MAINTENANCE MANUAL

EW-A/B SERIES

A&D MERCURY PTY. LTD.
32 DEW ST, THEBARTON, S.A., 5031

1. INTRODUCTION

This Maintenance Manual concerns various models from the A & D range of electronic precision balances.

EW-60A/B, EW-300A/B, EW-600A/B and EW-3000A/B.

This manual should be used in conjunction with the Instruction Manual sent with the balances.

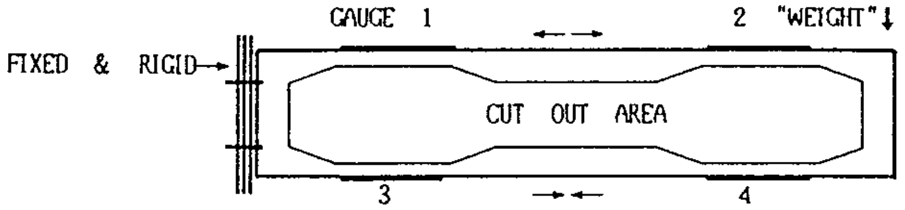
If the display is blank check whether the internal, or any external, fuse has blown and change if necessary. Check the power cord for continuity and insulation between Live, Neutral and Earth. Check that the adapter is receiving the correct AC input voltage.

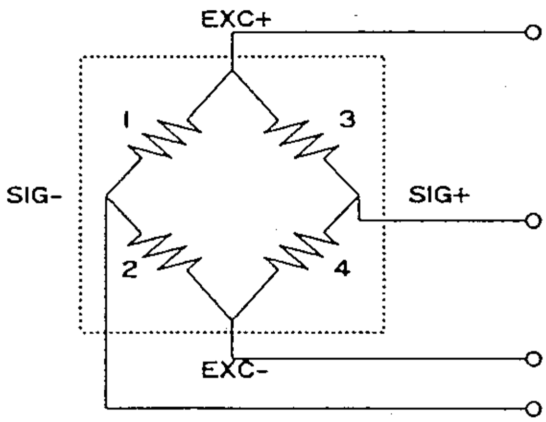
If the display panel is working check that all the display segments are functioning correctly. They should all switch on when the power switch is switched on.

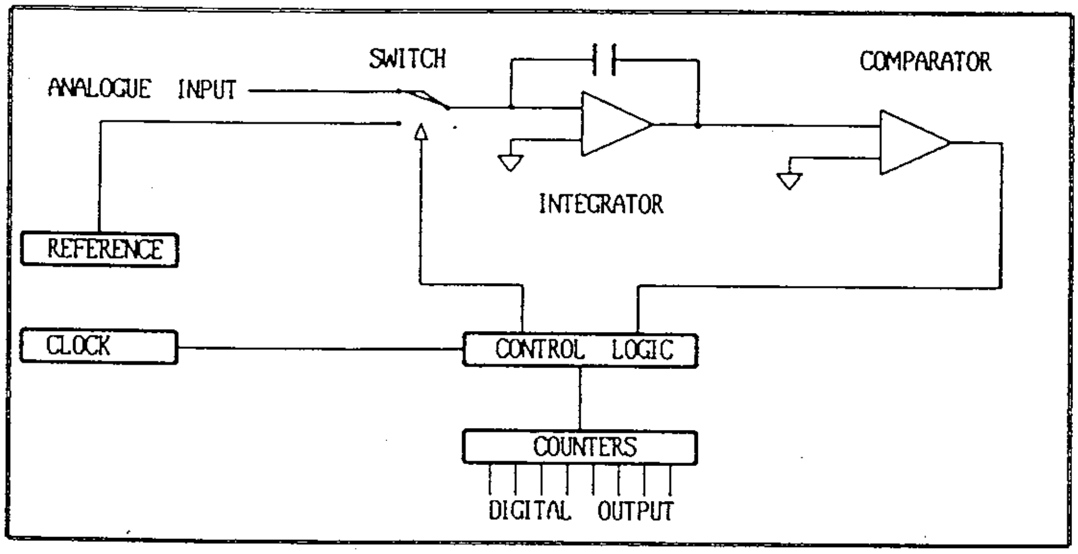
Briefly the EW range of electronic balance is based on the principle of detecting a weight via a load cell transducer. These load cells work by the use of strain gauges bonded to the top and bottom surfaces of the cell. When a weight is applied from above the upper surface undergoes tension and the lower surface compression, these stress forces are transmitted to the strain gauges which register the stress in the form of a change in resistance which produces a small analogue voltage signal. This output is amplified and then converted in a dual slope A/D converter to a digital signal which can be operated upon by a microprocessor. An electronic balance can thus be damaged if some physical shock or twisting force damages the ability of the load cell accurately to transmit stress to the strain gauges, or if an electronic component either degrades over time or is damaged by (for instance) a short circuit. The EW series are reasonably simple to repair as mechanical problems will probably be limited to the load cell and electronic problems to the hybrid. In either event repair of these components is impossible so they must be replaced and the balance must then be fully recalibrated.

