

FC series

COUNTING SCALES

MAINTENANCE MANUAL

Maintenance-FC-v.1.a 91/06/20 AOK

HIGH RESOLUTION COUNTING SCALES

MODEL: **FC-500**
 FC-1000
 FC-2000
 FC-5000
 FC-10K
 FC-31K
 FC-50K

A&D
A&D Company, Limited

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1 INTRODUCTION

The FC series of digital weighing scales feature a display resolution of 1/10,000 and an internal resolution of 1/500,000.

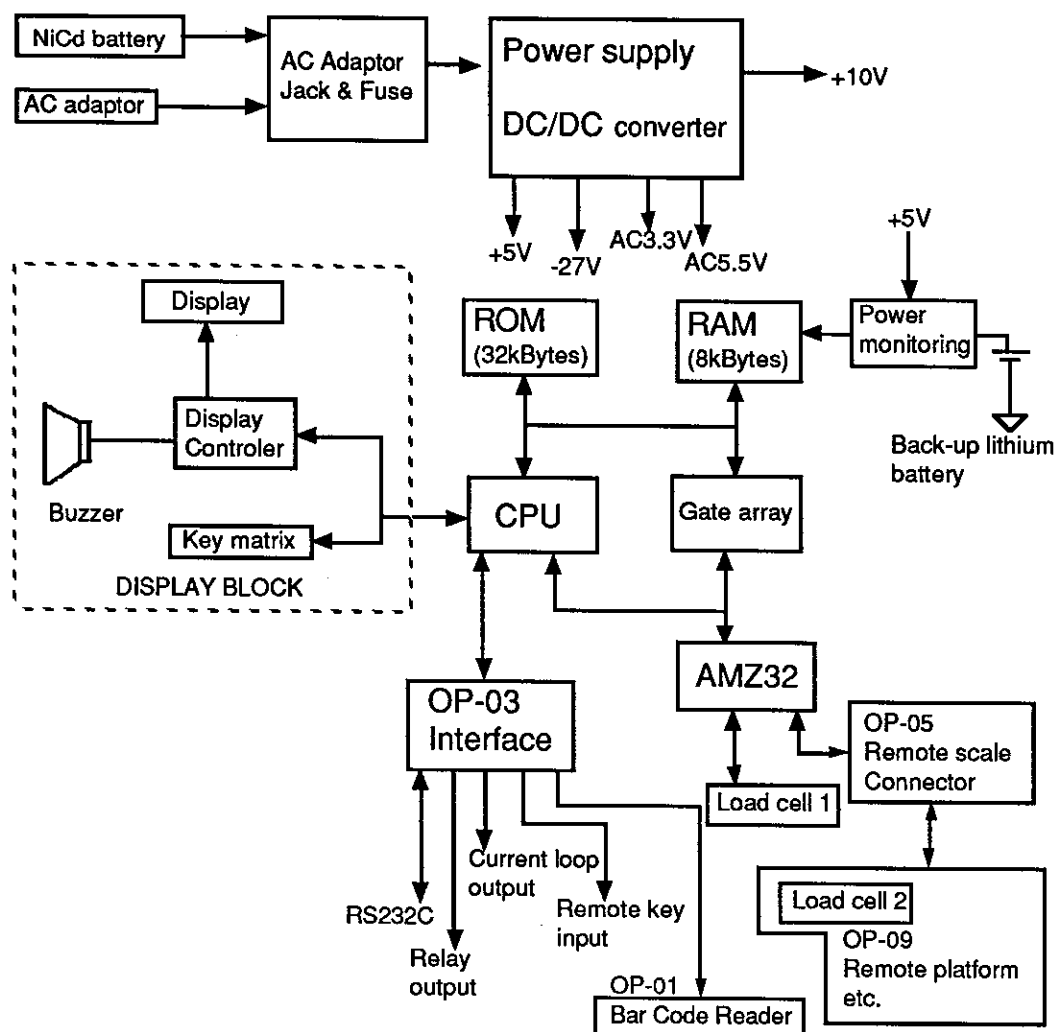
The FC series weighing scales are largely divided into two sections: the main unit including load cell, A/D converter and control block, and the detachable display unit. The power rating is 11 to 22VDC (300mA) with power being supplied by an accessory AC adaptor or the OP-02 NiCd battery.

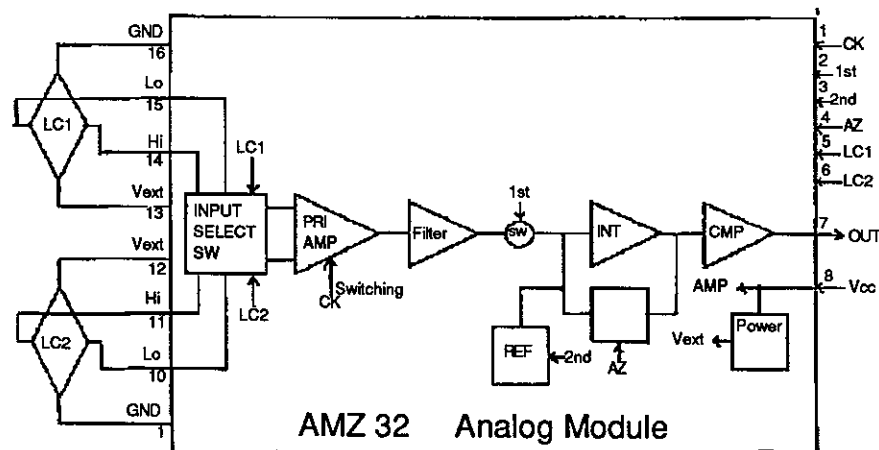
Most parts and components are the same except for the load cell, load cell angle, pan supports, pan and plate, which differ according to each model.

The following products are optionally available:

- OP-01 Bar Code Reader
- OP-02 NiCd Battery Pack
- OP-03 Serial Interface/Bar Code/Comparator Out I/O
- OP-04 Display Arm
- OP-05 Remote Scale Connector
- OP-07 Wall Mounting Kit
- OP-08 Extension Cable (2m)
- OP-09 Remote Platform (10kg ~ 102t)
- OP-21~26 AC Adaptors (100V-240V)

2 BLOCK DIAGRAM





3 GENERAL DESCRIPTION OPERATIONS

1 POWER SUPPLY BLOCK

A DC/DC converter is used in the power supply to enable battery application. From the DC supply input, 10VDC is supplied to the analog circuit through the series regulator, with -27V for driving the vacuum fluorescent display (VFD) through the DC/DC converter, 3.3VAC and 5.5VAC as filament voltages, and 5V for the logic circuit. The excitation voltage for the load cell is supplied from the AMZ32.

2. LOGIC BLOCK

1) CPU D87C10G is an 8-digit single-chip CPU incorporating a 256K× 8 bit RAM. It is driven by the 12 MHz clock supplied from the gate array.

2) Gate Array D65013GC388 (NEC)

The CMOS gate array designed for the FX/FY balances is used. It incorporates the various functions of a memory decoder, A/D controller, counter and clock generator.

3) ROM 27C256-15

The 27C256 is a 32K× 8 bit CMOS ROM with an access time of less than 200μsec.

4) RAM TC5564APL-15 (Toshiba)

This 8K× 8 bit CMOS RAM is backed up by a lithium battery. The service life of the lithium battery is estimated to last more than 15 years. Write-protection is provided for calibrating values while CAL-SW is OFF.

3 DISPLAY BLOCK

1) Display Controller D7516 (NEC)

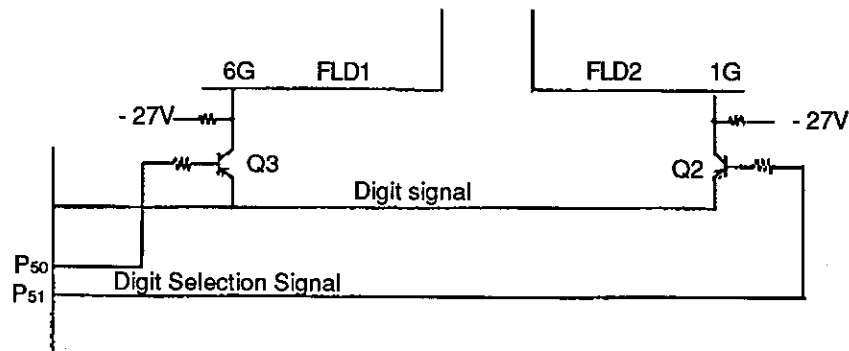
The display is controlled by display controller D7516 (A&D custom programmed).

2) VFDs FIP7B13 (FLD1), FIP13C10E (FLD2)

The FIP7B13 is a 7-segment, 7-digit display with a ▼ mark. The Lower 6 digits are used. The FIP13C10E is a 7-segment, 13-digit display with a decimal point.

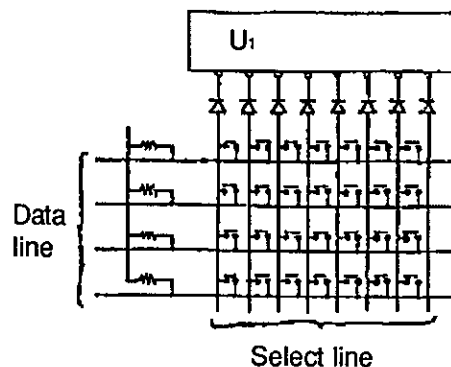
There are 5 low-order digits followed by one digit for a space, with 6 digits used for numerical display.

The sixth digit of the FLD1 and the first digit of the FLD2 cannot be turned ON simultaneously because they are used for switching the common digit signal.



3) Keys

Twenty-six keys are positioned on a matrix consisting of seven select lines generated by the decoder, and four data lines connected to the main CPU ports.



4 ANALOG BLOCK

The analog block is enclosed in an aluminum case, and features the follow functions.

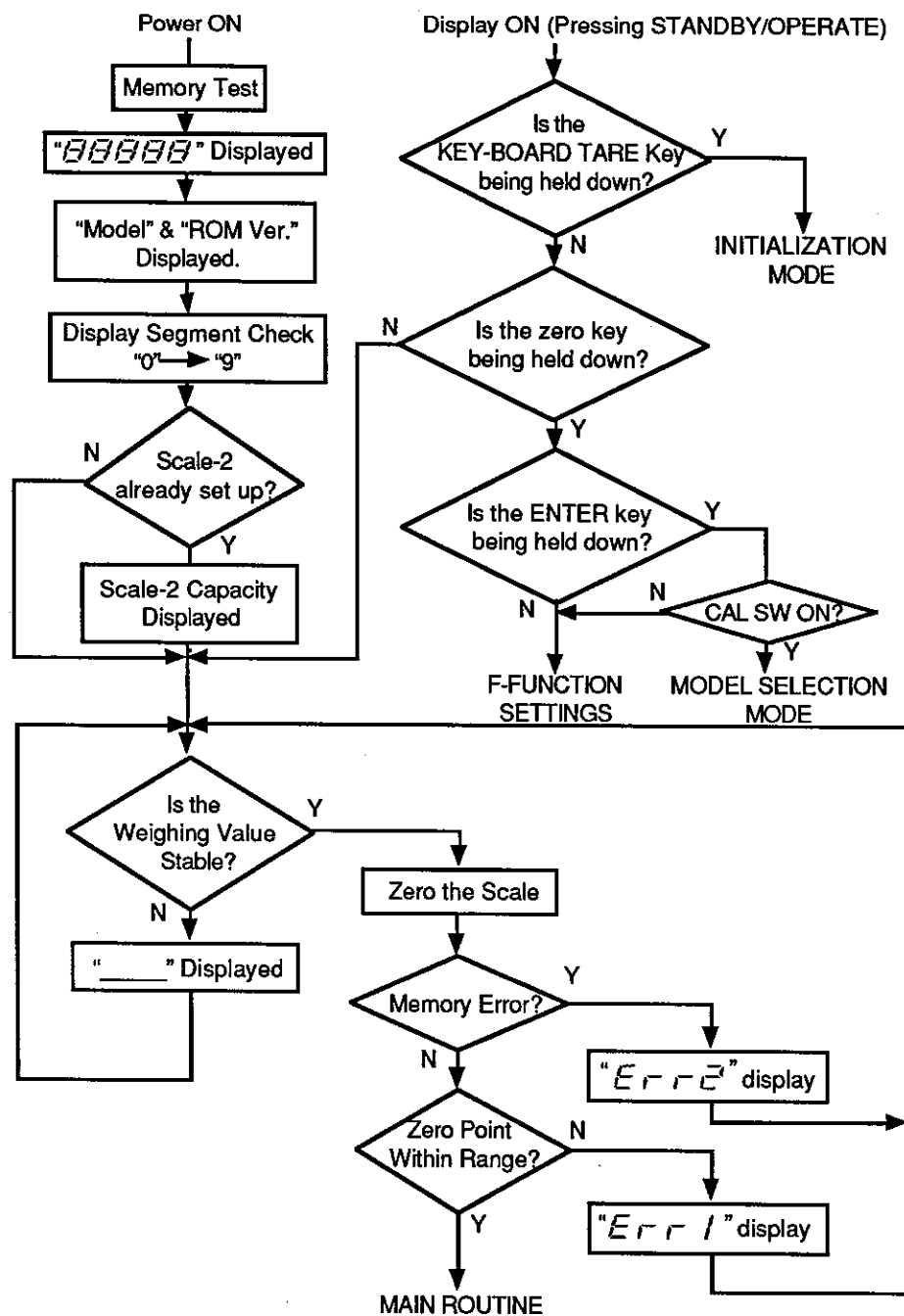
Load cell power supply (+6V)

