FX/FY SERIES

BALANCES

MAINTENANCE MANUAL

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BALANCES

MODELS

SINGLE RANGE
FX-40
FX-200 FX-300 FX-400
FX-1200 FX-2000 FX-3000
FX-4000 FX-6000
FY-200 FY-300
FY-2000 FY-3000

DUAL RANGE
FX-320 FX-3200

A&D Company, Limited

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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.

FX/FY SPECIFICATIONS

CAPACITY x RESOLUTION	FX-200	FX-300	FX-400	FX-1200	FX-2000	FX-3000	FX-4000	FX-6000	FX-320	FX-3200	FY-200	FY-300	FY-2000	FY-3000	FX-40
GRAM	210x0.001g	310x0.001g	410x0.001g	1250x0.01g	2100x0.01g	3100x0.01g	4100x0.01g	6100x0.1g	310x0.01 60x0.001	3100x0.1 600x0.01	210x0.01g	310x0.01g	2100x0.1g	3100x0.1g	41x0.0001g
DECIMAL OUNCE (av)	7x0.00005	10x0.00005	14x0.00005	44x0.0005	74x0.0005	109x0.0005	144x0.0005	215x0.005	10x0.0005 2x0.00005	109x0.005 21x0.0005	7x0.0005	10x0.0005	74x0.005	109x0.005	1.4x0.000005
DECIMAL POUND (av)	0.4x0.000005	0.6x0.000005	0.9x0.000005	2.7x0.00005	4.6x0.00005	6.8x0.00005	9.0x0.00005	13.4x0.0005	0.6x0.00005 0.13x0.000005	6.8x0.0005 1.3x0.00005	0.4x0.00005	0.6x0.00005	4.6x0.0005	6.8x0.0005	
POUND/OUNCE (x 0.01oz)	7.40oz	10.93oz	14.46oz	2lb 12.09oz	4lb 10.08oz	6lb 13.35oz	9lb 0.62oz	13lb 7.17oz	10.93oz	6lb 13.35oz	7.40oz	10.93oz	4lb 10.08oz	6lb 13.35oz	
CARAT	1050x0.005	1550x0.005	2050x0.005	6250x0.05	10500x0.05	15500x0.05	20500x0.05	30500x0.5	1550x0.05 300x0.005	15500x0.5 3000x0.05	1050x0.05	1550x0.05	10500x0.5	15500x0.5	205x0.001
PENNYWEIGHT	135x0.001	199x0.001	263x0.001	803x0.01	1350x0.01	1993x0.01	2636x0.01	3922x0.1	199x0.01 38x0.001	1993x0.1 385x0.01	135x0.01	199x0.01	1350x0.1	1993x0.1	26x0.0001
TROY OUNCE	6.7x0.00005	9.9x0.00005	13x0.00005	40x0.0005	67x0.0005	99x0.0005	131x0.0005	196x0.005	9.9x0.0005 1.9x0.00005	99x0.005 19x0.0005	6.7x0.0005	9.9x0.0005	67x0.005	99x0.005	1.3x0.000005
GRAIN	3240x0.02	4783x0.02	6327x0.02	19290x0.2	32407x0.2	47839x0.2	63274x0.2	92592x2	4783x0.2 925x0.02	47839x2 9259x0.2	3240x0.2	4783x0.2	32408x2	47839x2	632x0.002
MOMME	56x0.0005	82x0.0005	109x0.0005	333x0.005	560x0.005	826x0.005	1093x0.005	1626x0.05	82x0.005 16x0.0005	826x0.05 160x0.005	56x0.005	82x0.005	560x0.05	826x0.05	10x0.00005
TAEL (HONG KONG)	5x0.00005	8x0.00005	10x0.00005	33x0.0005	56x0.0005	82x0.0005	108x0.0005	162x0.005	8x0.0005 1.6x0.00005	82x0.005 16x0.0005	5x0.0005	8x0.0005	56x0.005	82x0.005	1x0.000005
TAEL (SINGAPORE)	5x0.00005	8x0.00005	10x0.00005	33x0.0005	56x0.0005	82x0.0005	108x0.0005	161x0.005	8x0.0005 1.5x0.00005	82x0.005 15x0.0005	5x0.0005	8x0.0005	56x0.005	82x0.005	1x0.000005
TAEL (TAIWAN)	5x0.00005	8x0.00005	10x0.00005	33x0.0005	56x0.0005	82x0.0005	109x0.0005	162x0.005	8x0.0005 1.6x0.00005	82x0.005 16x0.0005	5x0.0005	8x0.0005	56x0.005	82x0.005	1x0.000005
TOLA (INDIA)	18x0.00005	26x0.0001	35x0.0001	107x0.001	180x0.001	256x0.001	351x0.001	522x0.01	26x0.001 5x0.0001	265x0.01 51x0.001	18x0.001	26x0.001	180x0.01	265x0.01	3.5x0.00001
REPEATABILITY/std.dev.	0.001g	0.001g	0.001g	0.01g	0.01g	0.01g	0.01g	0.1g	0.005g/0.001g	0.05g/0.01g	0.01g	0.01g	0.1g	0.1g	0.0002g
LINEARITY	±0.002g	±0.002g	±0.002g	±0.02g	±0.02g	±0.02g	±0.02g	±0.1g	±0.01g/±0.002g	±0.1g/±0.02g	±0.01g	±0.01g	±0.1g	±0.1g	±0.0002g
SENS DRIFT (10°-30°C)	±3ppm/°C	±3ppm/°C	±3ppm/°C	±3ppm/°C	±3ppm/°C	±3ppm/°C	±3ppm/°C	±8ppm/°C	±10ppm/°C	±10ppm/°C	±10ppm/°C	±10ppm/°C	±10ppm/°C	±10ppm/°C	±3ppm/°C
STABILIZATION TIME	2.5sec (approx)	2.5sec (approx)	3.5sec (approx)	2.5sec (approx)	2.5sec (approx)	2.5sec (approx)	3.5sec (approx)	2.5sec (approx)	2.5sec (approx)	2.5sec (approx)	2.0sec (approx)	2.0sec (approx)	2.0sec (approx)	2.0sec (approx)	3.5sec (approx)
PAN SIZE mm	ø105mm	ø105mm	127mm	ø150mm	ø150mm	ø150mm	160mm	185x210mm	ø105mm	ø150mm	ø105mm	ø105mm	ø150mm	ø150mm	75mm
PAN SIZE inches	ø4.1"	ø4.1"	5.0"	ø5.9"	ø5.9"	ø5.9"	6.3"	7.3"x8.3"	ø4.1"	ø5.9"	ø4.1"	ø4.1"	ø5.9"	ø5.9"	2.95"
NET WEIGHT (approx)	4kg/8.8lb	4kg/8.8lb	4kg/8.8lb	4kg/8.8lb	4kg/8.8lb	4kg/8.8lb	4kg/8.8lb	4.7kg/10.3lb	4kg/8.8lb	4kg/8.8lb	3kg/6.6lb	3kg/6.6lb	3kg/6.6lb	3kg/6.6lb	6kg/13.2lb
CALIBRATION MASS	200g	200g	400g	1000g	2000g	2000g	4000g	5000g	200g	2000g	200g	200g	2000g	2000g	20g

Introduction

This Maintenance Manual covers fifteen different models from the A&D FX and FY series of balances, the: FX-40/40CJ, FX-200, FX-300, FX-320, FX-400, FX-1200, FX-2000, FX-3000, FX-3200, FX-4000, FX-6000, FY-200, FY-300, FY-2000 and FY-3000 . Please read this Maintenance Manual and the owner's Instruction Manual fully before you start any maintenance work.

The FX/FY series of high resolution multifunction balances 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, increased functions, high resolution and portability.

The FX series has nine single range balances:	FX-40 / 40CJ	41g x 0.0001g
	FX-200	210g x 0.001g
	FX-300	310g x 0.001g
	FX-400	410g x 0.001g
	FX-1200	1250g x 0.01g
	FX-2000	2100g x 0.01g
	FX-3000	3100g x 0.01g
	FX-4000	4100g x 0.01g
	FX-6000	6100g x 0.1g
There are also two automatic dual range balances:	FX-320	310g x 0.001g and 60g x 0.001g
	FX-3200	3100g x 0.01g and 600g x 0.01g
In the FY series there are four single range balances:	FY-200	210g x 0.01g
	FY-300	310g x 0.01g
	FY-2000	2100g x 0.1g
	FY-3000	3100g x 0.1g

Options include:

OP-03 RS-232C - Current Loop Interface
OP-04 NiCd battery packs for the FX Series
OP-05 NiCd battery packs for the FY Series
OP-06 Glass breeze break for the FX Series (except the FX-6000)
OP-07 Glass breeze break for the FY Series

AC adapters available:

100VAC TB-109
110VAC TB-110
117VAC TB-117
220VAC TB-123
240VAC TB-124

Using this Manual

The FX and FY series of balances are built to last, and much attention has been paid to seeing that they function as fault free as possible. However, with time, use, and change of location, all things tend to get out of adjustment. So, somewhere along the life of a balance, someone may need to work on it. The intent of this Maintenance Manual is to make that as easy as possible for you with a step-by-step guide through the FX or FY balance.

We ask that you read through the entire owner's *Instruction Manual*, and this *Maintenance Manual* prior to starting any work on a balance. If you are familiar with balances in general, we ask that you at least read the sections: PRINCIPLES OF OPERATION (below), CALIBRATION INTRODUCTION (page 7), and LINEARITY CALIBRATION (page 9). This will give you a look at how the balance operates, and how the manual takes you through each operation.

When a customer has a problem, make sure that: the BEST CONDITIONS FOR WEIGHING (page 10) have been met, the balance has been calibrated and adjusted correctly, it's is receiving power from the proper AC adapter, and the CAL switch is off. Next, look at the troubleshooting sections. If you definitely have a damaged balance, look at the troubleshooting sections, and go through the MECHANICAL FAULT FINDING and the ELECTRONIC FAULT FINDING, depending on the type of problem. We think that you will find that the most common problem is damaged Flexible Bearings. Look for visible balance damage, bent pan or pan support, case cracks, the sort of things that may indicate that the balance may have been dropped. Look carefully as the materials used in construction tend to mask physical abuse. Then check the Flexible Bearings. Other common problems are: loose or damaged connections, the Stopper Plate out of adjustment, and dust or particles of metal in the area of the Force Motor magnet. Keep your work area clean, use only non-magnetic tools, or tools that have no plating that may flake off and get into the area of the magnet. Remember how something came apart, and, always adjust and calibrate the balance after you have worked on it.

Principles of Operation

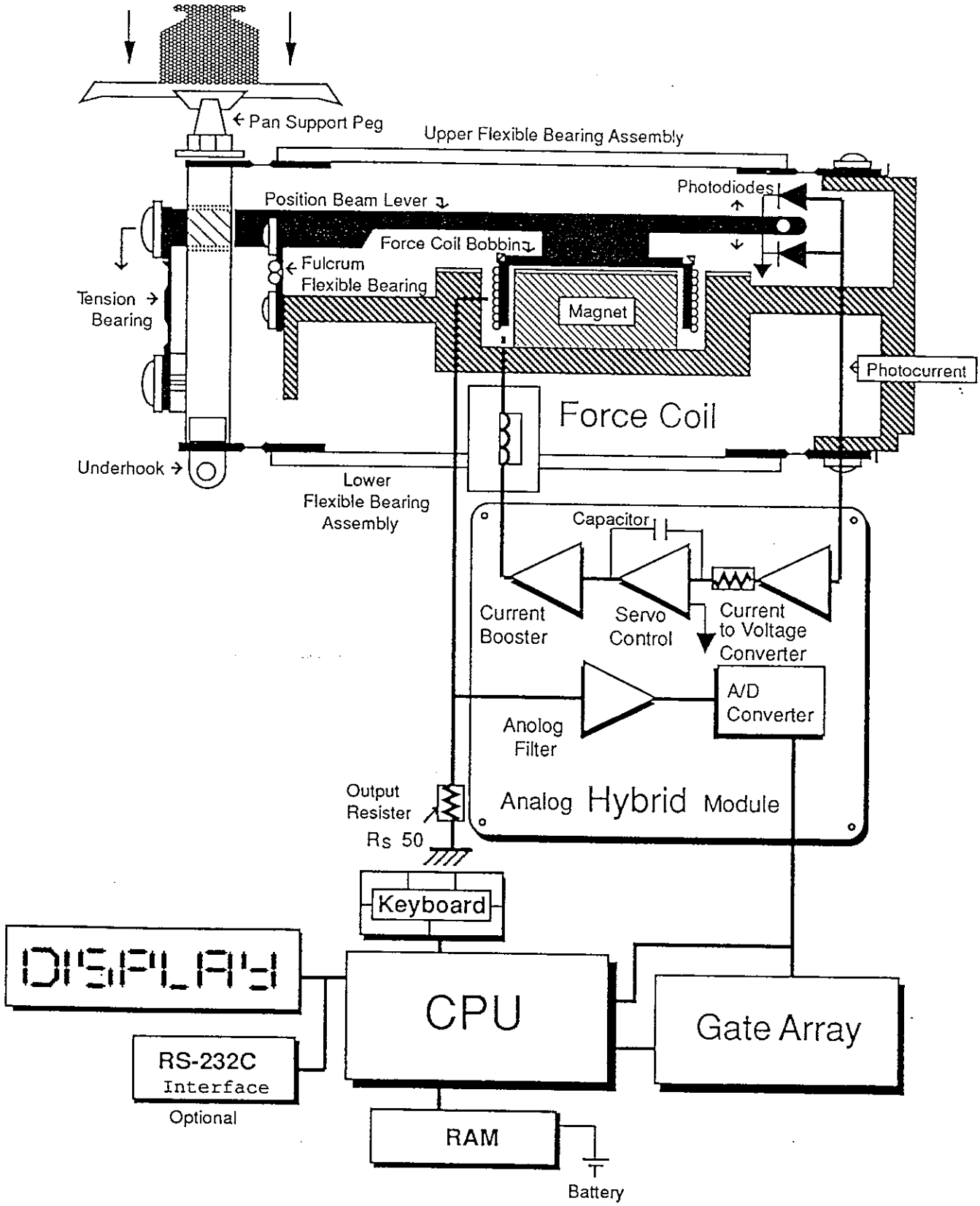
The FX/FY balances work on the principle of "Force Restoration". Any change in the load on the weighing pan causes a Position Beam Lever to pivot on two Flexible Fulcrum Bearings (please see the FORCE MOTOR BLOCK DIAGRAM on the following page). Attached to this beam is a bobbin (wound with fine wire), called the "Force Coil", which floats in a permanent magnets field. This assembly is called the "Force Motor". At the end of the Position Beam Lever there is a small hole which allows light from a Light-Emitting Diode (LED) to pass through to two Photodiodes (light measuring diodes) as it moves up or down. At zero weight, the light detected by the upper Photodiode is equal to that detected by the lower Photodiode. These three diodes make up the Position Detector.

When the Force Coil is pulled up by the leverage exerted by a mass on the weighing pan, the Position Detector detects a change in the position of the Force Coil as the light reaching the upper Photodiode will be greater than that reaching the lower one. The electronic section then feeds the force coil with more current to pull it back until the light measured by the two Photodiodes is equal again. This is accomplished by the Analog Hybrid Module receiving photo current from the Photodiodes, amplifying it, and boosting it back to the Force Coil. As the current increases, so does the magnetic power, pulling the Force Coil back until the Position Detector is once again at equilibrium.

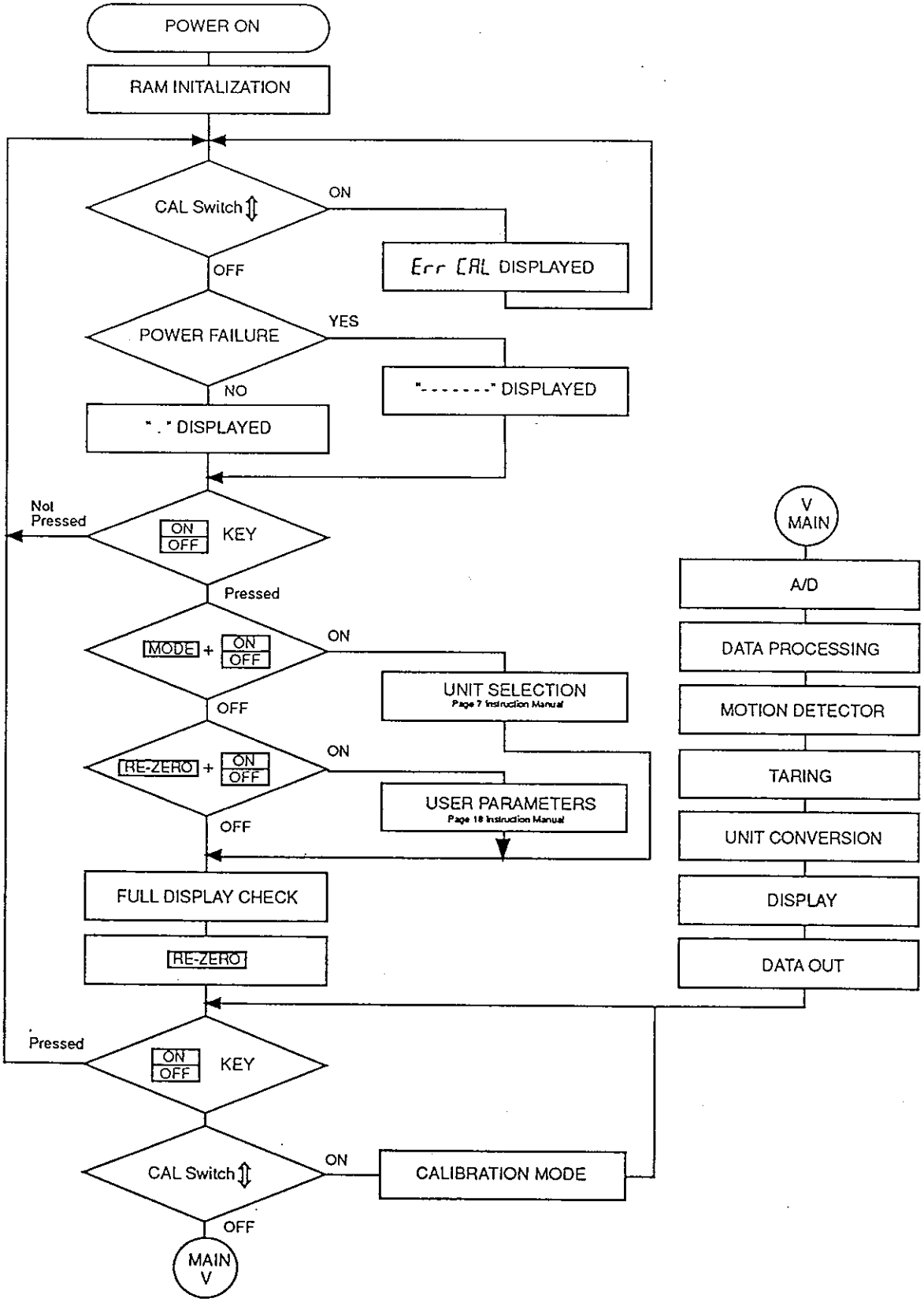
The current flowing through the Force Coil generates a voltage proportional to the load weight on the pan. This is read back through the Hybrid, first being filtered - then the Analog-Digital (A/D) Converter digitizes this measuring voltage, the resulting value is then fed to the microprocessor (CPU).

The CPU performs a multitude of commands and mathematical operations in conjunction with parameter and calibration information stored in random access memory (RAM) which is backed up by a long lasting Lithium Battery. Also, the user can specify how the calculated information should be displayed by using the keyboard. Finally, the results are displayed on the Fluorescent Display, or sent through the optional RS–232C interface.

Force Motor Block Diagram



Software Flow Chart

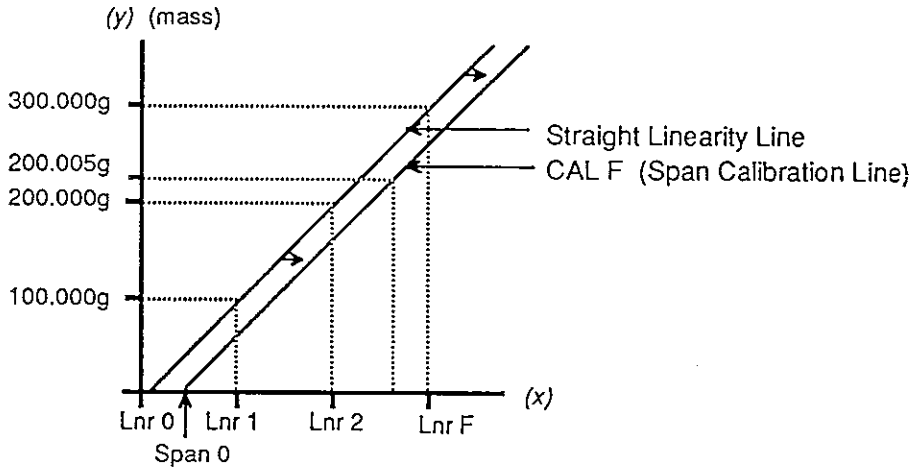


Calibration Introduction

Calibration of the balance is required when it is initially installed, when changing the installation site, and additionally every 90 days. 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" is the product of 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. The sun and the moon exert inconstant forces of gravitational attraction. Air buoyancy (approx. 0.0012g ±10% of air displaced per cm^3 at 20°C [68°F]) and other factors also vary from location to location and from time to time.

There are a number of calibrations that will need to be done in the life of an FX/FY Balance, they are briefly explained below. The actual calibration procedures are contained throughout this manual, please see the TABLE OF CONTENTS.

Linearity Calibration means that when an FX-300 (for example) has been calibrated for span at 200g, an exact weight of 100g will display 100.000g and an exact weight of 300g will display 300.000g. That is, if you imagine a graph with the X axis representing the displayed weight and the Y axis the "true" weight of the mass on the pan, an accurate mass of any weight value will be plotted on a linear (straight line) path from zero to the maximum capacity. However, although a straight line will be generated in Linearity Calibration, this line must be correctly placed by the balance during Span Calibration.



Span Calibration: A very real problem is that the calibrating mass may not be as accurate as the balance. With Span Calibration we are shifting the straight line generated during Linearity Calibration (so that it will accurately read true weight) by giving it the exact known weight of the calibration mass as a reference point (see graph above). It is important to understand that an electronic balance is only as accurate as the mass used to calibrate it - for example:

If a FX-300 was calibrated with a 200g mass that actually had a true weight value of 200.005, then the balance would have been calibrated out of specifications: ±0.001d (one minimum division) at 200g. The error would be in the nature of 200.005 / 200.000 (=1.000025). This would result in a minimum division error at weights above 20g. This problem is avoided by using a calibration mass of better accuracy than the balance when calibrating it.

Since the FX/FY Balances are exceptionally accurate instruments, they should receive extremely accurate calibration. Span Calibration should be carried out when the balance is initially installed, when changing the installation site, and additionally every 90 days.

RAM: If the data in RAM is lost (by lithium battery failure, short, or component replacement) then all initialization and calibration data is cleared. The balance must then have the RAM reinitialized, plus Linearity and Span Calibration, setting the Legal Functions and resetting the Temperature Compensation Calibration.

Temperature Compensation Calibration: When the Initialization of RAM occurs, averages for temperature compensation are also reset. For most users and climates, this may suffice. However, this might not be precise enough if the user requires a highly accurate balance, or if there are great changes in the ambient temperature.

As further explained in the PRINCIPLES OF OPERATION section (page 4), the FX/FY Force Motors operate by a force coil moving in a permanent magnet field. A change in ambient temperature causes a change in the temperature of the Force Motor, in turn altering the characteristics of the magnet. Unless this is compensated for, it will cause sensitivity drift problems. The FX/FY balances use a temperature sensor in the Force Motor to detect these changes in temperature. The temperature compensation settings, to match the temperature characteristics of the Force Motor sensor, are stored in random access memory (RAM) protected by a long lasting lithium battery.

If the balance is not calibrated for temperature compensation, then it will not be able to meet the FX/FY sensitivity drift specifications. Also, if the Force Motor is replaced it includes a new Temperature Sensor, and Temperature Sensor Calibration should be carried out.

The Complete Initialization/Calibration Cycle for the FX/FY Series:

Step 1. RAM Initialization.
Step 2. "Lnr", Linearity Calibration at 20~25°C (68~77°F).
Step 3. Span/Zero calibration at 20~25°C (68~77°F).
Step 4. Place in temperature testing chamber at about 5°C (40°F) for 4 hours.
Step 5. "tL", (temperature Low) calibration at 5°C (40°F).
Step 6. Reset the temperature to 35°C (95°F) for at least 4 hours.
Step 7. "tH". (temperature High) calibration at 35°C (95°F).
Step 8. Return balance to room temperature at 20~25°C (68~77°F) for 4 hours.
Step 9. "Lnr", Linearity Calibration at 20~25°C (68~77°F).
Step 10. Span/Zero calibration at 20~25°C (68~77°F).
Step 11. Priming the Balance for Legal Functions.

Calibration Masses: An FX/FY balance is a high resolution instrument, so a high quality non-magnetic or stainless steel mass should be used for calibration - OIML class F_2 or better. By international convention, weight in air is measured against the buoyant weight of steel in air. Steel has a density of about 8.0g/cm^3, Brass has about 8.4g/cm^3. So, 100g of steel would occupy: 100g ÷ 8g/cm^3 = 12.5cm^3. Since air buoyancy is 0.0012g/cm^3, we can calculate that 12.5cm^3 X 0.0012g/cm^3 = 0.015g of air displaced. Whereas a brass weight would only displace about 0.014g (100g ÷ 8.4g/cm^3 = 11.9cm^3, 11.9cm^3 X 0.0012g/cm^3 = 0.014g) of air unless it had been adjusted via a cavity to mimic steel density. By using a brass mass instead of steel, it would cause a one division error on the FX-300.

Table A. Calibration / Adjustment Masses Required

MODEL	"A" Linearity	"B"	Tempreature	Span	Corner load
FX-40/40CJ	10g	20g	20g	20g	20g
FX/FY-200/300/320	100g	200g	200g	200g	100g
FX-400	100g	200g	200g	200/300/400g	200g
FX-1200	500g	500g	1kg	1kg	500g
FX/FY-2000/3000/3200	1kg	2kg	2kg	2kg	2kg
FX-4000	1kg	2kg	2kg	2/3/4kg	2kg
FX-6000	1kg	5kg	5kg	5kg	4kg

Linearity Calibration

Linearity Calibration should be carried out during servicing of an FX/FY Balance at a temperature of 20~25°C (68~77°F). The balance must be fully warmed-up (plugged in for 30 minutes) and all of the BEST CONDITIONS FOR WEIGHING should be met (see following page). After Linearity Calibration, the balance must be calibrated again for Span. An FX/FY balance is a high resolution instrument so please use a high quality non-magnetic, metric, stainless steel, "Standard Mass" for calibration (≈8.0g/cm^3) OIML class F_2 or better (see CALIBRATION INTRODUCTION, pages 7-8).

Step 1. Start with the balance leveled, no weight on the pan (0g) and the display *OFF*.

Step 2. Press and hold RE–ZERO, then press ON/OFF. Release both keys.

DISPLAY The display will come on with all segments illuminated.

Step 3. Press MODE.

DISPLAY The display will change to either "C0-(number)" or "C1-(number)". These are not important here, see owner's Instruction Manual, page 18, for parameter definitions.

Step 4. Slide the CAL switch on⇑ (rear of balance to the right of center).

