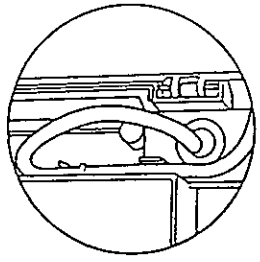
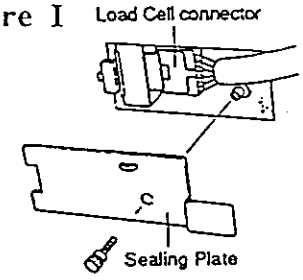
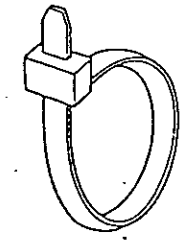


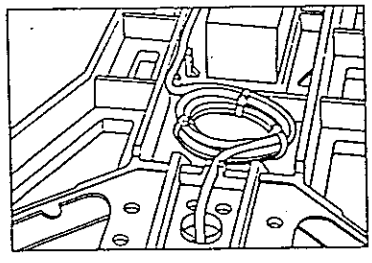
Figure I



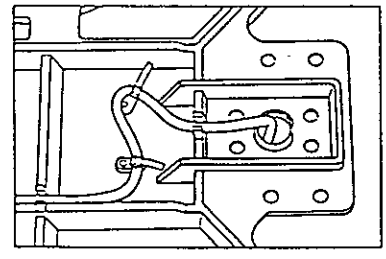


Step 7. Connect the Load Cell cable to the Display Pod and replace Sealing Plate (Figure I).

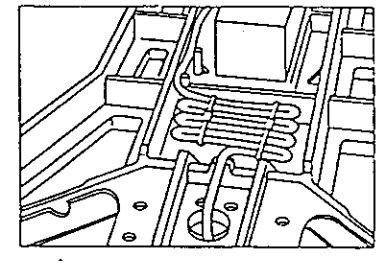
Step 8. Coil the remaining cable and secure it with plastic tie bands (Figure J).



FV-60KA1/B1, FV-150KA1/B1



Cable Extended



FV-30KA2/B2, FV-60KA2/B2

Figure J

Step 9. Attach the plastic tie bands to the Platform Base with the holders (see Step 5., Disassembly).

Step 10. Attach the bolts (the FV-30KA2/B2, FV-60KA2/B2 has two, while the FV-60KA1/B1, FV-150KA1/B1 has three) holding the Pan Support Bar assembly to the Load Cell (see Figure B, **B❹**).

- FV-30KA2/B2 — There are two spacers, a thinner one that goes between the Pan Support Bars, and a thicker one that goes between the Pan Support Bar assembly and the Load Cell.
- FV-60KA2/B2 FV-60/150KA1 — There is a spacer that goes between the Pan Support Bar assembly and the Load Cell.
- If you are using a torque wrench:

  FV-60KA1/B1, FV-150KA1/B1 — Set it to **300kg•cm**.

  FV-30KA2/B2, FV-60KA2/B2 — Set it to **150kg•cm**.

Step 11. Replace the rubber Center Support in the center of the Pan Support Bar assembly (see Figure B, **B❷**).

Step 12. Replace the Weighing Pan (see Figure B, B❶).

✔ You must check here to make sure that the Pan Support Bar assembly was correctly installed. If you have difficulty replacing the Weighing Pan (it is a tight fit and the sides of the Pan are obviously rubbing on the Pan Support assembly) then just loosen the bolts (•three on the FV–150/60KA1/KB1; •two on the FV-60/30KA2/KB2 - it is not necessary to tighten the stopper bolt with the hex nut at this time) holding the Pan Support Bar assembly to the Load Cell and adjust the Pan Support Bars so that they are closer together (please see SCALE DIMENSIONS section for Pan Support Bar assembly dimensions)

Step 13. Go to the CALIBRATION section, page 9, and complete the full Zero and Span calibration procedure (including Setting "g" if scale location is to be elsewhere).

Attention

Do not use the scale, or return it to the customer without completing the above step, the scale will not be accurate without it!

Step 14. If you are working on an:

- FV-60KA1/B1, FV-150KA1/B1 — You are finished.
- FV-30KA2/B2, FV-60KA2/B2 — Please continue to LOAD CELL STOPPER ADJUSTMENT.

END End of LOAD CELL REPLACEMENT procedure.

Load Cell Stopper Adjustment

** Please read the opening NOTE in the LOAD CELL REPLACEMENT section.*

There is a bolt that runs through the Load Cell on the FV-60KA2/KB2 and FV–30KA2/KB2 that will hit an Overload Stopper Plate when there is too much weight on the Weighing Pan. This bolt is called the Stopper Bolt and its head is located on the Pan Support Bar assembly. It consists of a long, thin, threaded shaft that is tightened with a hex nut after it has been correctly adjusted.

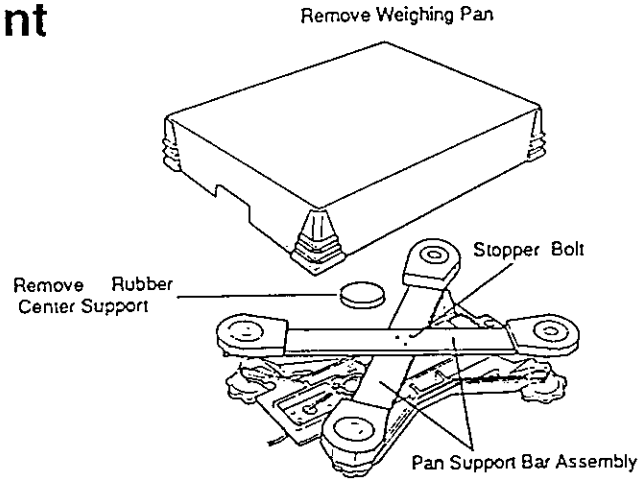
You must adjust the Load Cell Stopper Bolt when the Load Cell has been replaced, or if there is a scale malfunction that indicates stopper misadjustment.

To perform this operation, you must have the correct Stopper Jig for the:

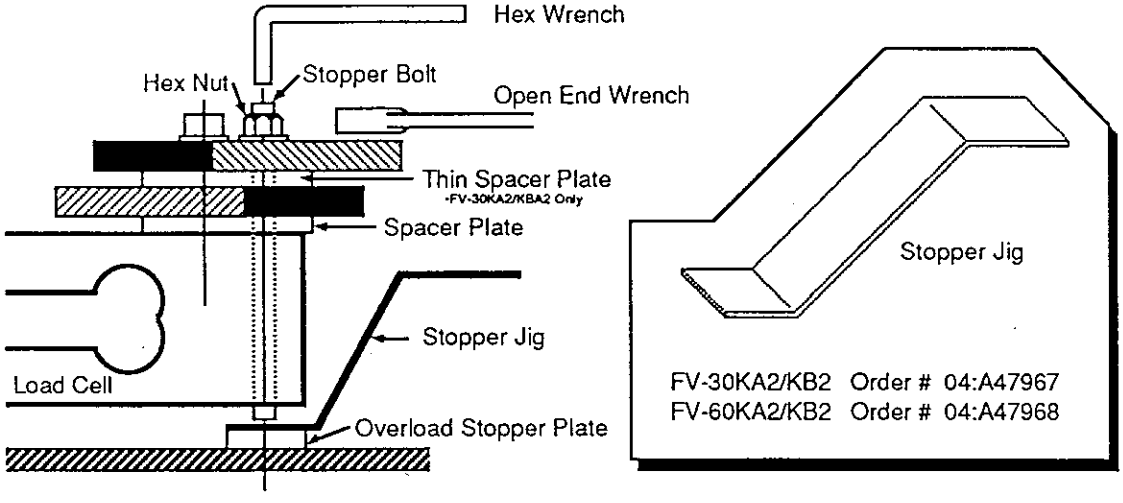
- FV-30KA2, FV-30KB2 it is order number **04:A47967.**
- FV-60KA2, FV-60KB2 it is order number **04:A47968.**

Stopper Adjustment

Step 1. Remove the Weighing Pan, the rubber center support, and turn on the display.



Step 2. Holding the Stopper Bolt with a hex wrench - loosen the hex nut holding the Stopper Bolt with an open end wrench. You may also want to loosen (counterclockwise) the Stopper Bolt a little.



Step 3. Slide the correct jig for the scale you are working on between the Load Cell Stopper Bolt and the Overload Stopper Plate.

Step 4. Watching the display, adjust the Stopper Bolt with the hex wrench until the display shows: **–1.00 to –0.50**.

Step 5. Holding the hex wrench tightly, tighten the hex nut (clockwise).

- If you are using a torque wrench: Set it to **150kg•cm**.

DISPLAY During the above step you will see display fluctuations, after you have tightened the hex bolt, the following display readings are allowable: **–1.00 to 0**.

Step 6. Check that the display readings are in the allowable range listed above. If not, restart the procedure.

Step 7. Carefully remove the stopper jig.

Step 8. Replace the rubber Center Support, and the Weighing Pan.

Step 9. Go to the CALIBRATION section, page 9 and complete the full Zero and Span calibration procedure (including Setting "g" if scale location is to be elsewhere).

Attention

Do not use the scale, or return it to the customer without completing the above step, the scale will not be accurate without it!

END End of LOAD CELL STOPPER ADJUSTMENT procedure.

LOAD CELL MOISTURE-PROOF IMPROVEMENT PROCEDURE

For FV Series Scales - Load Cells LC:105/106

Note: This procedure is not required for load cells and scales shipped after April 1987 when the procedure became standard during manufacturing.

This is a procedure to improve the moisture-proof characteristics of the Load Cells LC:105/106 (FV series scales). It is intended for those Load Cells of the initial FV series lot. The current FV series Load Cells have this improvement. Please check with your A&D representative if you are unsure whether a Load Cell requires improvement.

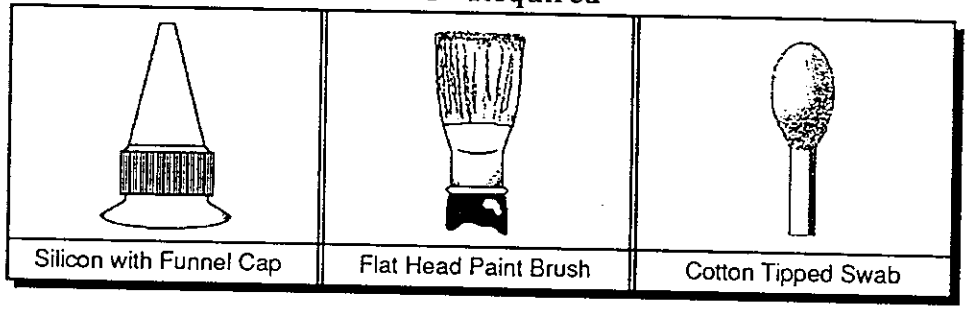
In this procedure you will peel back the Black Rubber Moisture Covers that protect the two thin Flexible Printed Circuits on either side of the Load Cell. Then, you will paint on additional silicon over the parts of the Flexible Printed Circuits not under the Moisture Covers. Finally, you will seal the rubber moisture covers back on with bond.

The entire process could be somewhat lengthy - as at one step (Step 7.), you will need to let the silicon cure for over six hours before proceeding. You will also need to have the specified silicon product, as it will have the particular characteristics desired.