Load cell input switching

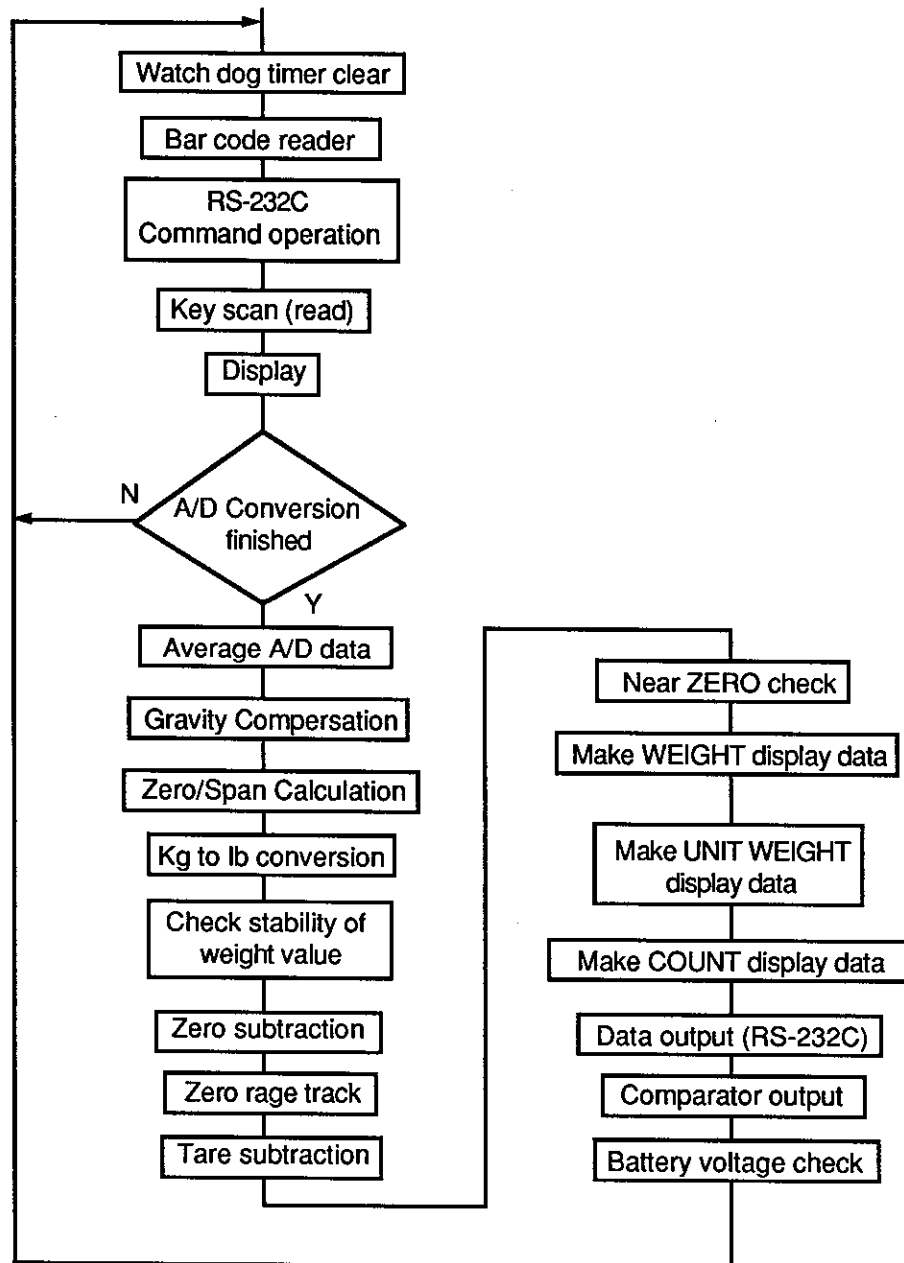
Filter

Dual slope A/D converter

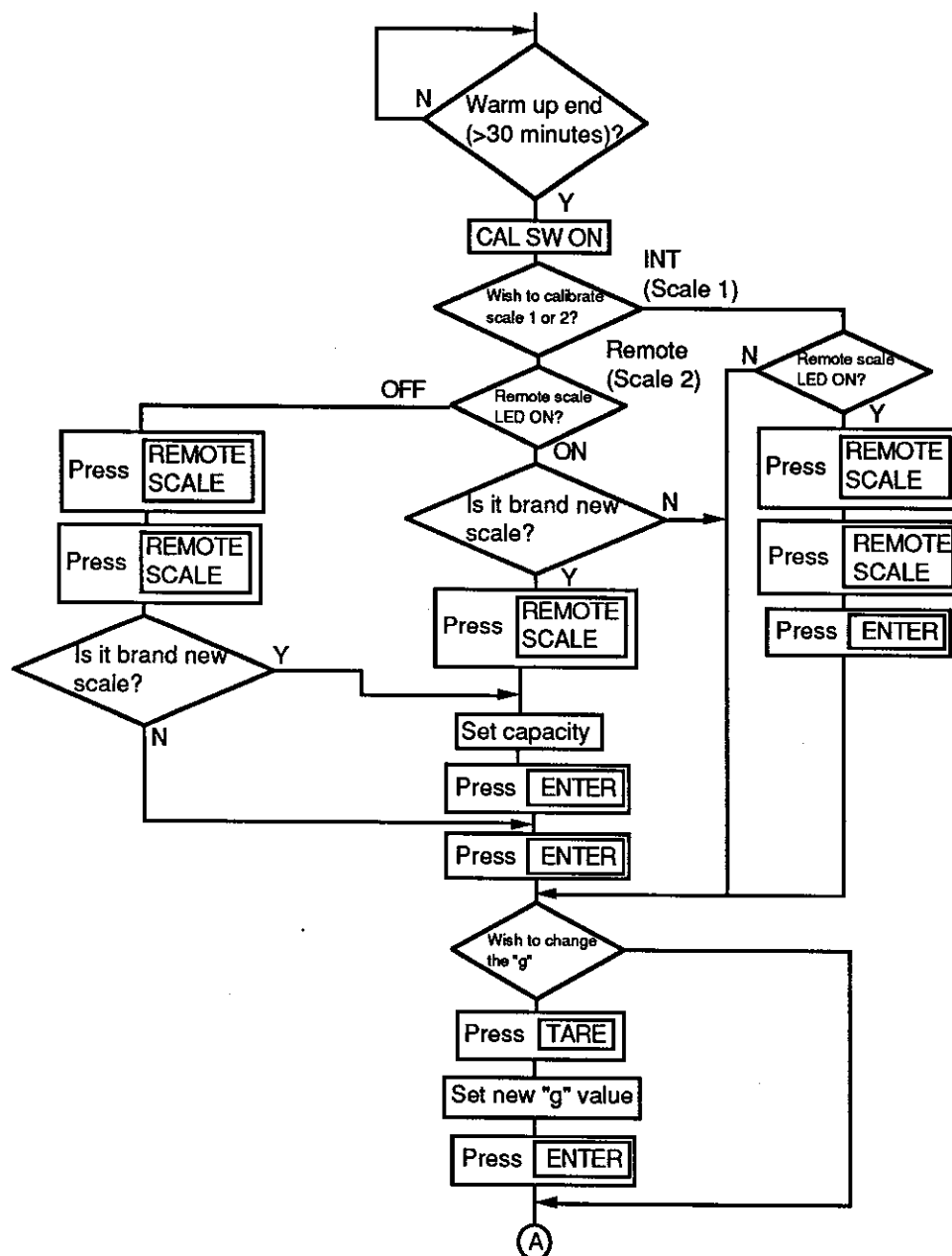
4 SOFTWARE FLOWCHART

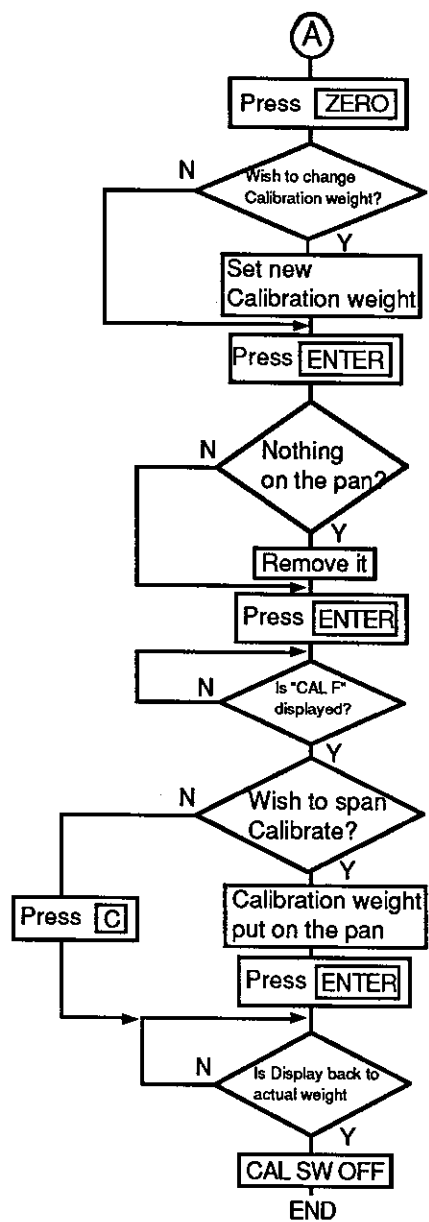


MAIN ROUTIN



5 CALIBRATION FLOWCHART





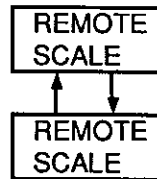
1 CALIBRATION MODE

1. Remove the front cover by using a screwdriver.
2. Slide the CAL switch ON, "CAL" is then displayed on the Pcs. Display, and the scale enters the calibration mode.

2 SELECTING THE SCALE 1 or 2

Select the scale to calibrate.

Key operation



Display

"COUNT"	"WEIGHT"	
"5 C A L E 1"	"5 0 0 0 0"	Alternates when the key is pressed.
"5 C A L E 2"	"2 0 0 0 0"	

When changing the capacity of the remote scale (GO to *1 in other cases.)