DISPLAY The display will now alternate between "Lnr", "tH' and "tL".

Step 5. Press RE–ZERO when "Lnr" (linearity) is displayed. (if you press at the wrong time, press ON/OFF and start over, do not press RE–ZERO)

DISPLAY "Lnr 0" will be displayed.

Step 6. Press RE–ZERO.

DISPLAY After a pause, "Lnr 1" will be displayed.

Step 7. Place the "A" mass for your balance (see Table A-1 below) on the weighing pan.

Table A-1. Linearity Calibration Masses

MODEL	"A" Linearity	"B"
FX-40/40CJ	10g	20g
FX/FY-200/300/320	100g	200g
FX-400	100g	200g
FX-1200	500g	500g
FX/FY-2000/3000/3200	1kg	2kg
FX-4000	1kg	2kg
FX-6000	1kg	5kg

Step 8. Wait for about 15 seconds for the balance to stabilize and press RE–ZERO.

DISPLAY After a pause, "Lnr 2" will be displayed.

Step 9. Place the "B" mass for your balance (see Table A-1 above) on the weighing pan.

Step 10. Wait for about 15 seconds for the balance to stabilize and press RE–ZERO.

DISPLAY After a pause, "Lnr F" will be displayed.

Step 11. Place the both the "A" and "B" masses for your balance on the weighing pan.

Step 12. Wait for about 15 seconds for the balance to stabilize and press RE–ZERO.

DISPLAY The display will now alternate between "Lnr", "tH' and "tL" again.

Step 13. Slide the CAL switch off⇓, press ON/OFF twice.

Step 14. Carry out Span Calibration (see following page).

Span Calibration

• Titled "CALIBRATING YOUR BALANCE" in the owner's Instruction Manual •

The Balance should be calibrated when it is first installed and then every 90 days or so. An FX/FY balance is a high resolution instrument so please use a high quality non-magnetic, metric, stainless steel, "Standard Mass" for calibration (≈8.0g/cm^3) OIML class F_2 or better (see CALIBRATION INTRODUCTION, pages 7-8). Also, the balance must be fully warmed-up (plugged in for 30 minutes) and all of the BEST CONDITIONS FOR WEIGHING below should be met.

If your calibration mass is not exact but is known (e.g.: 200.05g instead of 200.00g with the FY-300) then we must set the balance to accept this value. When "CAL 0" is displayed (after Step 2.) press PRINT and "200.00" will be displayed. You may adjust the display to "200.05" by pressing the MODE key 5 times; next press RE-ZERO (Step 3.) and proceed with normal calibration. The value "200.05" will not be recalled next time you calibrate the balance, so be sure to set it again.

The complete cycle is Calibration Mass ±15 minimum divisions - for example: For an FY-300, the calibration mass is 200.00. The cycle progresses in the following order: 200.00, 200.01, 200.02, 200.03, 200.04, 200.05, 200.06, 200.07, 200.08, 200.09, 200.10, 200.11, 200.12, 200.13, 200.14, 200.15, then, 199.85, 199.86, 199.87, 199.88, 199.89, 199.90, 199.91, 199.92, 199.93, 199.94, 199.95, 199.96, 199.97, 199.98, 199.99, 200.00.

Step 1.	Start with the balance leveled, no weight on the pan (0g) and the display *ON*.
Step 2.	Slide the CAL switch on⇧.
DISPLAY	"CAL 0" will be displayed.
Step 3.	Wait for about 15 seconds for the balance to stabilize and press RE–ZERO.
DISPLAY	After a pause, "CAL F" will be displayed.
Note:	If known: enter true weight of mass at this time (see above).
Step 4.	Place the "B" mass for your balance (see Table A-1, preceding page) on the weighing pan.
Step 5.	Wait for about 15 seconds for the balance to stabilize and press RE–ZERO.
DISPLAY	After a pause, "CAL End" will be displayed.
Step 6.	Slide the CAL switch off⇩, press ON/OFF twice.
Note:	* "Err CAL" means Error in Calibration method (display was off?). * "-CAL E" means the calibration mass is too light (check requirement).

Best Conditions for Weighing

* The Balance must be level (check the spirit level on the Balance).
* Best temperature is about 20°C (68°F), at about 50% Relative Humidity.
* The weighing room should be kept clean and dry.
* 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 balance near heaters or air conditioners.
* Don't install the balance in direct sunlight.
* Keep equipment containing magnets away from the balance.
* Use a breeze break to keep out drafts.
* Try to ensure a stable AC power supply.
* Warm-up before use or leave on standby (display off) overnight.

Temperature Compensation Cal.

• OPTIONAL - See CALIBRATION INTRODUCTION, pages 7-8 •

Temperature Compensation Calibration is necessary for the FX/FY to be highly accurate. This is because a temperature change in the Force Motor alters the characteristics of the permanent magnet. Unless it is compensated for, this will cause sensitivity drift problems. The FX/FY balances use a Temperature Sensor integrated into the Force Motor assembly to detect temperature changes. The Temperature Compensation Calibration settings are then stored in random access memory (RAM) protected by a long lasting lithium battery. If the data in RAM is lost, then this calibration procedure will need to be performed again.

This is a lengthy procedure, and should not be rushed. Please take the time to read and study the order of all the steps below that must be undertaken for successful calibration.

Full Temperature Compensation Calibration Cycle:

Step 1. "Lnr", Linearity Calibration at 20~25°C (68~77°F).

Step 2. Span/Zero calibration at 20~25°C (68~77°F).

Step 3. Place in temperature testing chamber at about 5°C (40°F) for 4 hours.

Step 4. "tL", (temperature Low) calibration at 5°C (40°F).

Step 5. Turn up the heat and keep the balance at 35°C (95°F) for at least 4 hours.

Step 6. "tH". (temperature High) calibration at 35°C (95°F).

Step 7. Return balance to room temperature at 20~25°C (68~77°F) for 4 hours.

Step 8. "Lnr", Linearity Calibration at 20~25°C (68~77°F).

Step 9. Span/Zero calibration at 20~25°C (68~77°F).

A room or large temperature chamber with the range of 5°C (41°F) to 35°C (95°F) is required to carry out the Temperature Compensation Calibration. These temperatures do not have to be exact, but within a 6°C (10°F) range. If you have a room that can be adjusted to these temperatures it would be ideal - if not, then a temperature chamber will have to be used which is large enough so that the insertion of the technician's hand into the chamber to press the keyboard will not have an effect on the Temperature Sensor. Warm-up and cool-down time between temperatures is at least four hours, with the power connected.

PREPARATION: Complete a Linearity and Span Calibration before starting the following procedure. You may start with either the high or low calibration temperature point, but make sure that the balance has been adjusting to the ambient chamber temperature for at least four hours. This is imperative as the entire balance must reach the ambient chamber temperature. The balance itself must do its internal temperature warm up also. This can be accomplished by either the normal 30 min. warm-up prior to use, or leave the balance on during the four hour temperature change. DO NOT USE THE BATTERIES, IF INSTALLED, DURING THIS PROCEDURE. Initially, there should be nothing on the pan. Obtain the appropriate Temperature Calibration mass for your balance (see Table A-2, on the next page). You must use the same physical mass(es) for both the high and low temperature calibration.

Step 1. With the display *OFF*, press and hold **RE-ZERO**.

Step 2. Press the **ON/OFF** key. Release **RE-ZERO**.

DISPLAY The display will come on with all segments illuminated.

Step 3. Press **MODE**.

DISPLAY The display will change to either "C0-(number)" or "C1-(number)". These are not important here, see user's Instruction Manual, page 18 for parameter definitions.

Step 4. Slide the **CAL** switch on.

DISPLAY The display will now alternate between "Lnr", "tH" and "tL". These abbreviations are for Linear Calibration, Temperature High, and Temperature Low respectively.

Step 5. Depending on whether you are doing the high or low calibration temperature point, press RE–ZERO when the appropriate "tH" or "tL" appears. For this description we will describe "tH 0".

If you miss and press RE–ZERO for the wrong setting, simply slide the CAL switch off⇓, press MODE and slide the CAL switch on⇑. The display will again alternate between "Lnr", "tH" and "tL".

DISPLAY "tH 0" ("tL 0" next time) will be displayed.

Step 6. Wait for about 15 seconds for the balance to stabilize and press RE–ZERO.

DISPLAY After a brief pause, "tH F" ("tL F" next time) will be displayed.

Step 7. Place the appropriate Temperature Calibration mass for your balance on the pan (see Table A-2, below). You must use the same physical mass(es) for both "tH F" and "tL F". Use 200g for the FX-400 and 2kg for the FX-4000.

Table A-2. Temperature Compensation Masses

MODEL	Mass Required
FX-40/40CJ	20g
FX/FY-200/300/320	200g
FX-400	200g
FX-1200	1kg
FX/FY-2000/3000/3200	2kg
FX-4000	2kg
FX-6000	5kg

Step 8. Wait for about 15 seconds for the balance to stabilize and press RE–ZERO.

DISPLAY After a brief pause, the display will now again alternate between "Lnr", "tH" and "tL".

Step 9. Now, if you have not completed the Temperature Compensation Calibration ("tH" temperature high, and, "tL" temperature low) repeat the above steps after the balance has been four hours in the appropriate temperature. If you have completed the Temperature Compensation Calibration, let the balance sit at room temperature (20~25°C [68~77°F]) for four hours and proceed with Linearity and Span Calibration.

Legal Functions ONLY Procedure

CONFIDENTIAL INFORMATION

This section concerns disabling/enabling the multiple functions of the FX/FY balances at a deeper software level than the method mentioned in the Instruction Manual. Because some functions will be illegal in some countries it is important that the end users should not have access to this information. In addition, criminal misuse could occur if the end user was able to substitute a different Tael unit in countries where the Tael is used to weigh gold. Clearly it is important to A&D and to our dealers that these balances should not be used in fraudulent or other criminal activity. NOTE: Even if non-necessary units are available, the end user can still disable unwanted units at the higher software level as described in the Instruction Manual. He cannot access units disabled by this deeper level software programming.

STOP *PLEASE KEEP THIS INFORMATION SECURE!* STOP

Step 1. With the display *OFF* - Slide CAL switch on⇑.

DISPLAY "Err CAL" will be displayed.

Step 2. Press and hold the SAMPLE and MODE keys - while continuing to hold them, press ON/OFF. Release all keys.

DISPLAY Display will alternate between "0." and "0," every second. This is for your option of a period or comma for the decimal point.

Step 3. Press RE–ZERO during "0." for a "." decimal point.
Press RE–ZERO during "0," for a "," decimal point.
If you choose the wrong one, start again from the beginning.

DISPLAY "0." (or "0,").

Step 4. If you need only level "0" units press SAMPLE and go to step 9.
If you need only level "1" units, press MODE to change the display to "1", press SAMPLE and go to step 9.
If you need Tael go to Step 5.

Level	Available Units
"0"	g, Pct, A-g
"1"	g, cnt, Pct, OZ, Lb, LO (lb/oz), ct, dwt, ozt, GN, A-g, mm
"0" or "1" + RE-ZERO	g, cnt, Pct, OZ, Lb, LO (lb/oz), ct, dwt, ozt, GN, A-g, mm, TH(Tael HK) TS(Tael Singapore), TT(Tael Tiawan), TC(Tael China)

Step 5. Press RE–ZERO and the display will blank and the "g" will light. This is necessary to access the Tael units.

Step 6. Press SAMPLE. Then press MODE to go through the following units one at a time:

cnt, Pct, OZ, Lb, LO (lb/oz), ct, dwt, ozt, GN, *A* - g, mm, TH (Tael HK), TS (Tael Singapore), TT (Tael Taiwan), TC (Tael China).

Step 7. Press SAMPLE to register each unit in turn (only one Tael unit can be registered).

Step 8. Press RE–ZERO to store your selection at this level.

DISPLAY "Err CAL" will be displayed.

Step 9. Slide the CAL switch off⇓.

Troubleshooting - Operation

Display Remains Dark	A) AC adapter is defective. B) Internal fuse blown. C) Display tube broken. D) Battery is dead.
Fuse Is Blown	A) Wrong type fuse. B) Defective battery (if option installed). C) Defective main board.
"E" or "- E" Display	A) Pan and pan support are missing or are the wrong type. B) Broken bearings in the force motor. C) Plastic splash shield touching the pan support.
Balance Will Not ZERO	A) Unstable weighing surface or table. B) Breeze affecting stability.
Repeatability Error Balance will not repeat the same displayed value for the same weight applied repeatedly.	A) Unstable weighing surface or table. B) Plastic splash shield touching the pan support. C) Breeze affecting stability.
Cornerload Out Of Adjustment	A) Balance not leveled. B) Pan support bent. C) Plastic splash shield touching pan support.
Battery Life To Short	A) AC adapter left connected to AC line for long periods with the balance on. B) Balance seldon used on battery. C) Wrong option installed.
Battery Won't Charge	A) Battery switch left on during charging.
Measured Value Of A Known Mass Wrong	A) Balance needs span calibration. B) Balance needs linearity calibration.
Displaying "Lb"	A) Battery needs to be charged. B) AC adapter wrong type.

Troubleshooting - Repair

Display Remains Dark	A) Is the AC adapter the correct type? remove the connector from the balance and place a 82 Ω 2watt resistor across the output. The output should be about 14V ~ 16V. B) With the AC adapter connected to the balance, the output should be 15V ~ 16V (measure at terminals 4 and 5 on the main PC board where the wires from the power board enter the main board. If 0V, check the fuse on the power input board. C) Check the front corners of the display tube, none should be white. Silver or black is ok, while white indicates that the tube is cracked and has air in it.
Fuse Is Blown	A) Chech the fuse rating, it should be 500mA slow blow. If correct, check the main board for shorts. If the battery option is installed, check the battery, if dead it will blow the fuse. B) If the battery option is installed, remove it and place a jumper connector in it's place and test again. If the fuse continues to blow, check for defective components on the main board. Check Q3, it may be shorted. Power up the balance with Q3 removed to determine if the problem is in the display power supply. The display will remain dark, but other voltages can then be checked.
"E" or "- E" Display	A) "- E" generally indicates that the pan and pan support are missing or are the wrong type (to light). B) "E" or "- E" can be an indication of broken bearings in the force motor, or the balance is over range (to much weight) C) Plastic splash shield touching the pan support.
Repeatability Error Balance will not repeat the same displayed value for the same weight applied repeatedly.	A) Dust or metal particles in the force motor. B) Hybrid molule defective. C) Noise in power circuits. D) Resistance values for R50 ~ R54 incorrect. E) Plastic splash shield touching the pan support. F) Loose bearing screws. G) Partially cracked flexible bearing. If suspected, it is most often the fulcrum bearings, but can be a cracked tension bearing.
Cornerload Can't Be Adjusted	A) If three corners will adjust to within one count, but one is out of specifications, one of the bearings is bent, usually the lower bearing assembly. Check the tension and fulcrum bearings for bends and twists. This is best done by laying the bearing on a flat plate of glass. Press on each corner of the bearing, it should not move. Turn the bearing over and repeat the process. Inspect the upper and lower flexible bearings by laying them bering side down on glass and pressing on the end of each flexible bearing. It should not move. Look at the bearing end. Both sides of the bearing must be in contact with the glass. B) Bearing screws loose. C) Lower bearing assembly upside down (FY Series)
Linearity Can't Be Adjusted	A) Linearity was set with underhook in place and removed later and the balance was calibrated without the under hook. This is a combination caused by an offset of the linearity zero and the calibration zero. If the underhook is to be used, attach it after linearity calibration and span calibration have been completed. B)Memory is defective and will not maintain the values.
Balance Will not Hold Calibration	A) Check the splash shield, if touching the pan support, the symptom will apear to be loss of calibration. B) If the balance cones up with "E" or "- E" but will calibrate ok then after power is removed for about eight hours comes up "E" or "- E" again, the memory battery, memory or associated circuitry is defective.

Power/Battery Check
Electronic

√ **Adapter:** The adapter that was supplied with the FX/FY is the one that should be used. If "Lb" is displayed while using the power adapter then it is providing too little voltage to the balance. If the display does not turn on at all, check the AC adapter under load. The output voltage should be 14VDC to 16VDC. The center pin of the AC adapter connector will be the negative terminal and the outer shell of the connector will be the positive terminal. If not, it's not the right adapter.

√ **Batteries:** The life of the rechargeable battery will vary greatly with frequency of charge and use of the balance. A display "Lb" means that the battery level is too low for the balance to work correctly. If the battery cannot seem to hold a charge, check it by: charging for fifteen hours, and operate the balance on battery only until the "Lb" is displayed. Repeat this process several times, and if the FX cannot run for 5 hrs, or the FY for 3 hrs (≈50% of normal), then replace battery. **Failure to use the battery (keeping the AC adapter connected) will shorten it's life.** Run the balance as often as possible on battery power. Let the balance run all day on battery power (disconnect the AC adapter) and recharge it at night with the battery power switch off (on the right side near the rear).

√ **Fuse:** If the fuse (0.5amp) keeps blowing, then there is a short. Check circuitry for objects touching, or broken circuit paths (see VISUAL CHECK). Also, check the power supply electronics as they may be suspect.

Visual Check
Electronic

√ Look for dirt, corrosion, or foreign objects anywhere in the balance.

√ Check for dust on the Force Motor, or anything touching it.

√ Check for anything touching circuitry. Look at the circuitry for possible contamination, broken circuit paths, cold solder joints, Corrosion, or damage to the board.

√ Look at suspect units for broken wires or loose connections.

RAM Check
Electronic

√ If the RAM data has been lost, then the balance at start-up will read "–E" and "0.0 oz" (or other unit) will be displayed when weighing is attempted, not "0.0 g" as it should. If the main board is dirty, clean with an electronic cleaner that specifies that it is okay to be used on plastics. If the board has corrosion on it, clean and repair any broken traces. Power surges (if excessive) can cause memory to be lost.

√ You can also check what Span Calibration mass is in memory by doing a **Print Check**. It should match the Span Calibration mass for your balance, if not, then RAM data has been lost or set improperly.

√ To check if the RAM memory is defective, set a different user parameter (see **Setting User Parameters.** owner's Instruction Manual) such as "C0–1", then disconnect the AC adapter (if the battery option has been installed, turn the power switch on the side of the balance to the off position). Allow the balance to remain off for about eight hours, then apply power again. After reconnecting the AC adapter (or if the battery option is installed, turn the power switch on), check the parameter setting. If it is different, then there is something wrong with the RAM memory.

√ If RAM memory is defective, do a LITHIUM BATTERY CHECK . If it's OK, check all circuitry, and finally replace the RAM if nothing wrong is found with the battery or circuitry.

A/D Converter Check

Electronic

When checking the A/D Converter we will be looking at the inner A/D count from the Force Motor. Two weighing conditions will be tested, and at the appropriate step you will be reading a number on the display and comparing it to Table B. below.

Step 1. Start with nothing on the pan (0g).

Step 2. With the display on, and the **CAL** switch off⇓, press and hold **RE-ZERO**.

Step 3. Slide the **CAL** switch on⇑. Release **RE-ZERO.**

DISPLAY "CCCCCCC" for Check Mode will be displayed.

Step 4. Slide the **CAL** switch off⇓.

DISPLAY This will give the internal A/D Converter value. Vibrations or drafts may cause fluctuations. Disregard any fluctuations as this is normal.

Step 5. Place Maximum Capacity mass for the balance on the pan (see Max. Cap. Masses, in Table B., below). Let the displayed number equal **X** (Maximum Capacity = X).

Step 6. Now, remove all weight. Let the displayed number equal **Y** (0g = Y).

Calc Subtract: Maximum Capacity minus 0g, let it equal **Z**. (**Z = X - Y**).

Step 7. Check Table B. below for the appropriate A/D Converter value for X, Y and Z. If the numbers are in the correct table range, go to the VOLTAGE CHECK section.

If the X, Y, and Z values are not in the proper range, then the Hybrid Unit or the Force Motor is not working correctly. Do the Analog Hybrid Module check.

Table B. Internal A/D Converter Value

MODEL	Max. Cap. Masses	Maximum Capacity = X	0g = Y	Z = X - Y
FX-40/40CJ	40g	X ≤ 1,000,000	50,000 ≤ Y ≤ 100,000	810,000 ≤ Z ≤ 880,000
FX-200	300g	X ≤ 900,000	60,000 ≤ Y ≤ 160,000	640,000 ≤ Z ≤ 800,000
FX-300/320	300g	X ≤ 900,000	60,000 ≤ Y ≤ 160,000	640,000 ≤ Z ≤ 800,000
FX-400	400g	X ≤ 960,000	30,000 ≤ Y	810,000 ≤ Z ≤ 900,000
FX-1200	1kg	X ≤ 600,000	Y ≥ 100,000	Z ≥ 250,000
FX-2000	3kg	X ≤ 900,000	50,000 ≤ Y ≤ 100,000	650,000 ≤ Z ≤ 800,000
FX-3000/3200	3kg	X ≤ 900,000	60,000 ≤ Y ≤ 150,000	650,000 ≤ Z ≤ 800,000
FX-4000	4kg	X ≤ 960,000	30,000 ≤ Y	810,000 ≤ Z ≤ 900,000
FX-6000	6kg	X ≤ 750,000	Y ≥ 300,000	270,000 ≤ Z ≤ 350,000
FY-200/300	300g	X ≤ 700,000	Y ≥ 200,000	Z ≥ 270,000
FY-2000/3000	3kg	X ≤ 700,000	Y ≥ 100,000	Z ≥ 270,000

Step 8. Try cleaning the Force Motor assembly and check all wiring and circuits, make sure that nothing is touching the Force Motor assembly. Exchange the force motor assembly if available, then run the check again. Continue if there is still a problem.

If you are testing an FY, replace the Hybrid Unit (use caution removing the Hybrid Unit, as the eyelets in the board pull out easily), as the servo control would be suspect, run the check again. If there are still problems, replace the main board.

If you are testing an FX, turn the board over and look at Register 53. If there is nothing there, determine and attach the appropriate resistor (see PARTS LIST for the proper value). Also check for the proper resistors at R50, R51, and R52 (see PARTS LIST for the proper values). Change or add as needed, run the check again. If there is still a problem, change the Hybrid Unit (use caution removing the Hybrid Unit, as the eyelets in the board pull out easily), as the servo control would be suspect, run the check again, replace the main board if there is still a problem.

Voltage Check
Electronic

√ Check Voltage: There are a number of voltage checks that can be carried out on the main board for pinpointing faulty electronics. If the voltage is out of the ranges below, replace connecting electronics.

Measure from	Measure to	Voltage Range
GND	U1 Case	- 9V to - 11V
GND	VCC	9V to 11V
GND	LG (logic ground)	- 5.4V to - 5.9V
GND	VSS	- 30V to - 34V
LG	VDD (top of R-38)	4.5V to 5.5V
Display pin 1	Display pin 1	AC 3.0V to 3.5V RMS

√ Display Tube Filament: If needed, see Display tube Filament Check at the end of this section.

Wave form Check
Electronic

If everything is correct in the Voltage Check section above but the displayed value is still incorrect, then either the CPU or the Gate Array is at fault. We will be able to tell by the wave form that is generated during testing. See the Wave form table for the test points (also see Main Board Drawing). If an incorrect wave form is found (CAUTION, the wave forms in this table are optimized and the actual wave form may be slightly rounded rather than square), then replace the unit (either CPU or Gate Array) that is the generator of the signal.

ANALOG HYBRID MODULE Check
Electronic

When checking the Hybrid module we will be looking at the inner, or naked A/D count, free of any input from the Force Motor or Temperature Sensor. At the appropriate step you will be reading a number on the display and comparing it to Table C.

Step 1. Disconnect the following cables from the main board: (J4) from the Force Motor assembly, and (J5) from the Temperature Sensor (a sub part of the Force Motor).

Step 2. With the display on, and the CAL switch off⇓, press and hold RE–ZERO.

Step 3. Slide the CAL switch on⇑. Release RE–ZERO.

DISPLAY "CCCCCCC" for Check Mode will be displayed.

Step 4. Slide the CAL switch off⇓.

DISPLAY This will give the naked offset voltage from the Hybrid , the internal A/D Converter value. Sometimes "–E" will be displayed on and off, this is okay.

The last digits of the displayed number could be fluctuating, disregard.

Step 5. Check Table C. for the appropriate A/D Converter value. If the number displayed is in the correct range on the table, go to the Temperature Sensor check.

Table C. Naked Internal A/D Converter Value

MODEL	RANGE
FX-40/40CJ R53 = Short	550,000 ≤ Y ≤ 650,000
FX-200 R53 = 5.2k	350,000 to 370,000
FX-300/320 R53 = 5.2k	350,000 to 370,000
FX-400 R53 = 22k	230,000 to 250,000
FX-1200 R53 = 10k	62,000 ≤ Y ≤ 660,000
FX-2000 R53 = 10k	280,000 ≤ Y ≤ 300,000
FX-3000/3200 R53 = 10k	280,000 ≤ Y ≤ 300,000
FX-4000 R53 = 2k	420,000 ≤ Y ≤ 440,000
FX-6000 R53 = Short	490,000 ≤ Y ≤ 520,000
FY-200/300 R53 = None	340,000 ≤ Y ≤ 370,000
FY-2000/3000 R53 = None	340,000 ≤ Y ≤ 370,000

If the displayed value is not in the proper range, then the Hybrid may not working correctly. If you have another balance of the same series, temporarily exchange the board and test again. If you exchange the board, do not calibrate the unit, or the values set into RAM memory will have to be reset when you return the board to the original unit. This method will give you some readings to compare to.

If you are testing an FX, go to Step 6. If you are testing an FY, the Hybrid unit may have to be replaced. For the FY series, there will be no resistor at R53.

Step 6. If you are testing an FX, turn the board over and look at R53. If there is nothing there, then put in the appropriate resistor (see PARTS LIST for values associated with each model). The FX-40 and the FX-6000 will have a wire jumper in place of R53. Repeat the above test procedure and if it still does not read correctly, then the Hybrid unit will have to be replaced (use caution removing the Hybrid Unit, as the eyelets in the board pull out easily).

Temperature Sensor Check

Electronic

It should be very seldom that a Temperature Sensor becomes defective. But, if it does, the Force Motor magnet assembly will have to be replaced since the Temperature Sensor is an integral part. If the Hybrid unit has checked out correctly, and the balance still does not work correctly, then check the Temperature Sensor as follows:

Step 1. If you disconnected the Force Motor in a previous step, reconnect the cables from the Force Motor assembly to J4 and the Temperature Sensor to J5, and replace the weighing pan.

Step 2. With the display on and the CAL switch off⇓, press and hold RE–ZERO.

Step 3. Slide the CAL switch on⇑. Release RE–ZERO.

DISPLAY "CCCCCCC" for Check Mode will be displayed.

Step 4. Slide the CAL switch off⇓.

DISPLAY This will give the voltage from the Hybrid, disregard.

Step 4. Press MODE.

DISPLAY At room temperature (approx. 25°C [77°F]) the display should read between "450000" and "550000".

If the displayed values are correct, then go to Step 6.

Step 5. If the displayed values are not in the correct range, cool the balance and watch the display as the balance warms. For every one degree increase in the temperature of the balance, the display should decrease by –"002000". If the reading are correct, the Temperature Sensor may be okay. Go to Step 6.

If it is possible, exchange the entire motor assembly with one that has the same range and test again. If it has been determined that the Temperature Sensor is not working correctly, then the Force Motor Magnet assembly, containing the sensor, must be replaced.

Step 6. Return to the normal display by pressing ON/OFF.