You will need the following materials:

- Silicon: ☞ **"Toray Silicon SE 9140RTU"**
- Bond (for rubber): ☞ **"Konishi G17"**
- A flat-head watercolor paint brush around 1cm (1/2 inch) wide.
- Cotton Tipped Swabs.

Items Required



Step 1. Remove the Load Cell from its base and set it down on its end as shown in Figure A.

Step 2. Very carefully peel the Black Rubber Moisture Covers down, on both sides, about half way as shown in Figure A, **A❶**. Be careful not to rip the covers.

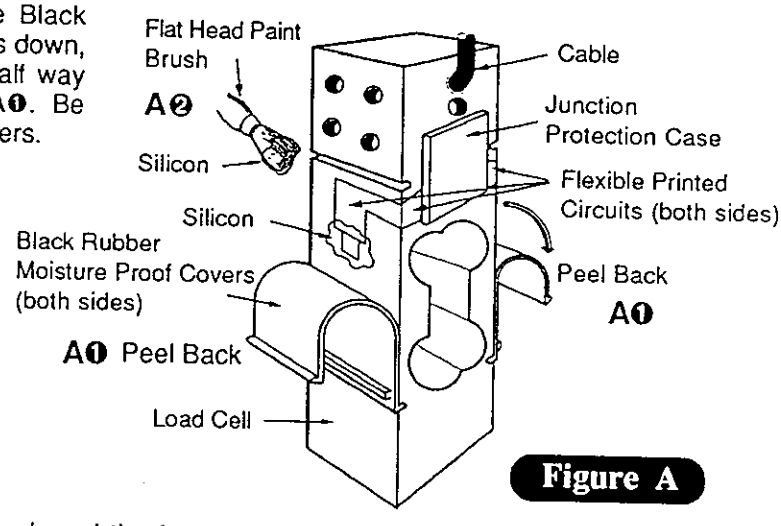


Figure A

Step 3. Use a flat-head paint brush and the funnel cap (Figure D, **D❶**) to coat the exposed Flexible Printed Circuit (F.P.C.) with undiluted silicon (Figure A, **A❷**) (Figure B, **B❶**), on both sides. Make sure that you apply the silicon evenly over the area indicated in Figure B. You should apply the silicon evenly to about 0.3~0.5mm thick.

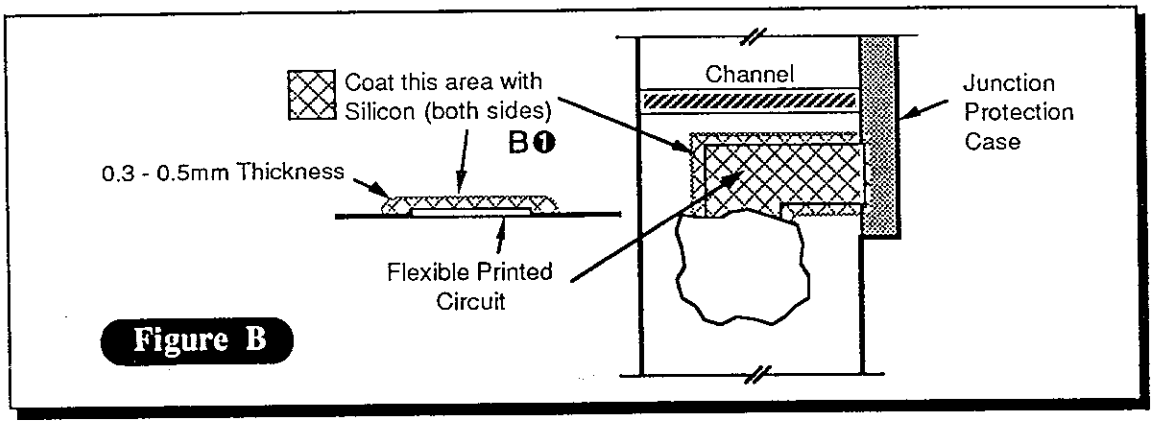


Figure B

Step 4. Set the Load Cell on its side with the Junction Protection Case facing up. (see Figure D).

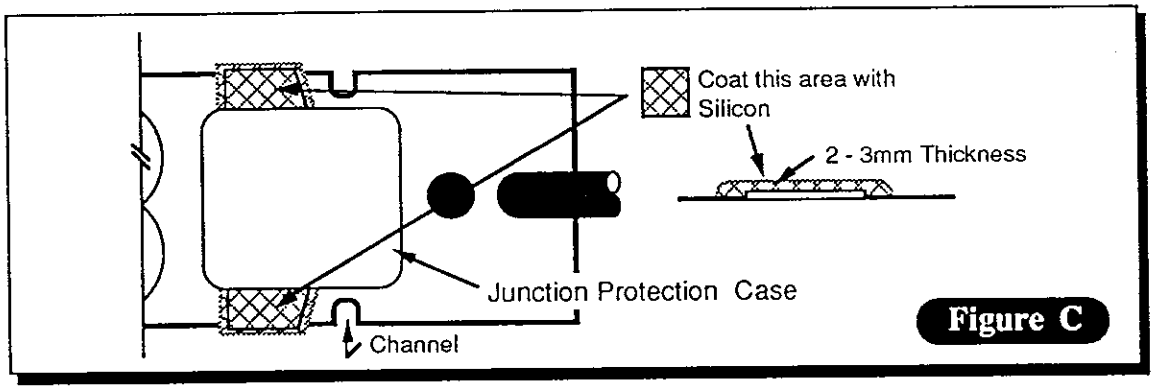
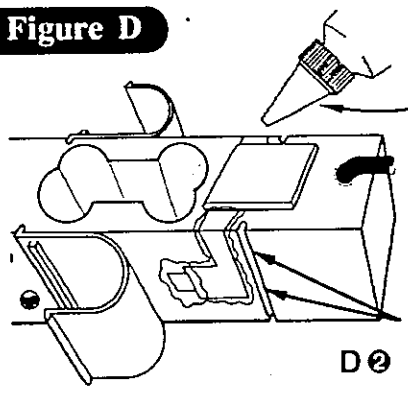


Figure C

Step 5. Use the funnel cap (Figure D, D❶) (and a flat-head paint brush if needed) to coat the remaining Flexible Printed Circuit (F.P.C.) ribbon with undiluted silicon (Figure C).
•Please apply the silicon evenly to about 2~3mm thickness.

Figure D



D❶ Use the funnel cap to apply silicon, it will go on in a more even manner.

Place the Load Cell on its side with the Junction Protection Case up.

D❷ Coat the insides of the channels (both sides) with bond using the cotton tipped swabs. Quickly replace the Black Rubber Moisture Proof Covers. Wipe away excess glue. This will seal the covers.

Step 6. Let the silicon cure fully - for over six hours.

Step 7. Apply bond to the tip of a cotton tipped swab and use it to coat the channel with silicon (Figure D, D❷).

Step 8. Quickly replace the black moisture covers, pressing the ends firmly into their channels. Wipe away any excess bond.

Step 9. Mount the Load Cell to its base.

NOTE: If you are working on a FV series scale, please see the LOAD CELL REPLACEMENT chapter and the appropriate ASSEMBLY section of the FV MAINTENANCE MANUAL.

END End of LOAD CELL MOISTURE-PROOF IMPROVEMENT PROCEDURE.

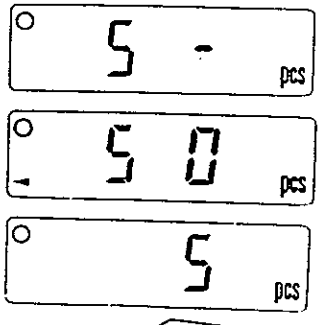
INSTRUCTION MANUAL UPDATES

The following is an update from the user's INSTRUCTION MANUAL, version one. This will replace the section on the Counting Mode, "pcs" - at the bottom of page 8. Please update your customers.

COUNTING MODE

"pcs"

1) Weigh one unit of what is to be counted. If it is too small for the scale to detect ("0" stays displayed) then it is also too small to use with Counting Mode. We suggest in this case that you use 10 units and count them as one "pcs". So, a sample size of 5 pcs would be 50 units.



2) 

Select "pcs" with the **MODE** key.

3) 

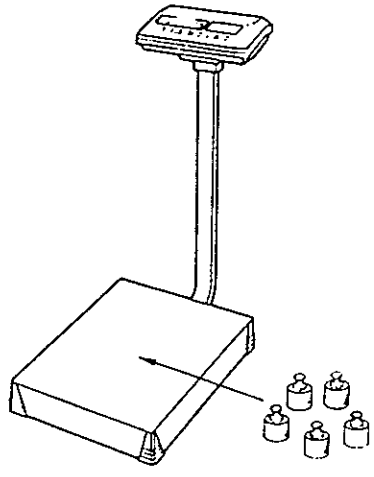
Press **ZERO** to zero the display.

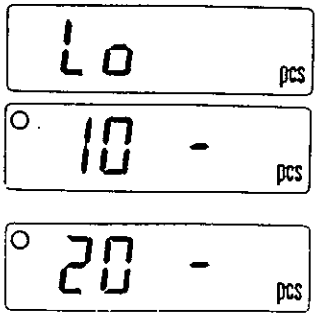
4) 

Press the **SET** key and "5 0 pcs" will be displayed. Place 5 units on the pan and the display will read "5 - pcs".

5) 

Press the **SET** key again.





- Having established the unit weight of the parts you are counting, you may now count up to 10,000 pieces.
- If 5 units is not enough weight, the display will show "Lo" when you press the **SET** key. This means that the unit weight is less than the scale can detect (see above).
- You can also use the **HI/LO–S.SIZE** key to display 10, 20, 50 or 100 units as a sample. As a rule, the higher the sample size, the more accurate the count, so use the largest sample size that is convenient for you.

NOTE: You should only use the Counting Mode to count pieces of the same weight .

INSTALLING OPTION OP-03 RS232C INTERFACE AND COMPARATOR BUZZER

Step 1. Open the Display Pod by pressing the two latch clips and lifting (Figure A).

Step 2. Disconnect the Battery Pack leads (Figure A).

Step 3. Remove the four screws holding the Display Pod Faceplate to the Pod Body (Figure A).

Step 4. Carefully detach the thin ribbon cable from the Display Pod Keypad to the Mother board (J4) by pressing in on the clips and gently sliding out the connector assembly, and then detaching the cable (Figure B). NOTE: The clip does not come out of the connector, just the flat cable! Set the Display Pod Faceplate aside with the screws.