6 0 . 0 0

ENTER

*1

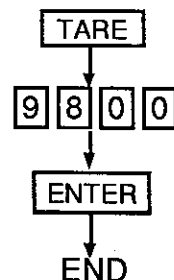
ENTER

End

"COUNT"	"WEIGHT"	
"5 C A L E 2"	"6 0 0 0"	Enter the capacity
"5 C A L E 2"	"6 0 0 0"	
"0 0 0 0 0"	"0"	"0" New capacity entered

3 CHANGING the SET GRAVITY VALUE

Key operation



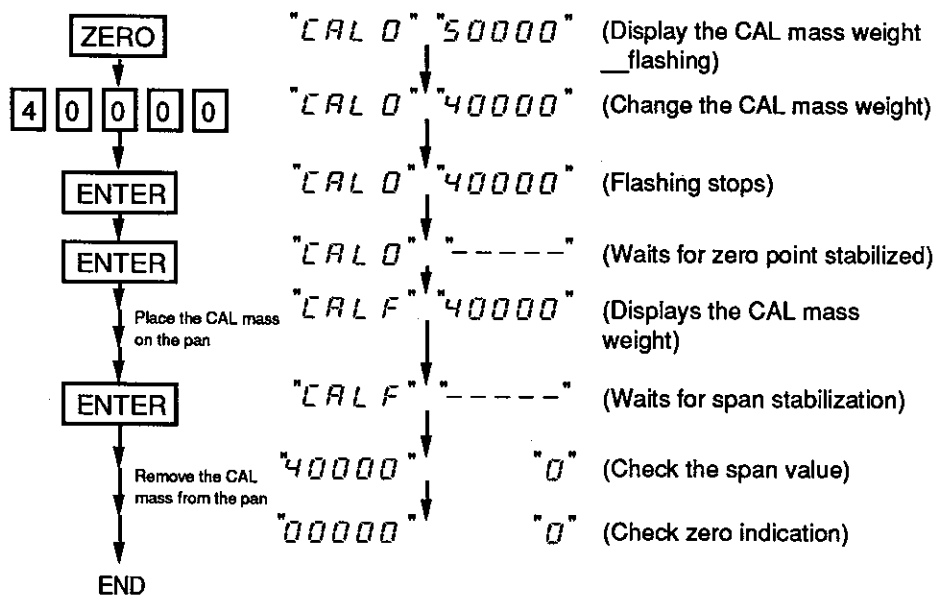
Display

"WEIGHT"	"UNIT WEIGHT/DATA ENTRY"	
"0 "	"9 7 8 0"	Displays the pervious value of GRAVITY
"0 "	"9 8 0 0"	Enter the desired GRAVITY value.
"0 0 0 0 0"	"0"	

4 ZERO and SPAN CALIBRATION

Key operation

Display



6 CHECK MODE

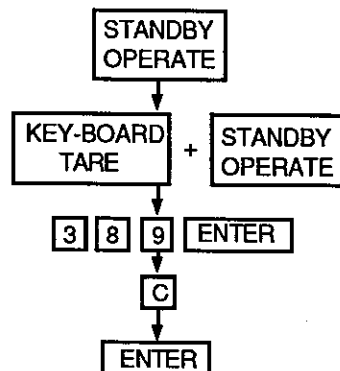
1 LOGIC BLOCK CHECK

1-1 Activating the Check Mode

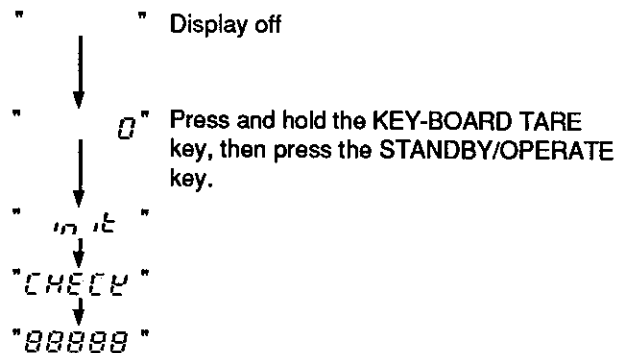
a. Turn the power on with the jumper (J2) shorted on PZ: 2286, then check mode will automatically start. (If method b. can not be done, then try this a. method.)

b. The check mode can be entered by the following key operations.

Key operation



Display



1-2 Check Procedure

-1 All displays ON

-2 Displays (FLD 1 and 2, LEDs 1~11, Buzzer)

-3 Keys

1-2-1 All Displays ON

All VFDs and LEDs go on.

LEDs do not go on.

→ LED, U2 soldering

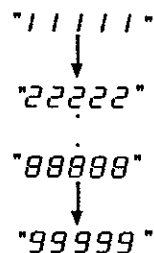
VFDs do not go on.

→ VFD, U2 soldering, KO631

When OK, hold down any key for about three seconds, then each display check starts.

1-2-2 Displays

First, all digits of the VFD go on simultaneously as shown below.



Incorrect letters are displayed.

→ VFD, U2 soldering, KO631

Then, the each digit of the VFD goes on sequentially.

The FLD1 G7 and FLD2 G1 go on simultaneously.

→ Q2 and Q3

Then, LEDs go on sequentially from the upper left to right and the buzzer sounds simultaneously.

The buzzer does not sound.

→ Buzzer, Q1, U2, wiring to the buzzer board

When the OP-03 is installed, the relay is switched on in order of Hi, Go and Lo.

#The relay is not switched on.

→ OP-03 (RY1~3, Q2~4)

1-2-3 Keys

"5 - " is displayed.

Press each key to display its key number. When several keys are pressed, the relevant numbers are displayed in ascending order.

A key does not work.

→ Key pad height, key switch defected

All keys connected to a data line do not work.

→ R12~R15, KO631

All keys connected to a select line do not work.

→ U1, D1~D7, KO618

When the CAL switch is set on, "CAL" is displayed.

The CAL switch does not work.

→ SW1, U2

When the OP-01 switch is pressed, "bRr" is displayed.

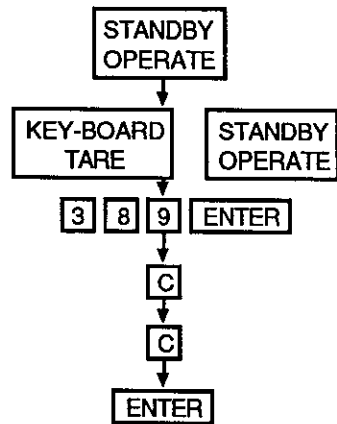
The switch does not work.

→ OP-01 plug wiring, OP-03 R12

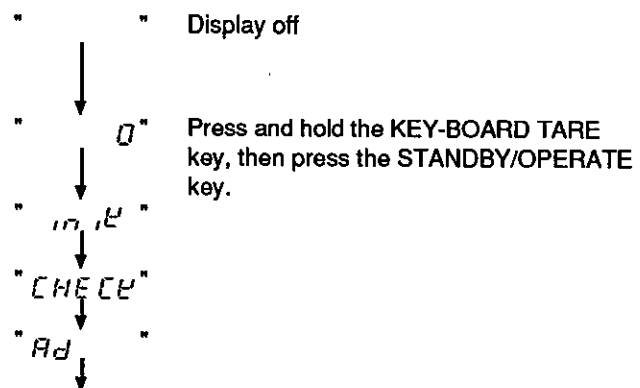
When all OK, hold down RESET key for about three seconds.

2 ANALOG BLOCK CHECK

Key operation



Display



The numeric value is displayed on the Weight Display. (The million's digit is not displayed.)

Confirm that the display shows 150,000~250,000 with nothing on the pan, and that the variation exceeds 500,000 when the mass of capacity is placed on the pan.

Stability of the weight display should be less than ± 10 counts.

→ +10V, AMZ32, load cell, load cell stopper

7 INITIALIZATION

1 SETTING MODEL NO. AND TYPE

The type of machine is set by entering the 2-digit machine code.

Code List

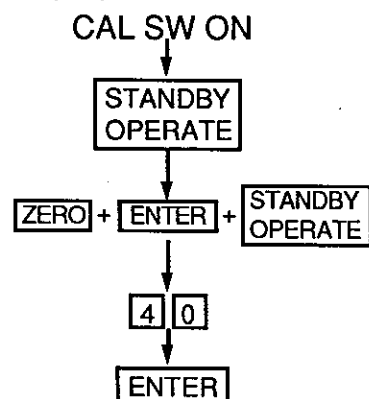
MODEL	MACHINE CODE		DISPLAY of MODEL No.
	METRIC	NON-METRIC	
FC-500	01	11	FC-05
FC-1000	02	12	FC-1
FC-2000	03	13	FC-2
FC-5000	04	14	FC-5
FC-10K	05	15	FC-10
FC-20K	06	16	FC-20
FC-31K	07	17	FC-31
FC-50K	08	18	FC-50

All settings are returned to the initial values by setting the type of machine, and memory is cleared.

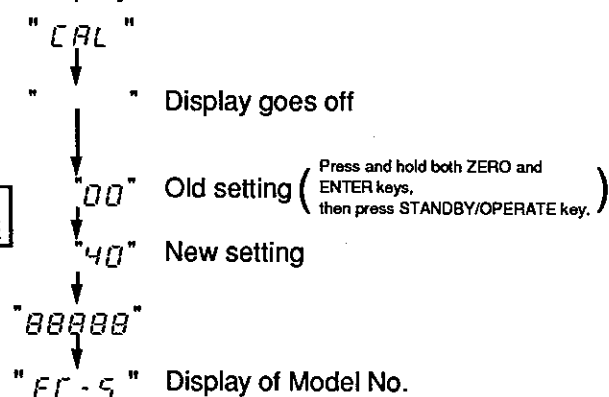
How to set up

(Ex: Setting a new board <PZ: 2286> to FC-5000 metric version)

Key operation

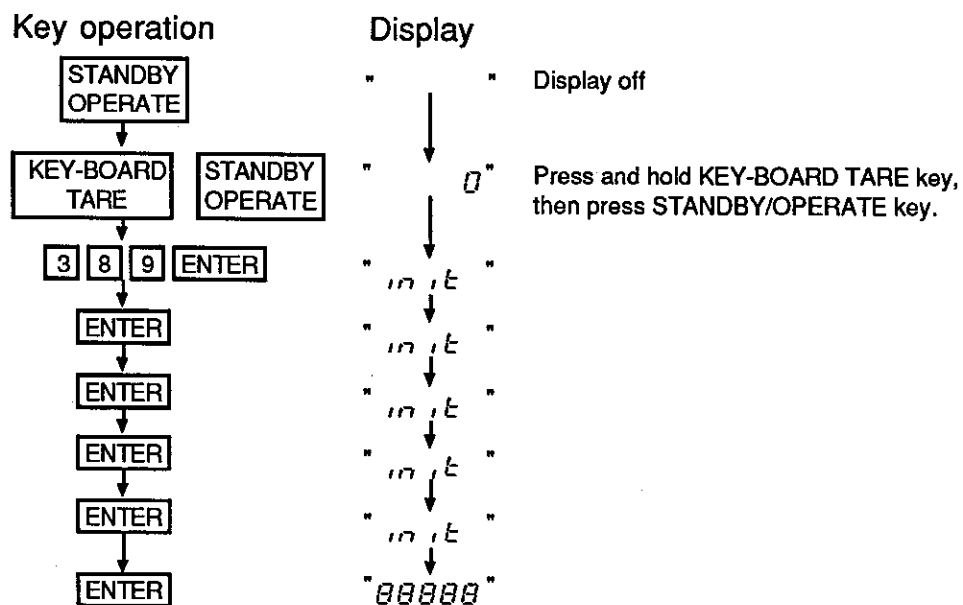


Display



2 INITIALIZING F-Function settings

The following key operations return to the setting made when the machine was delivered.



All F-Function settings returned to the settings made at delivery by initialization and memory is cleaned, with the current calibrated values remaining.

LIST OF SETTINGS AT DELIVERY

1.	Function	Metric	Non-metric
F-1	-1	0	0
	-2	0	0
	-3	0	0
	-4	0	0
	-5	0	0
	-6	0	1 *
F-2	-1	0	0
	-2	0	0
	-3	0	1 *
F-3	-1	0	0
	-2	0	0
F-4	-1	0	0
	-2	3	3
	-3	1	1
	-4	0	0
F-5	-1	0	0
	-2	0	0
	-3	0	0
	-4	0	0
	-5	010	010
F-6	-1	0	0
	-2	0100	0100
	-3	0	0
	-4	2	2
F-7	-1	1	1 (ENTER)
	-2	2	2 (TARE)
	-3	3	3 (ZERO)
	-4	4	4 (SAMPLE)
	-5	0	0 (RESET)
F-8	-1	—	1 *
	-2	—	0 *

The functional differences between the metric and non-metric models are only found in the parts marked with an asterisk (*).

8 TROUBLE SHOOTING

1 IN CASE OF IMPROPER OPERATION

The following conditions frequently result from improper operation. The machine will function normally after correcting the causes of improper operation.

The "Err 1" is displayed (with the display ON).

No pan is mounted or set properly.

Something has already been placed on the pan.

The keys do not work.

When registering the unit weight by SAMPLE, KEY-BOARD or ID key:

When entering the tare weight by KEY-BOARD TARE key:

→ Press the [RESET] key.

When in the wait state for ZERO or TARE operation:

→ Press the [RESET] key.

Hold down the push switch on the bar code reader.

F-1-1 is set to 1.

→ Confirm the setting (Refer to the Instruction Manual.)

" _ _ _ _ " Display remains unchanged.

The scale is unstable due to wind or vibration.

Something is touching the pan or pan supports.

The weighing result is incorrect.

Not level

→ Adjust the level by levelling feet

The installation location has been changed.

→ Recalibration

The counting error is large.

The unit weight is rather small.

Variation of the each weight of the object is large.

→ Perform ACAI by taking as many samples as possible.

The repeatability is not good due to wind and/or vibration.