Lithium Battery Check
Electronic

The life of the Lithium Battery should be about eight years. If the balance cannot seem to keep the calibration parameters stored, or if they have just disappeared altogether there might be a problem with the Lithium Battery. The Lithium Battery is a flat round metal object. It sits perpendicular to the main board by the Hybrid unit and U7 (see Main Board Drawing on the next page).

Step 1. Make sure all power is off to the main board for about 1 hour. Disconnect the AC adapter, and, if the optional battery pack is installed, Make certain the switch is off.

Step 2. Test with a voltmeter (5V range) from LG to D11 (see Main Board Drawing). Let that voltage equal A.

Step 3. Check from LG to U7 pin 24 (RAM), let that voltage equal B.

CALC B minus A should be less than 1mV, and voltage B should be more than 2.5V. If your readings correspond, then the battery is okay.

If B is less than 2.5V then replace the battery.

If B minus A is greater than 1mV, to much current is being drawn from the battery, this indicates a problem with Q4 (see Circuit Diagram), the surrounding diodes, or U7. Check for shorts between traces on the board. Check Q4, D9, D10, D11, and C20 (see Circuit Diagram). If the reading is still wrong, replace RAM U7 and recheck. Replace D9 and Q4. Unsolder one side of C20 and check again.

Print Key Check
Electronic

Sometimes it is difficult to tell if the print key is working without (or with) the optional RS-232C interface. There is a simple check for the PRINT key:

Step 1. Turn the display on.

Step 2. Slide the CAL switch on.

Step 3. Press PRINT.

DISPLAY If the PRINT key is working correctly, the Span Calibration mass for your balance will be displayed, e.g.: 200.000g for the FX-300. If nothing is displayed then the PRINT key may be defective. Measure between pins 4 and 6 of J6 (the keyboard connector) with power removed (using an Ohm meter). Operate the print key. The meter will indicate the switch closure. If not, the entire keyboard will have to be replaced. If the switch seems to be okay, there may be static voltage damage to the CPU (U6) or the CMOS Gate Array (U5). A defective RAM (U7) can also cause the print switch not to work properly.

Display Tube Filament Check

Electronic

√ The voltage check for the display tube filament is at pins #1 and #40 (the end pins), the voltage should be AC 3.0V ~ 3.5V. Use only a battery powered or passive type AC meter.

√ If the voltage is correct, then with the power on, look at the display tube in the dark and look at the wire filaments running horizontally through the tube. If the filaments look dim red, then the display tube may be okay. Look at the face of the tube, there should be a silvery or blackened patch at one end. If there is a white patch, the tube has air in it, and will have to be replaced.

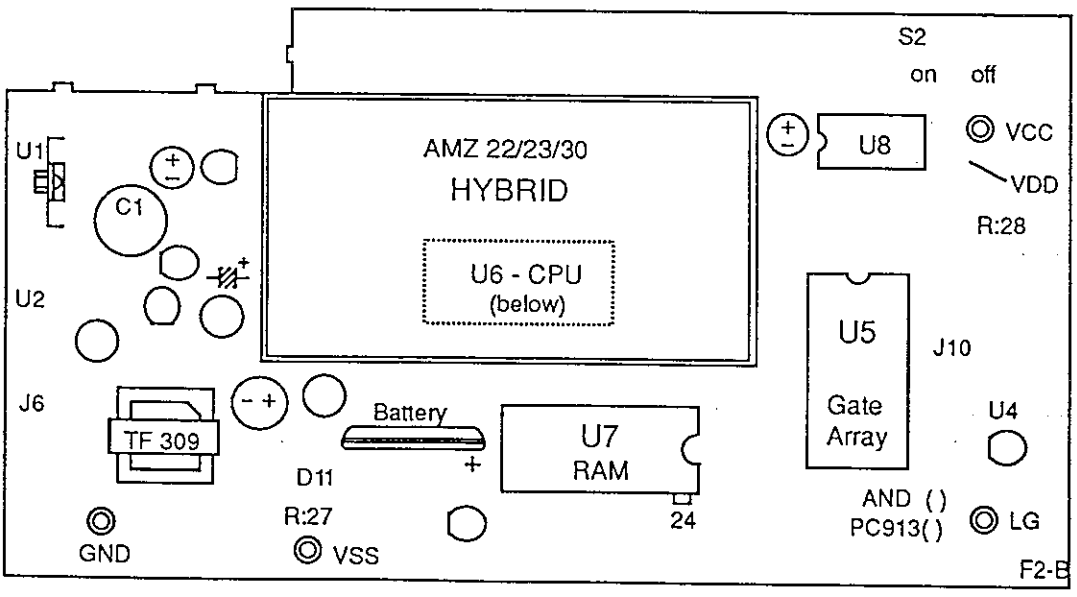
√ If the display tube has already been removed from the main board, the you can check the filaments by connecting an Ohm meter at pins #1 and #40. The value should be about 40Ω.

An "E" or "-E" Display

Mechanical and Electronic

√ If the display shows "E", remove power, take the pan and pan support off and lay them aside. Gently press on the pan support cone. It should move slightly (the higher range balances such as the FX-6000 may require considerable force to move the main beam of the motor). Pick up the balance and turn it over while noting the cone that the pan support sets on. If it moves more than one millimeter, the tension bearing is broken. While you have the balance inverted gently press on the pan support cone. If it moves, the bearings are broken. If you turn the balance over, then back and it makes a clunking sound, then one or more of the bearings are broken.

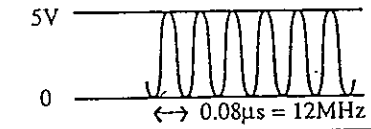
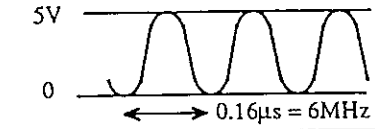
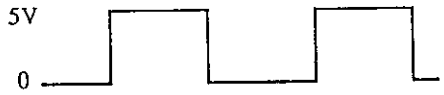
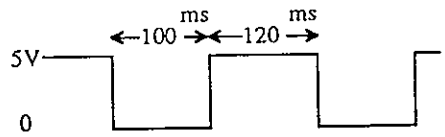
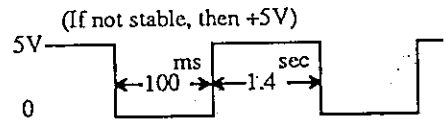
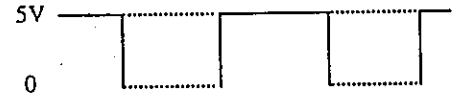
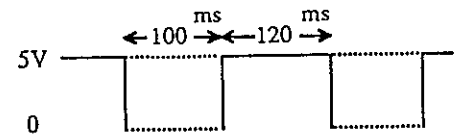
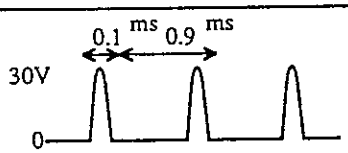
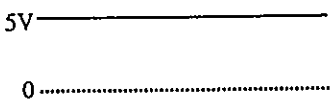
√ If the display shows "-E", check the pan and pan support for the correct type for the balance. Many are similar and may have mistakenly been exchanged. This can be verified by placing a mass on the pan of about 10 percent of the span range. If the balance then zeros it's self, the pan or pan support may be the wrong type. Another cause of the "-E" display is a stopper in the motor that is out of adjustment. Bent fulcrum bearings can also be the cause of a "-E" display. Examine the motor bearings for "S" or "Z" bends in the thin part of the bearing. Examine the upper and lower support bearings for bent or broken flexures. Move the beam up and down (carefully), it should move freely. If it will not move, the bearings are bent or the magnet has shifted to one side (usually caused by being dropped). Most bearing failure is caused by misuse or mishandling.



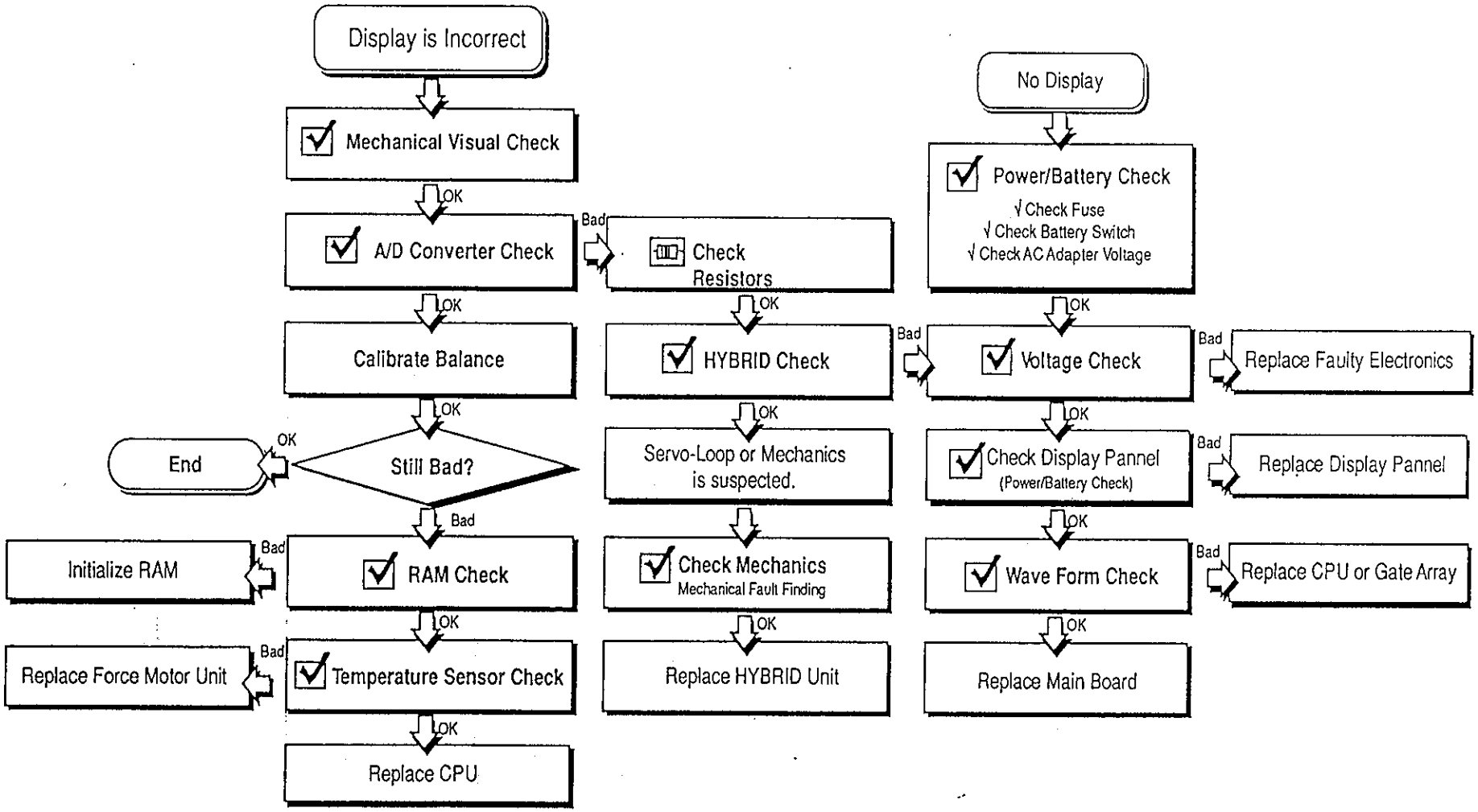
Main Board Drawing

Wave form Check - LOGIC WAVE FORM

Electronic

	No.	Signal Name	Test Points	Wave Form	Comments
Clock for CPU + Gate Array	1	OSCI $\overline{OSC2}$	U5(10) ~LG U5(12)		Gate Array (U5) Clock Input
	2	X_1 X_2	U5(9),U6(24) ~LG U5(8),U6(23)		CPU (U6) Clock Input
A/D Converter Signal	3	$\overline{AZ}$	U6(9) ~ LG		A/D Auto Zero
	4	$\overline{WIST}$	U5(4) U6(8) ~ LG		Weighing A/D 1st Signal
	5	$\overline{TIST}$	U5(15) U6(7) ~ LG		Temperature A/D 1st Signal (When Stable)
	6	$\overline{CNTE}$	U5(16) U6(6) ~ LG		A/D Count Enable
	7	EVENT	U5(7) U6(22) ~ LG		A/D Count Pulse 2^8 bit.
	8	$\overline{CMP\ I}$	U5(17) ~ LG		Comparator Input from HYBRID to Gate Array
	9	$T_0 \sim T_9$	U6(41-50) ~VSS FLP 1G~11G		Display Timing
	10	$\overline{CSW\ I}$	U5(33) ~ LG	If CAL is OFF, then H (+5) If CAL is On, then L (0)	CAL switch Input Reading
	11	$\overline{KSWE}$	U5(28) ~ LG		Key Switch Enable

ELECTRONIC FAULT FINDING FLOW CHART



CONFIDENTIAL INFORMATION/SELECTION OF R50 ~ R54

INIT. DIGIT	MODEL NUMBER	BOARD USED	CPU USED
"1"	FX-40	PZ:913E	UC-7516HG621-12, 631-12
"2"	FX-200	PZ:913A	UC-7516HG595-12, 606-12
"4"	FX-300	PZ:913A	UC-7516HG559-12, 574-12, 595-12, 606-12
"5"	FX-320	PZ:913A	UC-7516HG559-12, 574-12, 595-12, 606-12
"0"	FX-400	PZ:913S	UC-7516HG625-12, 630-12
"7"	FX-1200	PZ:913Y	UC-7516HG630-12
"3"	FX-2000	PZ:913B	UC-7516HG595-12, 606-12
"6"	FX-3000	PZ:913B	UC-7516HG559-12, 574-12, 595-12, 606-12
"7"	FX-3200	PZ:913B	UC-7516HG559-12, 574-12, 595-12, 606-12
"1"	FX-4000	PZ:913T	UC-7516HG625-12, 630-12
"L"	FX-6000	PZ:913C	UC-7516HG559-12, 574-12, 595-12, 606-12
"-"	FY-200	PZ:913D	UC-7516HG595-12, 606-12
"8"	FY-300	PZ:913D	UC-7516HG559-12, 574-12, 595-12, 606-12
"C"	FY-2000	PZ:913D	UC-7516HG595-12, 606-12
"9"	FY-3000	PZ:913D	UC-7516HG559-12, 574-12, 595-12, 606-12

R50	R51	R52	R53	R54
RL:B440R0B	Not used	Not used	Short with a jumper wire	Not used
RL:86R0F	Selected	Selected	RF:5.2KRF	Selected
RL:86R0F	Selected	Selected	RF:5.2KRF	Selected
RL:86R0F	Selected	Selected	RF:5.2KRF	Selected
RL:86R0F/ RF:3.3KRF	Selected	Selected	RF:22KRF	Selected
RL:B34R0F	Selected	Selected	RF:10KRF	Selected
RL:B34R0F	Selected	Selected	RF:10KRF	Selected
RL:B34R0F	Selected	Selected	RF:10KRF	Selected
RL:B34R0F	Selected	Selected	RF:10KRF	Selected
RL:86R0F 2 in parallel	Selected	Selected	RF:2KRF	Selected
RL:10R0F	Selected	Selected	May not used	Not used
RL:FBY20R0F	RF:5.2KRF	Not used	Not used	Not used
RL:FBY20R0F	RF:5.2KRF	Not used	Not used	Not used
RL:FBY20R0F	RF:5.2KRF	Not used	Not used	Not used
RL:FBY20R0F	RF:5.2KRF	Not used	Not used	Not used

** Selected.. In most cases these values are selected to place the INTERNAL A/D VALUE at mid range. R50~R52 set span, R53 and R54 set zero. In all cases R55 is a jumper wire.

**In all cases the values in the table are an average value and may need to be adjusted. Use the values listed for R50 and R53 first and adjust from there.

**Select the values for R50~R52 prior to setting R53~R54. Leave R53 out until the Value for R50~R51 has been selected and installed.

**In all cases, if the A/D value is outside the values specified, check the values of the resistors at R50 and R53, if correct, check the motor connections, they may be loose.

Refer to Table B for Span and Zero values. The value of "Z" will be used first. If within the range specified, then R51 and R52 should be left out. If you chose to install a resistor to bring the A/D value closer to center, start with one about 10 times the value as the one at R50 (if R50 = 86 ohms, then R51 should be about 1000 ohms). If the A/D value is already to low, increase the value of R50 by about 1/10 the value of R50 in Table B (if R50 = 86 ohms then increase it to 94 ohms). Then select a value for R51. The value of R 51 should be greater than the value of R50. Use the type resistors listed in the manual for R50 and R53 as these are temperature compensated resistors. If you experiance drift with full span weight on the pan, check the type of resistor used at R50~R52. Drift can be the result of other parts in the balance heating, so use care. Some drift is normal and should be expected.

**Has the A/D value been set for R50? If not, do so now, do not install R53 or R54 until R50~R52 have been selected.

**Start by installing the values listed for R53. These should place the A/D value neer the center of that listed in Table B.

To select the value of the resistor to install at R53, the value of "Y" will be used from Table B. Make certain that you have R50~R52 installed and that the A/D value is within the range listed in Table B. The value of "Y" should be about mid range of the value of "Y" in Table B, or in the case of values that give only an upper limit, about 80 to 90% of the A/D value listed. If it is less than half the A/D value listed the balance may become unstable and vibrate. A condition must be set that will give quick responce and yet give you good stability. If a value is listed for R53 and the A/D value is to high, use a resistor at R54 that is about 10 times the value of that listed for R53 (if R53 = 5.2k then use about 52k for R54). In all cases R54 should be at least the value of R53 or greater. If the A/D value is to low, increase the value at R53 by about 10%

Initialization of RAM

CONFIDENTIAL INFORMATION

This procedure is to be done only by an authorized representative of A&D, and is necessary only when a loss of memory has occurred. A loss of memory can occur from a battery failure, a short circuit, or component replacement. To successfully complete this procedure you will need to Initialize the RAM, do Linearity and Span Calibration, and you may also want to reset the Temperature Compensation Calibration. Please read the CALIBRATION INTRODUCTION chapter, and see **The Complete Initialization/Calibration Cycle for the FX/FY Series** section in it. You will also need to reset the proper legal weighing units for your location. See: PRIMING THE BALANCE FOR LEGAL FUNCTIONS.

PLEASE KEEP THIS INFORMATION SECURE!

Step 1. With the display on, and the **CAL** switch off⇓, press and hold **RE–ZERO**.

Step 2. Slide the **CAL** switch on⇑. Release **RE–ZERO**.

DISPLAY "CCCCCCC" for Check Mode will be displayed.

Step 3. Slide the **CAL** switch off⇓.

DISPLAY Inner A/D count numbers will be displayed, they are to be ignored here.

Step 4. Slide the **CAL** switch on⇑.

DISPLAY "0"," 1 ","2",".....","L" will flash by repeatedly in one second intervals. These numbers correspond to the following model numbers:

Table D. Initalization Number

DIGIT	TYPE	DIGIT	TYPE	DIGIT	TYPE	The use of several different CPU ICs cause some digits to repeat.
0	FX-400	6	FX-3000	C	FY-2000	
1	FX-40	7	FX-3200			
1	FX-4000	7	FX-1200	NOT USED IN FX/FY SERIES		
2	FX-200	8	FY-300	A b ɔ d E F L U		
3	FX-2000	9	FY-3000			
4	FX-300	L	FX-6000			
5	FX-320	-	FY-200			

Step 5. When the number corresponding to your balance flashes by on the display, press **RE–ZERO**.

DISPLAY "FFFFFFF" for Function initialization will be displayed.

Step 6. Press **SAMPLE** and **MODE** together.

DISPLAY "PPPPPPP" for Parameter initialization will be displayed. If you only wish to set the model number, go to step 9. If you wish to clear memory of temperature settings continue with step 7.

Step 7. Press **SAMPLE** and **MODE** together.

DISPLAY "EEEEEEE" for Exit will be displayed.

Step 8. You can now get back to the normal display by sliding the **CAL** switch off⇓.

Step 9. You have now completed the initialization process, and it is necessary to complete Linearity and Span Calibration. You may also want set the Temperature Compensation Calibration if needed.

NOTE: The Mode memory will have been initialized so that only g → Pct → A-g will be displayed (or g → cnt → Pct → ct → mm → A-g). Please reset the proper legal weighing units for your location. See: PRIMING THE BALANCE FOR LEGAL FUNCTIONS.

Mechanical Fault Finding

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

Visual Check
Mechanical

√ If any damage is found in the following visual checks, replace the damaged unit.

- ☐ **Balance Case and Chassis:** There should be no cracks or gaps in the balance housing. Check that all housing screws are in place.
- ☐ **Adapter:** The adapter that was supplied with the FX/FY is the one that should be used. Check the wire for kinks, breaks, holes in the wire insulation. Also check the AC input connector for loose or bent pins.
- ☐ **Keyboard:** The Keyboard pad should be free of cracks or tears. When a key is depressed, contact should be felt, and a faint clicking sound heard.
- ☐ **Weighing Pan:** The Weighing Pan should be free of dents or bends, and parallel to the balance. The pan support leaf spring should not be bent (FX-6000). Also, the Pan Guard should lie flat against the case, and its lip should not be touching the Weighing Pan or support.
- ☐ **Protective Cover:** The protective plastic cover should lie flat against the case, be free of cracks or gaps, and not touch the Weighing Pan or pan support.
- ☐ **Level Vial:** The level vial should be filled with fluid and the leveling bubble should be within the circle at the top. Use the front Adjustable Feet to level.
- ☐ **Adjustable Feet:** The Adjustable Feet dials should be parallel with the chassis, and turn smoothly.
- ☐ **RS-232C:** (Option OP-03) Check for any damage, including dirt in the connectors.

Function Check
Mechanical

√ Perform the following check to see if the Keyboard functions are working correctly.

Step 1. Apply power – The display should show: " . " or " ----------". ☐ok

Step 2. Press **ON/OFF** – The display should show: ZERO. ☐ok

Step 3. Press **RE–ZERO** – The display should blank, and then read zero. ☐ok

Step 4. Press **MODE** and select "Pct" or "cnt". The display should read: " ## cnt", or " #.## Pct", then press **SAMPLE • %**. The display should read: " 10 0 cnt" or " 100 0 Pct". ☐ok

Step 5. Press **SAMPLE • %** – "Lo" should be displayed. ☐ok

Step 6. Slide the **CAL** switch on⇑ – "CAL 0" should be shown. ☐ok

Step 7. Press **PRINT** – The calibration mass value should be displayed (see Table A.). ☐ok

Step 8. Slide the **CAL** switch off⇓.

Cornerload Check
Mechanical

√ After the normal Cornerload adjustment has been performed (see CORNERLOAD ADJUSTMENT), carry out the following check.

Step 1. Place the Test Mass for your balance (Table E.) at point "A".

Step 2. Press **RE–ZERO**.

Step 3. Next move the mass to the four points "B" through "E" (the points are halfway between the center of the pan and the rim).

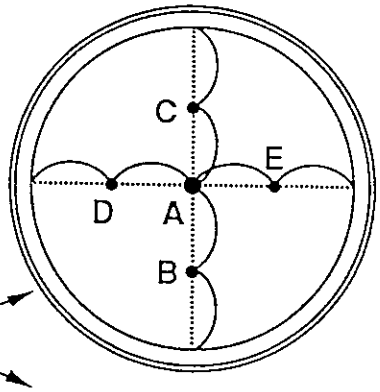
Table E. Cornerload Check

MODEL	TEST MASS	TOLERANCE
FX-40	20g	± 0.0002g
FX-200	100g	± 0.002g
FX-300	200g	± 0.002g
FX-400	200g	± 0.002g
FX-1200	500g	± 0.02g
FX-2000	1,000g	± 0.02g
FX-3000	2,000g	± 0.03g
FX-4000	2,000g	± 0.03g
FX-6000	4,000g	± 0.2g
FX-320	50g	± 0.001g
FX-3200	500g	± 0.01g
FY-200	100g	± 0.02g
FY-300	200g	± 0.02g
FY-2000	1,000g	± 0.2g
FY-3000	2,000g	± 2g

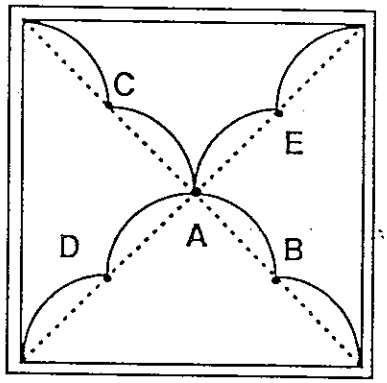
CORNERLOAD POINTS

ALL MODLES EXCEPT FX-6000

WEIGHING PAN



FX-6000 ONLY



Step 4. Check the deviation from the listed Tolerance (above).

√ If the results are <u>not</u> within tolerance, check for:

A) Loose screws on the Force Motor. ☐ok

B) Defective Flexible Bearing Assemblies. ☐ok

C) Defective Fulcrum Flexible Bearings, Tension Bearings, or links that are improperly mounted or defective. ☐ok

Linearity Check

Mechanical

√ Test the Balance with the masses listed below, and check that the display reads in the acceptable tolerance range.

NOTE: Before checking the linearity:

1) The balance must be calibrated. ☐ok

2) The Cornerload error should be within tolerance. ☐ok

3) Test weights must be accurate. ☐ok

4) Take care to place the weight on the center of the pan.