Figure A

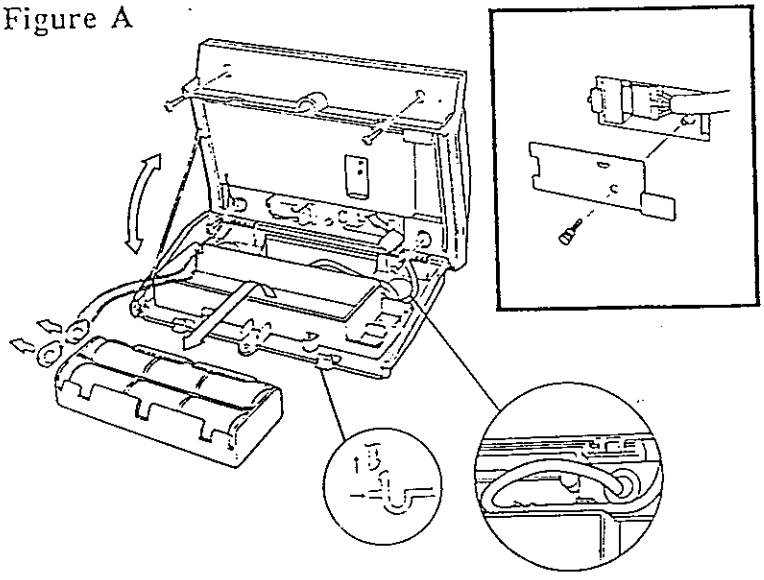
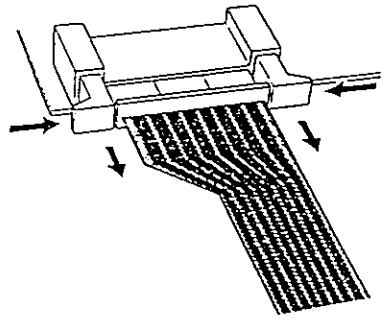


Figure B



Press in on the clips, then slide out connector

Step 5. Remove the RS232C Interface and Comparator Buzzer Board from its package. If the board is in one piece, carefully snap it apart at the grooved line between the DIP switches and the 7-PIN connector.

Step 6. Turn both the main and small board over. Slide the 7-PIN connector into its' slot until the two holding pins can be seen in the board (Figure C, **C❶**). Screw down the small board (Figure C, **C❷**).

Step 7. Now take the large board and fold it up and back, then slip the end into the corner slots (Figure D, **D❶**). Screw the main board down (Figure D, **D❷**).

Figure C

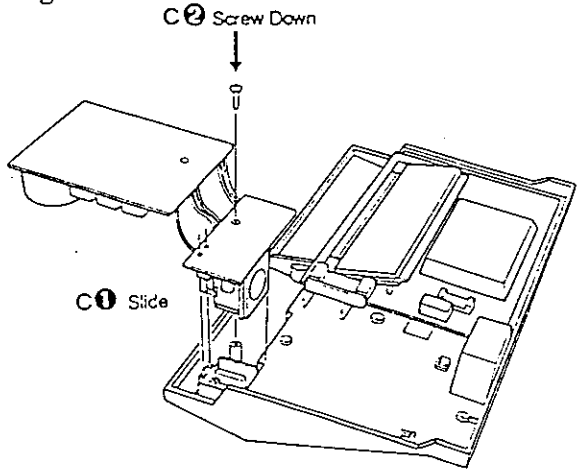
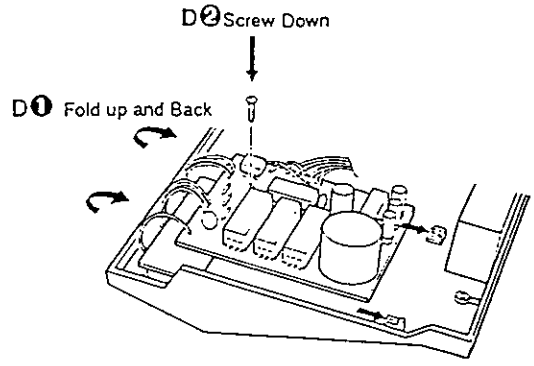


Figure D



Step 8. Attach the cable to the Mother Board at the J2 - OPTION connector (Figure E).

Step 9. Set the Comparator DIP switches as desired.

Comparator DIP Switch Settings		
1	OFF	Transmit when stable.
	ON	Transmit when stable, or unstable.
2	OFF	For "LO" signal buzzer OFF.
	ON	For "LO" signal buzzer ON.
3	OFF	For "GO" signal buzzer OFF.
	ON	For "GO" signal buzzer ON.
4	OFF	For "HI" signal buzzer OFF.
	ON	For "HI" signal buzzer ON.

Step 10. Re-attach the thin ribbon cable from the Display Pod Keypad to the Mother board (J4) by carefully sliding the cable (shinny side down) into the bottom of the connector, and when it's in solidly, slid the clip unit back into place until the snap from the clips can be heard (Figure F).

Figure E

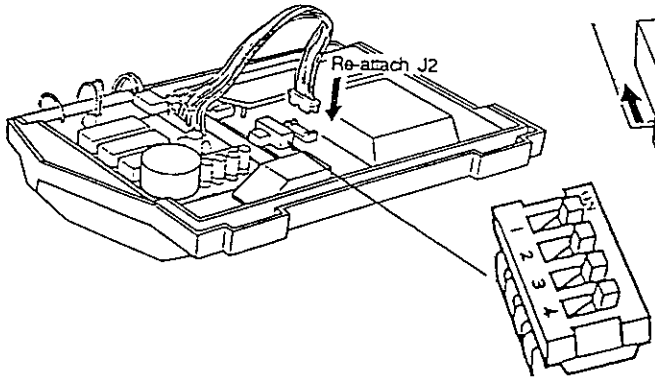
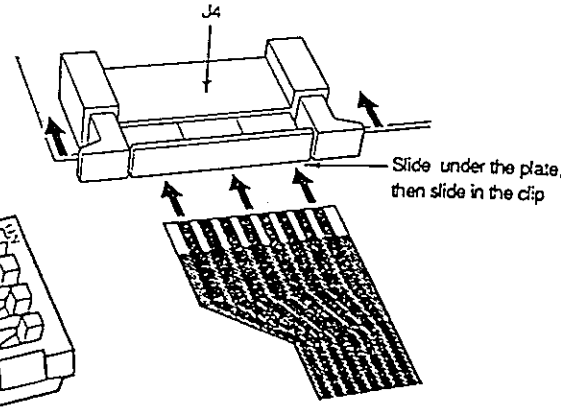


Figure F



Step 11. Re-attach the Display Pod Faceplate to the Pod Body using the four screws (the short screws at the front, the longer screws at the back).

Step 12. Close the Display Pod, and connect the Battery Pack leads.

Step 13. The FV scale is now ready to use. When attaching the printer cable to the FV, make sure that the 7-PIN connector is inserted tightly.

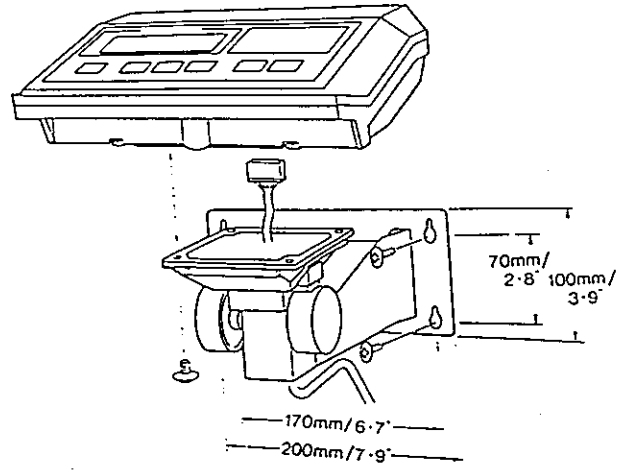
END End of INSTALLING OPTION OP-03 procedure.

INSTALLING OPTIONS OP-01, OP-02

OP-01 Wall Mounting Kit

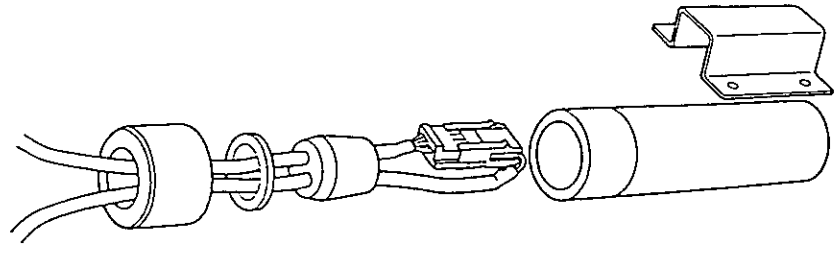
Step 1. Attach the Wall Mounting Bracket to a wall (or other supportive surface) with self-tapping screws. In some wall surfaces, you will need to drill holes and use Rawlplugs (wall plugs) to provide a key for the screws.

Step 2. Attach the Display Pod to the Wall Mounting Bracket.

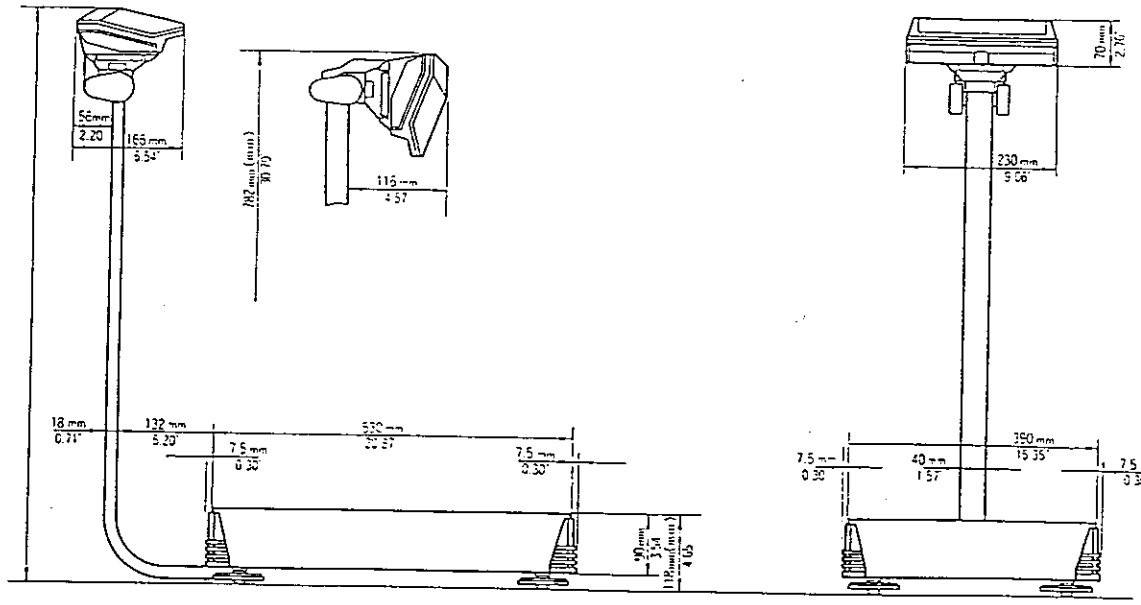


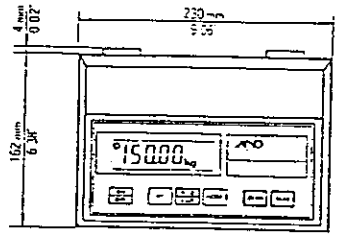
OP-02 Display Pod Extension Cable

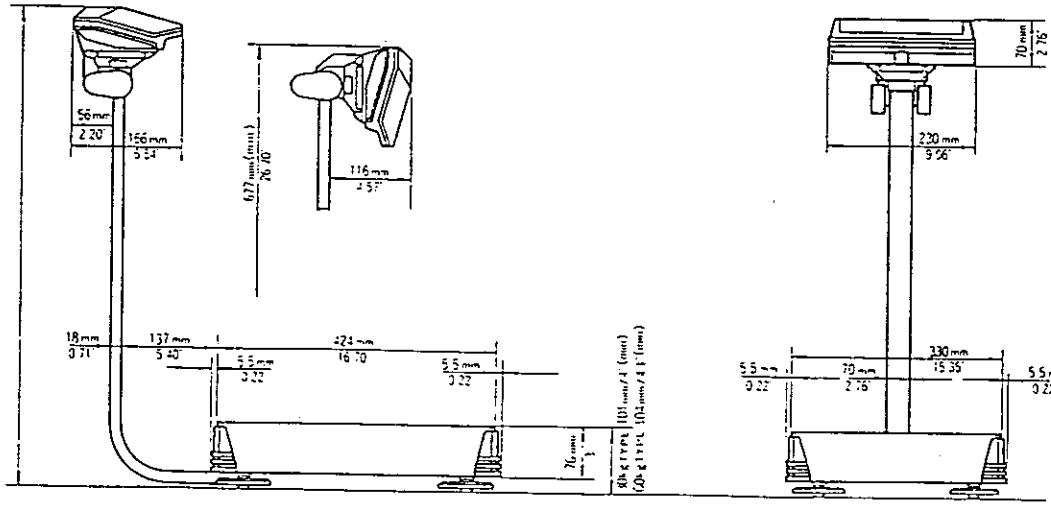
If the Display Pod is to be used in a position remote from the platform, as a desk-top or wall mounted unit, then the standard Load Cell cable can be extended by 5 meters through the addition of this cable. The scale must be recalibrated for Zero and Span (see CALIBRATION section, page 9) if this extension cable is used. A waterproof boot has been provided to protect the male/female connectors from splash - but a waterproof junction box may be required for some installations. Commercial scales will need to have the junction box sealed by the authorities.