→ Change the installation location.

The unit weight is not displayed.

The comparator function is set on.

→ Confirm the setting F-5-1 (Refer to the Instruction Manual.)

The Pcs Display indicates a 6-digit number including a sign.

"Lo b" is displayed.

AC adaptor is not correct one.

The voltage of the AC power supply is too low.

The battery is discharged (when using the OP-03.)

→ Charge the battery.

"Hi b" is displayed.

AC adaptor is not the correct one.

The voltage of the AC power supply is too high.

The OP-01 bar code reader does not read.

Labels are dirty.

Labels are not those supplied from A&D.

Scan speed is too fast (or too slow).

The OP-02 does not operate.

Is the battery charged?

Make sure that the Battery Switch is ON.

OP-03 relay output is not generated.

Confirm the setting (F-5).

Is the power switch turned on?

The OP-03 RS-232C or the current loop does not output.

Confirm the setting (F-6).

The OP-05; display does not switch to the remote scale.

The remote scale is not registered or calibrated.

The remote scale is not connected.

2 IN CASE REPAIR IS REQUIRED

The following conditions may result from troubles. Check for troubles according to the checklist

The power will not turned on.

- a) AC adaptor malfunction
- b) Fuse
- c) Resetting circuit
- d) Display cable (KO: 631)
- e) DC/DC converter
- f) CPU
- g) Gate array
- h) Memory

The OP-02 battery pack

Abnormal display

- i) VFD
- j) Display driver
- d) Display cable (KO: 631)
- e) DC/DC converter

Testing in the check mode

Keys do not work.

Testing in the check mode

"E", "-E" Display and zero point deviation

- k) AMZ32
- l) A/D control signal
- p) Load cell
- q) Load cell stopper

Display is not stable.

(Display remains "_____.")

- n) Analog power supply (+10V)
- k) AMZ32
- p) Load cell

"Err 2", "Err 3" Displays

- g) Gate array
- h) Memory
- m) Logic power supply (+5V)
- o) Memory backup circuit (battery)

When the system power is turned OFF, calibrated values and memory contents are lost.

- o) Memory backup circuit (battery)

Linearity is not within the tolerance.

- k) AMZ32
- p) Load cell
- q) Load cell stopper

Check items

a) AC adaptor malfunctions

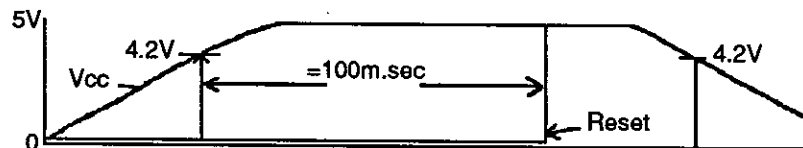
- # Is the proper AC adaptor being used?
- # Is the output power proper (12V to 22V)?

b) Fuse

- # Is the rated fuse being used (Slow blow 1A)?
- # Is the fuse blown?

c) Resetting circuit

- # Is the reset signal proper?

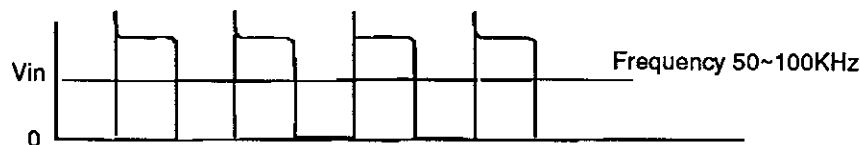


d) Display cable (KO: 631)

- # Is the connector properly inserted?
- # Are the connector pins bent or liable to disconnect?
- # Are the connector pins broken?
- # Is the cable defective?

e) DC/DC converter

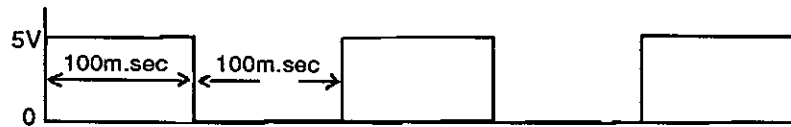
- # Is the drain waveform of Q2 correct? → Q2, T1



- # Is the output voltage correct (-27V)?
→ ZD1, D6, T1
- # Is the output voltage correct (+5V)?
→ D4, D5, U10, T1
- # Is the output voltage correct (3.3VAC)?
→ R8, R9, T1
- # Is the output voltage correct (5.5VAC)?
→ R8, R9, T1

f) CPU

- # Is the CPU well soldered?
- # Are 12-MHz clocks X1 and X2 entered? → U2
- # Is the 1st signal C01 output?



g) Gate array (U2, PZ: 2286)

- # Is the gate array well soldered?
- # Are 12-MHz clocks CK01 and CK02 oscillating?
- # Is SCK CK01 output?

h) Memory (U6, PZ: 2286)

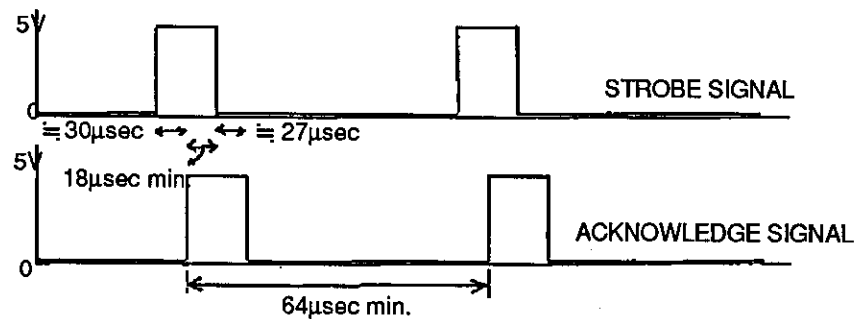
- # Is the memory unit well soldered?
- # Is RAMCE L?

i) VFD

- # Is the heater broken?
- # Confirm each digit and each segment in the check mode.

j) Display driver (U2, PZ: 2287)

- # Is the display driver well soldered?
- # Are 6-MHz clocks X1 and X2 oscillating?
- # Is a strobe signal Poo input or an acknowledge signal PPo output?

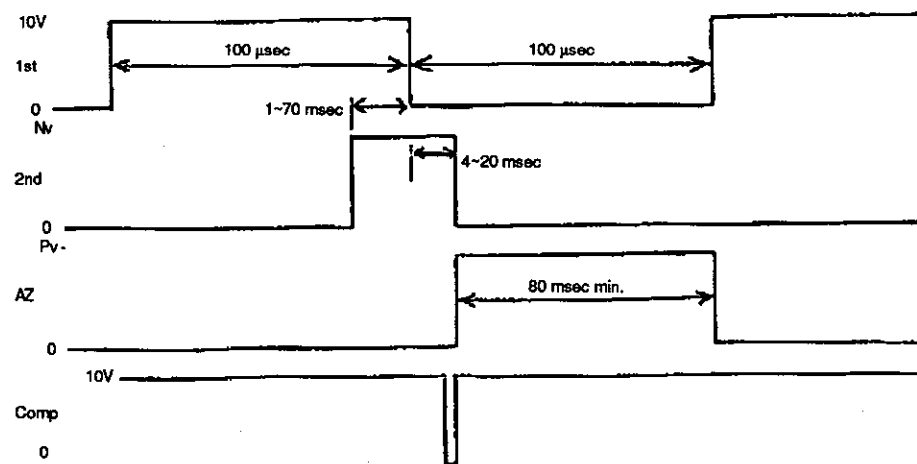


k) AMZ32

- # Is the voltage of the load cell power supply correct ($6V \pm 0.6V$)?
- # Confirm operation in the check mode.

l) A/D control signal

- # Is the waveform correct?



m) Logic power supply (+5V)

Is the voltage correct (+5V \pm 0.5V)? → D4, D5, U11, T1

Is there any ripple? → C12, 13, 14, 25

n) Analog power supply (+10V)

Is the voltage correct (+10V \pm 1V)? → R35, U9

Is there any ripple? → C7, 8, 9, 10

o) Memory backup circuit (with the power supply disconnected?)

Is the BAT1 voltage over 3V? → BAT1

The voltage of R15 should be less than 1mV. → D8, U6

CE1 should be 0V. → D8, ZD4, Q3

p) Load cell

Is the voltage of the load cell power supply correct (6V \pm 0.6V)?

Is the flat cable defective?

Output voltage at zero point: 0.3mV/V \pm 15%

Output voltage variation at full-scale: 1mV/V \pm 15% } For kg
However, FC31K is 0.62mV/V \pm 15% } capacity.

q) Load cell stopper

At no load, the upper stopper should not touch.

At full load, the lower stopper should not touch.

9 LIST OF MESSAGES

COUNT. Display

"-----"	Waiting for stabilization
" E "	Plus-over <small>The number of Pcs. exceeds 6 digits or the weight display indicates "E."</small>
" -E "	Minus-over <small>The number of Pcs. exceeds 5 digits or the weight display indicates "-E."</small>
" Add "	The sample is being registered. Place the displayed number of samples on the pan.
"SCALE 1"	The main scale is selected.
"SCALE 2"	The remote scale is selected.
" F-X-X "	The display of F-Function settings is being changed.
" S- "	Check mode: Key entry is awaited. Press the key to display the corresponding number.
" ES-X "	Check mode: Remote input x is entered. (OP-03)
" BAR "	Check mode: The Bar Code Reader's switch is pressed.
"CAL "	Calibration mode

WEIGHT Display

" Err 1 "	When the display turned on, the zero point deviates more than $\pm 5\%$ of the capacity.
" Err 2 "	An error occurred during the memory test
" Err 3 "	An error occurred during the memory test
" LO b "	The power voltage is too low (less than 10.5V)
" HI b "	The power voltage is too high (more than 25V)
"-----"	Waiting to stabilize
" E "	Plus-over <small>The weight is exceeds the capacity</small>
" -E "	Minus-over <small>The weight is minus and measurement is not possible</small>
"Print"	The list is being printed
"CLEAR"	The unit weight stored in memory is deleted
"CALO"	Calibration mode: Zero adjustment
"CALF"	Calibration mode: Span adjustment
" G "	Calibration mode: Setting gravitational acceleration

UNIT WEIGHT/DATA ENTRY Display

"	no id	"	ID Memory without the unit weight is recalled.
"	Lo wt	"	The unit weight is too small to register.
"	Hi wt	"	The unit weight is too large to register.
"	Lo	"	The comparator result is Lo: Count/ Weight < Lower limit
"	GO	"	The comparator result is Go: Lower limit ≤ Count/ Weight ≤ Upper limit
"	Hi	"	The comparator result is Hi: Upper limit < Count/Weight
"	-----	"	Waiting to stabilize
"	Ad	"	AD conversion value display mode
"	CHECK	"	Check mode
"	init	"	Initialization of F-Function settings
"	Err	"	Calibration error in calibration mode
"		"	(Blank) conditions to compare are not complete when using the comparator
"		"	(Blank) The sixth digit of the COUNT. Display is required.

10 ASSEMBLY AND DISASSEMBLY

1. MAIN CASE AND MAIN BOARD

The Main Board can be removed by following this procedure :

1 Remove the pan and the four screws on the pan supports.

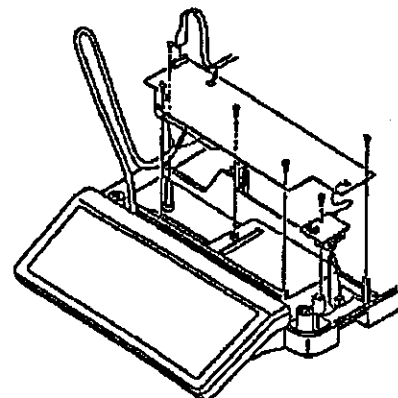
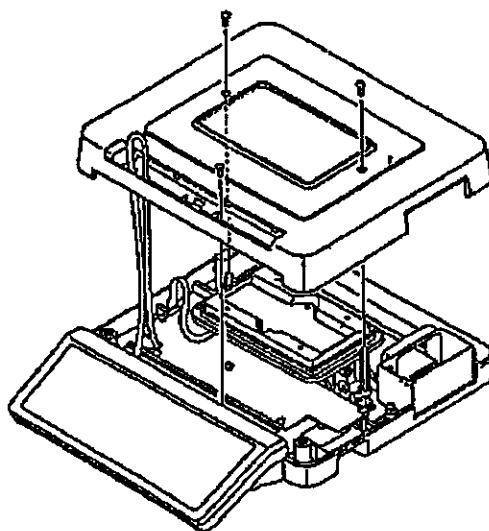
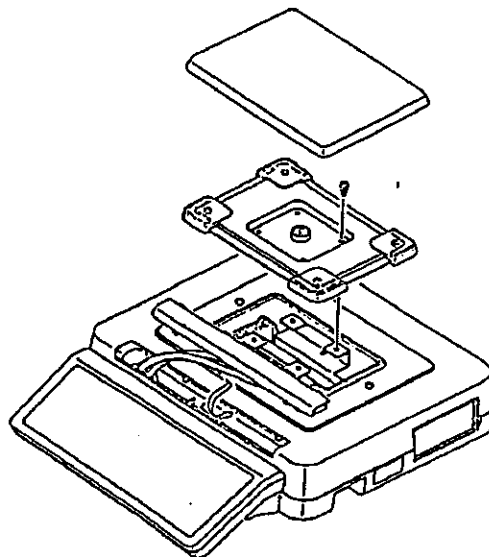
2 Open the front cover to remove the internal screw and two screws on the upper case. And lift off the upper case.