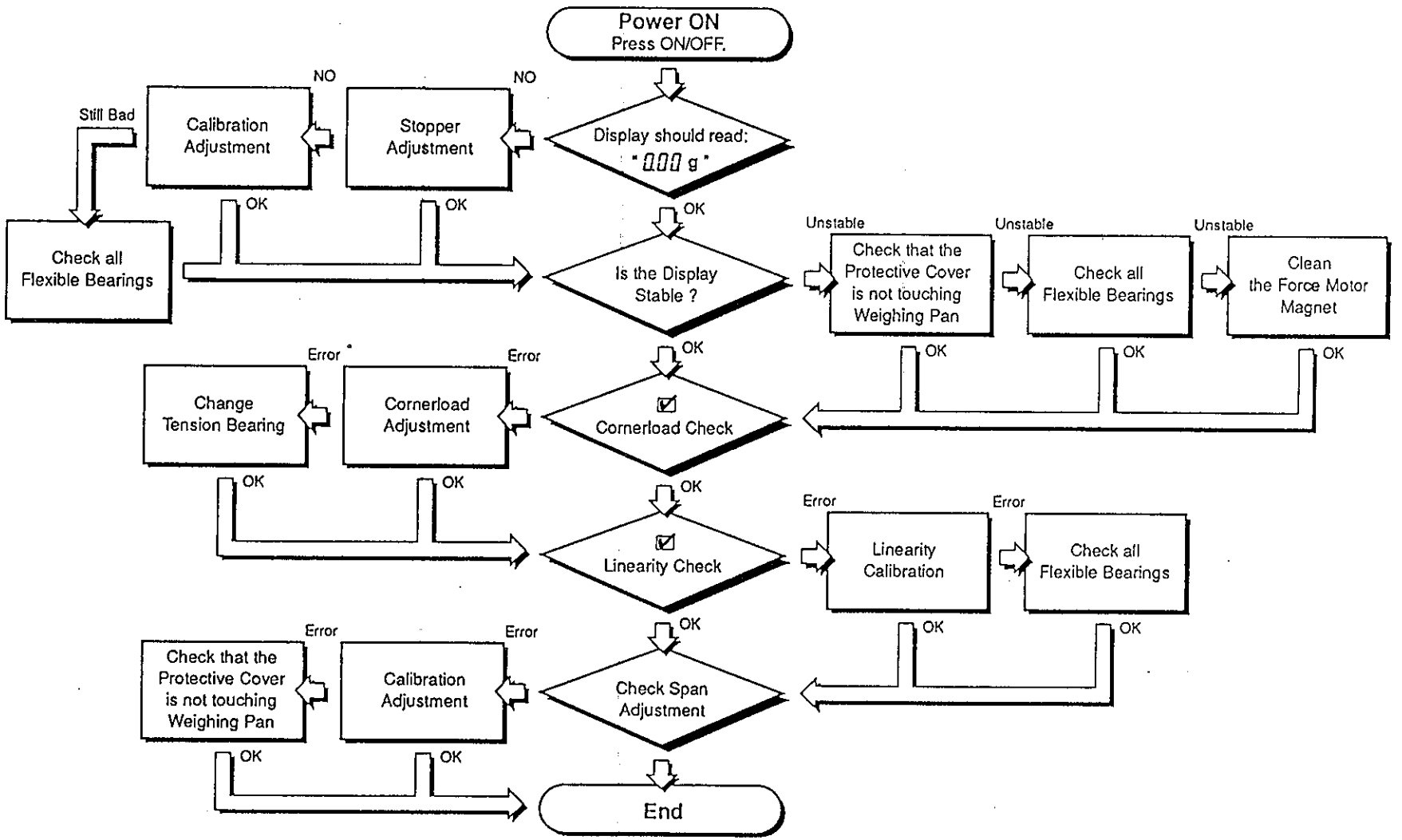
Table F. Linearity Check

MODEL	TEST MASSES			TOLERANCE	
FX-40/40CJ	10g	20g	40g	± 0.002g	
FX-200	100g	200g	300g	± 0.002g	
FX-300	100g	200g	300g	± 0.002g	
FX-400	100g	200g	300g	± 0.002g	
FX-1200	500g	500g	1,000g	± 0.01g	
FX-2000	1,000g	2,000g	3,000g	± 0.02g	
FX-3000	1,000g	2,000g	3,000g	± 0.02g	
FX-4000	1,000g	2,000g	3,000g	± 0.02g	
FX-6000	2,000g	4,000g	6,000g	± 0.1g	
FX-320	50g* 100g	200g	300g	*± 0.002g	± 0.01g
FX-3200	500g* 1,000g	2,000g	3,000g	*± 0.02g	± 0.1g
FY-200	100g	200g	300g	± 0.01g	
FY-300	100g	200g	300g	± 0.01g	
FY-2000	1,000g	2,000g	3,000g	± 0.1g	
FY-3000	1,000g	2,000g	3,000g	± 0.1g	

√ If the results are <u>not</u> within tolerance, check the items listed below. If the items listed below are okay, then disassemble and reassemble the balance.

A) The Cornerload not adjusted properly. ☐ok
B) Loose screws on the Force Motor. ☐ok
C) Defective Flexible Bearing Assemblies. ☐ok
D) Defective Fulcrum Flexible Bearings, Tension Bearings, or links that are improperly mounted or defective. ☐ok

MECHANICAL FAULT FINDING FLOW CHART



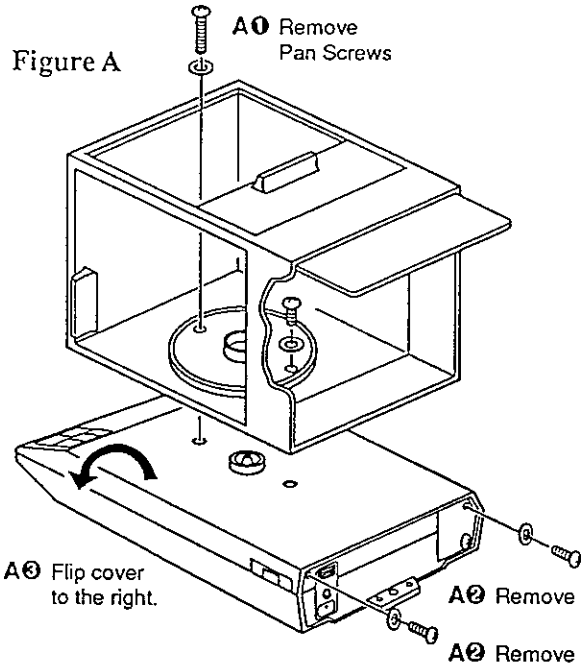
FX - Disassembly / Assembly

NOTE: Please make sure that *NO* short circuits take place with screwdrivers, or shorting to the die-cast aluminum chassis of an FX balance.

NOTE: When removing screws that are holding the same object, loosen them all first, then remove - and when attaching, get all of them firm, then tighten.

FX - Opening the Case

Figure A



Step 1. Unplug the AC adaptor from the balance (if NiCd Batteries have been installed, the Battery Power/Charger Switch should be OFF). Remove the Weighing Pan and Pan Support (the FX-6000 also has a pan support screw to be removed). Remove the front screw on the Pan Guard (Figure A, A❶).

Step 2. Remove the two top screws in the back upper corners (A❷).

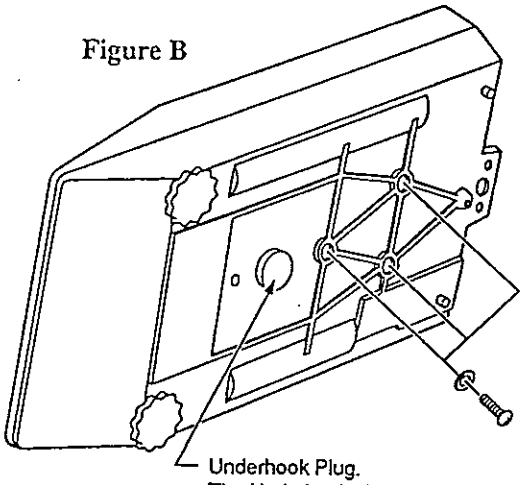
Step 3. Gently lift up the top cover, flipping it to the right (A③). • DO NOT JERK THE FLAT RIBBON CABLE LEAD. Gently remove the flat ribbon cable from its connector on the main board.

FX - Removing the Force Motor

Step 1. Grasping the Force Motor Assembly firmly (it is heavy!), turn the chassis on its side and remove the three screws holding the Force Motor Assembly to the chassis (Figure B). Carefully place the chassis back on its feet.

Step 2. Disconnect connectors J4 and J5 (Figure C).

Figure B



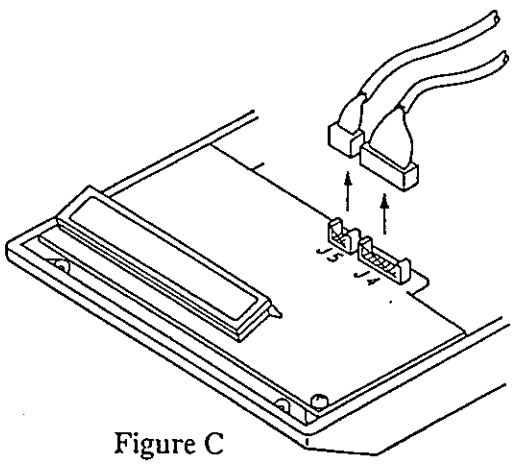


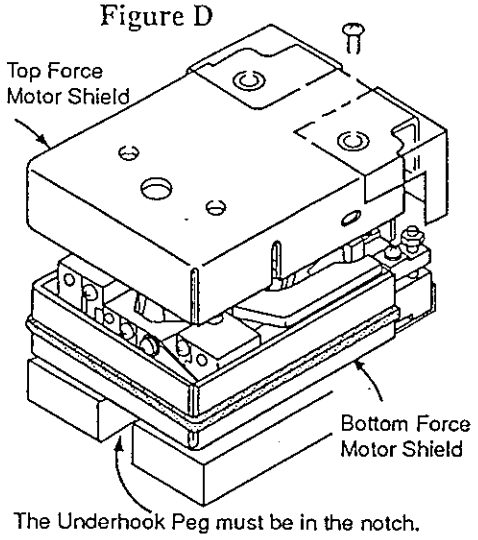
Figure C

Step 3. Lift the Force Motor Assembly out of the chassis, and set it on the motor support plate, making sure that the Underhook Peg dose not touch the repair surface. • THE FORCE MOTOR WILL BE DAMAGED IF THE PAN SUPPORT PEG OR THE UNDERHOOK PEG COME IN CONTACT WITH THE SAME SURFACE THAT SUPPORTS THE FORCE MOTOR ASSEMBLY.

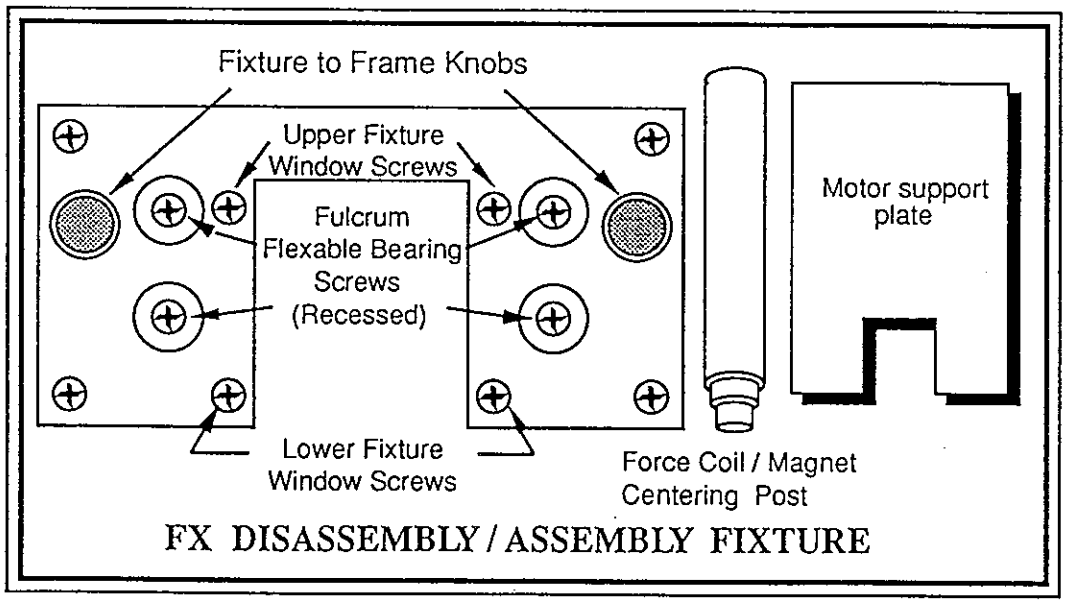
Step 4. Remove the four screws holding the top Force Motor shield and lift it off (Figure D).

Step 5. Lift the Force Motor Assembly out of the bottom shield and set it down making sure that the Underhook Peg is in the notch of the fixture plate.

Figure D



FX - Force Motor Disassembly

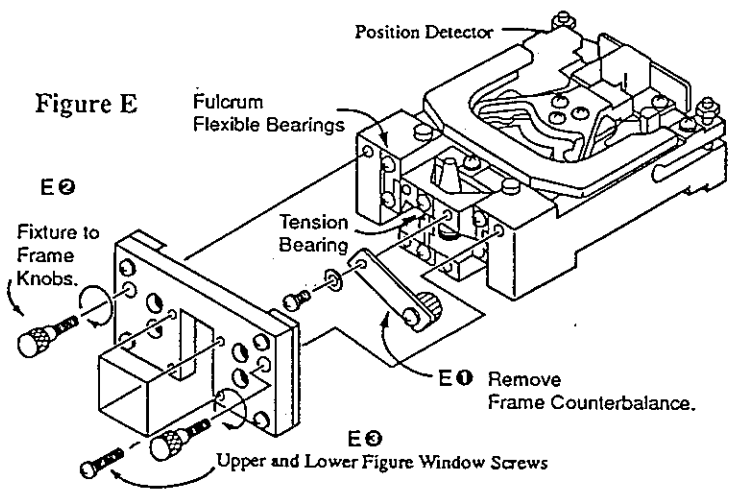


Step 1. Remove the Suspension Frame Counterbalance (Figure E, E❶).

Step 2. Tightly attach the FX Disassembly Assembly Fixture to the Force Motor Assembly by the Fixture to Frame Knobs (Figure E, E❷).

Step 3. Firmly, but not tightly, attach the Upper and Lower Fixture Window Screws (about 1 /2 turn before tight) (E❸).

Figure E



Step 4. Loosen the four recessed Fulcrum Flexible Bearing screws 1/2 turn (ref. Fig H, H❷).

Step 5. Loosen the three screws on the Upper Flexible Bearing Assembly (Figure F).

Step 6. Place the Force Motor Assembly on its end, loosen the three Flexible Bearing Screws on the Lower Flexible Bearing Assembly (Figure G).

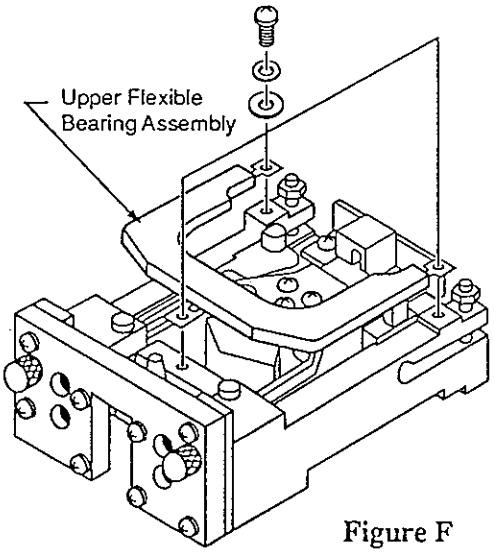


Figure F

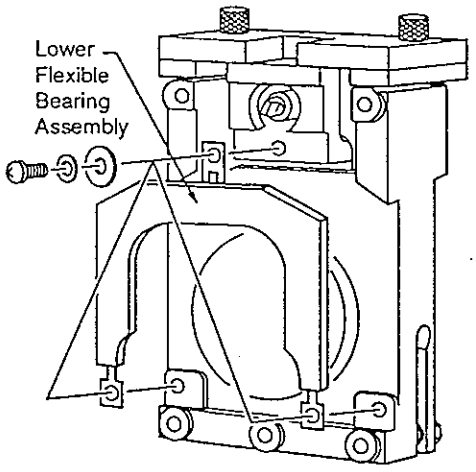


Figure G

Step 7. Tighten the Upper and Lower Fixture Window Screws.

Step 8. Remove the Upper Flexible Bearing Assembly and then the Lower Flexible Bearing Assembly (ref. Figures F & G).

Step 9. Remove the Tension Bearing (Figure H, H❶) and fixing plates.

Step 10. Fully unscrew the four recessed Fulcrum Flexible Bearing screws (loosened in Step 3) (H❷), then remove them by tilting the whole Force Motor Assembly forward and catching everything in your hand. There will be 4 screws, washers, and 2 Fulcrum Flexible Bearings dropping out. Take careful note of the relationship of each for reassembly, keeping the correct washers with the corresponding screws.

Step 11. Loosen and remove the Lower Fixture Window Screws, then carefully remove the Suspension Frame (Figure J, J❶).

Step 12. Unsolder the two short wires, coming from the circuit board on the Position Beam Lever, on the PC-919 circuit board (Figure J, J❷).

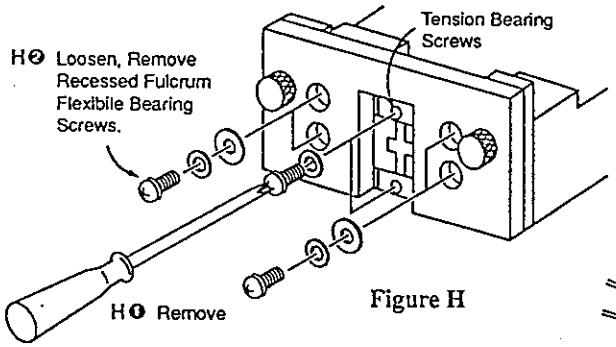


Figure H

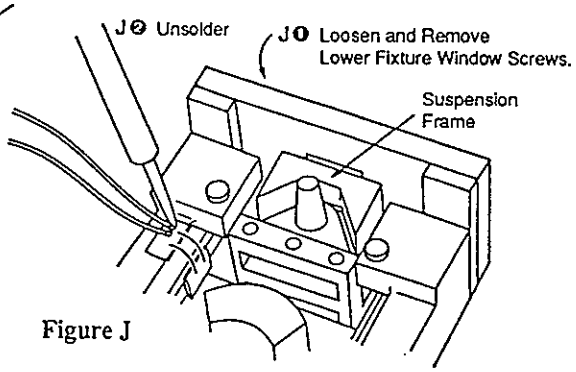


Figure J

Step 13. Loosen and remove the two screws on the Position Detector Assembly. Make careful note of which holes the screws are in, it is important for reassembly. Remove the Position Detector Assembly (Figure K, κ❶).

Step 14. Loosen the screw holding the Stopper Plate and slide the Stopper Plate away from the Stopper Plate Restriction Bolt (κ❷).

Step 15. Loosen and remove the Upper Fixture Window Screws (κ❸).

Step 16. Loosen and then remove the Fixture (κ❹).

Step 17. Carefully remove the Position Beam Lever by gently lifting up on the end with the bobbin, guiding it out of the Magnet Assembly, then out from the main frame (κ❺).

Step 18. Remove the three screws holding the Force Motor Magnet Assembly to the frame (κ❻). Lift the frame up and away from the Magnet Assembly .

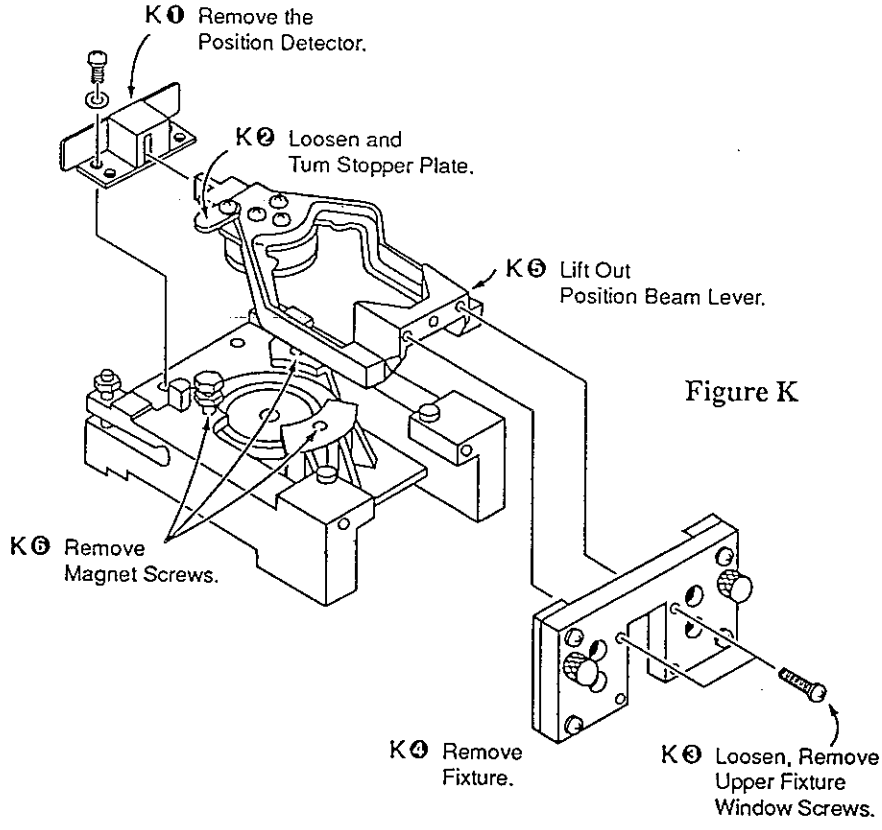


Figure K

NOTE: Please remember to first attach all screws holding an object, then tighten them

Step 1. Carefully place the frame back over the Magnet Assembly (clean the Magnet and Force Coil Bobbin first! See CLEANING THE FORCE MOTOR, page 43). Reattach the three screws that hold the Magnet Assembly to the Force Motor.

Step 2. Replace the Position Beam Lever.

Step 3. Check that the Fulcrum Flexible Bearings are flat, then attach them, do not tighten.

Step 4. Attach the FX Disassembly/Assembly Fixture to the Force Motor Assembly by the Fixture to Frame Knobs.

Step 5. Loosen the three screws on the Position Beam Lever that holds the Force Coil bobbin (Figure L, L❶).

Step 6. Attach the Position Beam Lever to the Fixture by the Lower Fixture Window Screws.

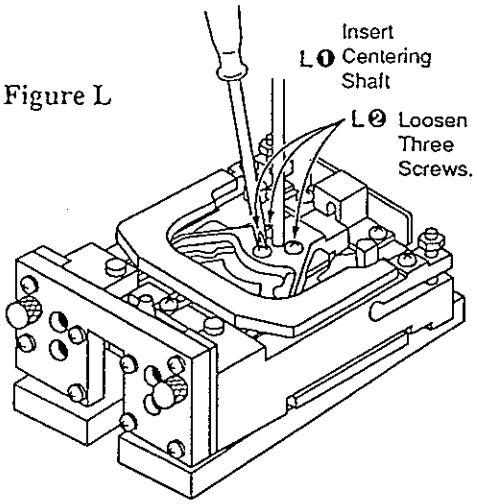


Figure L

Step 7. Insert the Centering Shaft through the hole on the Position Beam, jiggle it until it until it slips into the hole on top of the Magnet Assembly (L❷).

Step 8 Tighten the three screws and remove shaft.

Step 9. Resolder the short Force Coil leads to the PC-919 circuit board. (ref. Fig. J, J❷)

Step 10. Attach the Suspension Frame to the Fixture by the Upper Fixture Window Screws.

Step 11. Reattach the Position Detector Assembly. The end of the Position Beam Lever should be centered in the Position Detector hole.

Step 12. Check that the Upper Flexible Bearing Assembly is flat, then reattach (ref. Figure F).

Step 13. Turn the assembly on its end.

Step 14. Check that the Lower Flexible Bearing Assembly is flat, then reattach (ref. Figure G)- turn the assembly back down.

Step 15. Check that the Tension Bearing is flat, then attach it along with the fixing plates (ref. Fig. H, H❶).

Step 16. Tighten the Fulcrum Flexible Bearing Screws (ref. Fig. H, H❷).

Step 17. Remove the Alignment Fixture.

Step 18. Loosely reconnect the Suspension Frame Counterbalance (Figure E, E❶).

Step 19. Turn the Force Motor Assembly on its side and check the motion of the Position Beam Lever. It should be move smoothly and be free of any friction.

Step 20. Place the Assembly into the bottom Force Motor shield, reattach the top Force Motor shield (see Figure D).

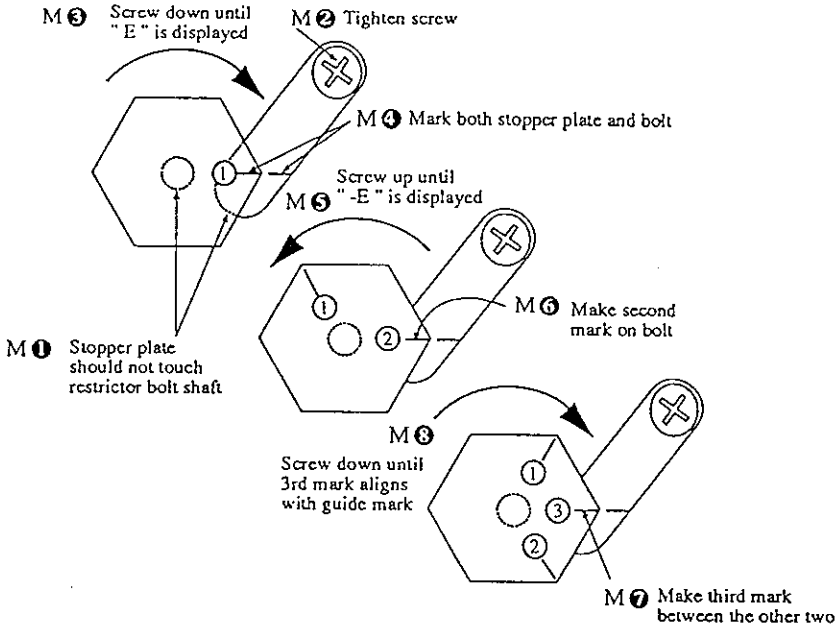
Step 21. Position the Force Motor Assembly into its place in the chassis. Grasp the Force Motor Assembly firmly and turn the chassis on its side. Replace the three screws holding the Force Motor Assembly (see Figure B). Make sure that the Underhook is centered in its chassis hole. Carefully place the chassis back on its feet.

Step 22. Remove the top Force Motor shield.

Step 23. Reconnect connectors J4 and J5 (see Figure C)

Step 24. Reconnect the AC Power Adaptor. Press ON/OFF.

Step 25. Reposition the Stopper Plate in the Stopper Plate Restriction Bolt (make sure the Stopper Plate does not touch the Restriction Bolt shaft) (Figure M, M❶), and tighten the screw holding the Stopper Plate (M❷).



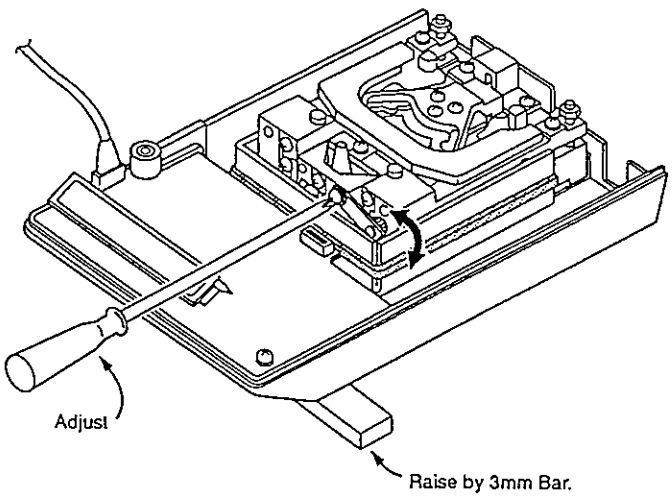
Step 26. Screw down the Stopper Plate Restriction Bolt until "E" is displayed on the Fluorescent Display (M❸).

Step 27. Make a guide mark on the Stopper Plate and Stopper Plate Restriction Bolt (M❹).

Step 28. Screw up the Stopper Plate Restriction Bolt until "-E" is displayed (M❺).

Step 29. Make a second guide mark on the Stopper Plate Restriction Bolt from the guide mark on the Stopper Plate (M❻).

Step 30. Make a third guide mark on the Stopper Plate Restriction Bolt between the other two (M❼). Screw down the Stopper Plate Restriction Bolt until the center mark aligns with the guide mark on the Stopper Plate (M❽).



FX-40 only

Step 32. Level the balance and press the **RE-ZERO** key to ZERO the balance.

Step 33. Raise the balance front 3mm by placing the supplied bar under the front feet.

Step 34. Adjust the Suspension Frame Counterbalance until the display is ±30 digits from ZERO.

- **MINUS** display: Turn the Counterbalance clockwise.
- **POSITIVE** display: Turn the Counterbalance counter-clockwise.

Step 35. Disconnect the AC Power Adaptor.

Step 36. Replace the top Force Motor shield, and attach the four screws.

FX - Closing the Case

Step 1. Reconnect the flat ribbon cable to its connector on the main board, and flip the top cover back onto the chassis (reference Figure A).

Step 2. Reattach the front screw on the Pan Guard. Replace the two top screws on the back upper corners (on the FX-6000, also attach the pan support).