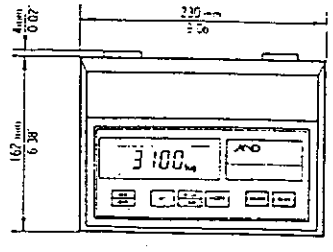


SCALE DIMENSIONS





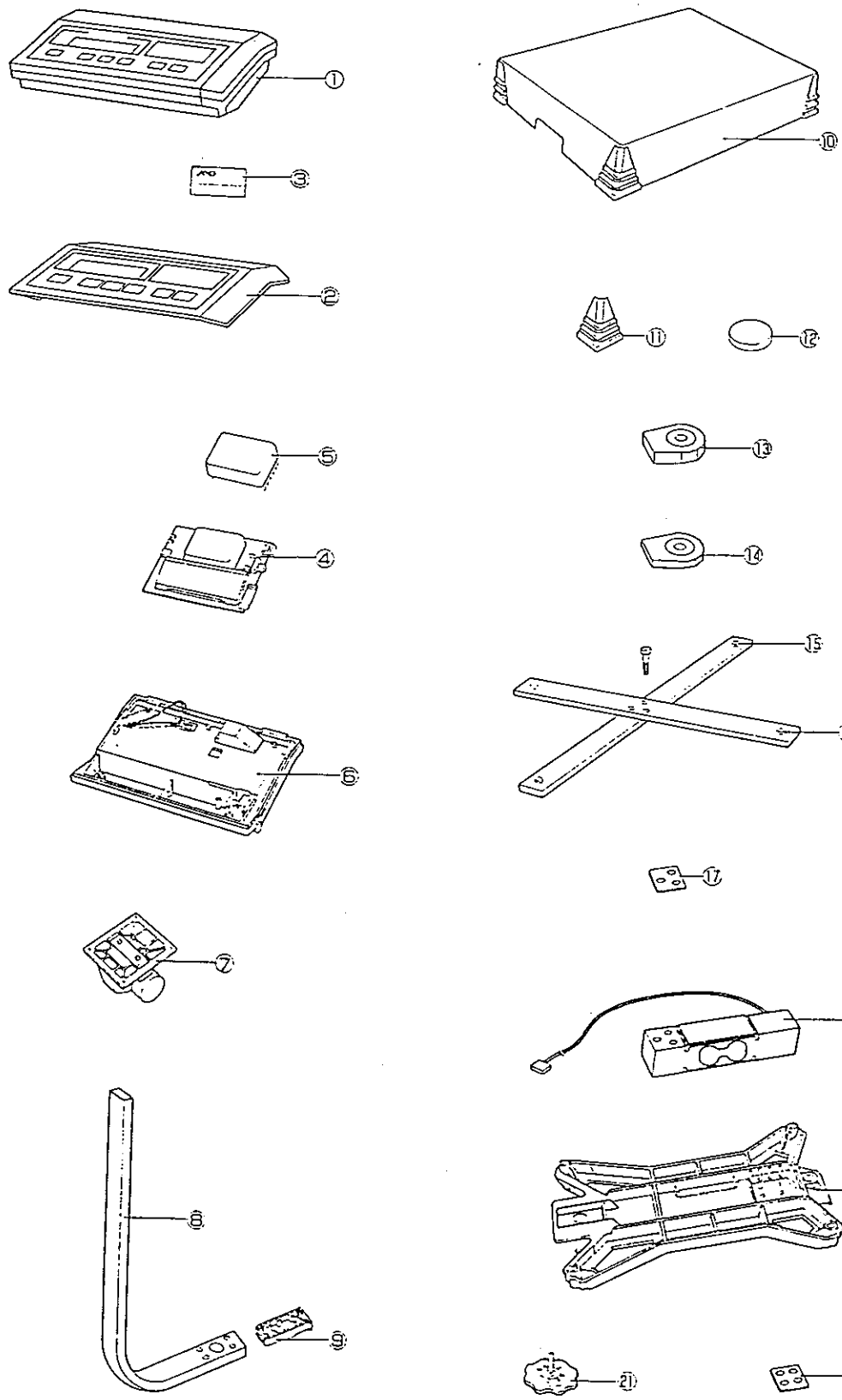




SPARE PARTS LIST

Number	Order Number	Description	Readjustment Necessary
1	7PA:FV-0	Display Unit	Yes
2	707:A10071A-1	Upper Case Unit (JPN)	No
(2)	707:A10071A-2	Upper Case Unit (Export)	No
3	08:A47373	Capacity Label FV-30KA (JPN)	No
(3)	08:A47372	Capacity Label FV-60KA (JPN)	No
(3)	08:A47371	Capacity Label FV-150K (JPN)	No
(3)	08:A47376	Capacity Label FV-30K (ENG)	No
(3)	08:A47375	Capacity Label FV-60K (ENG)	No
(3)	08:A47374	Capacity Label FV-150K (ENG)	No
4	7PZ:945-30	Main Board Unit FV-30K	Yes
(4)	7PZ:945-60	Main Board Unit FV-60K	Yes
(4)	7PZ:945-150	Main Board Unit FV-150K	Yes
5	MF:AMZ24	HYBRID IC	Yes
6	709:A34156	Lower Case Unit	No
7	707:A10078	Bracket Unit	No
8	04:A46953B	Arm FV-30KA2/60KA2	No
(8)	04:A45966D	Arm FV-60KA1/150KA1	No
9	03:A33740A	Pole Clamper	No
10	09:A34169	Pan Unit FV-30KA2/60KA2	No
(10)	09:A34095	Pan Unit FV-60KA1/150KA1	No
11	07:A34026A	Corner Piece Large	No
(11)	07:A34010	Corner Piece Small	No
12	06:A47308	Center Support FV-60KA1/150KA1	No
(12)	06:A46166C	Center Support FV-30KA2/60KA2	No
13	06:A33710-1A	Cushion Rubber 15H	No
14	06:A33710-2A	Cushion Rubber 24H	No
15	09:A47744-1	Suspension Bar-Upper FV-150KA1	No
(15)	09:A47745-1	Suspension Bar-U FV-60KA1	No
(15)	09:A47746-1	Suspension Bar-U FV-60KA2	No
(15)	09:A47747-1	Suspension Bar-U FV-30KA2	No
16	09:A47744-2	Suspension Bar-Lower FV-150KA1	No
(16)	09:A47745-2	Suspension Bar-L FV-60KA1	No
(16)	09:A47746-2	Suspension Bar-L FV-60KA2	No
(16)	09:A47747-2	Suspension Bar-L FV-30KA2	No
17	04:A46165B	Spacer Plate FV-150K1/60K1	No
(17)	04:A46971-1	Spacer Plate FV-60K2/30K2	No
(17)	04:A46971-2	Spacer Plate FV-30K2	No
18	LC:106-150K	Load Cell FV-150KA1	Yes
(18)	LC:106-60K	Load Cell FV-60KA1	Yes
(18)	LC:106-60K	Load Cell FV-60KA2	Yes
(18)	LC:106-30K	Load Cell FV-30KA1	Yes
19	703:A10076A	Base Unit FV-30KA2/60KA2	No
(19)	703:A20564B	Base Unit FV-60KA1/150KA1	No

20	04:A47453	Spacer Plate C	No
21	07:A33688D	Adjustable Foot	No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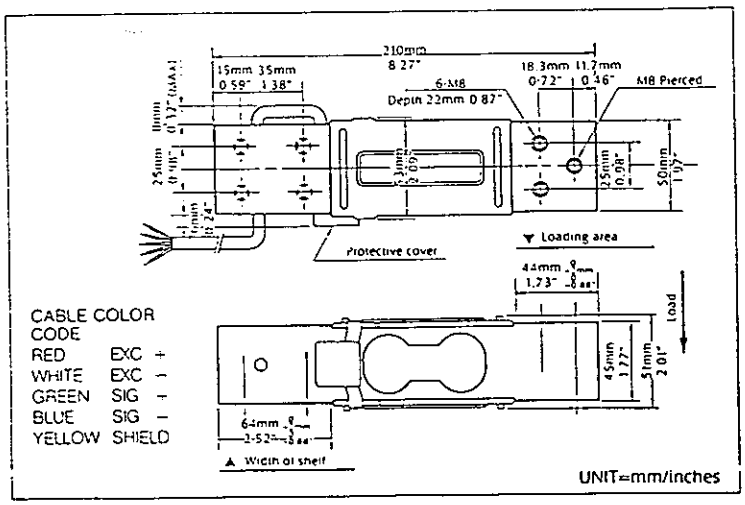
LOAD CELL SPECIFICATIONS

Load Cells LC:106

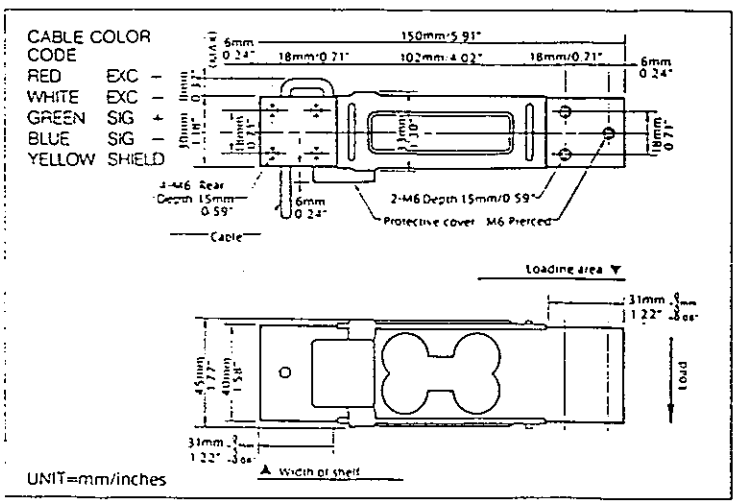
FV-150KA1	FV-150KK1	FV-150KB1
FV-60KA1	FV-60KK1	FV-60KB1