3 Disconnect the load cell cable from the connector and strip the cable off from the main board, while being careful not to damage the cables. Then disconnect the cable from the battery holder.

4 Remove the five screws on the main board, then draw the board out a little bit toward the front side to remove. Remove the screw on the power input block.

(At this time, remove the OP-03/05 if attached)

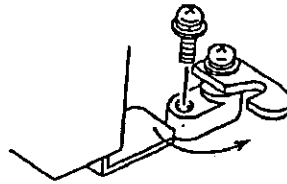
The main board can be removed by following this procedure.



2. LOAD CELL

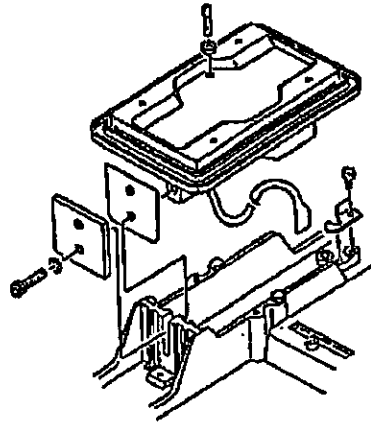
1 Disassembly

1 Loosen the two screws on the upper stopper fixture to release the stopper.



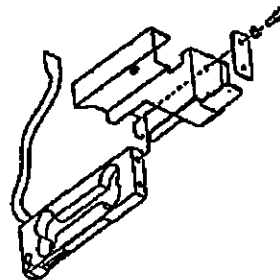
2 Loosening the two screws at the end of the load cell enables removal of the load cell unit. When removing a load cell of 10K to 50K, apply a lateral force to the unit because it is attached with an adhesive agent.

(At this time, no need to remove the load cell spacer from the base.)



3 Remove the load cell from the load angle. When removing a load cell of 10K to 20K, apply a lateral force to the unit because it is attached with an adhesive agent.

(At this time, no need to remove the cell guide plate from the load angle. Be sure to disconnect the cell guide plate after removing the load cell from the base.)



2 Assembly

1 Attach the load cell to the load angle by using the two screws.

Tightening torque

FC500/1000 45kg.cm

FC2000/5000 150kg.cm

Attach a load cell of 10k to 50k with an adhesive agent.

* Use 3M DM-110 Gray or an equivalent adhesive agent.

* Rub off the old adhesive agent.

* Clean the contact surface with alcohol.

When the cell guide plate is detached, also use an adhesive agent to attach it.

2 Turn adjustable feet until the spirit level shows that the base is level.

3 Attach the load cell unit to be level on the base.

Be careful not to apply excessive force when assembling it.

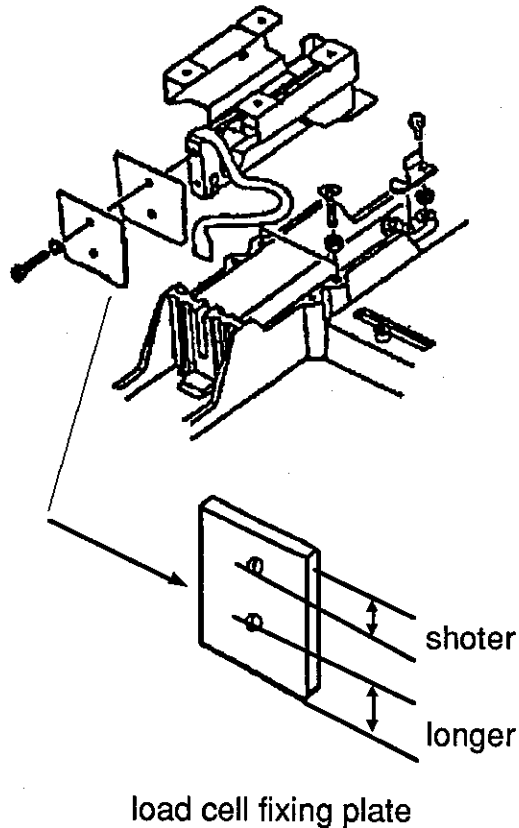
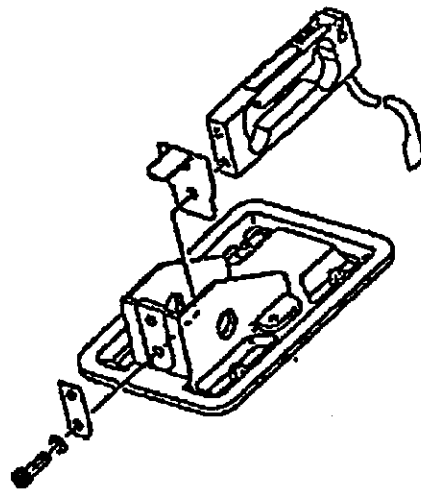
Tightening torque
500/1,000 45kg.cm
2,000~50k 150kg.cm

To assemble a load cell of 2k to 50k, place a levelling instrument on the load angle to make the load cell level. At this time, attach the load cell fixing plate so that its upper part will be shorter.

To attach a load cell of 10k to 50k, use an adhesive agent for the load cell fixing plate.

If the load cell spacer is detached, also use an adhesive agent to attach it.

When an adhesive agent is applied, proceed to the next step after the agent is dried.



3 Cornerload Adjustment

This weighing scale requires cornerload adjustment after the load cell is attached.

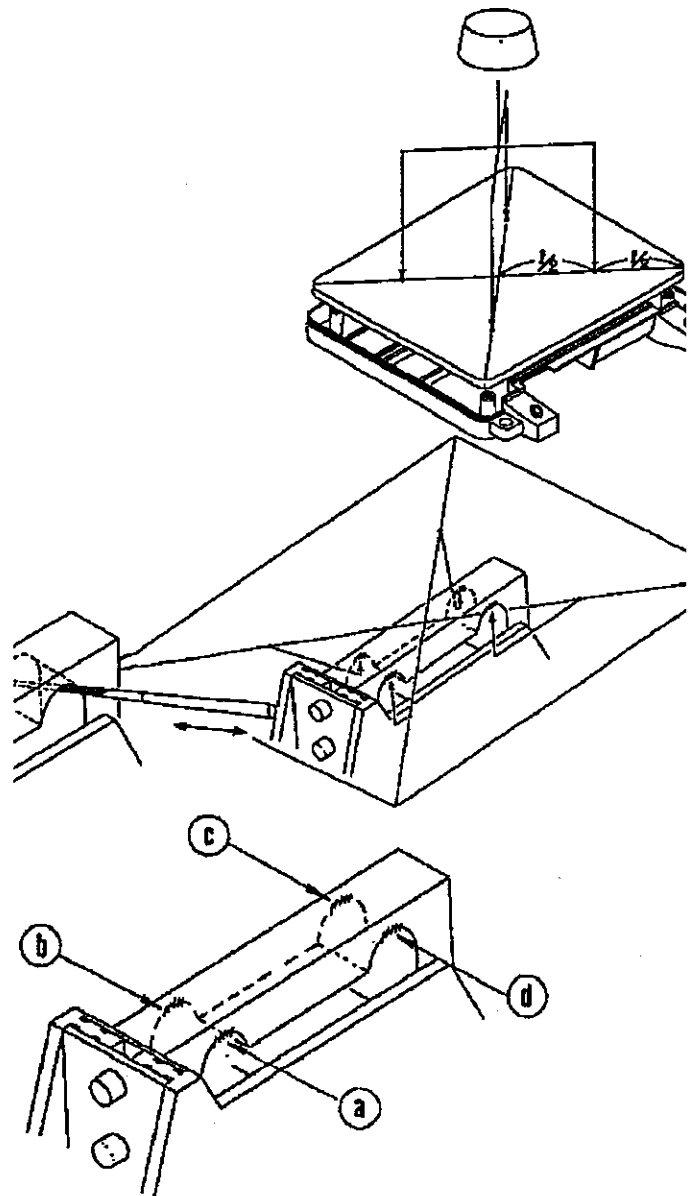
- 1 Remove the display pod from the base.
- 2 Remove the main board.
- 3 Connect the load cell to the main board by using the load cell connection cable (jig) and display cable, then turn on the power. Make sure that no short circuits take place.
- 4 Level the base.
- 5 Attach the pan supports to the load angles.
- 6 After running the load cell for several minutes, set the value by one fifth the minimum division as the unit weight.

Make the corner adjustment while observing the Pcs. Display.)

- 7 Place a weight (half the scale capacity) on the diagonal lines between the center and corners of the pan, then read each Pcs. Display after the display is fully stabilized.

- 8 File a little (a), (b), (c), or (d) corresponding to the smallest display.

- 9 Repeat steps (7) and (8) until each output become ± 5 counts against the Pcs. Display in the center.



4 Stopper Adjustment

1 Upper stopper

After tightening the upper stopper fixing screws, tighten the adjustment screw to adjust the upper stopper by bringing it close to the load angle under the following conditions.

Models

Conditions

FC500/100

With 300g weight on the load angle

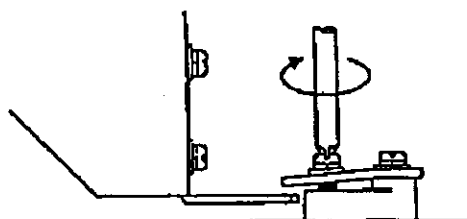
FC2000/5000/10k

With 1kg weight on the load angle

FC20k/31k/50k

Nothing on the load angle

* Tighten the adjustment screw while observing the COUNT. Display, then loosen it a little when the display value is varied. Confirm that the displayed value after loosening is the same as before loosening.



2 Stopper

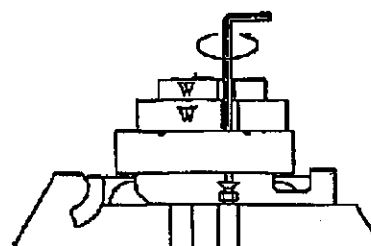
Adjust the stopper screw to meet the following conditions, then secure the lock state by tightening the lock nut after adjustment.

FC500~2000

Adjust the stopper with a weight on the load angle.

The stopper and the load angle are:

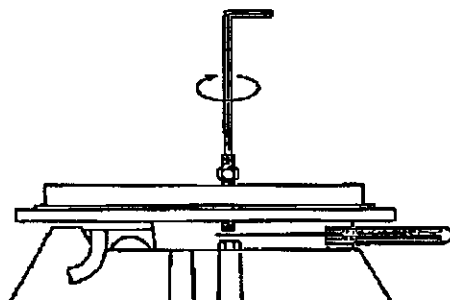
	Not touching	Touching
FC500:	1.15kg	1.3kg
FC1000:	2.0kg	2.3kg
FC2000:	4.2kg	5.0kg



FC5000~50k: Adjust the stopper by using a clearance gauge.

The clearance gauge is:

	Inserted	Not inserted
FC5000	0.6mm	0.7mm
FC10k/20k	0.35mm	0.45mm
FC31k/50k	0.6mm	0.7mm



* After mounting and adjusting, remove all cut chips by using an air blower.