Step 3. Replace the weighing pan. Reattach the AC Power Adaptor. • If the NiCd Batteries have been installed, remember to return the Battery Power/Charger Switch to ON.

Step 4. Do Cornerload Adjustment.

FY - Disassembly / Assembly

NOTE: Please make sure that *NO* short circuits take place with screwdrivers, or due to grounding.

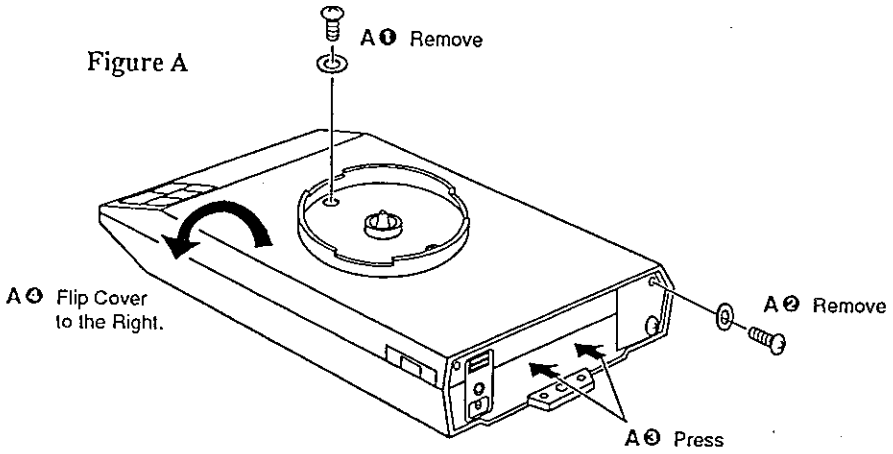
NOTE: When removing screws that are holding the same object, loosen them all first, then remove - and when attaching, get all of them firm, then tighten.

FY - Opening the Case

Step 1. Unplug the AC adaptor from the balance (if NiCd Batteries have been installed, the Battery Power/Charger Switch should be OFF). Remove the weighing pan, and remove the front screw on the pan guard (Figure A, A❶).

Step 2. Remove the back screw on the upper right corner (A❷).

Figure A



Step 3. Press in on the back of the chassis to release the two inside plastic catches (A❸), and gently lift off the top cover, flipping it to the right (A❸).

- DO NOT JERK THE FLAT RIBBON CABLE LEAD. Gently remove the flat ribbon cable from its connector on the main board.

FY - Removing the Force Motor

Step 1. Disconnect connectors J4 and J5 (Figure B, B❶). Loosen the left Force Motor shield screw and detach the wire coming from the RS-232C connector (B❷).

Step 2. Grasping the Force Motor Assembly firmly (it is heavy!), turn the chassis on its side and remove the four screws holding the Force Motor Assembly (Figure C). Carefully place the chassis back on its feet.

Figure B

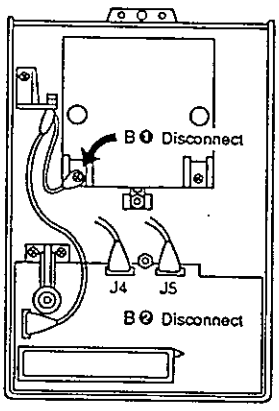
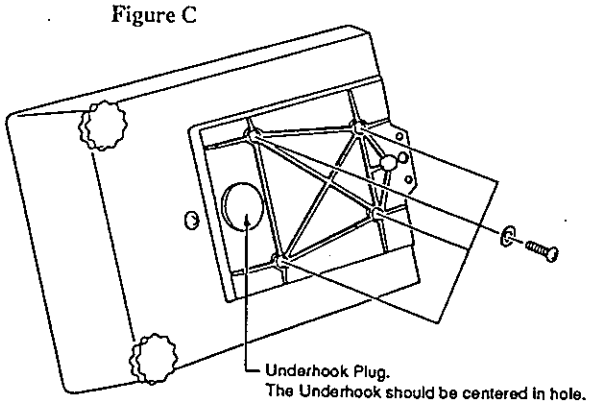


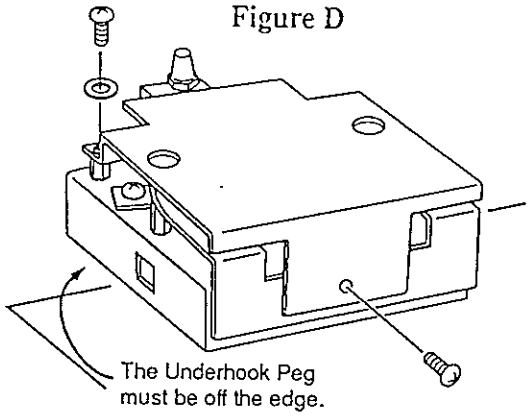
Figure C



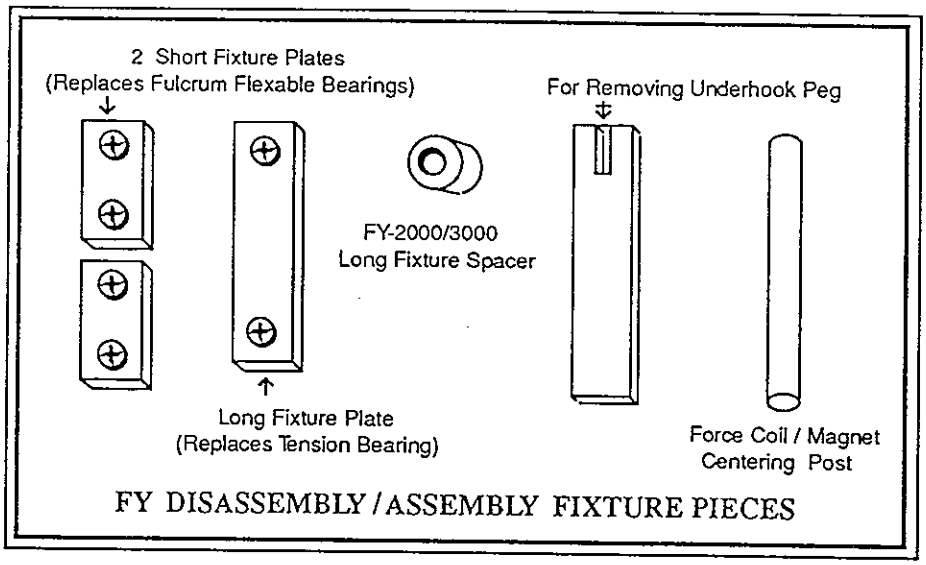
Step 3. Lift the Force Motor Assembly out of the chassis, leaving the Force Motor base plate with the chassis, and set it down making sure that the Underhook Peg is off the edge of the repair surface (Figure D). • THE FORCE MOTOR WILL BE DAMAGED IF THE PAN SUPPORT PEG OR THE UNDERHOOK PEG COME IN CONTACT WITH THE SAME SURFACE THAT SUPPORTS THE FORCE MOTOR ASSEMBLY.

Step 4. Remove the two remaining screws holding the top Force Motor shield and lift it off (Fig D)

Figure D



FY - Force Motor Disassembly



FY DISASSEMBLY / ASSEMBLY FIXTURE PIECES

Step 1. FY-200/300: Remove the Tension Bearing by first removing the lower screw, then the upper one (see Figure E, E❶). Save the washer to use in Step 2.

FY-2000/3000: Remove the upper screw of the Tension Bearing (Figure E, E❷).

Step 2. FY-200/300: Firmly attach (do not tighten) the Long Fixture Plate to the Riser Beam, use the washer from Step 1 on the lower screw (Figure F, F❶).

FY-2000/3000: Firmly attach (do not tighten) the Long Fixture Plate to the Riser Beam, use the long Fixture Spacer and a longer upper screw (Figure F, F❷).

Figure E

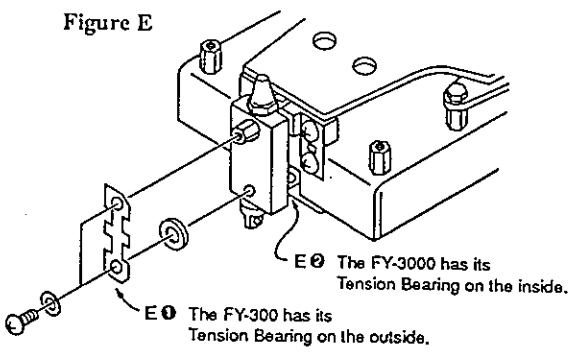
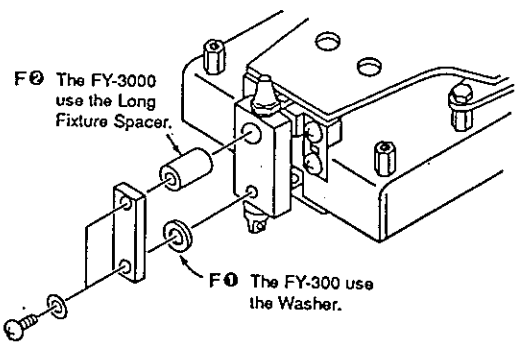


Figure F



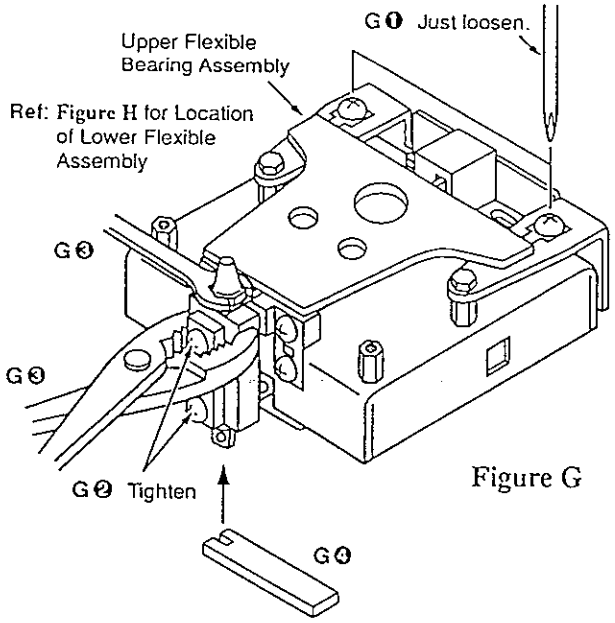


Figure G

Step 3. Loosen the two Upper and Lower Flexible Bearing Assembly Screws (Figure G, G❶).

Step 4. Tighten the Long Fixture Plate screws (G❷).

Step 5. Hold the Riser Beam with a pair of pliers, and unscrew the Pan Support Peg using a 10mm open-end wrench (G❸). Then, loosen the Underhook Peg using the removal tool (G❹).

Step 6. Remove the two remaining screws on the Upper Flexible Bearing Assembly and remove Assembly (Figure H, H❶).

Step 7. Place the Force Motor Assembly on its side, remove the Underhook Peg (H❷) and the two remaining screws on the Lower Flexible Bearing Assembly (H❸).

Step 8. Loosen and remove the two screws on the Position Detector Assembly. Take note of which holes the screws are in, it is important for reassembly. Remove the Position Detector Assembly (H❹).

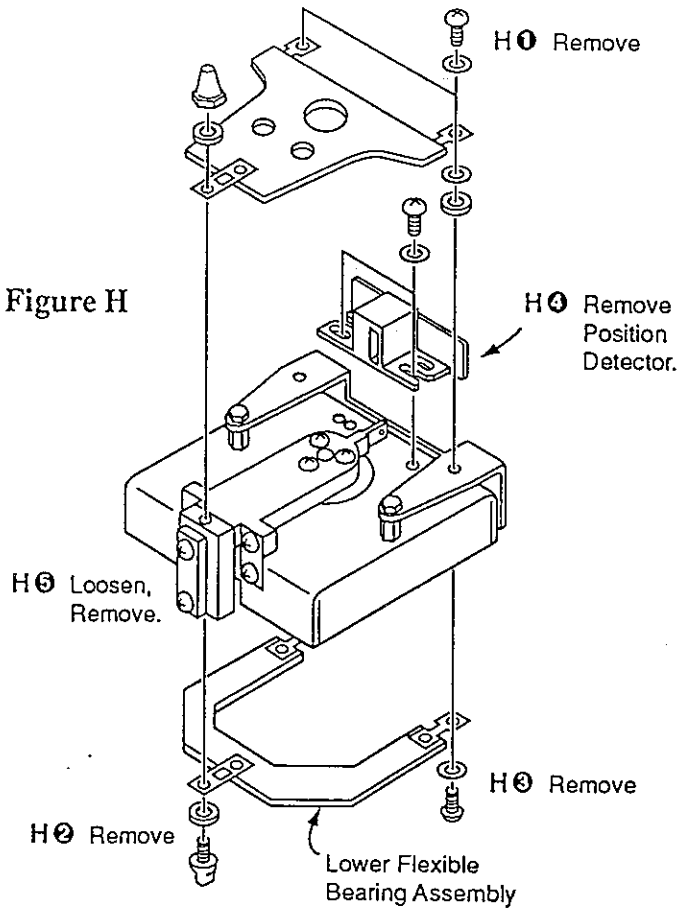
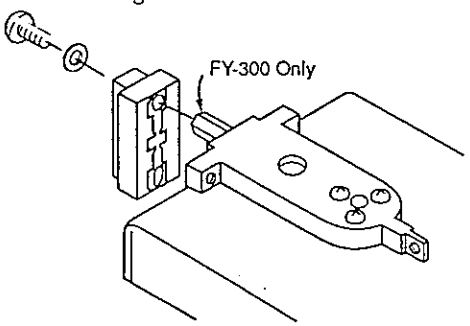


Figure H

Step 9. FY-200/300: Loosen the upper screw on the long Fixture Plate, and remove the Riser Beam along with the long Fixture Plate (H❸).

FY-2000/3000: Loosen the upper screw on the long Fixture Plate, and remove the Riser Beam along with the long Fixture Plate, and the Tension Bearing. Leave them attached (Figure I).

Figure I



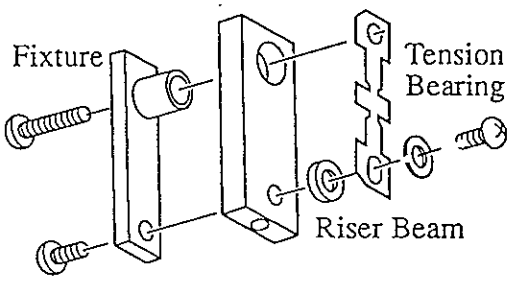
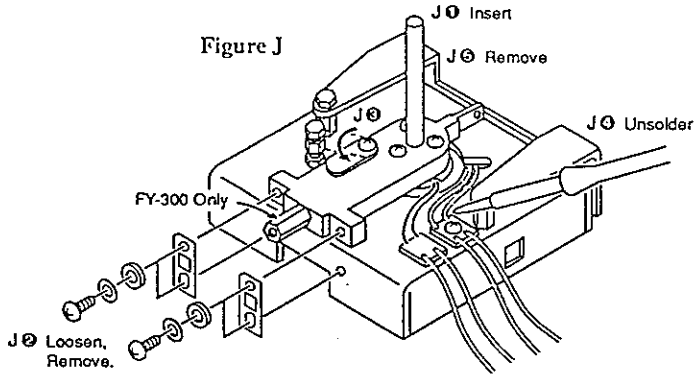


Figure J



Step 10. Insert the Centering Shaft through the hole in the Position Beam Lever (Figure J, J❶).

Step 11. Loosen, then remove the Upper, then Lower Fulcrum Flexible Bearing screws while holding the Position Indicator Beam (J❷). Carefully catch all the pieces. There will be 4 screws, washers, and 2 Fulcrum Flexible Bearings dropping off. Take careful note of the relationship of each for reassembly, keeping the correct washers with the corresponding screws.

Step 12. Loosen the screw holding the Stopper Plate and slide the Stopper Plate from the Stopper Plate Restriction Bolt (J❸).

Step 13. Unsolder the two wires coming from the Force Coil on the PC-927 circuit board, and unsolder the two wires coming from the Temperature Sensor on the PC-927 circuit board (J❹).

Step 14. Remove the Centering Shaft (J❸).

Step 15. Carefully remove the Position Indicator Beam by gently lifting up on the end with the bobbin (guiding it out of the magnet assembly) (Figure K, K❶).

Step 16. Remove the three screws holding the Force Motor Magnet to the frame. Lift the frame up and away from the magnet (K❷).

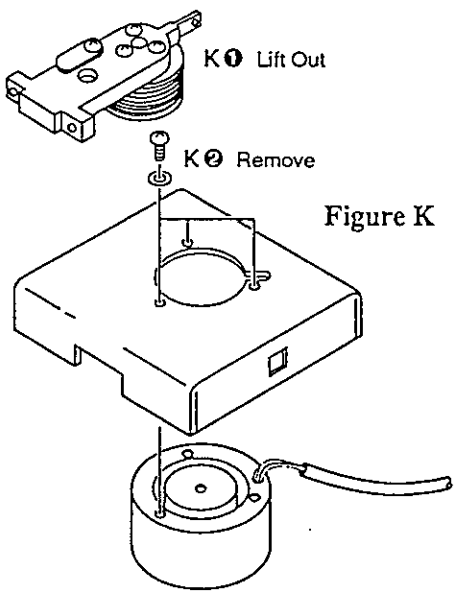


Figure K

NOTE: Please remember to first attach all screws holding an object, then tighten them

Step 1. Carefully place the frame back over the Magnet Assembly (clean the Magnet and Force Coil Bobbin first! See CLEANING THE FORCE MOTOR, page __). Loosely reattach the three screws that hold the Magnet Assembly to the Force Motor (see Figure K).

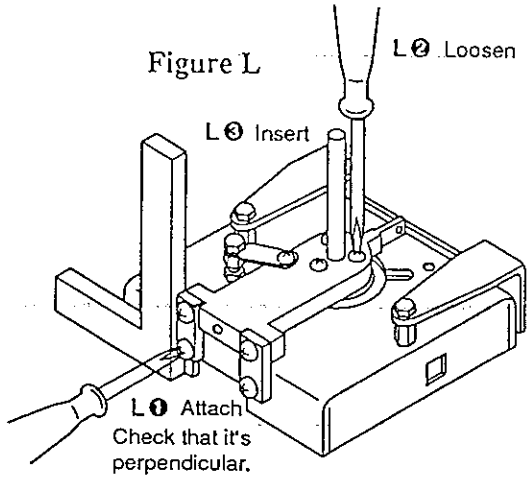


Figure L

Step 2. Replace the Position Beam Lever.

Step 3. Attach the two Short Fixture Plates in place of the Fulcrum Flexible Bearings - make sure that they are perpendicular to the repair surface (Figure L, L❶).

Step 4. Loosen the three screws on the Position Beam Lever that hold the Force Coil bobbin (L❷

Step 5 Insert the Centering Shaft through the hole, jiggle it until it until it slips into the hole on top of the Magnet Assembly (L❸).

Step 6. Tighten the three Magnet and Position Beam Lever screws.

Step 7. Resolder the Force Coil and Temperature Sensor leads to the PC-927 and PC-927 circuit board (see Figure J, J❸).

Step 8. Reattach the Position Detector (Figure M, M❶)

Step 9. Remove the Short Fixture Plate on the left and attach the left Fulcrum Bearing. First install the upper screw, then the lower one. Remove the Short Fixture Plate on the right and attach the right Fulcrum Bearing. Install the upper screw, then the lower one. Be careful to have the notched end of the Flexible Bearing up, and the smooth side towards the frame (M❷). Remove the bobbin alignment shaft (M❸).

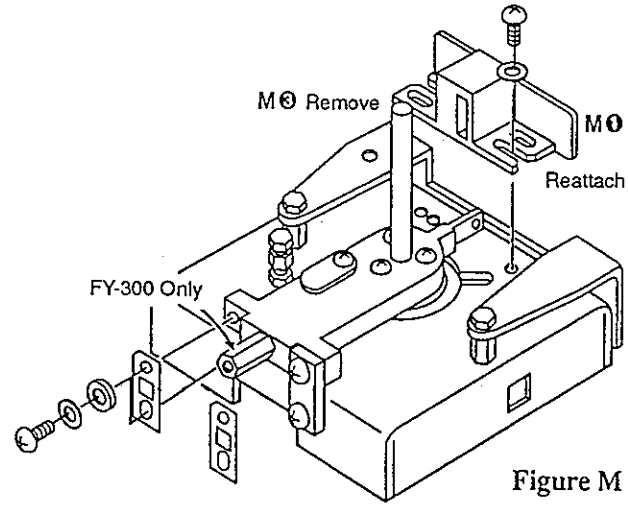


Figure M

M❷ Remove Fixture.
Attach Flexible Bearing.

Step 10. FY-200/300: Reattach the Riser Beam with the long Fixture Plate, and tighten the upper screw. Take care to set the hexagonal shaft on the Position Beam Lever so that it is centered in the hole of the Riser Beam (Figure N, N❶), and the Riser Beam is perpendicular to the repair surface (reference Fig. L, L❶).

FY-2000/3000: Check that the Tension Bearing is flat, if it is not perfectly flat, obtain a new one. Reattach the Riser Beam with the long Fixture Plate and the Tension Bearing. Tighten the upper screw, and check that the Riser Beam is perpendicular to the repair surface (reference Fig. L, L❶).

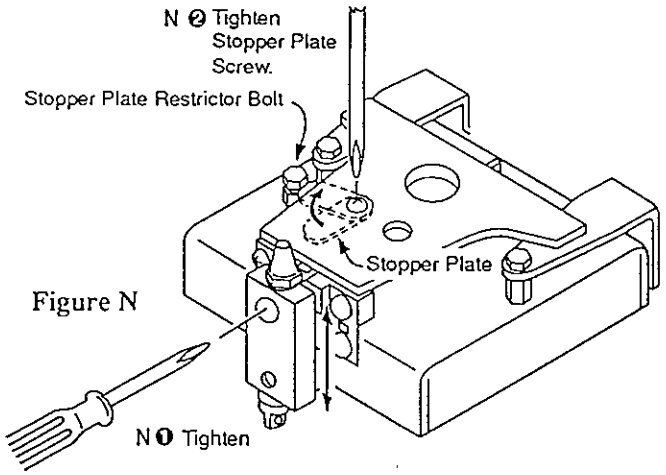


Figure N

Step 11. Turn the Force Motor Assembly on its side and reattach the Upper and Lower Flexible Bearing Assemblies, Riser Beam (including Pan Support and Underhook Peg), do not tighten (reference Figure H, H❶ and H❸).

Step 12. Check that the Riser Beam and Flexible Bearing Assemblies are not out of line (everything should be at right angles, and the Riser Beam perpendicular to the repair surface). Tighten all of the Flexible Bearing Assembly screws and pegs.

Step 13. FY-200/300: Check that the Tension Bearing is flat, if it is not perfectly flat, obtain a new one. Remove the Long Fixture Plate, then attach the Tension Bearing. First tighten the upper screw. Then, setting the hexagonal shaft in the center of the Riser Beam hole, tighten the lower screw.

FY-2000/3000: Remove the Long Fixture Plate and replace the original upper screw on the Riser Beam (Figure N, N❶). Tighten the screw with the head in the center of the hole.

Step 14. Reposition the Stopper Plate in the Stopper Plate Restriction Bolt, and tighten the screw holding the Stopper Plate (N❷).

Step 15. Turn the Assembly on its side and check the motion of the Position Beam Lever. It should move smoothly and be free of any friction.

Step 16. Place the Force Motor Assembly to the right of the chassis with the underhook peg off the edge of the work surface. Reconnect connectors J4 and J5 (reference Fig. B, B❶) and the weighing pan. Supply power. It will not be necessary to turn the balance on.

Step 17. Adjust the Stopper Plate Restriction Bolt up, or down, until the Stopper Plate is centered in the middle of the gap. Disconnect the power and connectors J4 and J5, and remove the weighing pan.

Step 18. Attach the top Force Motor Shield and position the Force Motor Assembly in its place in the chassis.

Step 19. Holding the Force Motor Assembly firmly, turn the chassis on its side and replace the three screws holding the Force Motor Assembly. Make sure that the Underhook is centered in its chassis hole (see Figure C). Carefully place the chassis back on its feet.

Step 20. Reconnect connectors J4 and J5, and reattach the wire coming from the RS-232C connector (attach to the left Force Motor shield screw, reference Fig. B, B❷).

FY - Closing the Case

Step 1. Reconnect the flat ribbon cable to its connector on the main board, and flip the top cover back onto the chassis (reference Fig. A, A❸). Reattach the screw on the Pan Guard. Replace the screw in the back (ref. Fig. A, A❶). Replace the weighing pan.

Step 2. Reattach the AC Power Adaptor. • If the NiCd Batteries have been installed, remember to return the Battery Power/Charger Switch to ON.

Step 3. Do Cornerload Adjustment (see page 44).

Cleaning the Force Motor

It is important that no dust or magnetic particles enter into the Force Motor Assembly, and especially the channel around the Magnet. If it is suspected that there might be dust or particles in the Force Motor, or you have worked on the Force Motor - clean it with the following procedure. You will need adhesive tape (use a paper or fiberglass backed not plastic or cloth, about 5cm (2") long pieces), a strong light, alcohol, and lint free gauze. Do not use high pressure air, as it will not remove metal particles from the Magnet.

WORK AREA MUST BE FREE FROM DIRT	NO SMOKING

Step 1. Complete the **Opening the Case**, and **Removing the Force Motor** procedures in the DISASSEMBLY/ASSEMBLY section for your balance.

Step 2. Complete the **Disassembly of the Force Motor.**

Step 3. Take a strong light and inspect the channel around the magnet. If there is any dust or metal particles found, remove with adhesive tape (**DO not use "SCOTCH TAPE", "SELLO TAPE" or "CELLOPHANE TAPE" as it will stick to the magnet and is very difficult to remove**).

Step 4. Repeat this until the both walls of the channel have been cleaned. Change the tape about every other time, or when a particle is detected.

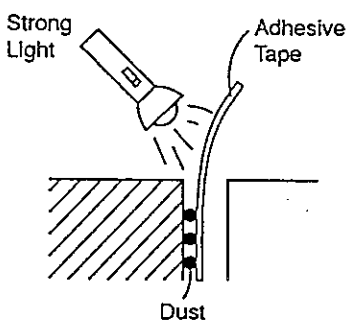
Step 5. Take a gauze swab, wet it with alcohol, and clean the inside of the Force Coil bobbin.

Step 6. Take another gauze swab, wet it with alcohol, and gently clean the wrapped wire of the Force Coil bobbin.

Step 7. Take a strong light and inspect everything again. If there is any dust found, remove it with adhesive tape.

Step 8. Complete the **Reassembly of the Force Motor.**

Step 9. Test the Force Motor assembly carefully, checking the repeatability at various points from zero to full span. When satisfied that the balance is working correctly, close the case, calibrate linearity and span, then check the repeatability again.



Cornerload Adjustment

Since the weighing pan is connected to the balance through one central point, as you move away from the center (towards the outer rim of the pan) mechanical distortions can occur, reducing accuracy. To compensate, we perform Cornerload Adjustment.

Table A-3. Cornerload Masses

MODEL	TEST MASS	MODEL	TEST MASS
FX-40	20g	FX-1200/3200	500g
FX/FY-200	100g	FX/FY-2000	1,000g
FX/FY-300	200g	FX/FY-3000	2,000g
FX-320	50g	FX-4000	2,000g
FX-400	200g	FX-6000	4,000g

NOTE: The balance must be fully warmed-up (plugged in and operating for 30 minutes) before starting.