Capacities 60kg, 100kg,150kg
Maximum deadload..... 80% of rated capacity
Rated Output ..... 1mV/V^{-15}/$_{-0}$%
Maximum Load ..... 300% of rated capacity
Hysteresis..... ±0.015% of rated output
Creep..... ±0.015% of rated output/ per hour
Zero Balance..... 20 ±5% of rated output
Temperature range..... −10°~+40°C (+14°~+104°F)
Recommended excitation voltage 12V
Maximum excitation voltage 15V
Input resistance..... Approx. 400Ω
Output resistance..... 300Ω ±5Ω
Insulation resistance... 500MΩ at greater than DC50V
Temperature coefficient
−Zero ..... 0.004% of rated output/°C
−Span ..... 0.0014% of rated output/°C
Platform size ..... 400X600mm (15.8X23.6 inches)
Cable Length..... 2m (78 inches)

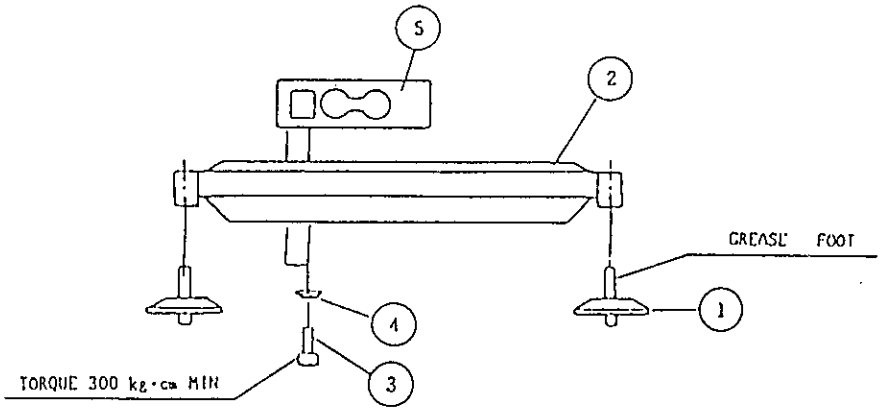
Load Cells LC:105

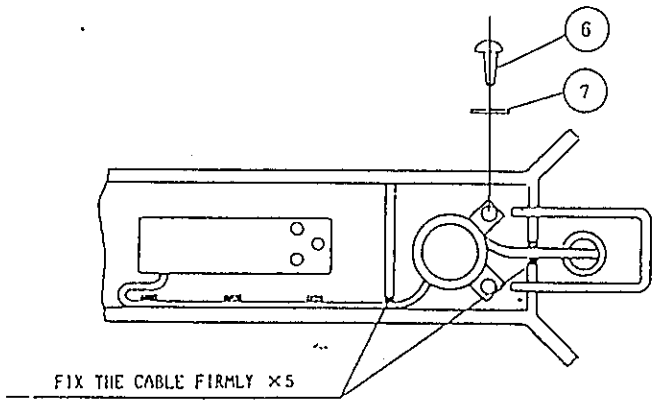
FV-60KA2	FV-60KK2	FV-60KB2
FV-30KA2	FV-30KK2	FV-30KB2

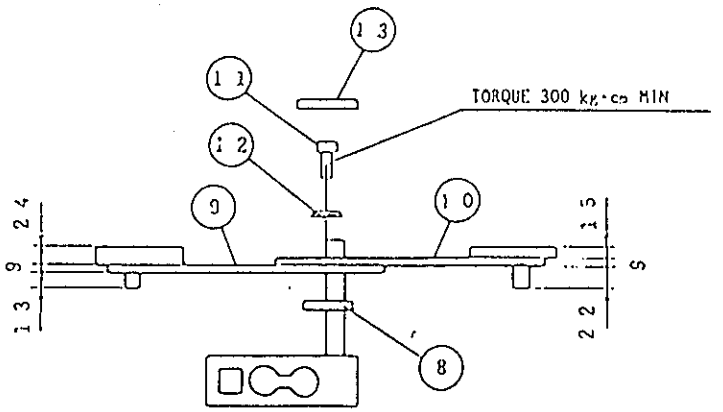


Capacities 10kg, 15kg, 30kg, 60kg, 150kg
Maximum deadload..... 80% of rated capacity
Rated Output ..... 1mV/V^{-15}/$_{-0}$%
Maximum Load ..... 300% of rated capacity
Hysteresis..... ±0.015% of rated output
Creep..... ±0.015% of rated output/ per hour
Zero Balance..... 20 ±5% of rated output
Temperature range..... −10°~+40°C (+14°~+104°F)
Recommended excitation voltage 12V
Maximum excitation voltage 15V
Input resistance..... Approx. 400Ω
Output resistance..... 300Ω ±5Ω
Insulation resistance... 500MΩ at greater than DC50V
Temperature coefficient
−Zero ..... 0.004% of rated output/°C
−Span ..... 0.0014% of rated output/°C
Platform size ..... 400X400mm (15.8X15.8 inches)
Cable Length..... 1.5m (59 inches)

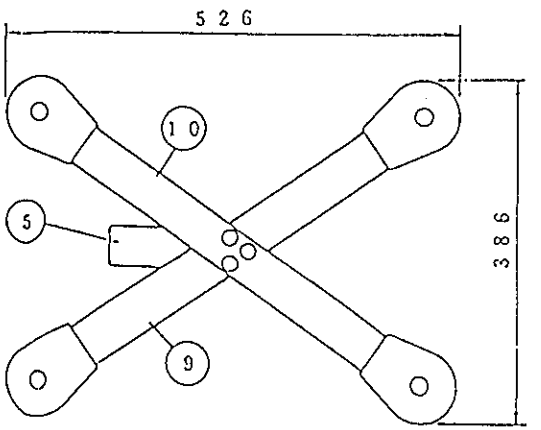
Platform Specifications FV-150KA1/B1





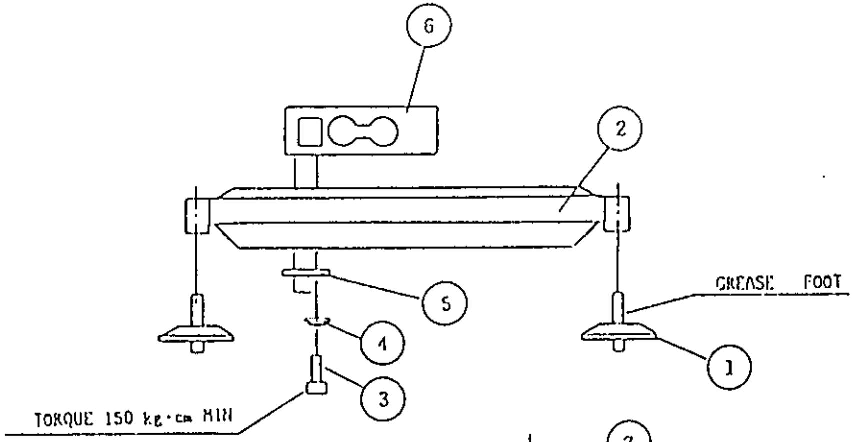


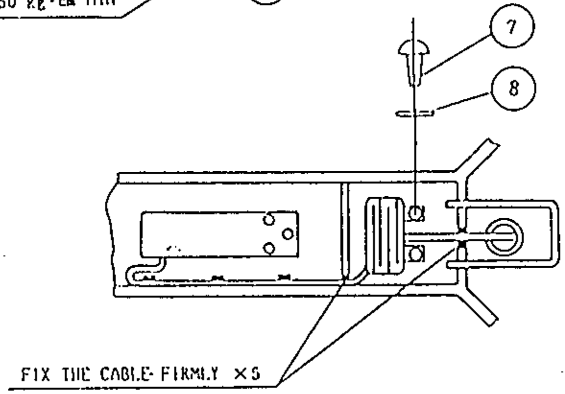
NO.	PARTS NAME	DESCRIPTION	SIZE (mm)	Q'TY
1	07:A33688D	ADJUSTABLE FOOT	M10×50(L)	4
2	03:A20564B	BASE	343(W)×500(D)×60(H)	1
3		HEX BOLT	M8×40(L)	4
4		CONVEX WASHER	M8(H)	4
5	LC:106-150K	LOAD CELL	50(W)×210(D)×51(H)	1
6		SCREW	M3×10(L) S-TYPE	2
7		WASHER	M3	2
8	04:A46165B	SPACER PLATE	50(W)×70(D)×5(T)	1
9	09:A47744-1	SUSPENSION BAR-R	50(W)×618(D)×9(T)	1
10	09:A47744-2	SUSPENSION BAR-L	50(W)×618(D)×9(T)	1
11		HEX BOLT	M8×40(L)	3
12		CONVEX WASHER	M8(H)	3
13	06:A46166C	CENTER SUPPORT	φ60×10(H)	1

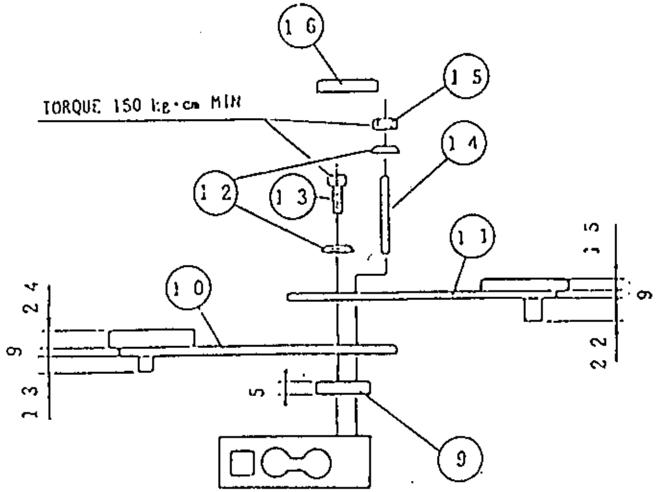


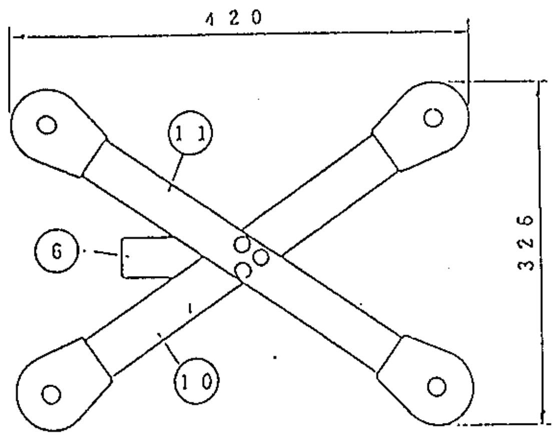
Platform Specifications FV-60KA2/B2

NO.	PARTS NAME	DESCRIPTION	SIZE (mm)	Q'TY
1	07:A33688D	ADJUSTABLE FOOT	M10×50(L)	4
2	03:A10076A	BASE	282(W)×397(D)×49(H)	1
3		HEX BOLT	M6×25(L)	4
4		CONVEX WASHER	M6(H)	4
5	04:A47453	SPACER PLATE	44(W)×32(D)×2.3(T)	1
6	LC:105-60K	LOAD CELL	30(W)×150(D)×45(H)	1
7		SCREW	M3×10(L) S-TYPE	2
8		WASHER	M3	2
9	04:A46971-1A	SPACER PLATE	40(W)×32(D)×5(T)	1
10	09:A47746-1	SUSPENSION BAR-R	50(W)×500(D)×9(T)	1
11	09:A47746-2	SUSPENSION BAR-L	50(W)×500(D)×9(T)	1
12		CONVEX WASHER	M6(H)	2
13		HEX BOLT	M6×30(L)	2
14		STOPPER BOLT	M6×70(L)	1
15		HEX NUT	M6	1
16	06:A47308	CENTER SUPPORT	φ60×10	1