3 Display Unit (Disassembly)

1 Remove the display support plate on the rear of the display pod, then remove the display pod from the main unit.

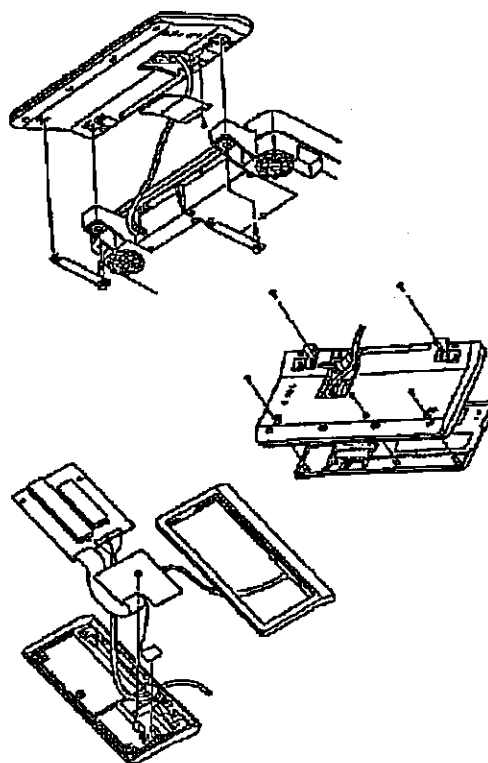
2 Remove the cable cover (by removing one screw) on the rear, then remove the cable.

3 Remove the three screws on the front of the rear side to remove the front panel

4 Raise the two display feet on the back of the rear side, then remove the two screws underneath and the screw in the center of the 10-key pad on the front side.

(The 10-key pad is attached on the upper cover. Remove it carefully.)

5 Remove the buzzer board from the lower cover.



* In case of any slippage between the key pad height and LED position when assembling, assemble after completing adjustment.

FC SERIES DISPLAY BOARD PARTS LIST

NO. 1

CIRCUIT SYMBOL OR DRWG. NO.	PARTS NAME	DESCRIPTION	Q'TY
	7PZ:2287	DISPLAY BOARD FC SERIES	1
C2,3	CC:FK16Y5V1H104	CAPACITOR 0.1 μ F/50V	2
C4	CT:1C100	CAPACITOR 10 μ F/16V	1
C1	CT:1VR33	CAPACITOR 0.33 μ F/35V	1
D1,2,3,4,5,6,7	DI:1S1588	DIODE	7
D16,17,18,19	DL:GL-1PR111	LED MINIMOLD RED	4
D11,12,13	DL:TLR102	RED	3
D10	DL:TLR144	RED	1
D9,14,15	DL:TLUG144	GREEN	3
D8	DZ:05Z9.1	ZENER DIODE 9.1V	1
FLD2	ED:FIP13C10E	FLUORESCENT DISPLAY	1
FLD1	ED:FIP7B13	FLUORESCENT DISPLAY	1
BUZ	ET:CPM121AOAWP	BUZZER	1
J4	JT:1-172430-2	SPRING HEADER 12P	1
J5	JT:172430-8	SPRING HEADER 8P	1
	KO:618-16-100	FLEXIBLE JUMPER	1
	KO:631-90	CABLE 90cm	1
Q2,3	QT:A1015Y	TRANSISTER	2
Q1	QT:BA1A4P	TRANSISTER	1
R4~10,11,16,17,34	RC:NAT1.2K	RESISTOR 1/4W 1.2K Ω	12
R2,3	RC:NAT1K	RESISTOR 1/4W 1K Ω	2
R31	RC:NAT3.3K	RESISTOR 1/4W 3.3K Ω	1
R12,13,14,15	RC:NAT4.7K	RESISTOR 1/4W 4.7K Ω	4
R1,18~30,32	RC:NAT56K	RESISTOR 1/4W 56K Ω	14
R33	RN:1HR-8-563JA	RESISTER NETWORK	1
S1~25,28	SK:KHC10902	KEY SWITCH	26
U1	UC:HC138	3 TO 8 DECORDER HCMOS	1
U2	UC:7516HG606-12	DISPLAY CONTROLLER	1
XTAL	XT:C4SB-6M-LO2	RESONATOR 6MHz	1
	06:B42081A	FLD PILLOW FC	4

FC SERIES

MAIN BOARD PARTS LIST

NO. 2

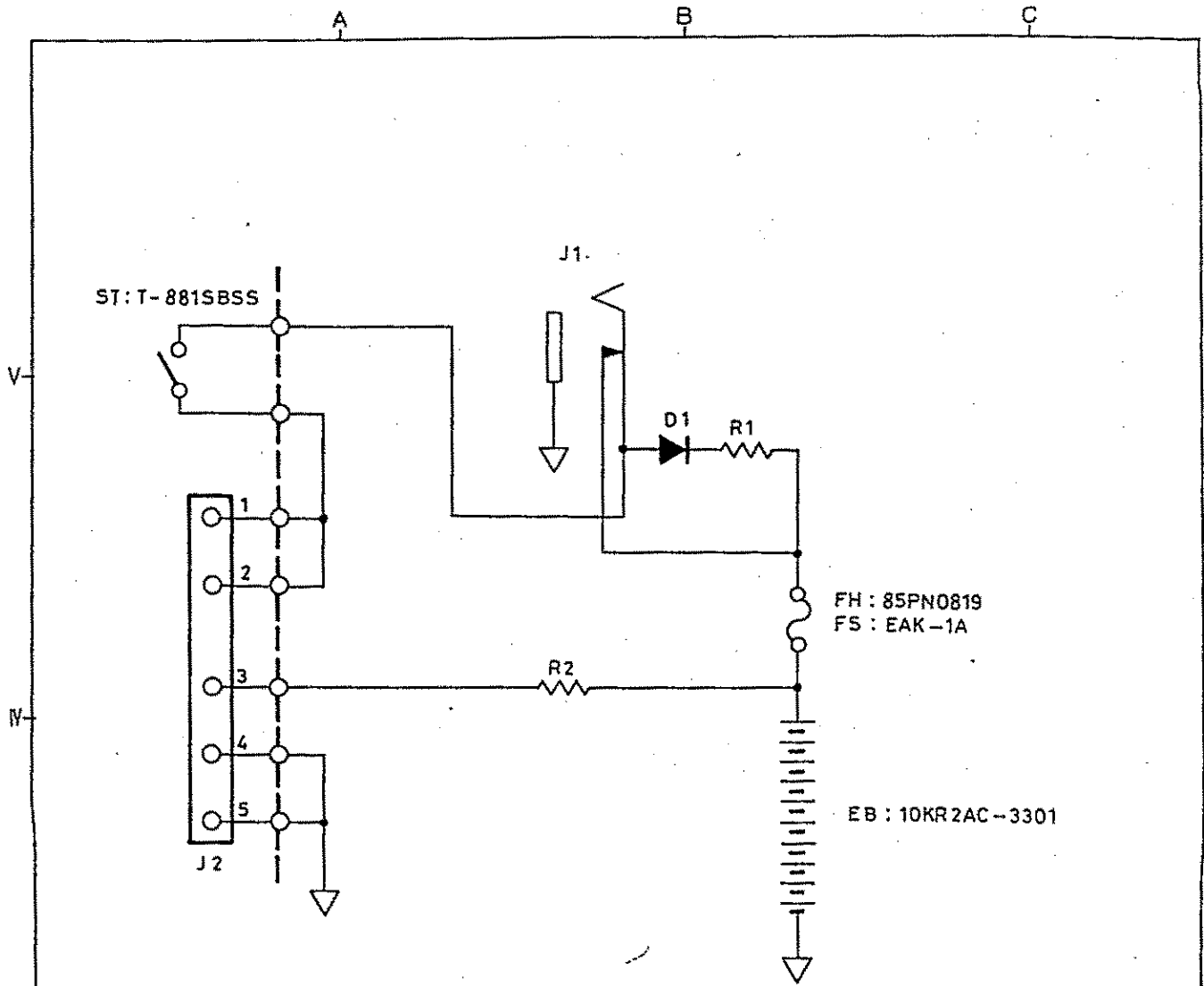
CIRCUIT SYMBOL OR DRWG. NO.	PARTS NAME	DESCRIPTION	Q'TY
	7PZ:2286-P	MAIN BOARD FC SERIES	1
C2,3	CC:FK16Y5V1H104	CAPACITOR 0.1 μ F/50V	16
C20,21	CC:0.001U	CAPACITOR 0.001 μ F	2
C1,33	CC:0.022U	CAPACITOR 0.022 μ F	2
C23	CC:150P	CAPACITOR 150PF	1
C5,24	CC:470P	CAPACITOR 470PF	2
C6,14,17	CK:SM50VB10	CAPACITOR 10 μ F/50V	1
C8	CK:SRA16VB-47	CAPACITOR 47 μ F/16V	1
C13,25	CK:SXE25VB10	CAPACITOR 10 μ F/25V	3
C7	CK:SXE35VB1000	CAPACITOR 1000 μ F/35V	1
	CK:9120	CAPACITOR 120 μ F/25V	1
C2	CT:1A4R7	CAPACITOR 4.7 μ F/10V	1
C9,15,16	CT:1D2R2	CAPACITOR 2.2 μ F/20V	3
C3	CT:1V010	CAPACITOR 1 μ F/35V	1
D4,9	DI:EK04	SCHOTTKY DIODE	2
D5	DI:1SS97	SCHOTTKY DIODE	1
D2,3,6,7,8,10~12	DI:1S2473	DIODE	9
DZ4	DZ:RD3.6EB	ZENER DIODE 6.3V	1
DZ3	DZ:05Z13	ZENER DIODE 13V	1
DZ1	DZ:05Z30	ZENER DIODE 30V	1
DZ2	DZ:05Z5.6	ZENER DIODE 5.6V	1
	EB:CR2032-WT12	LITHIUM BATTERY	1
J1	EJ:0470-01-230	HECO470-01-230 JACK	1
	FH:F-105	FUSE HOLDER	1
	FS:EAK-1A	FUSE 1A	1
	HT:6073PB	HEAT SINK	1
J6	JD:230-05-30	CONNECTOR	1
J3	JI:CL581-0113-2	SOCKET	1
	JS:10328-01-445	IC SOCKET	1
J4	JT:1-172429-2	SPRING HEADER 12P	1
J7	JT:171825-5	V POST HEADER	1
J2	JT:172429-5	V POST HEADER	1
J5	JT:172429-8	V POST HEADER	1
	K0:634	BATTERY CABLE	1