Step 1. Open the case as described in the DISASSEMBLY/ASSEMBLY section for your balance - except don't remove the keyboard flat ribbon cable from its main board connector.

Step 2. On some models it may be necessary to remove the top Force Motor shield to access the adjustments, or access them from the sides.

Step 3. Replace the weighing pan.

Step 4. Make sure the balance is level.

Step 5. With the display on, and the **CAL** switch off⇓, press and hold **RE–ZERO**.

Step 6. Slide the **CAL** switch on⇑. Release **RE–ZERO**.

DISPLAY "CCCCCCC" for Check Mode will be displayed.

Step 7. Slide the **CAL** switch off⇓.

Step 8. Press **MODE**.

Step 9. Press **MODE** again. **This will turn off Zero Tracking Mode.**

Step 10. Place the Cornerload Adjustment mass (see Table A-3, above) in the center of the weighing pan, point "A" (Figure A).

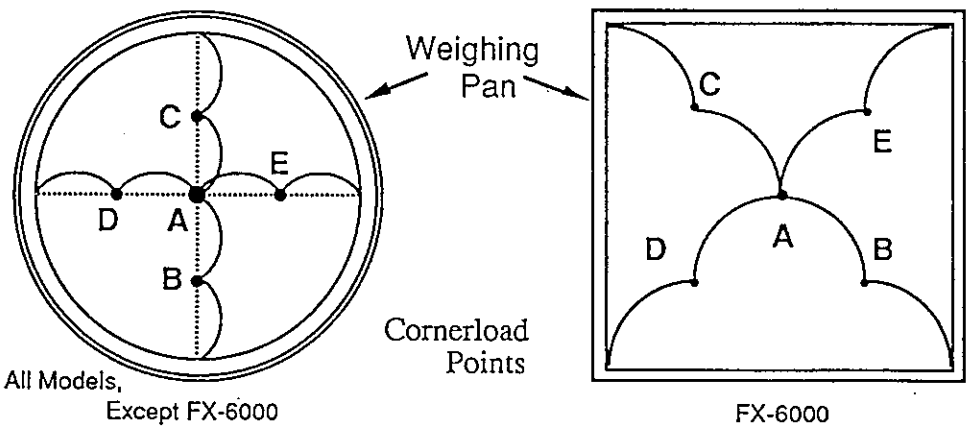


Figure A

Step 11. Press **RE–ZERO**.

Step 12. Next move the weight to the four points "B" through "E" making note if the reading is "+", "0", or "-" as shown in Figure B (the points are halfway between the center of the pan and the rim, not the rim!).

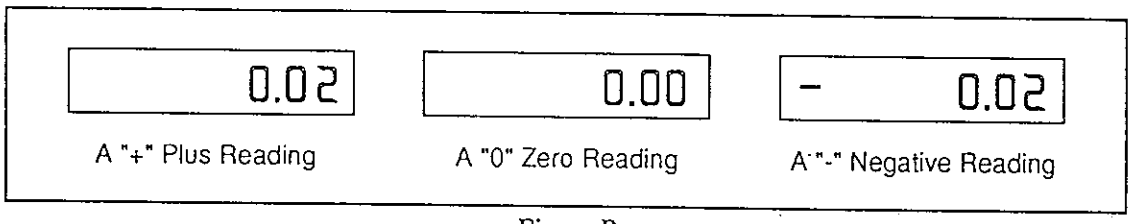


Figure B

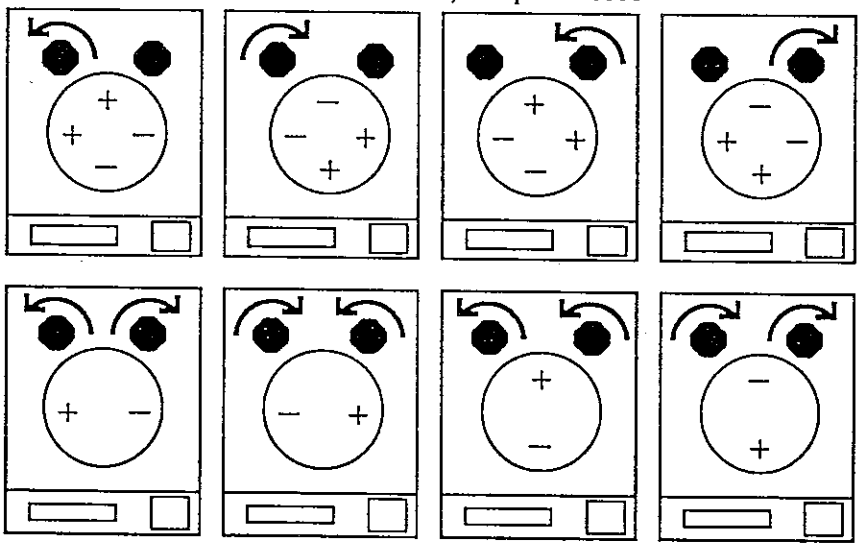
Step 13. Find the corresponding diagram on the next page matching your results, and turn the Cornerload adjusting screws slightly in the direction indicated. Wait for about 30 seconds for the stress in the metal to settle and check again.

Step 14. Repeat (from Step 10) until zero, or ± 1 minimum division, is read at each position.

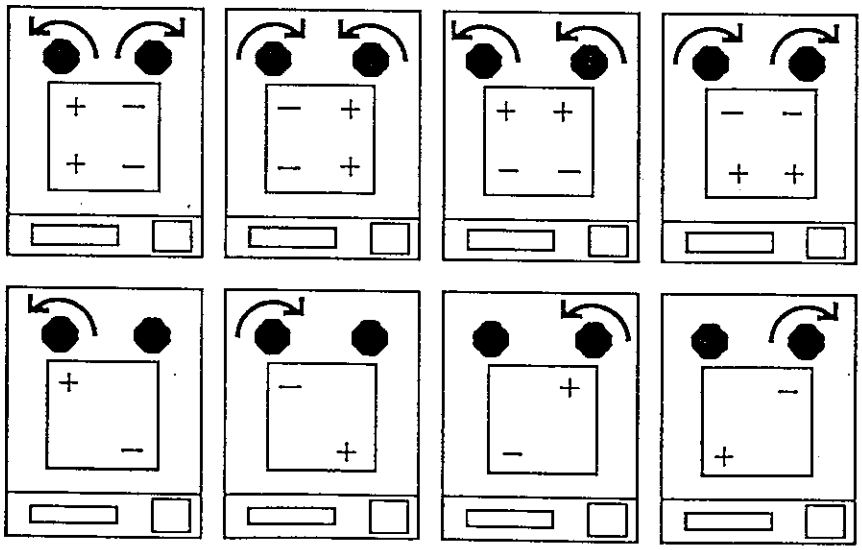
Step 15. Press ON/OFF.

Step 16. Remove the pan, reattach the upper Force Motor shield (if removed), and close as described in the DISASSEMBLY/ASSEMBLY section for your balance.

All FX/FY Balances, except FX-6000



FX-6000



Optional Battery Pack Installation

This is option OP-04 for the FX and OP-05 for the FY. The Battery Packs should not be installed by the end-user, as an incorrect installation could damage the balance. Please explain the following points to the customer.

THINGS TO KNOW:

- The Battery Power/Charger Switch positions:
  - "ON" • With the AC adaptor connected - means normal balance operation, power from the AC adaptor. The batteries can not be used while the AC adaptor is connected, nor will they charge if the balance is on.
    • With the AC adaptor disconnected - means normal balance operation, power from the batteries.
  - "OFF" • With the AC adaptor connected - means battery recharging.
    • With the AC adaptor disconnected - means no power to the unit.
- When the AC adaptor is connected, the balance will draw power from it. Only when the adaptor is unplugged from the balance (not the wall), will the unit switch to battery operation.
- When using the AC adaptor, turning the Battery Power/Charger Switch OFF is for recharging only. • Serious DAMAGE TO THE BATTERIES WILL RESULT from leaving the balance plugged in with the Battery Power/Charger Switch OFF for long periods!.
- The Battery Packs will recharge in about 15 hours (with the AC adaptor plugged in, and the Battery Power/Charger Switch OFF).
- Do not overcharge the Battery Packs. 15 HOURS CHARGING MAXIMUM.
- The packs can be expected to offer:
  FX - 9 hours of continuous operation between charges.
  FY - 6 hours of continuous operation between charges.
- A display of "Lb" (Low battery) indicates that the battery power has become too low for reliable weighing.
- The life of the rechargeable battery will vary greatly with frequency of charge and use of the balance. If the battery cannot seem to hold a charge, check it by: charging for 15 hours, and allow the balance to operate on batteries until "Lb" is displayed. Repeat this process 4 or 5 times. Then if the FX cannot run for 5 hrs, or the FY for 3 hrs (≈50% of normal), then replace the battery.

Installation Procedure

NOTE: Please make sure that *NO* short circuits take place with screwdrivers, or shorting to the die-cast aluminum chassis of an FX balance. Please take special care when installing the printed circuit board of the Battery Power/Charger Switch (PC 925) that shorts do not occur.

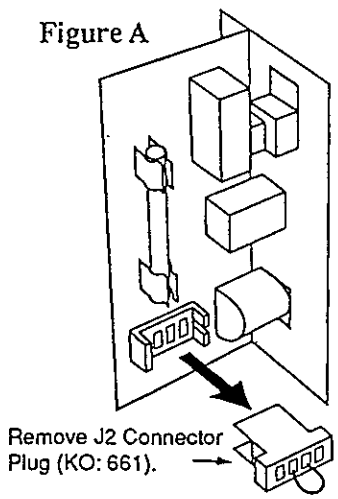
Step 1. Complete the OPENING THE CHASSIS procedure in the DISASSEMBLY/ASSEMBLY section for your balance.

Step 2. Lift out the entire Fuse / CAL Switch Assembly printed circuit board from the back of the chassis by sliding it upwards.

Step 3. Remove the J2 connector plug (KO: 661) on the Fuse / CAL Switch circuit board (Figure A).

Step 4. Position the two Battery Packs on either side of the Force Motor Assembly. Keep all leads well away from moving Force Motor parts to prevent entanglement.

Figure A



Step 5. Remove the plastic plate that is in the Battery Power/Charger Switch slot from the right side of the top case.

Step 6. Take the Battery Power/Charger Switch circuit board and slide the switch into the opened case slot (Figure B), making sure that it is switched OFF.

Step 7. Plug the connector from the Battery Power/Charger Switch circuit board into the J2 connector on the Fuse / CAL Switch circuit board where the J2 connector plug [KO: 661] was removed from in Step 3. Place a piece of electrical tape on top and down the side of the calibration switch to prevent the battery power switch from coming in contact with the shell of the calibration switch which is grounded.

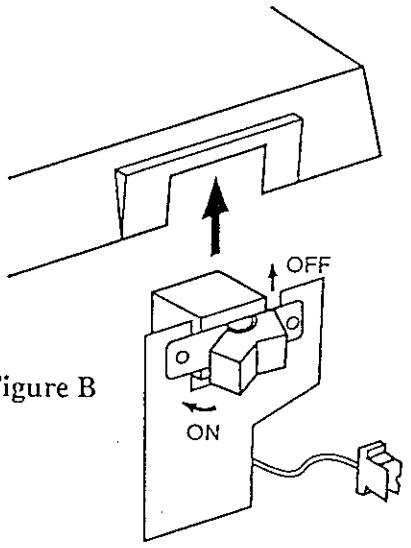


Figure B

Step 8. Return the fuse holder circuit board to its slot in the chassis (reversing Step 2.).

Step 9. Complete the CLOSING THE CASE procedure in the DISASSEMBLY/ASSEMBLY section for your balance.

NOTE: Keep the Battery Power/Charger Switch OFF with the adaptor connected for about 10 minutes before testing the Battery Packs (this allows the charges from the individual cells to equalize).

Step 10. Remove the adaptor and turn the Battery Power/Charger Switch ON.

DISPLAY The standby decimal point or the power failure "-------" indication should be displayed.

Step 11. Press ON/OFF to test weighing with the Battery Packs.

NOTE: If "Lb" (Low battery) is displayed, try charging the Battery Packs for an hour before testing them again. If the problem persists, or a buzzing sound is heard, there may be a problem with the Battery Packs. Try again with new packs.

NOTE: If the keyboard doesn't work after you have closed the case, check the keyboard flat ribbon cable and its connector for damage. Other areas of trouble during installation may be the cable to the J2 connector and the connector itself. No power may indicate a blown fuse.

PLEASE TELL YOUR CUSTOMERS TO PRESERVE BATTERY LIFE:

- When using the AC adaptor, turning the Battery Power/Charger Switch OFF is for recharging only. If you want to cut the balance power without recharging, unplug the AC adaptor from the wall, or, unplug the AC adaptor from the balance, and turn the Battery Power/Charger Switch OFF. • Serious DAMAGE TO THE BATTERIES WILL RESULT from the customer leaving the balance plugged in with the Battery Power/Charger Switch OFF for long periods!.
- Do not overcharge the Battery Packs. 17 HOURS CHARGING MAXIMUM.
- Do not try to operate the balance in very cold temperatures using the battery pack (batteries don't work well in low temperatures)
- Do not try to operate the balance in very hot temperatures above 30°C (86°F) using the battery pack. At temperatures of 40°C (104°F), the life of the Battery Packs will be reduced to 40 percent of normal.
- Switch OFF the battery pack as soon as "Lb" is displayed and recharge as soon as possible.

Parts List

EXPLODED VIEW FX 200 ~ FX6000

No.	Part No.	Part name
1	04:A46794	Weighing pan FX-200/300/320
	04:A49846B	Weighing pan FX-400
	04:A46795	Weighing pan FX-1200/2000/3000/3200
	04:A35257B	Weighing pan FX-4000
	04:A33969	Weighing pan FX-6000
2	PB:FX300-4	Pan support FX-200/300/320
	PB:FZ400-7	Pan support FX-400
	PB:FX3000-4	Pan support FX-1200/2000/3000/3200
	PB:FZ4000-7	Pan support FX-4000
	09:A47979D	Pan support FX-6000
3	09:A47833E-11	Upper case FX-200
	09:A47833-1	Upper case FX-300
	09:A47833-2	Upper case FX-320
	09:A36680A-1	Upper case FX-400
	09:A47833K-29	Upper case FX-1200
	09:A47833E-12	Upper case FX-2000
	09:A47833-3	Upper case FX-3000
	09:A47833-4	Upper case FX-3200
	09:A36697-1	Upper case FX-4000
	09:A47833-5A	Upper case FX-6000
4		Screw M4x10 + spring washer
5		Washer M4
6		Screw M4x6 + spring washer
7	09:A20605D	Keypad
8	04:A35801A-1	Top shield, Force Motor
	04:A35801A-2	Top shield, Force Motor, FX-6000
9		Screw M3x8 + spring washer
10		Washer M3
11		Flat screw M3x8
12		Screw M4x8
13	10:H-N0-1-SUS	Convex washer
14	05:A46367A	Aluminum washer
15	PB:FX300-2	Bearing assembly FX-200/300/320/400
	PB:FZ4000-2	Bearing assy. (U) FX-1.2k/2k/3k/3.2k/4k
	PB:FZ4000-3	Bearing assy. (L) FX-1.2k/2k/3k/3.2k/4k
	PB:FX6000-2	Bearing assembly FX-6000
16		Screw M3x6 + spring washer
17		Screw M3x6

18	03:A20565A-2	Position beam lever FX-40/200/300/400*
	03:A20565B-1	Position beam lever FX-1.2k/2k/3k/3.2k
	03:A20840-10	Position beam lever FX- 4000
	03:A20565A-3	Position beam lever FX- 6000
19	PB:FX300-5	Suspension frame FX- 200/300/320
	PB:FX400-5	Suspension frame FX- 400
	PB:FX3000-5	Suspension frame FX- 1.2k/2k/3k/3.2k
	PB:FZ4000-5	Suspension frame FX- 4000
	PB:FX6000-5	Suspension frame FX- 6000
20	04:A47695;B	Tension bearing FX- 200/300/320/400
	04:A47909B;B	Tension bearing FX-1.2k/2k/3k/3.2k/4k/6k
21	04:A46703A	Fitting plate
22	04:A47793;B	Fulcrum bearing FX-200/300/320/400
	04:A47644A;B	Fulcrum bearing FX- 1.2k/2k/3k/3.2k/4k/6k
23		Screw M4x12 + spring washer
24	09:A34017C	Force coil bobbin
25	03:A20566G-2	Force motor frame FX- 40/200/300/320/400
	03:A20566G-1	Force motor frame FX-1.2k/2k/3k/3.2k/4k/6k
26	PB:FX300-1	Force motor magnet assembly
27	04:A34316B-2	Force motor lower shield
28	02:A46923C	Option cover plate
29	04:A47459A	Chassis to cover post
30	03:A10063G	Chassis
31	07:A46858	Underhook chassis plug
32	07:A46735A	Leveling foot
33	00:A46916	Level vial
34	07:A34022B	Level vial stand
35	05:A46740B	Hex stud
36	05:A46919	Underhook peg FX- 40/40CJ/200/300/400
	05:B43355	Underhook peg FX- 1.2k/2k/3k/3.2k/4k/6k
37	04:A47006	Counterweight bar for FX-6000
	04:A47007	Counterweight for FX-6000
38		Screw M3x5 (FX6000 only)
39	04:A47288B	Pan support guide spring (FX-6000 only)
40		Screw M4x6 + spring washer (FX6000 only)
41		Screw M4x15 (FX6000 only)
42		Bolt M4x6+spring washer+washer (FX6000)
43		Bolt M4x12 + spring washer (FX6000 only)
101	PZ:918	Position detector assembly
102		CAL switch assembly
	07:A46857	Plastic support for CAL switch assembly
	07:A46856	CAL switch cap

103	PZ:913A	Main circuit board FX-200 ~ FX-320
	PZ:913S	Main circuit board FX-400
	PZ:913Y	Main circuit board FX-1200
	PZ:913B	Main circuit board FX-2000 ~ FX-3200
	PZ:913T	Main circuit board FX-4000
	PZ:913C	Main circuit board FX-6000
104		RS-232C option connector
	00:A34086-1	Splash shield FX-200 ~ FX-400
	00:A34086-2	Splash shield FX-1200 ~ FX-3200
	00:A43364B	Splash shield FX-6000
	PM:FX300-1	Complete force motor FX-200/300/320
	PM:FX400-1	Complete force motor FX-400
	PM:FX3000-1	Complete force motor FX-1200 ~FX-3200
	PM:FX4000-1	Complete force motor FX-4000
	PM:FX6000-1	Complete force motor FX-6000
	PA:FX-JIG	FX series mechanical alignment fixture

EXPLODED VIEW FX-40 and FX-40CJ

No.	Part No.	Part name
1	04:A46564A	Weighing pan FX40/40CJ
2	04:A49430A	Pan dead weight
3	04:A49835	Balance weight
4	09:B43862	Pan support FX-40/40CJ
5	04:A49161	Pan guard
6	04:A49272	Dust guard
7	04:A49675B	Weighing chamber cover
8	00:A49674A	Breeze break weighing chamber
9	04:A35060A	Carat bowl FX-40CJ
10	00:A46988A	Side glass door
11	00:A46987	Front glass window
12	00:A46989A	Upper glass door
13	FX-06	Complete breeze break chamber
14	PB:FX-40-2	Flexible bearing assembly
15	04:A49057;B	Tension bearing
16	04:A48929;B	Fulcrum bearing
17	09:A34817A-1	Upper case FX-40
	PB:FX40CJ-A	Upper case FX-40CJ
18	PM:FX40-1	Complete force motor assembly
19	PZ:913E	Complete main board
20	09:A20605D	Keysheet
21	07:A43749D	Door handle
22	07:A44229C	Door handle cushion
23	03:A10063G	Lower case

EXPLODED VIEW FY-200 ~ FY-3000

No.	Part No.	Part name
1	04:A46794	Weighing pan FY200/300
	04:A46795	Weighing pan FY2000/3000
2	09:A48655-1A	Pan support FY-200/300
	09:A48655-2A	Pan support FY-2000/3000
3	09:A47834B-5	Upper case FY-200
	09:A47834-1	Upper case FY-300
	09:A47834B-6	Upper case FY-2000
	09:A47834-2	Upper case FY-3000
4		Screw M4x10
5		Washer M4
6		Screw M4x6
7	09:A20605D	Keypad
8	04:A33964C	Top shield, Force Motor
9		Screw M3x6
10	PB:FY300-2	Upper bearing assembly
11		Screw M4x8
12	10:H-N0-1-SUS	Convex washer
13	04:A43298	Aluminum washer T-2
14	05:A46960A	Pan support peg
15	05:A46367A	Aluminum washer T-1
16	05:A46340C	Bolt
17	04:A33943C	Upper bearing support
18	05:A46341A	Hex stud
19		Washer M3
20	04:A41915A	Stopper plate
21	03:A46804A	Position beam lever
22	04:A46931;B	Tension bearing
23	05:A46810B	Riser beam
24	09:A33945F	Force coil bobbin
25	04:A46358;B	Fulcrum bearing
26	05:A43630D	Stopper plate restriction bolt
27		Nut M3
28		Spring washer M3
29	05:A41930A	Hex stud
30	05:A46808A-2	Hex spacer
31	07:A46858	Bolt M4x15
32		Spring washer M4
33	04:A33944C	Force motor frame
34	PB:FY300-1	Force motor magnet assembly
35	05:A46808A-1	Hex spacer
36	PB:FY300-3	Lower bearing assembly
37	05:A46919	Underhook peg
38	04:A46933A	Force motor bottom plate

39	02:A46923C	Option cover plate
40	07:A10075B	Chassis
41		Screw M4x12
42	07:A46858	Underhook chassis plug
43	07:A46735A	Leveling foot
44		Screw M3x8
45	07:A34022B	Level vial stand
46	00:A47310	Level vial
47		Screw M4x10
48	05:A46740B	Hex stud
49	05:A46807	Hex bolt (FY-200/300)
50	05:A47366 05:A47367	Aluminum washer T-3 (FY-200/300) Aluminum washer T-2 (FY-2000/3000)
101	PZ:918	Position detector assembly
102	PZ:2439 07:A46857 07:A46856	CAL switch assembly Plastic support for CAL switch assembly CAL switch cap
103	PZ:913D	Main circuit board
104		RS-232C option connector
	00:A33087	Splash shield
	PM:FX300-1 PM:FX3000-1	Complete force motor FY-200/300 Complete force motor FX-2000/3000

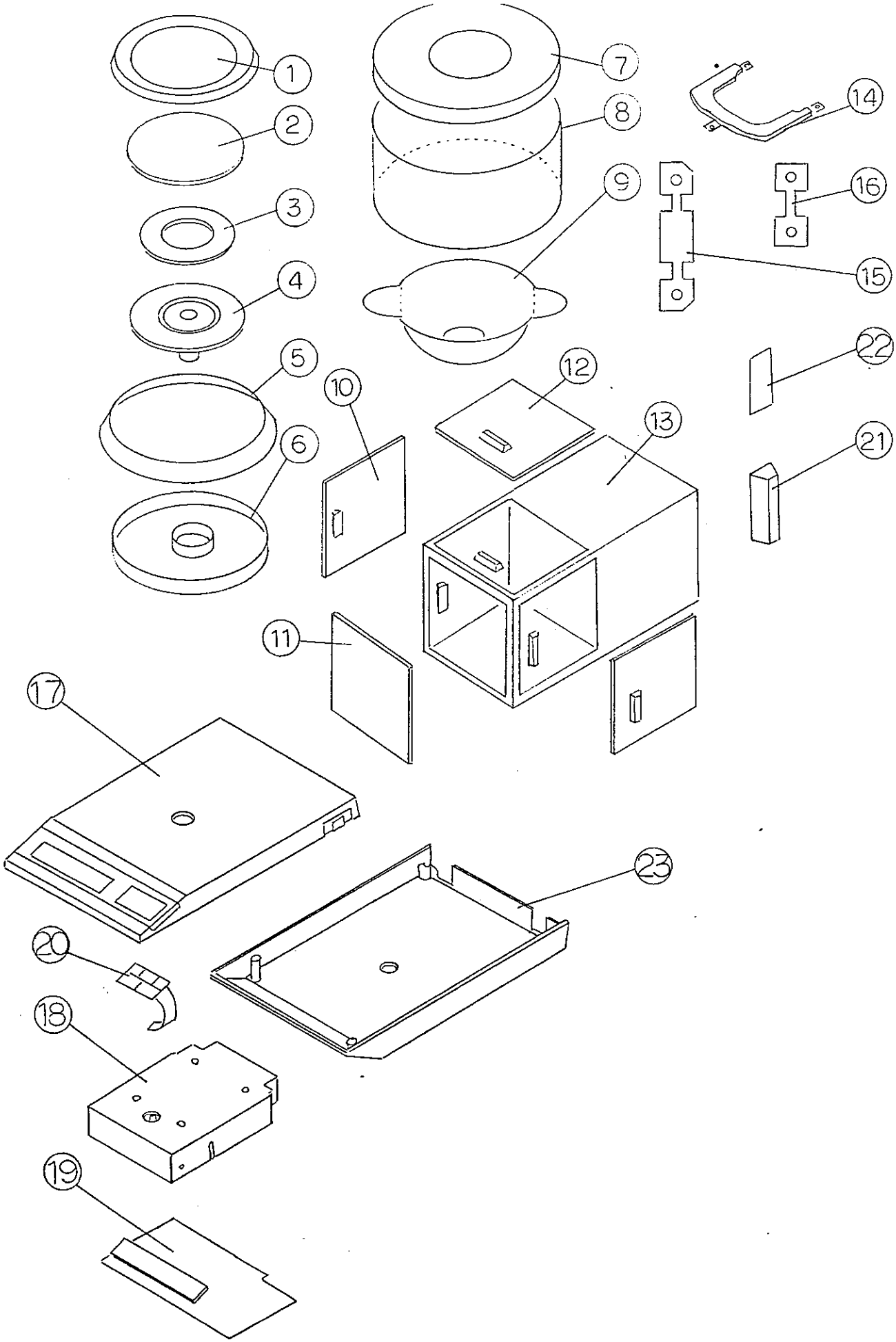
Electronic parts FX/FY series

Circuit Symbol	Part Number	Description
	PZ:913A	Main board FX-200/300/320
	PZ:913B	Main board FX-2000/3000/3200
	PZ:913C	Main board FX-6000
	PZ:913D	Main board FY-200/300/2000/3000
	PZ:913E	Main board FX-40/40CJ
	PZ:913S	Main board FX-400
	PZ:913T	Main board FX-4000
	PZ:913Y	Main board FX-1200
C10,23,24	CC:0.01U	Capacitor 0.01 µF 50V
C17 ~ C22	CC:0.022U	Capacitor 0.022 µF 50V
C2,3,5,12,13	CC:0.1U25V	Capacitor 0.1 µF 25V
C26	CC:220P	Capacitor 220 pF 50V
C8	CC:470P	Capacitor 470 pF 50V
C7	CK:SME16VB100	Capacitor 100 µF 16V
C4,14	CK:SME35VB100	Capacitor 100 µF 35V
C11	CK:SME35VB220	Capacitor 220 µF 35V
C1	CK:SME50VB1000	Capacitor 1000µF 50V
C15	CK:SM50VB10	Capacitor 10 µF 50V
C9,16	CK:SM50VB3R3	Capacitor 3.3 µF 50V
C6	CT:1V010	Capacitor 1µF 35V
D11	DI:1SS53	Diode
D1,2,4~6,9,12~15	DI:1S1588	Diode
D7,10	DZ:RD3.6EB	Zener diode 3.6V
D3,8	DZ:05Z9.1	Zener diode 9.1V
LiBatt	EB:CR2032-WT12	Lithium battery
	ED:FIP11C11	Display tube
J1	EJ:0470-01-230	Connector
FH	FH:85PN0819	Fuse holder
FS	FS:EAWK-500MA	Fuse 500mA T
	HT:6073PB	Heat sink
J6	JD:230-07-30	Connector
J3	JE:SHJ1785-01	Connector
J2	JT:172429-4	Connector
J10	JT:172429-8	Connector
Q1	QT:A1015Y	Transistor
Q3	QT:C1173	Transistor
Q2,4	QT:C1815Y	Transistor
R23	RC:1/21M	Resistor 1MΩ 1/2W
R2,9,10	RC:1K	Resistor 1KΩ 1/4W
R12~14,16,17,22	RC:15K	Resistor 15KΩ 1/4W
R26	RC:150R	Resistor 150Ω 1/4W