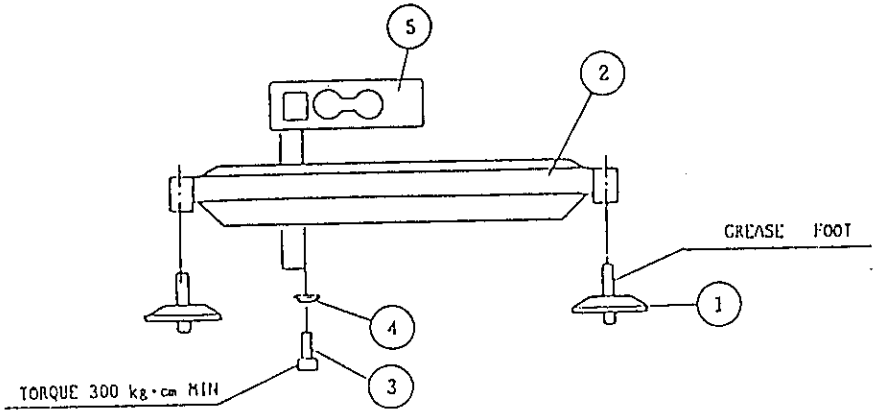


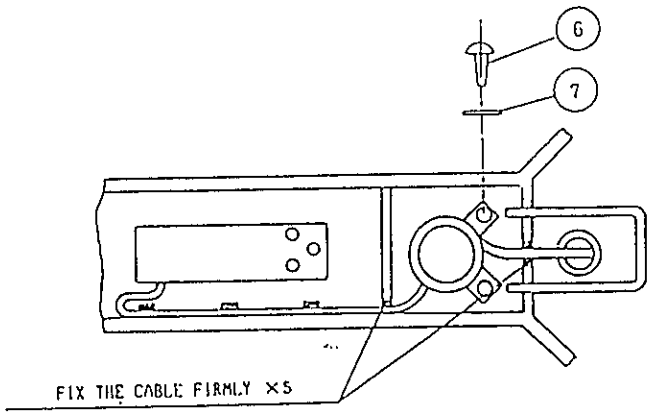


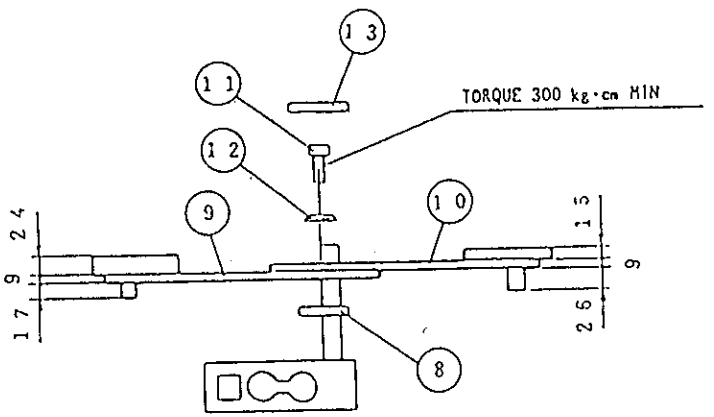




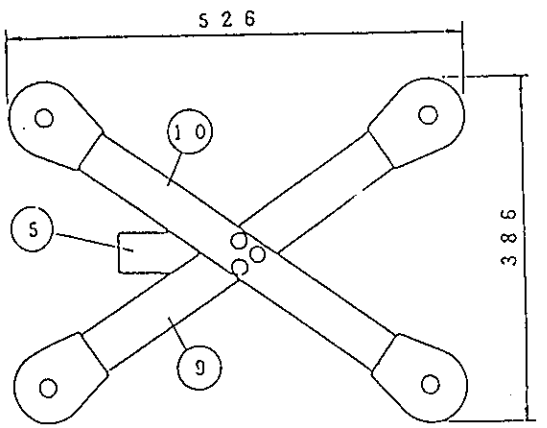
Platform Specifications FV-60KA1/B1





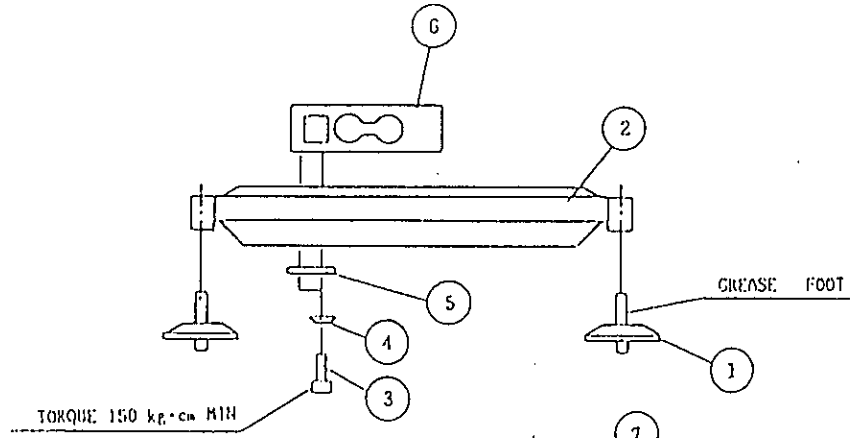


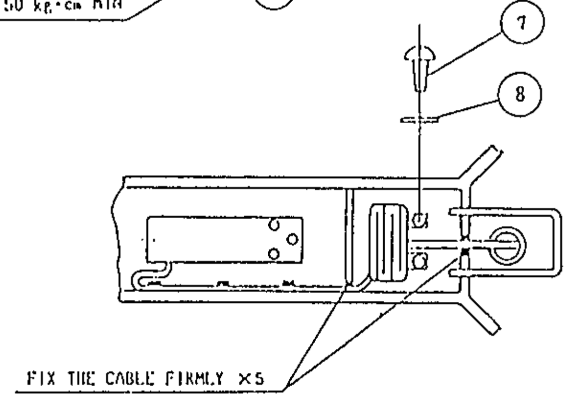
NO.	PARTS NAME	DESCRIPTION	SIZE (mm)	Q'TY
1	07:A33688D	ADJUSTABLE FOOT	M10×50(L)	4
2	03:A20564B	BASE	343(W)×500(D)×60(H)	1
3		HEX BOLT	M8×40(L)	4
4		CONVEX WASHER	M8(H)	4
5	LC:106-60K	LOAD CELL	50(W)×210(D)×51(H)	1
6		SCREW	M3×10(L) S-TYPE	2
7		WASHER	M3	2
8	04:A46165B	SPACER PLATE	50(W)×70(D)×5(T)	1
9	09:A47745-1	SUSPENSION BAR-R	50(W)×618(D)×9(T)	1
10	09:A47745-2	SUSPENSION BAR-L	50(W)×618(D)×9(T)	1
11		HEX BOLT	M8×40(L)	3
12		CONVEX WASHER	M8(H)	3
13	06:A46166C	CENTER SUPPORT	φ60×10(H)	1