FC SERIES

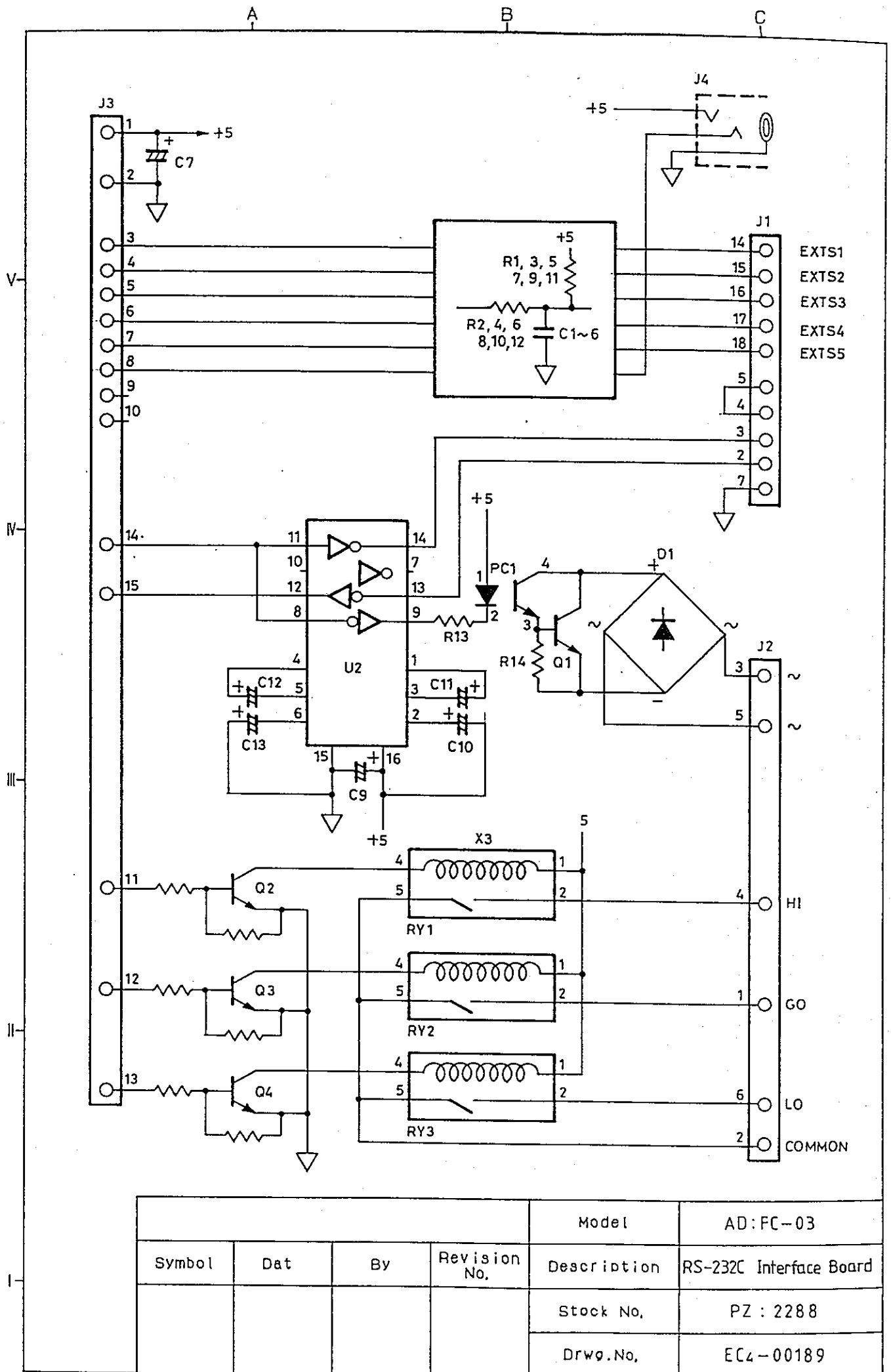
MAIN BOARD PARTS LIST

NO. 3

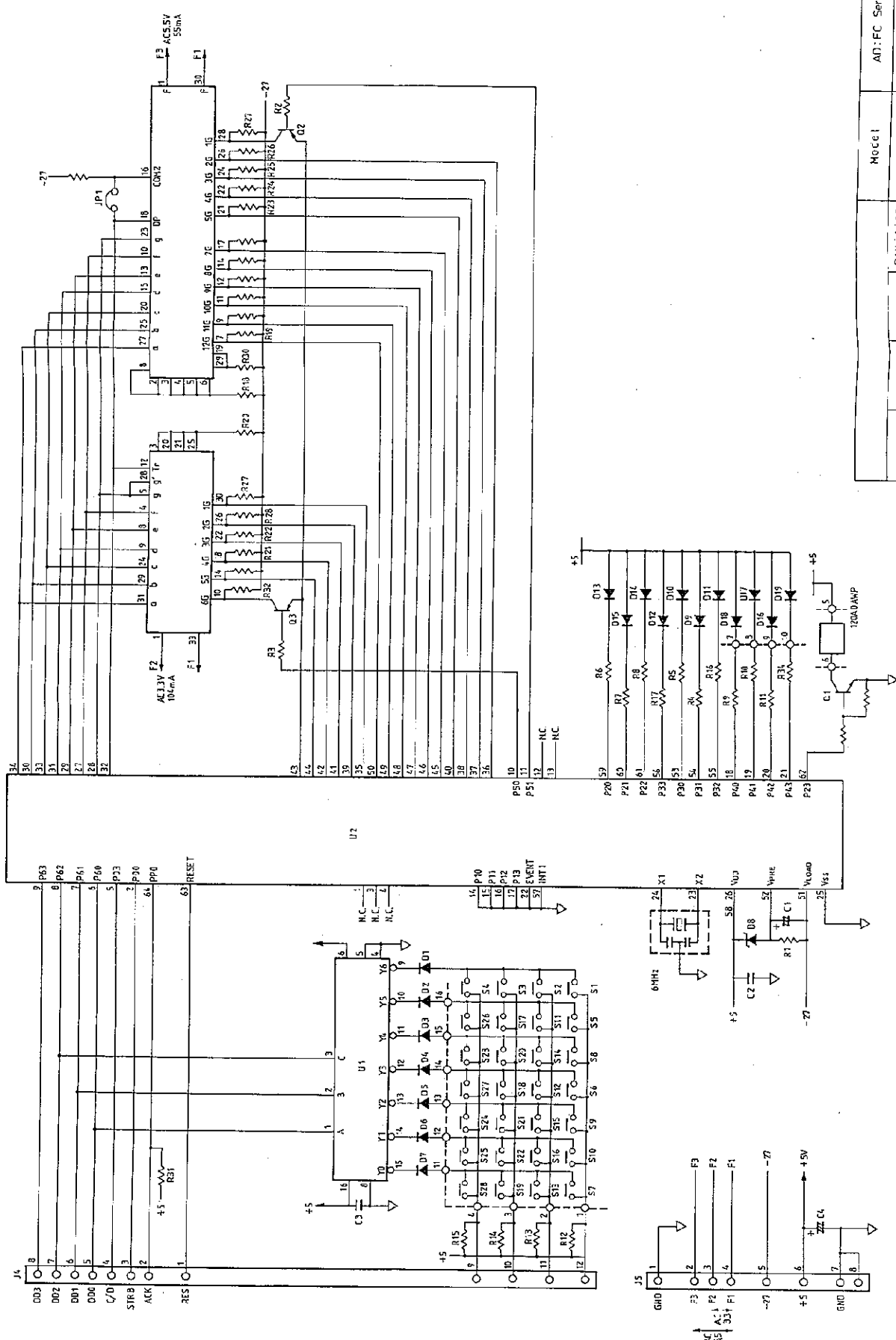
CIRCUIT SYMBOL OR DRWG. NO.	PARTS NAME	DESCRIPTION	Q'TY
	7PZ:2286-P	MAIN BOARD FC SERIES	1
Q2	QF:K701	POWER MOS FET	1
Q3	QT:A1015Y	TRANSISTOR	1
Q5, 6	QT:BA1A4P	TRANSISTOR	2
Q1, 4	QT:C1815Y	TRANSISTOR	2
R8, 17	RC:NAT1.2K	RESISTOR 1/4 1.2K Ω	2
R4, 15, 21	RC:NAT10K	RESISTOR 1/4 10K Ω	3
R1, 24	RC:NAT120K	RESISTOR 1/4 120K Ω	2
R25~32, 34	RC:NAT15K	RESISTOR 1/4 15K Ω	9
R18	RC:NAT150R	RESISTOR 1/4 150 Ω	1
R2, 3, 10, 11, 20, 23, 33	RC:NAT22K	RESISTOR 1/4 22K Ω	8
R7	RC:NAT22R	RESISTOR 1/4 22 Ω	1
R5, 19	RC:NAT220R	RESISTOR 1/4 220 Ω	2
R9	RC:NAT390R	RESISTOR 1/4 390 Ω	1
R6	RC:NAT560K	RESISTOR 1/4 560K Ω	1
R16	RC:NAT560R	RESISTOR 1/4 560 Ω	1
R12	RC:1/2 2.2M	RESISTOR 1/2 2.2M Ω	1
R35	RC:1/2 560R	RESISTOR 1/2 560R Ω	1
R36	RC:15K	RESISTOR 1/4 15R Ω	1
R13	RM:12.4KF	RESISTOR 1/4 12.4K Ω 100ppm	1
R14	RM:56.2KF	RESISTOR 1/4 56.2K Ω 100ppm	1
R37	RN:1HR-8-223MA	RESISTOR NETWORK	1
	SS:SSP1X2NB5X8	SLIDE SWITCH	1
	TF:368	TRANSFORMER	1
U8	UA:C339C	COMPARATOR	1
U1	UA:MB3771	VOLTAGE DETECTER	1
U2	UC:D65013GC-388	GATE ARRAY	1
U3	UC:D78C10G-1B	CPU	1
U4	UC:HC573	8 BIT LATCHES	1
U7	UC:4040	12 BIT BINARY COUNTER	1
U6	UC:5564APL-15	RAM 8K \times 8	1
U10	UR:TA78DL05P	REGULATOR	1
U9	UR:TA78DL10P	REGULATOR	1
X1	XT:C4SB-12M-L02	RESONATOR 12MH _z	1



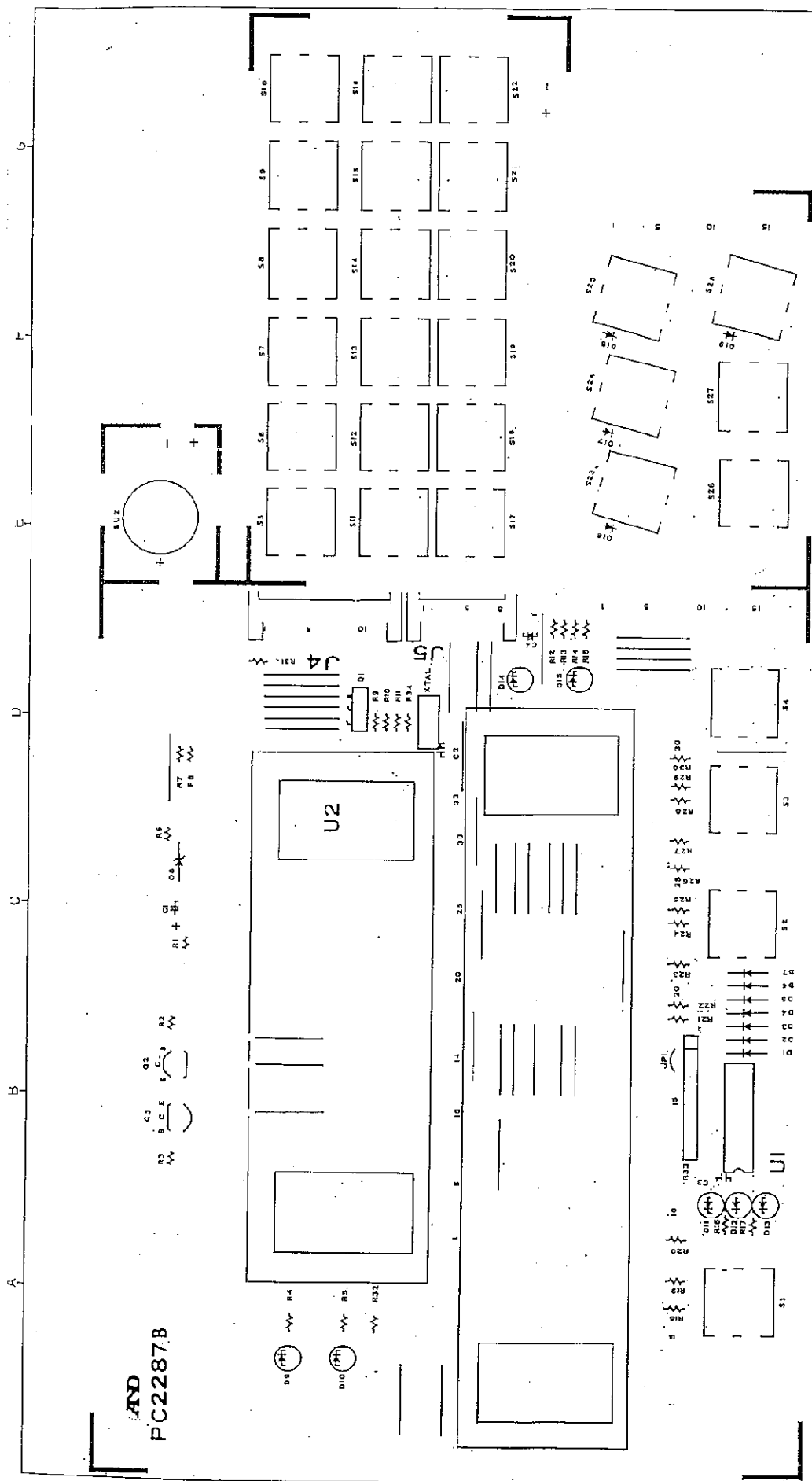
				Model	AD: FC-02
Symbol	Date	By	Revision No.	Description	Battery Unit
				Stock No.	PZ: 2290
				Drwg. No.	EC4-00188