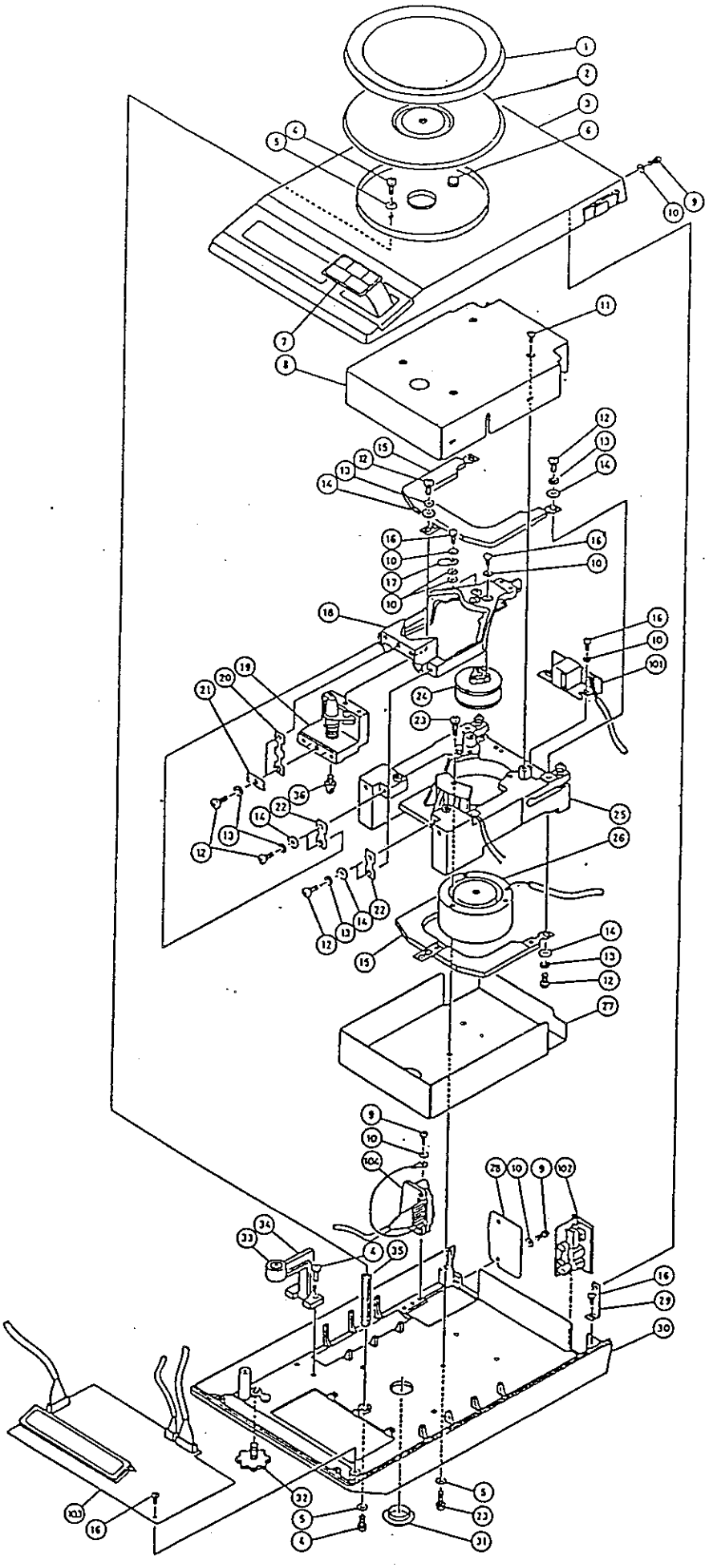
Circuit Symbol	Part Number	Description
R3	RC:18K	Resistor 18KΩ 1/4W
R27	RC:2.2K	Resistor 2.2KΩ 1/4W
R6,7,25,29	RC:270R	Resistor 270Ω 1/4W
R5	RC:33K	Resistor 33KΩ 1/4W
R15,37	RC:4.7K	Resistor 4.7KΩ 1/4W
R1,8	RC:5.6K	Resistor 5.6KΩ 1/4W
R4,11,18,28,33,34	RC:56K	Resistor 56KΩ 1/4W
R33,34	None	Not installed on PZ:913S,T
R24	RC:560K	Resistor 560KΩ 1/4W
R20,21,30	RN:IHR-4-223MA	Resistor network 22KΩ x 4 1/8W
R19	RN:IHR-8-223MA	Resistor network 22KΩ x 8 1/8W
R35,36	RN:IHR-8-563JA	Resistor network 56KΩ x 8 1/8W
R45	RC:1/28.2M	Resistor 8.2MΩ 1/2W
R46	RC:1/22.2M	Resistor 2.2MΩ For PZ:913A~D
	RC:47K	Resistor 47KΩ For PZ:913E
	RC:1/22.2M	Resistor 2.2MΩ For PZ:913S,T,Y
R47	RC:1/22.2M	Resistor 2.2MΩ For PZ:913A~E,Y
	RC:1/21M	Resistor 1MΩ For PZ:913S,T
S1,2	SS:SSP1X2NB5X8	Switch
T1	TF:309	Display supply transformer
	TM:CP-10	Test pin
U8	UA:C339C	Voltage comparator
U4	UA:S-8054ALR	Voltage comparator
U5	UC:MB64H433	CMOS gate array
U7	UC:5518BPL	CMOS static RAM
U6	UC:7516HG574-12	CMOS CPU early FX/FY-300~6k
	UC:7516HG595-12	CMOS CPU early FX/FY-300~6k
	UC:7516HG606-12	CMOS CPU latest FX/FY-200~6k
	UC:7516HG625-12	CMOS CPU early FX-400/4k
	UC:7516HG630-12	CMOS CPU latest FX-400/1.2k/4k
	UC:7516HG621-12	CMOS CPU early FX-40/40CJ
	UC:7516HG631-12	CMOS CPU latest FX-40/40CJ
U1,3	UR:TA78DL10S	Voltage regulator 10V 1A
U2	UR:TA79L005P	Voltage regulator 5V 150mA
	XT:C4SB-12M-K02	Ceramic resonator
	04:A44676	Heat sink
	06:A47138	Dubble sided tape for display
	07:A46734A	Display pillow
	07:A46998	Insulation sheet
	MF:AMZ22	Hybrid unit for PZ913A,B,C,S,T,Y
	MF:AMZ23	Hybrid unit for PZ913D
	MF:AMZ30	Hybrid unit for PZ913E

Selected resistors for FX and FY series

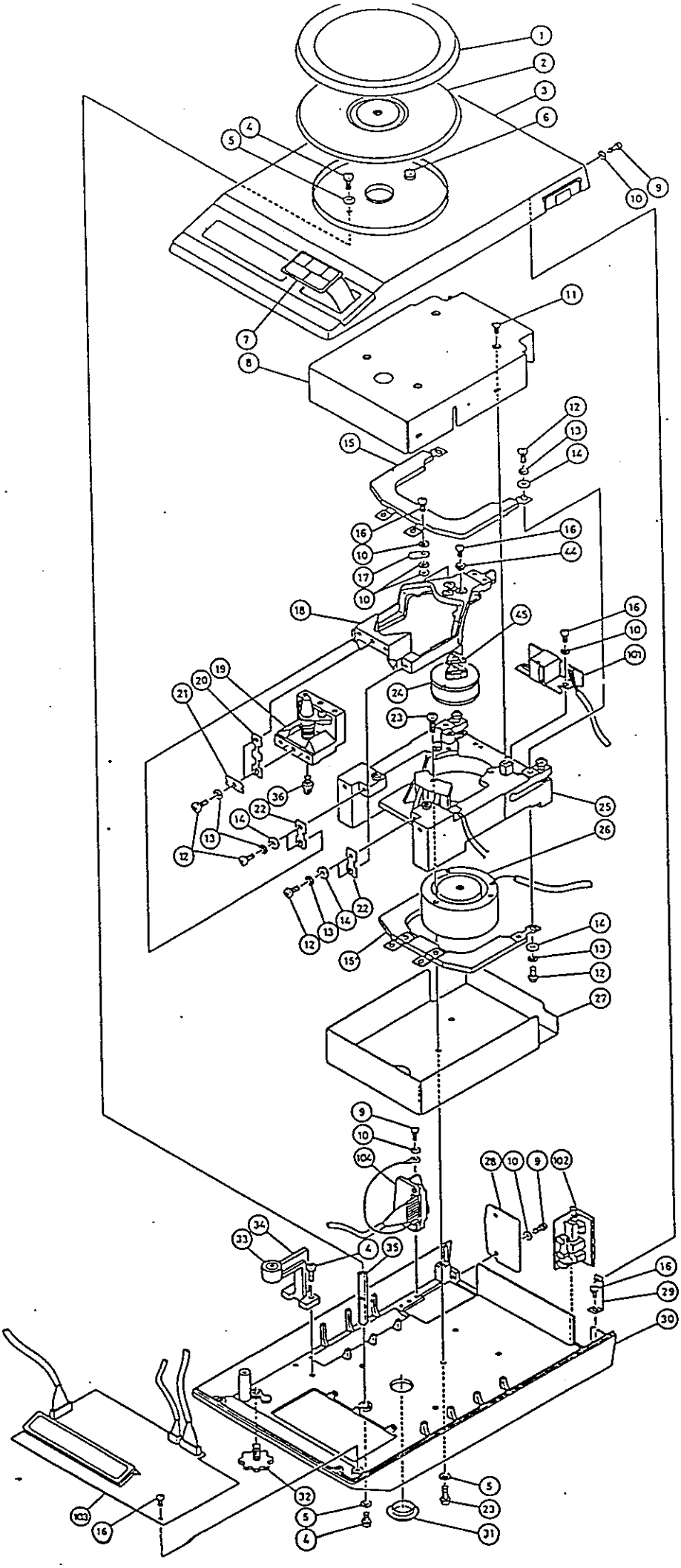
Circuit Symbol	Part Number	Description
R50	RL:86R0F	Metal foil resistor for PZ:913A
	RL:B34R0F	Metal foil resistor for PZ:913B
	RL:10R0F	Metal foil resistor for PZ:913C
	RL:FBY20R0F	Metal foil resistor for PZ:913D
	RL:B440R0B	Metal foil resistor for PZ:913E
	RL:86R0F	Metal foil resistor for PZ:913S
	RL:100R3A	Metal foil resistor for PZ:913T
	RL:B34R0F	Metal foil resistor for PZ:913Y
R51	As needed	Resistor for PZ:913A
	As needed	Resistor for PZ:913B
	As needed	Resistor for PZ:913C
	None	Resistor for PZ:913D
	None	Resistor for PZ:913E
	RF:3.3KRF	Resistor for PZ:913S
	RL:86R0F	Resistor for PZ:913T
	RF:5.2KRF	Resistor for PZ:913Y
R52	As needed	For all boards
R53	RF:5.2KRF	Resistor for PZ:913A
	RF:10KRF	Resistor for PZ:913B
	Jumper wire	Resistor for PZ:913C
	None	Resistor for PZ:913D
	None	Resistor for PZ:913E
	RF:22KRF	Resistor for PZ:913S
	RF:2KRF	Resistor for PZ:913T
	None	Resistor for PZ:913Y
R54	As needed	Resistor for PZ:913A
		Resistor for PZ:913B
		Resistor for PZ:913C
		Resistor for PZ:913D
		Resistor for PZ:913E
		Resistor for PZ:913S
		Resistor for PZ:913T
		Resistor for
R55	Jumper wire	Resistor for
	Jumper wire	Resistor for PZ:913B
	Jumper wire	Resistor for PZ:913C
	Jumper wire	Resistor for PZ:913D
	None	Resistor for PZ:913E
	Jumper wire	Resistor for PZ:913S
	RL:2001B	Resistor for
	Jumper wire	Resistor for PZ:913Y



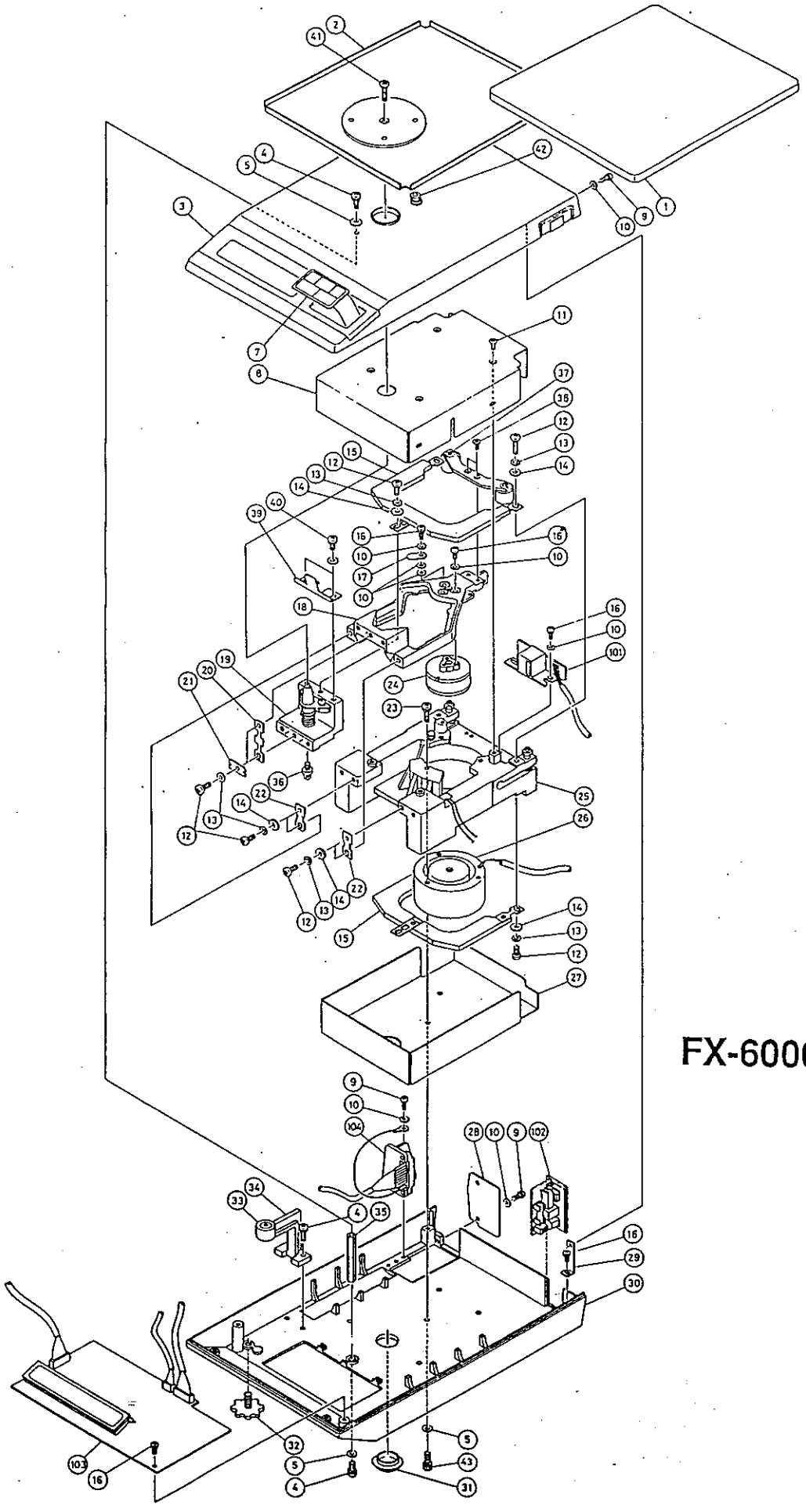
FX40/ FX40CJ



FX200
FX300
FX320
FX400



FX2000
FX3000
FX3200
FX4000



FX-6000

FX-300/320/3000/3200/6000

EXPLODED VIEW-2/2

PARTS LIST

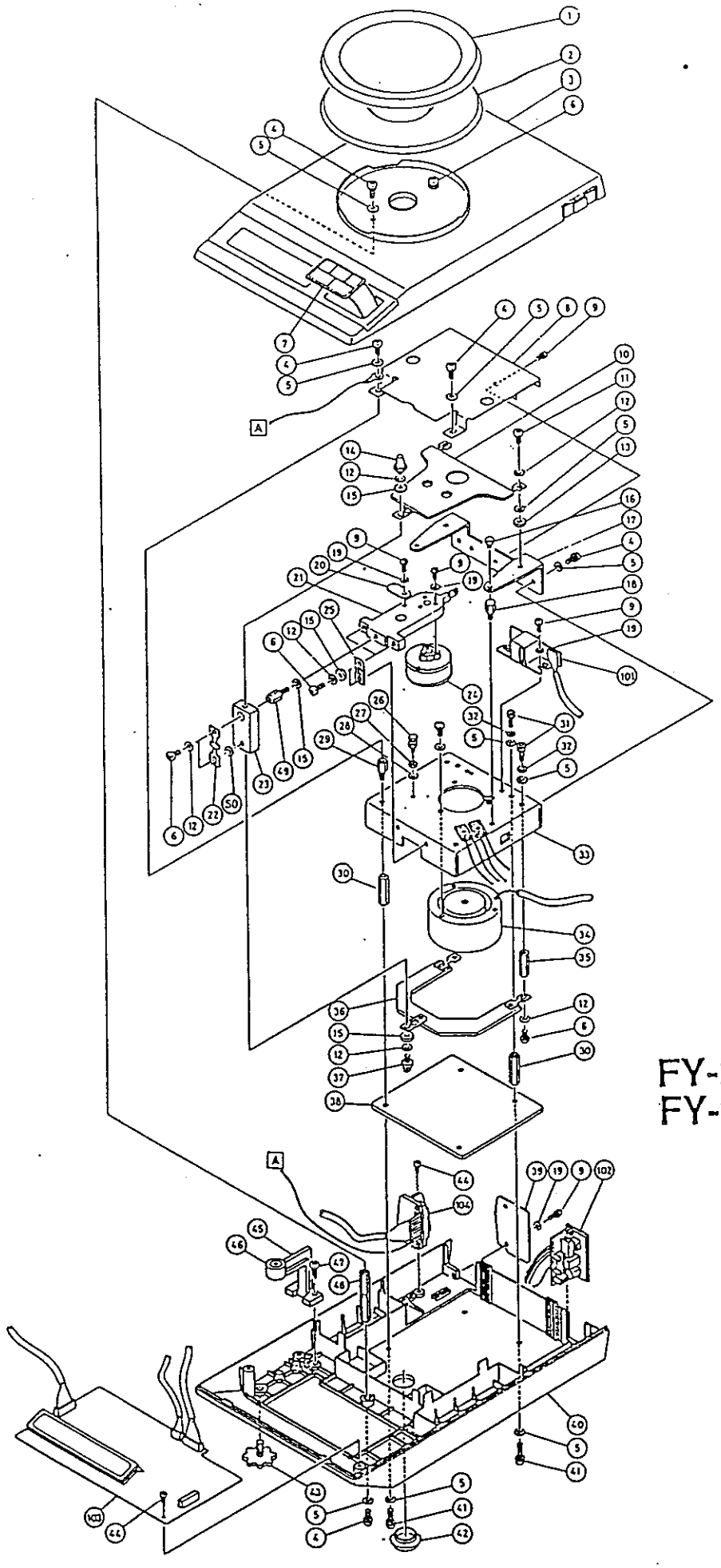
CIRCUIT SYMBOL OR DRWG. NO.	PARTS NAME	DESCRIPTION	Q'TY
(19)	PB:FX6000-5	SUSPENSION FRAME (FX-6000 ONLY)	
20	04:A47695;B	TENSION BEARING (FOR FX-300/320)	
(20)	04:A47909;B	TENSION BEARING(FOR FX-3000/3200/6000)	
21	04:A46703A	FITTING PLATE	
22	04:A47793;B	FLEXIBLE BEARING (FOR FX-300/320)	
(22)	04:A47644A;B	FLEXIBLE BEARING (FX-3000/3200/6000)	
23		SCREW M4×12 + SPRING WASHER	
24	09:A34017C	FORCE COIL BOBBIN	
25	03:A20566D-2	MAIN FRAME (FOR FX-300/320)	
(25)	03:A20566D-1	MAIN FRAME (FOR FX-3000/3200/6000)	
26	PB:FX300-1	FORCE MOTOR MAGNET	
27	04:A34316B	BOTTOM FORCE MOTOR SHIELD	
28	02:A46923B	OPTION COVER PLATE	
29	04:A47459	CHASSIS TO COVER POST	
30	03:A10063D	CHASSIS	
31	07:A46858	UNDERHOOK CHASSIS PLUG	
32	07:A46735A	LEVELING FOOT	
33	00:A46916	LEVEL VIAL	
34	07:A34022B	LEVEL VIAL STAND	
35	05:A46740A	HEX STUD	
36	05:A46919	UNDERHOOK PEG	
37	04:A47006+04:A47007	COUNTER WEIGHT (FX-6000 ONLY)	
38		SCREW M3×5 (FX-6000 ONLY)	
39	04:A47288A	PAN SWAY SUPPRESSOR (FX-6000 ONLY)	
40		SCREW M4×6 + S.W (FX-6000 ONLY)	
41		SCREW M4×15 (FX-6000 ONLY)	
42		BOLT M4×6 + S.W + W (FX-6000 ONLY)	
43		BOLT M4×12 + S.W (FX-6000 ONLY)	
101		POSITON DETECTOR	
102		FUSE/CAL SWITCH ASSEMBLY	
103		MAIN CIRCUT BOARD	
104		RS-232C OPTIONAL CONNECTOR	