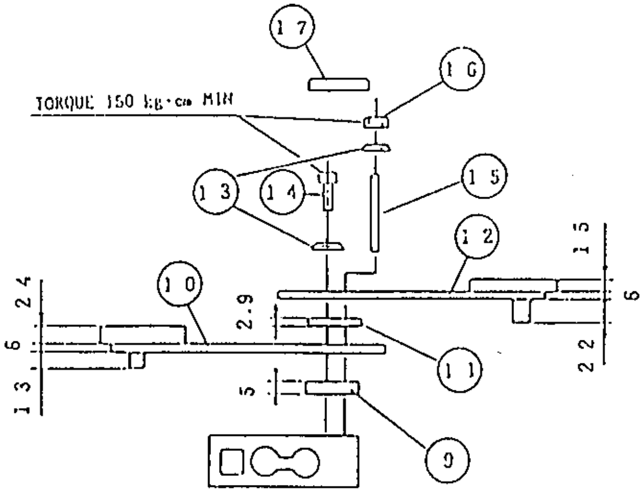


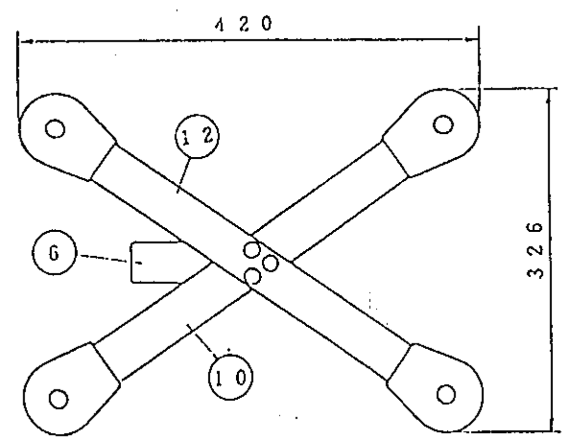
Platform Specifications FV-30KA2/B2

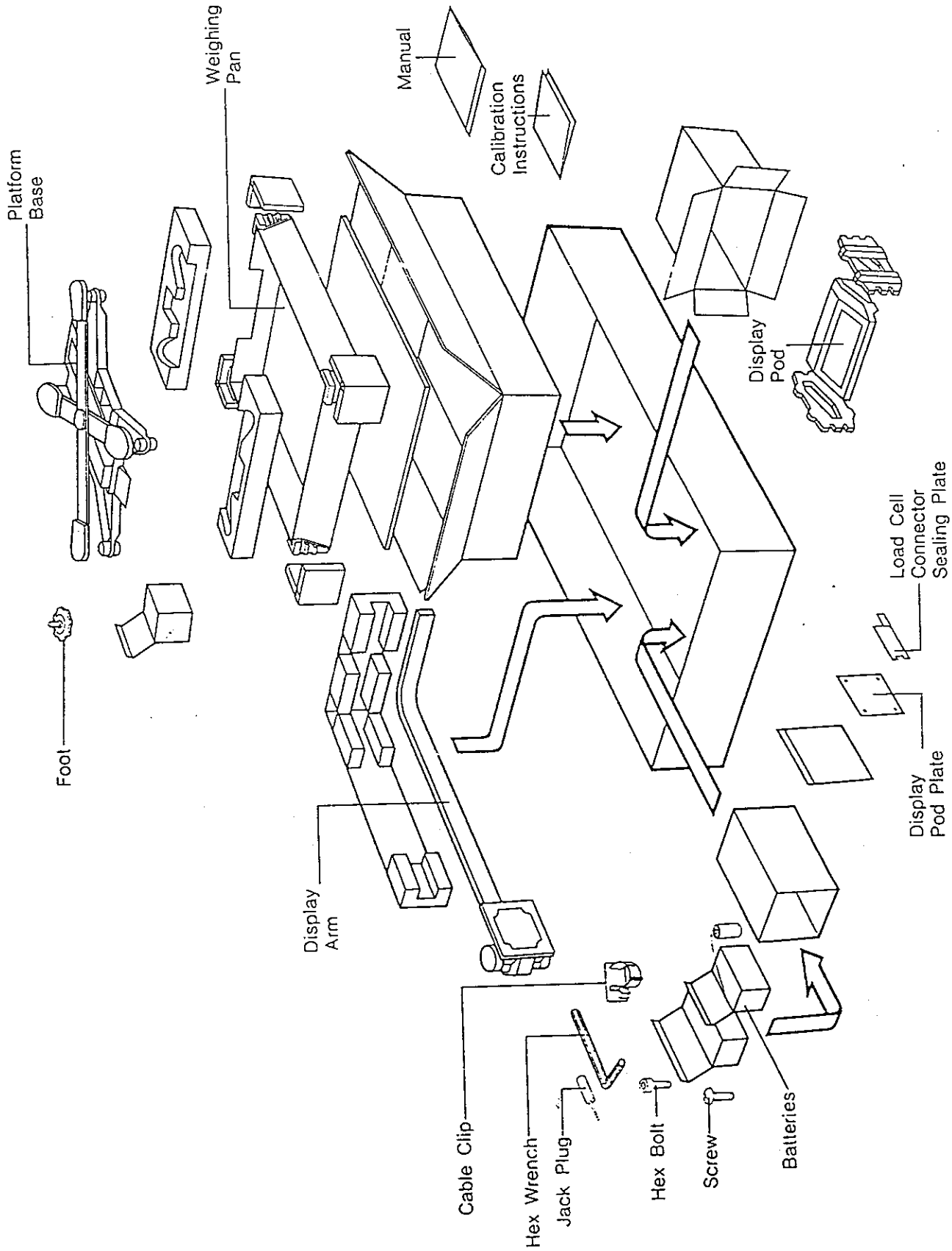
NO.	PARTS NAME	DESCRIPTION	SIZE (mm)	Q'TY
1	07:A33688D	ADJUSTABLE FOOT	M10×50(L)	4
2	03:A10076A	BASE	282(W)×397(D)×49(H)	1
3		HEX BOLT	M6×25(L)	4
4		CONVEX WASHER	M6(H)	4
5	04:A47453	SPACER PLATE	44(W)×32(D)×2.3(T)	1
6	LC:105-30K	LOAD CELL	30(W)×150(D)×45(H)	1
7		SCREW	M3×10(L) S-TYPE	2
8		WASHER	M3	2
9	04:A46971-1A	SPACER PLATE	40(W)×32(D)×5(T)	1
10	09:A47747-1	SUSPENSION BAR-R	50(W)×500(D)×6(T)	1
11	04:A46971-2	SPACER PLATE	40(W)×30(D)×2.9(T)	1
12	09:A47747-2	SUSPENSION BAR-L	50(W)×500(D)×6(T)	1
13		CONVEX WASHER	M6(H)	2
14		HEX BOLT	M6×30(L)	2
15		STOPPER BOLT	M6×70(L)	1
16		HEX NUT	M6	1
17	06:A47308	CENTER SUPPORT	ϕ60×10	1

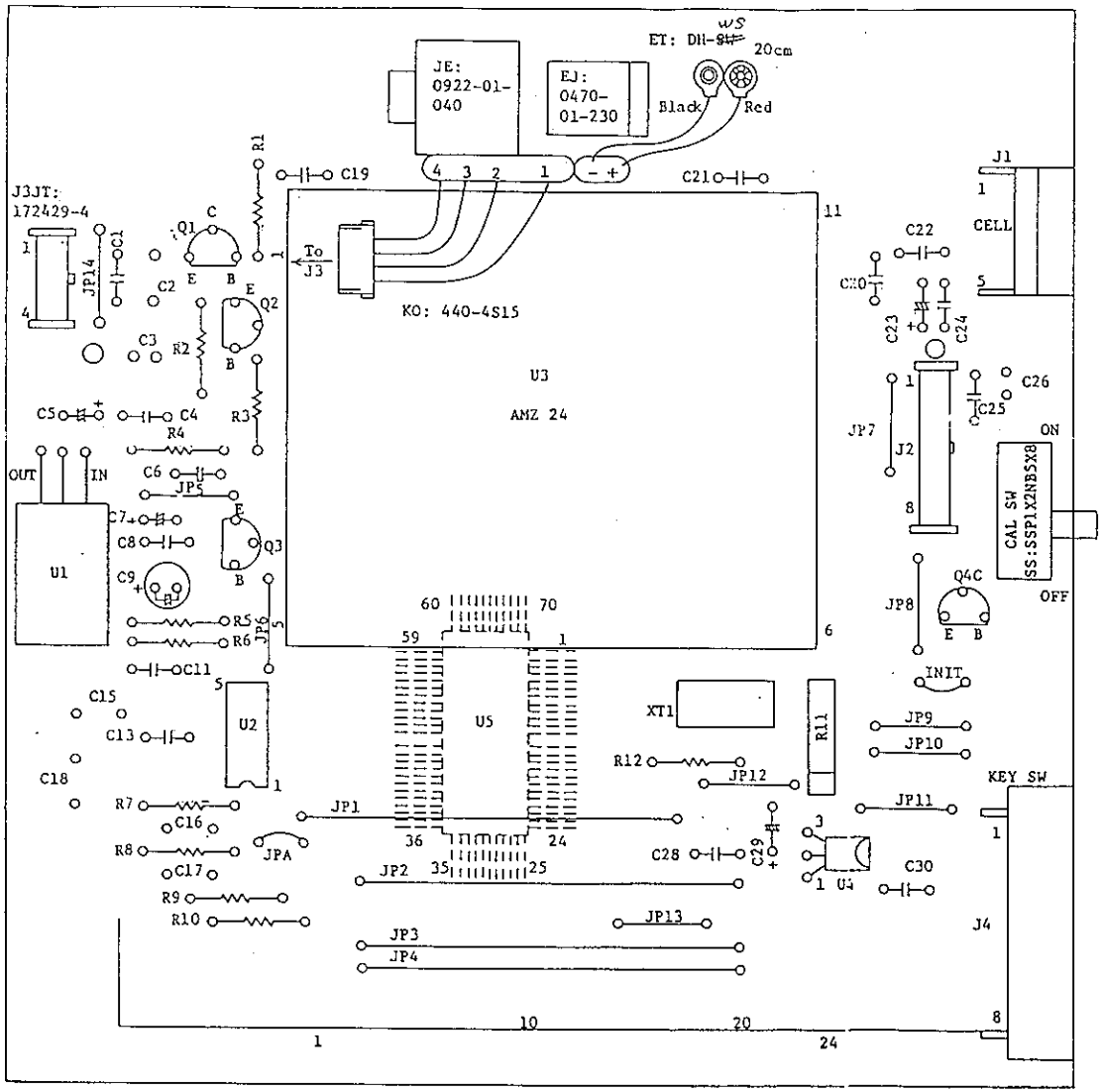




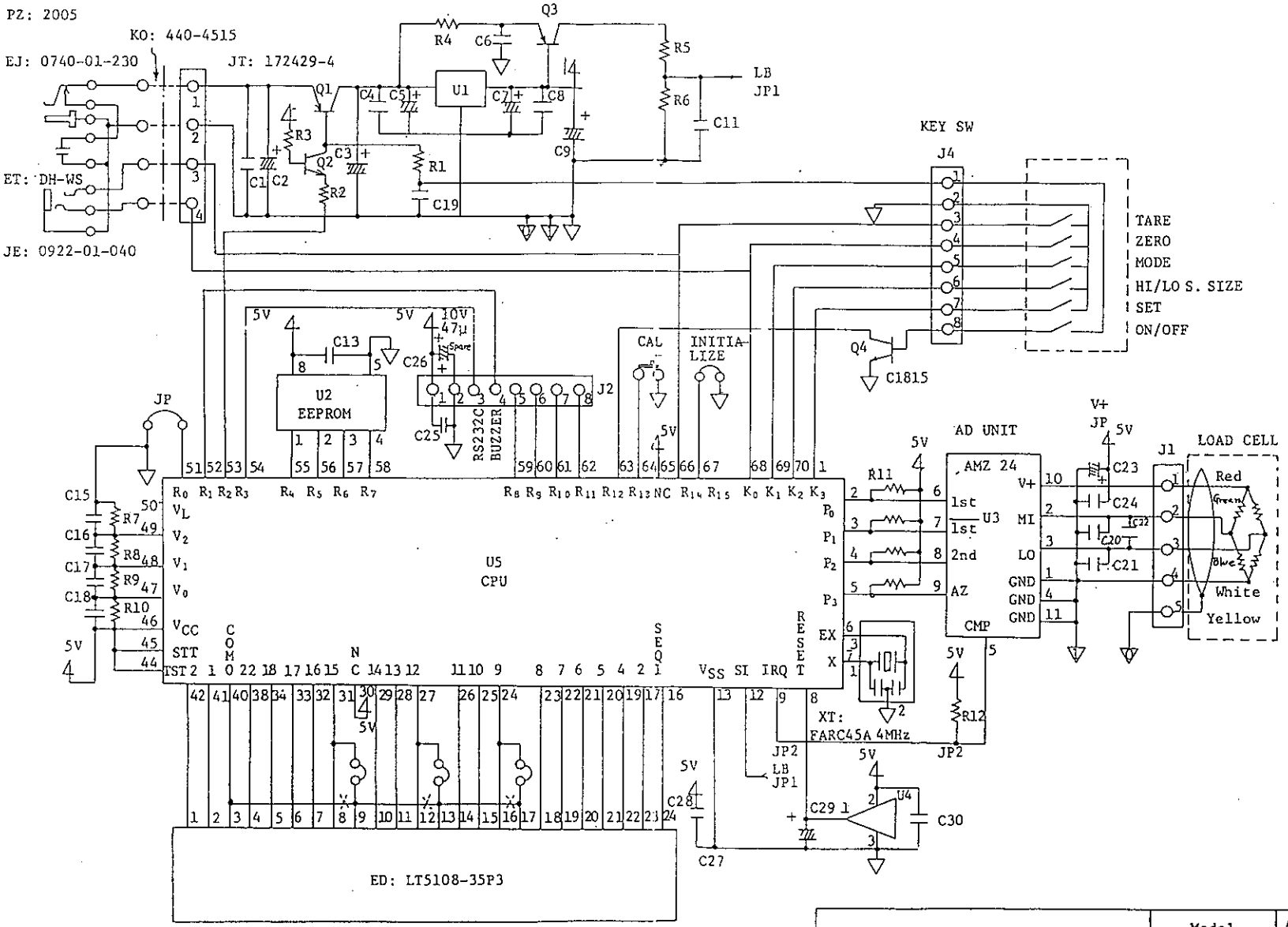





Platform Base
Weighing Pan
Manual
Calibration Instructions
Display Pod
Load Cell Connector Sealing Plate
Display Pod Plate
Foot
Display Arm
Cable Clip
Hex Wrench
Jack Plug
Hex Bolt
Screw
Batteries



				Model	AD: FV series
Symbol	Date	By	Revision No.	Description	FV Main Board Parts Allocation Chart
				Stock No.	PZ: 945
				Drwg. No.	KZ3-00586