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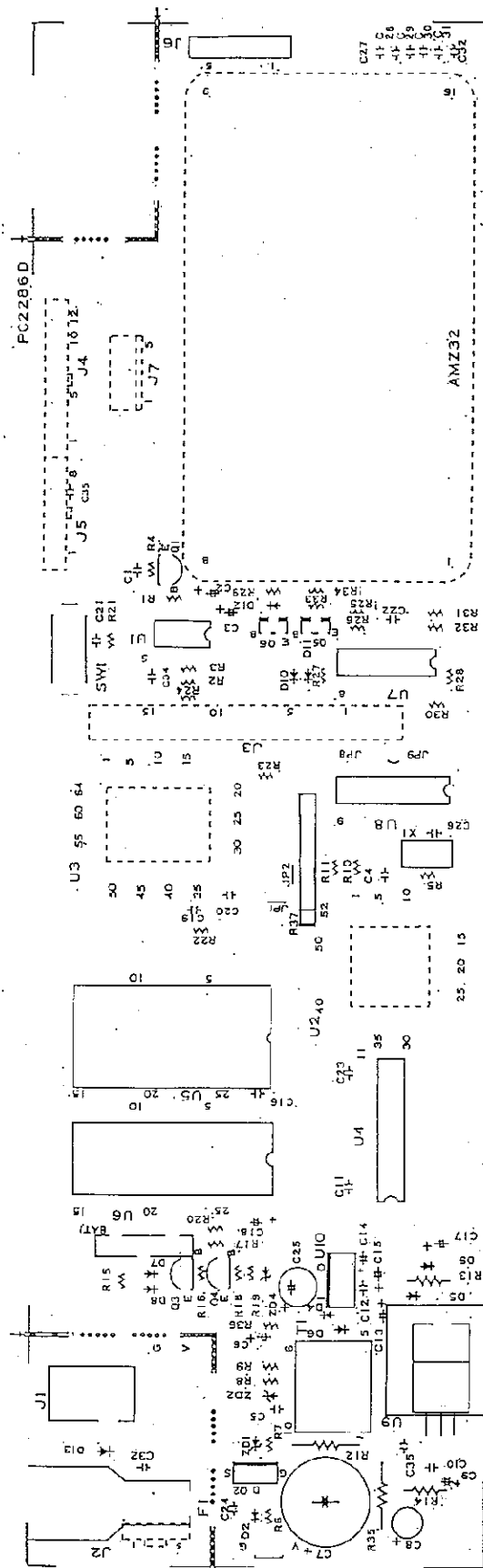


Symbol	Date	By	Revision No.	Model	AN:FC Series
				Description	Display Board
				Stock No.	PZ : 2287
				Draw No.	EC3-01297



Symbol	Date	By	Revision No.	Model	AD:PC
				Description	DISPLAY BOARD
				Stock No.	PZ:2287
				Draw.No.	K22-00403

A B C D E F G



Symbol	Date	By	Revision No.	Model	AD:FC
				Description	MAIN BOARD
				Stock No.	PZ:2286
				Draw.No.	K22-00402

PARTS LIST

FC-2000/5000/10K/20K/31K/50K EXPLODED VIEW -1 1/3

CIRCUIT SYMBOL or DRWG. NO.	PARTS NAME	DESCRIPTION	Q'TY
1	04:A36381A	WEIGHING PAN (L)	
2	04:A36383-1A	PAN SUPPORT 10K	
(2)	04:A36383-2A	PAN SUPPORT 2000/5000	
(2)	04:A36383-3A	PAN SUPPORT 20K/31K/50K	
3	04 :B42074A	CENTER CUSHION	
4	06:B42075A	SIDE CUSHION	
5	07:A10133A	TOP COVER	
6	07:A36354A	CABLE COVER	
7	03:A21016A	LOAD ANGLE (L)	
8	04:B42652-1	WASHER	
9	LC:109-2000	LOAD CELL FC-2000	
(9)	LC:109-5000	LOAD CELL FC-5000	
(9)	LC:109-10K	LOAD CELL FC-10K	
(9)	LC:109-20K	LOAD CELL FC-20K	
(9)	LC:109-50K	LOAD CELL FC-50K/31K	
10	04:B42651-1A	LOAD CELL SPACER	
11	04:B43375	LOAD CELL FIXING PLATE	
12	04:B42076A	STOPPER PLATE	
13	04:A36646	BATTERY GUIDE PLATE	
14	07:A21032A	BATTERY PACK HOLDER	
15	07:B42650	BATTERY HOLDER PANEL	
16	00:B42655	SPRING	
17	04:B42774	BATTERY LOCK PLATE	
18	05:B42653	50mm SPACER	
19	7PZ:2286	MAIN BOARD	
20	05:A44614	30mm SPACER	
21	10:13C	LEVEL VIAL	
22	03:A10129A	BASE	
23	07:A45469E	ADJUSTABLE FOOT	
24	06:A45509A	ADJUSTABLE FOOT RUBBER	
25	02:B42077A	OPTION BLANKING PLATE (A)	
26	02:B42078A	OPTION BLANKING PLATE (B)	
27	TM:T-10	EARTH TERMINAL	
28	04:B42080A	DISPLAY SUPPORT	
29	05:B42082A	LOCK SCREW	
30	07:A10135A	DISPLAY LOWER COVER	

PARTS LIST

FC-2000/5000/10K/20K/31K/50K EXPLODED VIEW -1 2/3

CIRCUIT SYMBOL or DRWG. NO.	PARTS NAME	DESCRIPTION	Q'TY
31	04:B42079A	NUT PLATE	
32	02:A36355A	CABLE COVER (B)	
33	07:B42031	DISPLAY FOOT	
34	7PZ:2287	DISPLAY BOARD	
35	07:A10134A	DIAPLAY TOP COVER	
36	09:A36645-1	FRONT PANEL UNIT JAPAN	
(36)	09:A36645-2	FRONT PANEL UNIT U.S.A	
(36)	09:A36645-3	FRONT PANEL UNIT INT'L	
37	08:A36647-3	MODEL NO. PLATE 2000	
(37)	08:A36647-4	MODEL NO. PLATE 5000	
(37)	08:A36647-5	MODEL NO. PLATE 10K	
(37)	08:A36647-6	MODEL NO. PLATE 20K	
(37)	08:A36647-7	MODEL NO. PLATE 50K	
(37)	08:A36647-8	MODEL NO. PLATE 31K	
(37)	08:A36677-3	MODEL NO. PLATE 2000 U.S.A	
(37)	08:A36677-4	MODEL NO. PLATE 5000 U.S.A	
(37)	08:A36677-5	MODEL NO. PLATE 10K U.S.A	
(37)	08:A36677-6	MODEL NO. PLATE 20K U.S.A	
(37)	08:A36677-7	MODEL NO. PLATE 50K U.S.A	
(37)	08:A36677-8	MODEL NO. PLATE 31K U.S.A	
38	05:B43428	LOCK PIN A	
39	05:B43713 05-B43428A	LOCK PIN B	
40	M4×8	W SEMUSU	
41	M3×12	BIND	
42	M3×6	BINE	
43	M6×18	SEMUSU	
44	M6×25	SEMUSU 10K~50K	
45	04:B42073A	CELL GUIDE PLATE	
46	M5×10	BOLT	
47	M5 NUT		
48	M3×8	W SEMUSU	
49	M3×6	PLATE	
50	05:B43567A	LOCK PLATE SCREW	
51	M3×6	W SEMUSU	
52	M3×8	TAPPING	
53	M3×8	BIND	

FC-2000/5000/10K/20K/31K/50K EXPLODED VIEW -1 3/3

FC-2000/5000/10K/20K/31K/50K EXPLODED VIEW -1 3/3

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PARTS LIST

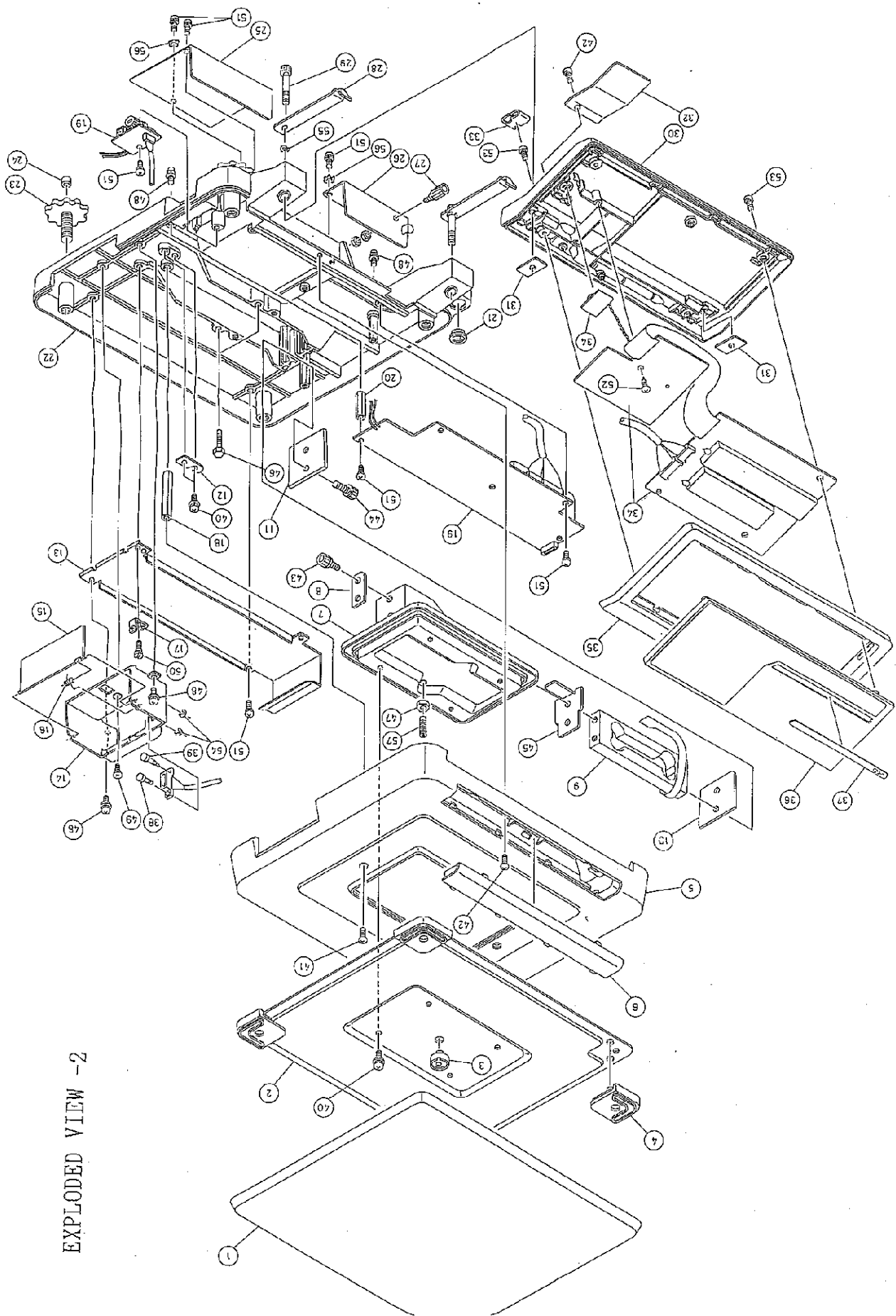
FC-500/1000 EXPLODED VIEW -2

1/2

CIRCUIT SYMBOL or DRWG. NO.	PARTS NAME	DESCRIPTION	Q'TY
1	04:A36382A	WEIGHING PAN (S)	
2	04:A36384A	PAN SUPPORT	
3	04: 04:B42074A	CENTER CUSHION	
4	06:B42075A	SIDE CUSHION	
5	07:A10133A	TOP COVER	
6	07:A36354A	CABLE COVER (A)	
7	04:A36414A	LOAD ANGLE (S)	
8	04:B42652-2	WASHER	
9	LC:109-500	LOAD CELL FC-500	
(9)	LC:109-1000	LOAD CELL FC-1000	
10	04:B42651-2A	LOAD CELL SPACER	
11	04:B42072-2A	LOAD CELL FIXING PLATE	
12	04:B42076A	STOPPER PLATE	
13	04:A36646	BATTERY GUIDE PLATE	
14	07:A21032A	BATTERY PACK HOLDER	
15	07:B42650	BATTERY HOLDER PANEL	
16	00:B42655	SPRING	
17	04:B42774	BATTERY LOCK PLATE	
18	05:B42653	50mm SPACER	
19	7PZ:2286	MAIN BOARD	
20	05:A44614	30mm SPACER	
21	10:13C	LEVEL VIAL	
22	03:A10129A	BASE	
23	07:A45469E	ADJUSTABLE FOOT	
24	06:A45509A	ADJUSTABLE FOOT RUBBER	
25	02:B42077A	OPTION BLANK PANEL (A)	
26	02:B42078A	OPTION BLANK PANEL (B)	
27	TM:T-10	EARTH TERMINAL	
28	04:B42080A	DISPLAY SUPPORT	
29	05:B42082A	LOCK SCREW	
30	07:A10135A	DISPLAY LOWER COVER	
31	04:B42079A	NUT PLATE	
32	02:A36355A	CABLE COVER (B)	
33	07:B42031	DISPLAY FOOT	
34	7PZ:2287	DISPLAY BOARD	
35	07:A10134A	DISPLAY TOP COVER	

FC-500/1000 EXPLODED VIEW -2

[illegible]



EXPLODED VIEW -2