FX—300/320/3000/3200/6000

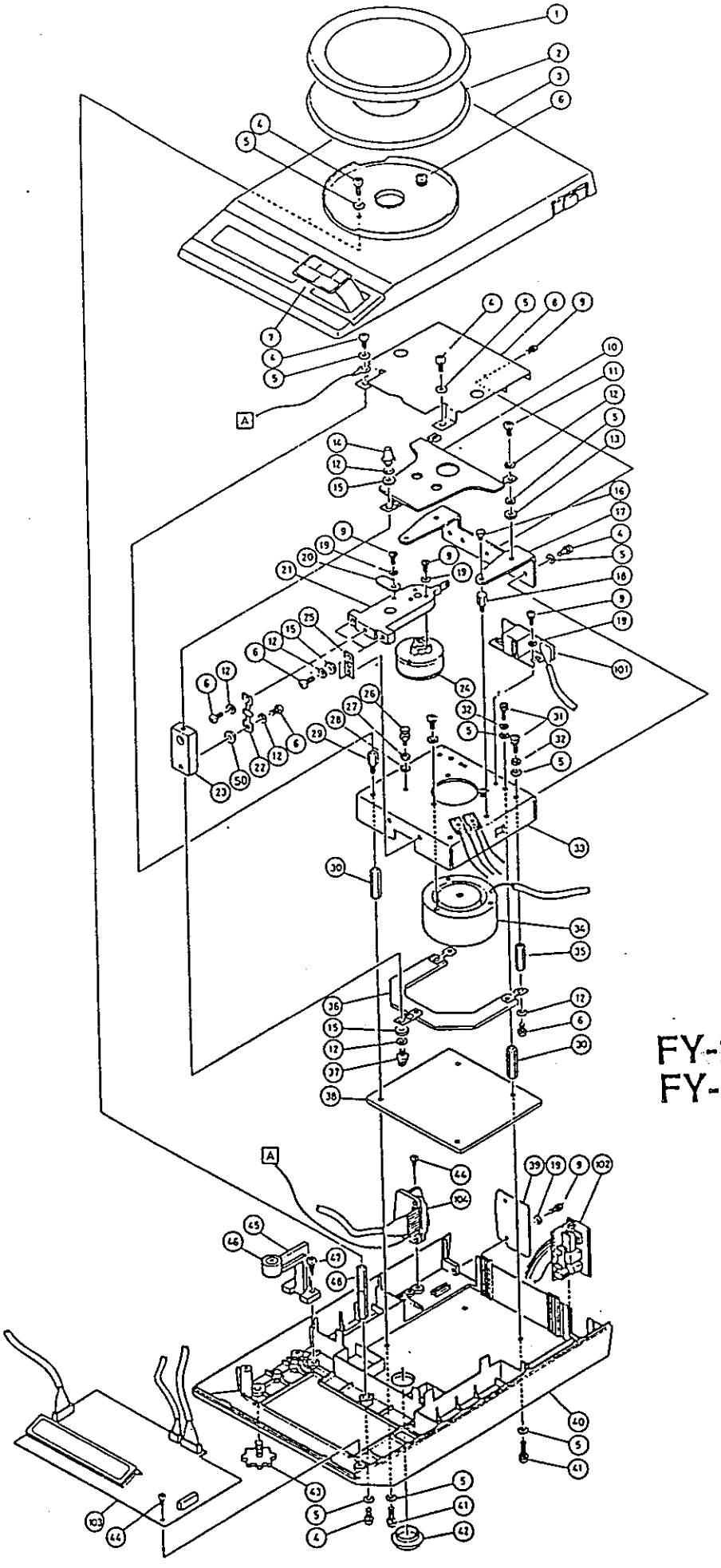
PARTS LIST

EXPLODED VIEW—1/2

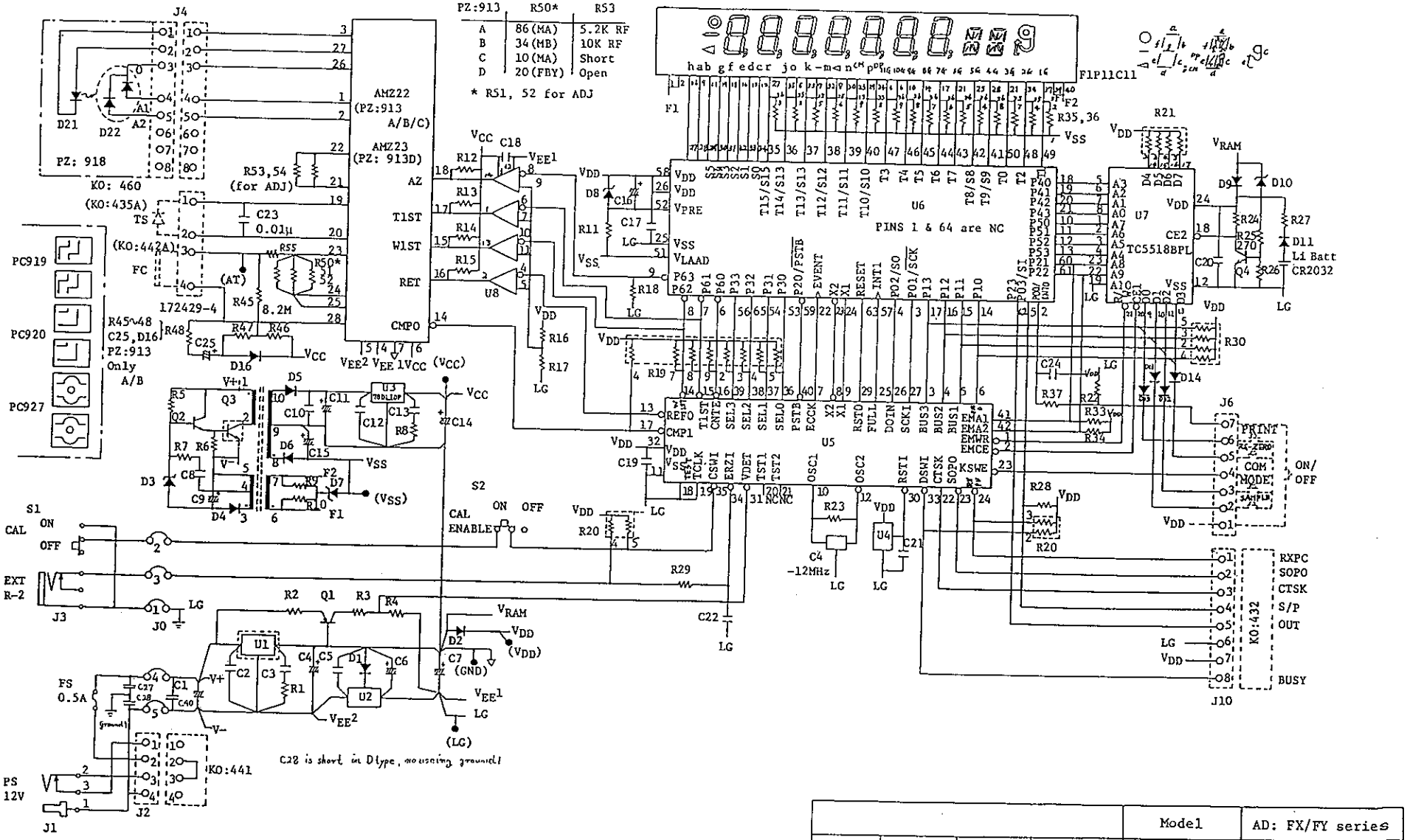
CIRCUIT SYMBOL OR DRWG. NO.	PARTS NAME	DESCRIPTION	Q'TY
1	04:A46794	WEIGHING PAN (FOR FX-300/320)	
(1)	04:A46795	WEIGHING PAN (FOR FX-3000/3200)	
(1)	04:A33969	WEIGHING PAN (FX-6000 ONLY)	
2	PB:FX300-4	PAN SUPPORT UNIT (FOR FX-300/320)	
(2)	PB:FX3000-4	PAN SUPPORT UNIT (FOR FX-3000/3200)	
(2)	PB:FX6000-4	PAN SUPPORT UNIT (FX-6000 ONLY)	
3	7PB:FX300-A	TOP COVER (FX-300 ONLY)	
(3)	7PB:FX320-A	TOP COVER (FX-320 ONLY)	
(3)	7PB:FX3000-A	TOP COVER (FX-3000 ONLY)	
(3)	7PB:FX3200-A	TOP COVER (FX-3200 ONLY)	
(3)	7PB:FX6000-A	TOP COVER (FX-6000 ONLY)	
4		SCREW M4×10 + SPRING WASHER	
5		WASHER M4	
6		SCREW M4×6 + SPRING WASHER	
7	09:A20605C	KEYPAD	
8	04:A34222B-1	TOP FORCE MOTOR SHIELD (FX-300/3000)	
(8)	04:A34222B-2	TOP FORCE MOTOR SHIELD (FX-6000 ONLY)	
9		SCREW M3×8 + SPRING WASHER	
10		WASHER M3	
11		FLAT SCREW M3×8	
12		SCREW M4×8	
13	10:H-N0-1-SUS	CONVEX WASHER	
14	05:A46367A	ALUMINUM WASHER T=1.0	
15	PB:FX300-2	FLEXIBLE BEARING ASS'Y (FX-300/320)	
(15)	PB:FX3000-2	FLEXIBLE BEARING ASS'Y (FX-3000/3200)	
(15)	PB:FX6000-2	FLEXIBLE BEARING ASS'Y (FX-6000 ONLY)	
16		SCREW M3×6 + SPRING WASHER	
16'		SCREW M3×6	
17	04:A47002A	STOPPER PLATE	
18	03:A20565A-2	POSITION BEAM LEVER (FX-300/320)	
(18)	03:A20565B-1	POSITION BEAM LEVER (FX-3000/3200)	
(18)	03:A20565A-3	POSITION BEAM LEVER (FX-6000 ONLY)	
19	PB:FX300-5	SUSPENSION FRAME (FX-300/320)	
(19)	PB:FX3000-5	SUSPENSION FRAME (FX-3000/3200)	



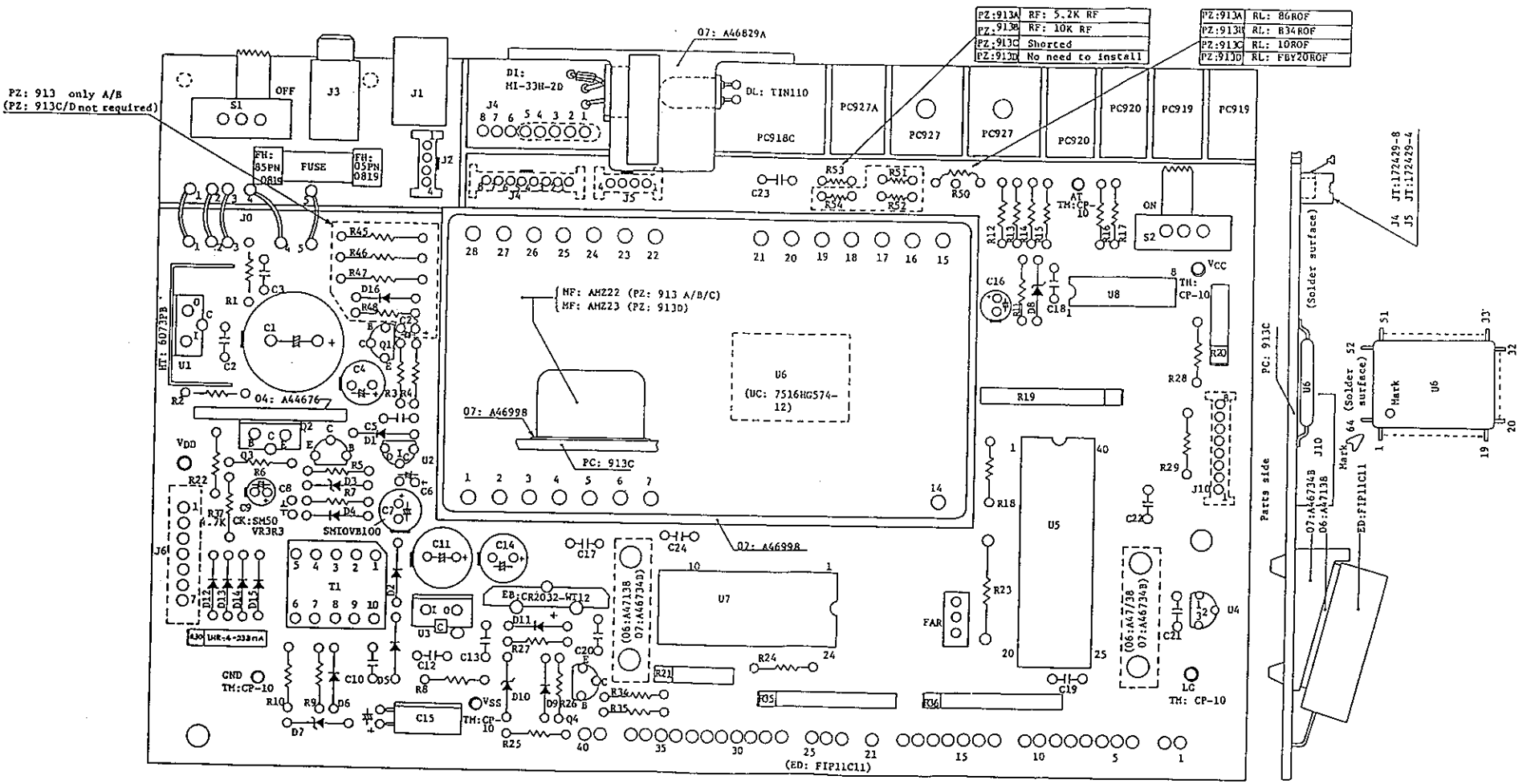
FY-200
FY-300



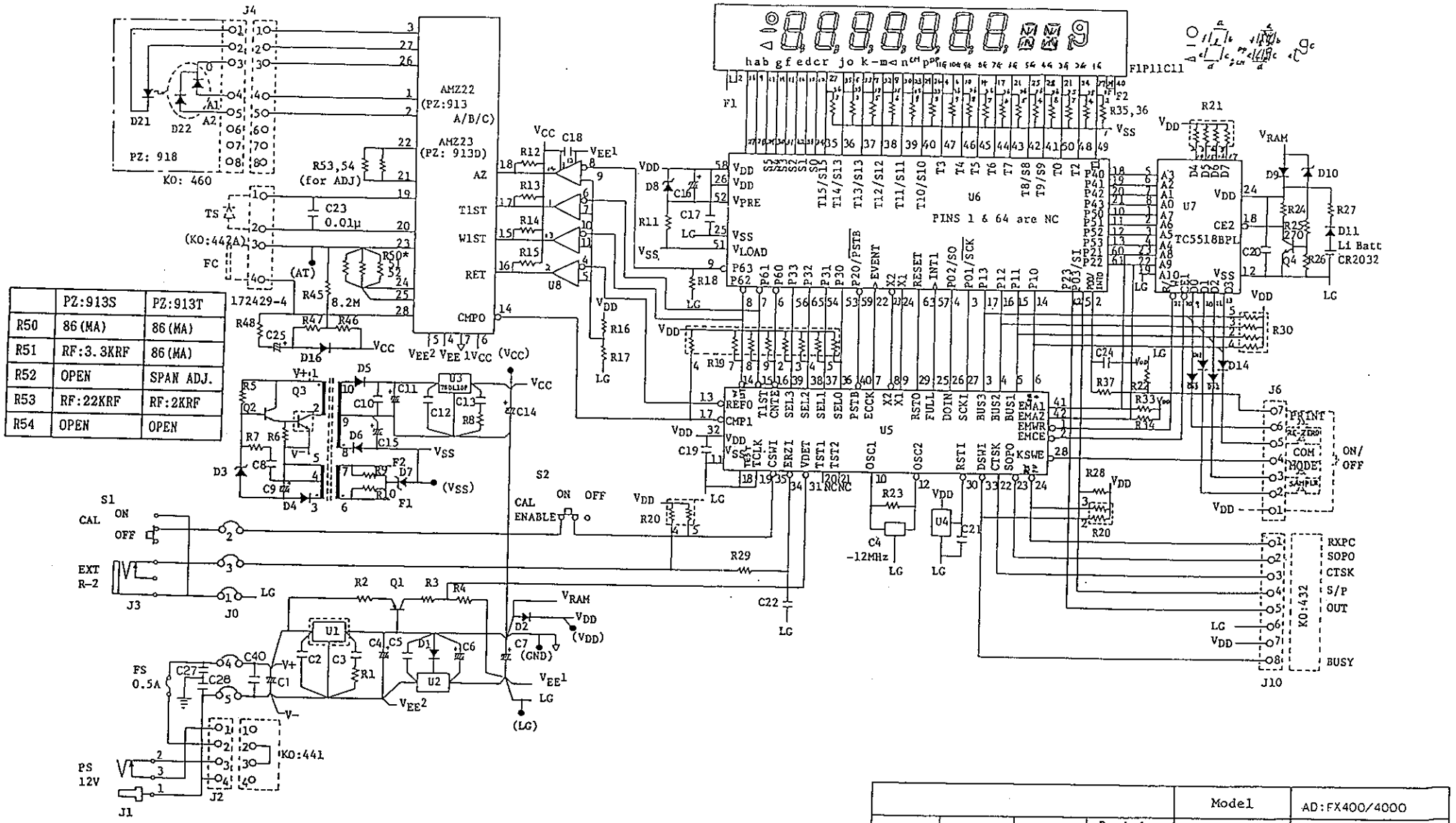
FY-2000
FY-3000



				Model	AD: FX/FY series
Symbol	Date	By	Revision No.	Description	Main Board
				Stock No.	PZ: 913 A/B/C/D
				Drwg. No.	EC_3-01078

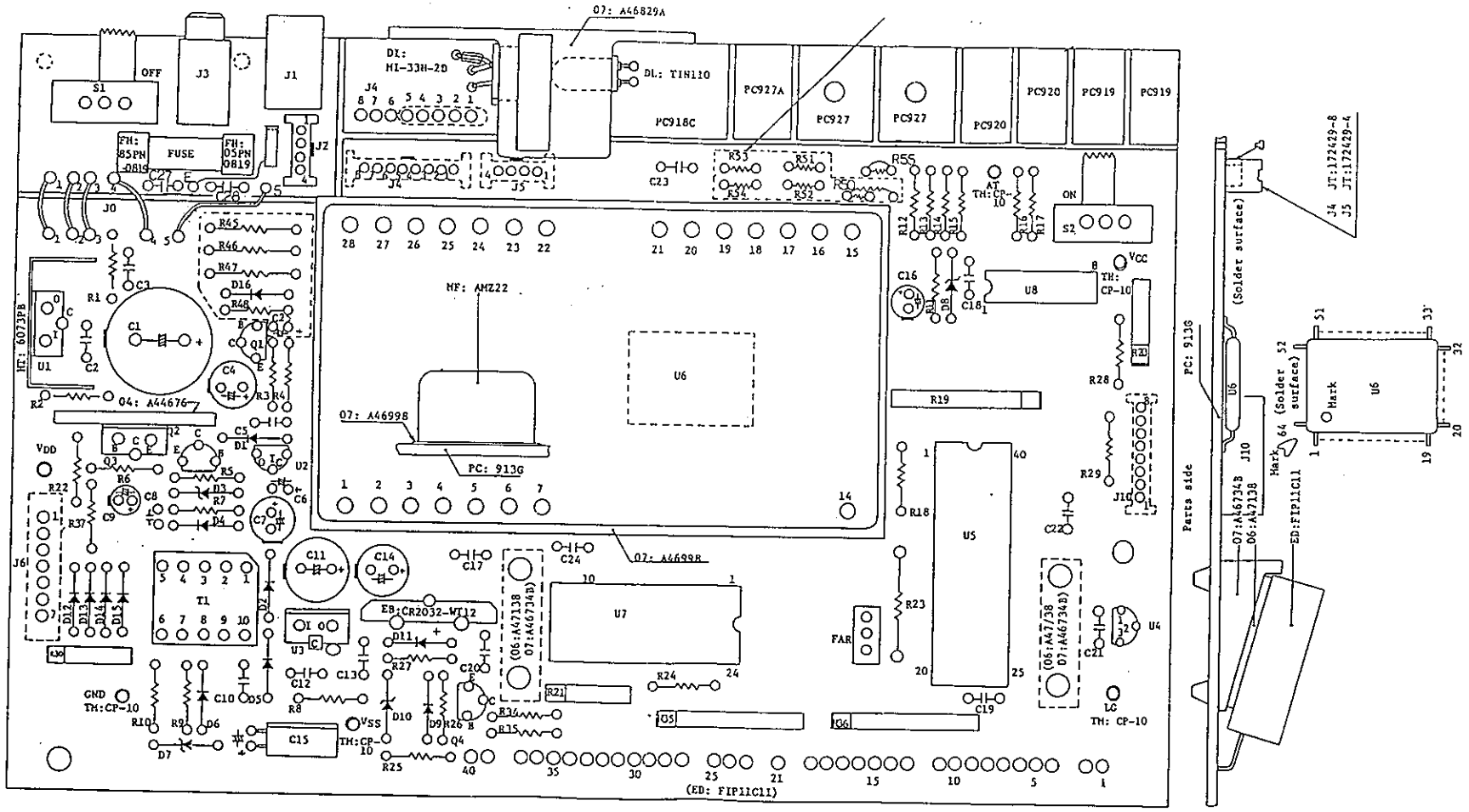


				Model	AD: FX/FY series
Symbol	Date	By	Revision No.	Description	Main Board
				Stock No.	PZ:913 A/B/C/D
				Drwg. No.	KZ4-00307

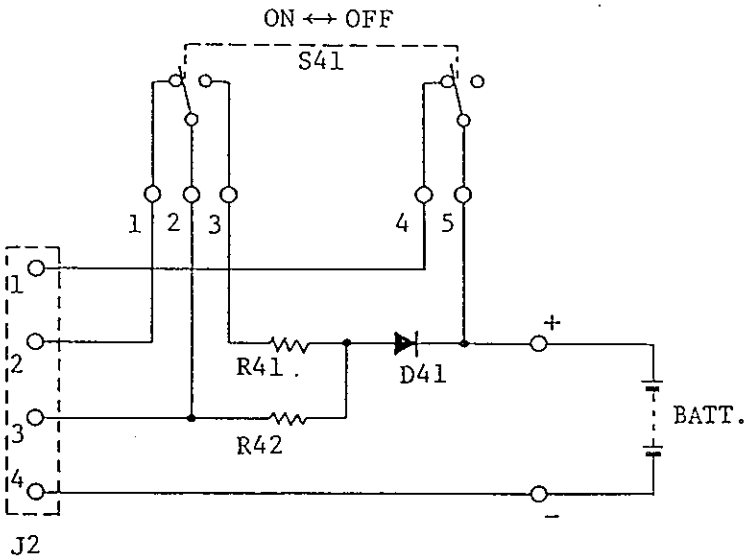


	PZ:913S	PZ:913T
R50	86(MA)	86(MA)
R51	RF:3.3KRF	86(MA)
R52	OPEN	SPAN ADJ.
R53	RF:22KRF	RF:2KRF
R54	OPEN	OPEN

				Model	AD:FX400/4000
Symbol	Date	By	Revision No.	Description	Main Board
				Stock No.	PZ:913S/T
				Drwg. No.	EC$_3$-01311

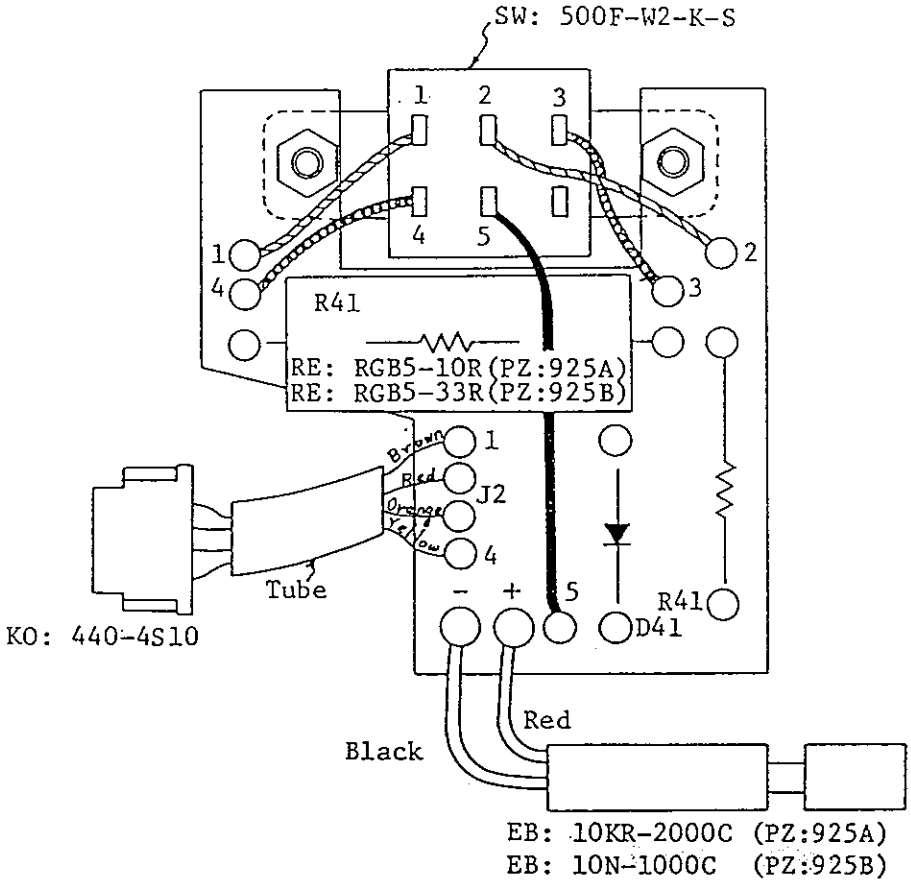


				Model	AD FX400/4000
Symbol	Date	By	Revision No.	Description	Main Board
				Stock No.	PZ:913 S/T
				Drwg. No.	KZ₂-00404

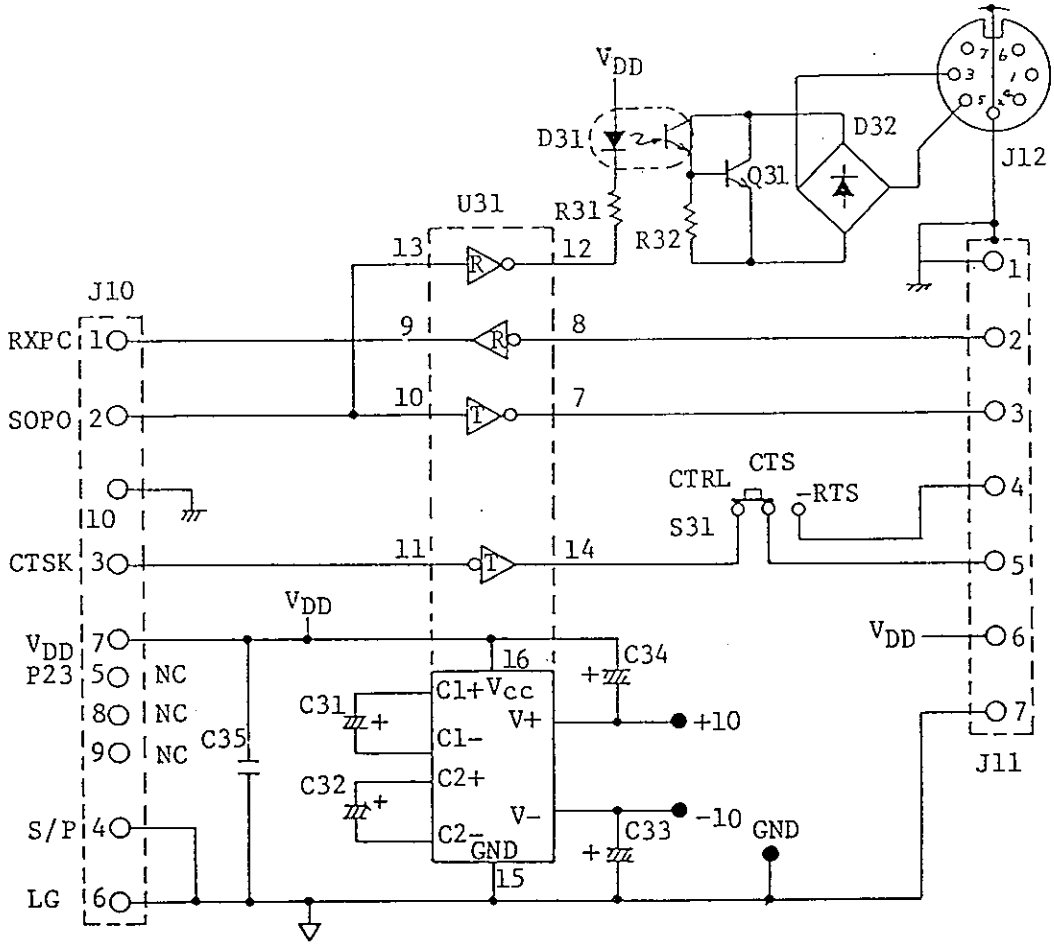


	FX-04	FY-05
PZ:	925A	925B
BATT.:	10KR-2000C	10N-1000C
R41:	10 Ω, 5 W	33 Ω, 5 W

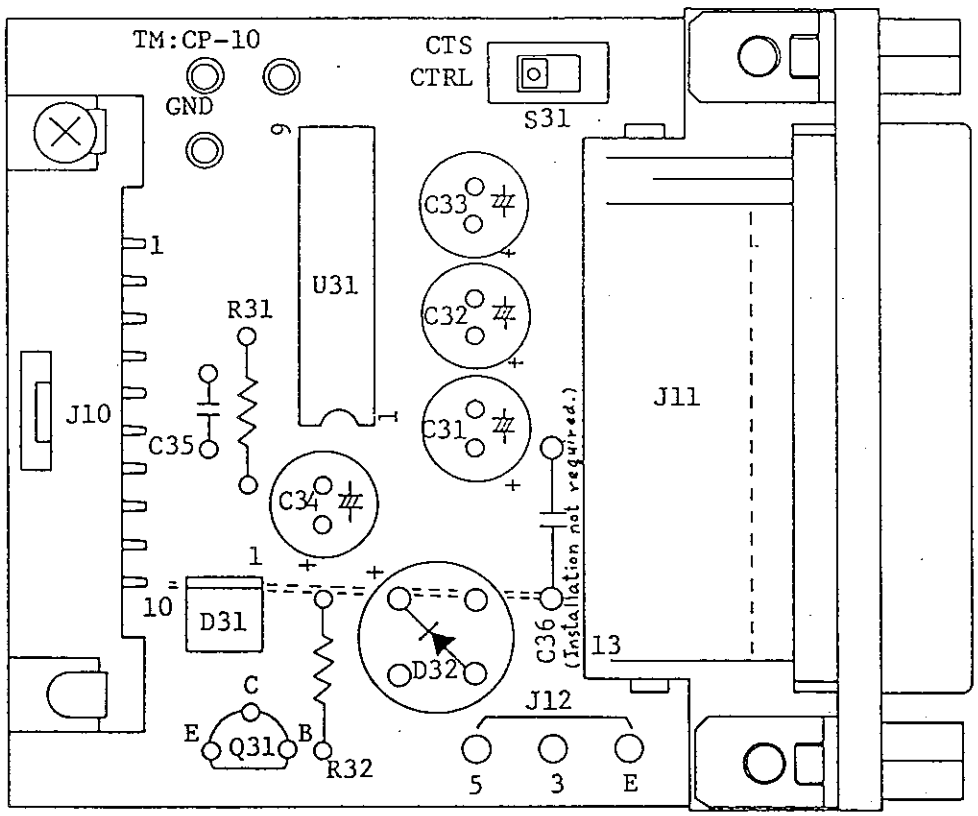
				Model	AD: FX-04 FY-05
Symbol	Date	By	Revision No.	Description	Battery Unit
				Stock No.	PZ: 925 A/B
				Drwg. No.	EC_4-00143



				Model	AD: FX-04 FY-05
Symbol	Date	By	Revision No.	Description	Battery Unit
				Stock No.	PZ: 925 A/B
				Drwg. No.	KZ_4-00322



				Model	AD: FXY-03
Symbol	Date	By	Revision No.	Description	Serial Interface
				Stock No.	PZ: 915
				Drwg. No.	



				Model	AD: FXY-03
Symbol	Date	By	Revision No.	Description	Interface Board
				Stock No.	PZ: 915
				Drwg. No.	KZ_3-00573