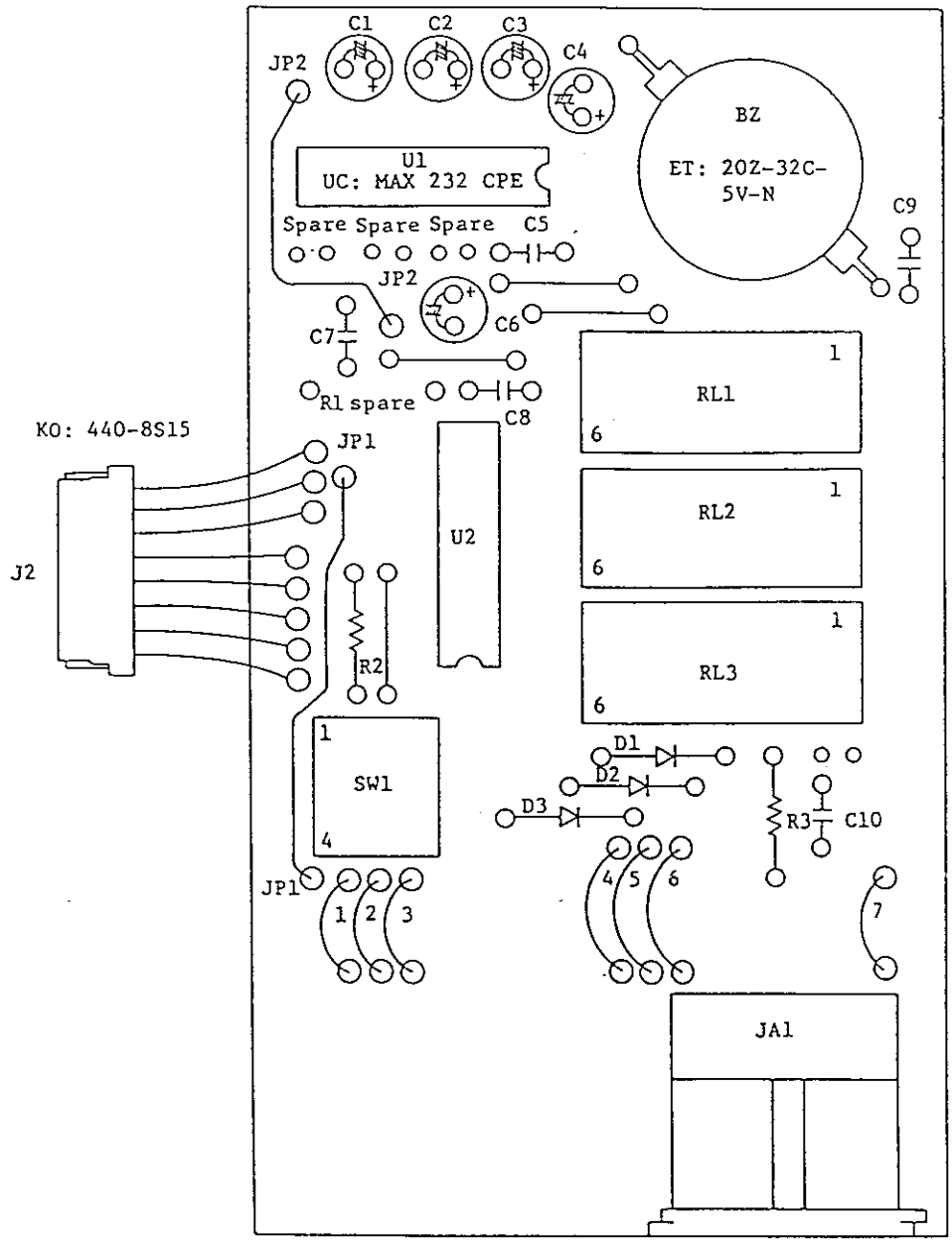


				Model	AD: FV series
Symbol	Date	By	Revision No.	Description	Main Board
				Stock No.	PZ: 945
				Drwg. No.	EC4-00147

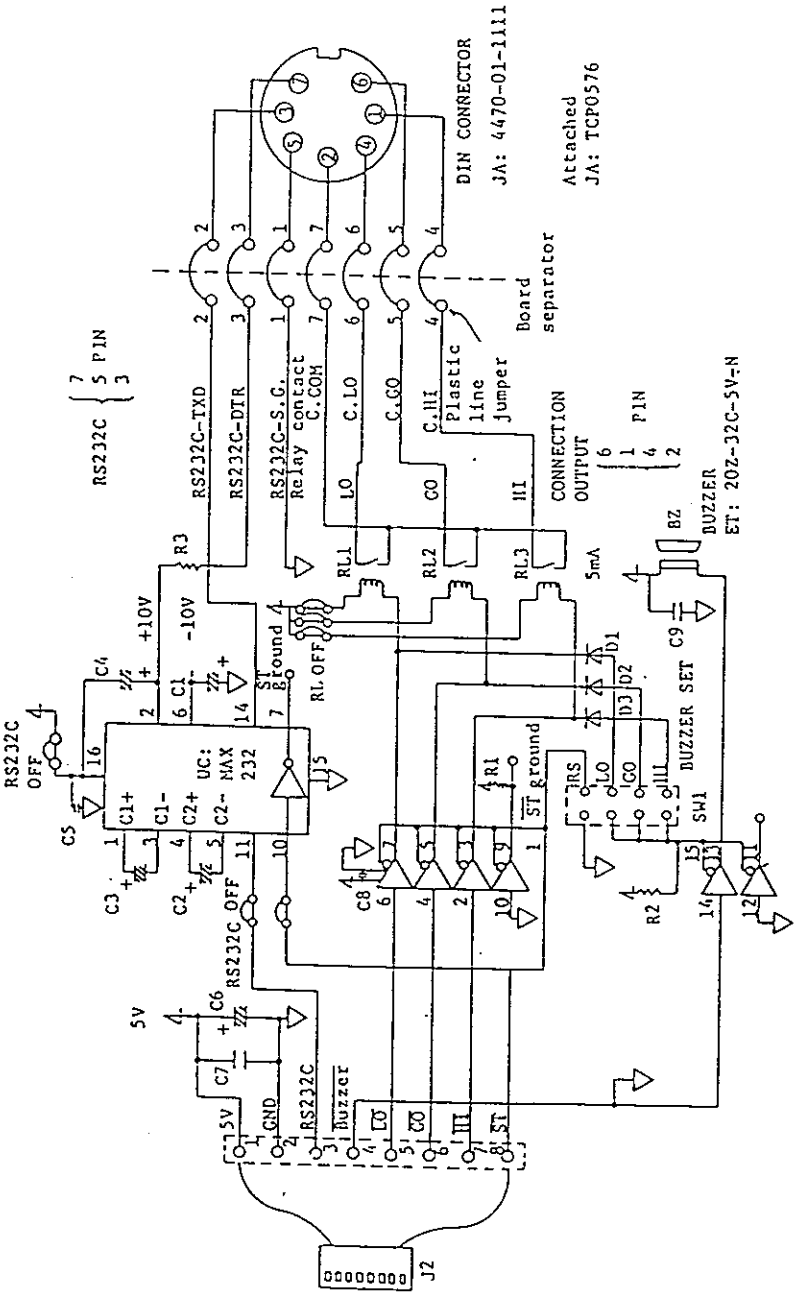
PARTS LIST

FV-A MAIN BOARD

CIRCUIT SYMBOL or DRWG.NO.	PARTS NAME	DESCRIPTION	Q'TY
	7PZ:945	MAIN BOARD FULLY ASSEMBLED	
C1,4,6,8,11,13 19~22,24,25,28,30	CC:0.022U	CAPACITOR 0.022μF 50V	14
C9	CK:SM10VB47	CAPACITOR 47μF 10V	1
C5,7,23,29	CT:1D2R2	CAPACITOR 2.2μF 20V	4
	ED:LT5108-35P3	LCD	1
	EJ:0470-01-230	CONNECTOR	1
	ET:DH-WS	BATTERY SNAP	1
J 4	JD:68147-008	CONNECTOR	1
	JE:0922-01-040	3P CONNECTOR	1
J 1	JT:171826-5	5P CONNECTOR	1
J 3	JT:172429-4	V POSTHEADER	1
J 2	JT:172429-8	V POSTHEADER	1
	KO:440-4S15	CONNECTOR CABLE	1
Q 3	QT:A1015Y	TRANSISTOR	1
Q 1	QT:A1020Y	TRANSISTOR	1
Q 2, 4	QT:C1815Y	TRANSISTOR	2
R 4	RC:1.5K	RESISTOR 1.5KΩ 1/4W	1
R3,5,7,8,9	RC:10K	RESISTOR 10KΩ 1/4W	5
R 1 2	RC:22K	RESISTOR 22KΩ 1/4W	1
R 6	RC:47K	RESISTOR 47KΩ 1/4W	1
R 2	RC:5.6K	RESISTOR 5.6KΩ 1/4W	1
R 1	RC:6.8K	RESISTOR 6.8KΩ 1/4W	1
R 1 0	RM:16.2KF	RESISTOR 16.2KΩ 1/4 ±50ppm/℃	1
R 1 1	RN:IHR-4-223MA	RESISTOR NETWORK	1
	SS:SSP1X2NB5X8	SWITCH	1
U 4	UA:S-8054ALB	VOLTAGE COMPARATOR	1
U 5	UC:MB8854-159M	CPU	1
U2	UN:NCR59306	EEPROM	1
U 1	UR:TA78DL05P	REGULATOR	1
X 1	XT:C4SA-4M-M00	XTAL 4MHz	1
	04:A46503B	LCD MOUNT PLATE	1
	06:A47290	SHEET	2



				Model	AD: FV-03
Symbol	Date	By	Revision No.	Description	FV-03 Board Parts Allocation Chart
				Stock No.	PZ: 946
				Drwg. No.	KZ_3-00587



DIP SW	
1	OFF: Contact output will only sound buzzer when stable. ON: Any contact output will sound buzzer.
2	OFF: No low buzzer ON: Low buzzer
3	OFF: No go buzzer ON: Go buzzer
4	OFF: No hi buzzer ON: Hi buzzer
5	RS232C OFF
6	RS232C OFF
7	Relay OFF
8	NC

				Model	AD: FV-03
Symbol	Date	By	Revision No.	Description	PZ: 946
				Stock No.	RS232C Comparator Dataout
				Drwg. No.	EC_4-00116

PARTS LIST

FV-03 SERIAL INTERFACE BOARD

CIRCUIT SYMBOL or DRWG.NO.	PARTS NAME	DESCRIPTION	Q'TY
	PZ:946	OPTION-03 FULLY ASSEMBLED	
C5,7~10	CC:0.022U	CAPACITOR 0.022μF 50V	5
C1~4,6	CK:SM25VB22	CAPACITOR 22μF 25V	5
D1~3	DI:1S1588	DIODE	3
BZ	ET:20Z-32C-5V-N	BUZZER	1
JA1	JA:4470-01-1111	CONNECTOR	1
J2	KO:440-8S15	CONNECTOR CABLE	1
R2	RC:22K	RESISTOR 22KΩ 1/4W	1
R3	RC:3.3K	RESISTOR 3.3KΩ 1/4W	1
SW1	SD:KTD04	DIP SWITCH	1
RL1~3	SL:LDI-1M-05D	REED RELAY	3
U2	UC:HC367	CMOS IC	1
U1	UC:MAX232CPE	TRANSMITTER RCEIVER	1