Load Cell & Analogue to Digital Conversion

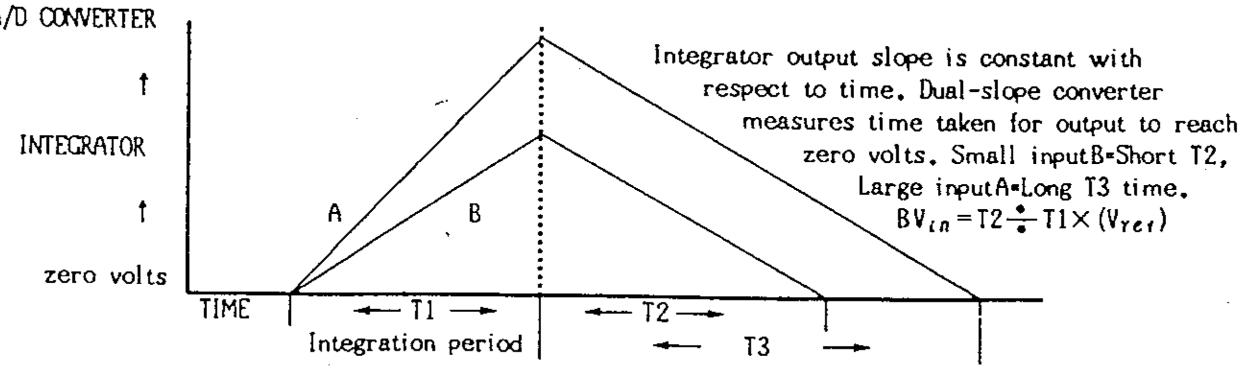
LOAD CELL







A/D CONVERTER



A-1 Adjustment Procedures

1. Analogue Check

Observe the location requirements listed in the Instruction Manual, make sure that the balance is level and warm it up for at least 30 minutes. Open the case and select gram mode, don't disconnect the keyboard.

(A: Zero)

If the POWER switch is turned on with the D37 diode connected (SPAN CHECK mode) and if both the ZERO and TARE switches (SW 1 and 2 of PZ690) are then simultaneously pressed, an internal-count display mode of 1/60,000 will be obtained. If the power switch is pressed in normal weighing mode, without D37, the display mode of 1/60,000 can still be obtained by attaching D37 afterwards.

In this display mode (1/60,000), the load cell output voltage is converted from an analogue value into a digital value less the values currently set via the zero dip-switch segments and the two zero links located to the right of the dip-switch assembly, Jumper 1 and Jumper 2. In this mode place the pan support and pan on the balance and then adjust zero: Only adjust zero if the displayed value is stable and not oscillating by more than ±1 min. div.

Zero calibration values to be subtracted from the displayed value are obtained by switching off dip-switch segments and by cutting Jumpers 1 & 2 sequentially. See the table below and cut the link or switch off the dip-switch with the negative value which is closest to, but less than, the positive display value. As the lowest dip-switch value is -16 counts, set the zero point so that the display reads between 0 and ±5 counts.

D12	Jumper 2	Cut = - 32768
D11	Jumper 1	Cut = - 16384
D10	Dip Switch 10	OFF= - 8192
D9	" 9	OFF= - 4096
D8	" 8	OFF= - 2048
D7	" 7	OFF= - 1024
D6	" 6	OFF= - 512
D5	" 5	OFF= - 256
D4	" 4	OFF= - 128
D3	" 3	OFF= - 64
D2	" 2	OFF= - 32
D1	" 1	OFF= - 16

*Jumper 2 is nearest the rear panel of the balance.

* THUS:- In order to be able to achieve zero adjustment, a "+" value must be displayed within 65,530 counts when both jumpers are in and all the dip-switches are turned on. If the count value is outside this range the balance has a major problem!

(B: Span)

Exercise the load cell with a maximum capacity standard "weight" (mass) by putting it on the weighing pan at least 3 times. After this make a note of the zero point value and then read the displayed internal count weight value for a maximum capacity load. Subtract the zero value (eg 0.07) from the weight value (eg 135.50), ignore the decimal point and then convert the result (ie 13543) to hexadecimal notation (=34E7).

NOW:- 2EE00000 divided by the hex. value (ie 34E7) equals Span (=E2D54).
Round the final digit up or down (E2D5) and then refer to the 16 span diodes:-
D16, 15, 14, 13; D20, 19, 18, 17; D24, 23, 22, 21; D28, 27, 26, 25.
In this example the four hex digits E2D5 = 1110, 0010, 1101 & 0101 binary.
Diodes D16 to D13 deal with the last digit (0101), D20 to D17 the second to last (1101) etc. Regard 1 as a disconnected diode and 0 as a connected diode.
Thus leave D16 and D14 connected and cut D15 & D13 (0101) and so on.
Test by cutting just one leg of each diode so that they can be reconnected with ease if you make a mistake. Finally cut both legs and remove the diodes.

(C: Normal Mode)

After completing zero and span adjustments disconnect D37, the span check diode, in order to return the balance to normal weighing mode with a display resolution of 1/3,000. Check that "0" is displayed without any weight on the weighing pan, if the zero value has drifted by ≤ ±2 counts press the ZERO key-switch (SW 2 of PZ690). Then test that the maximum capacity weight value is accurately displayed when the standard metric weight is on the pan.
If the weight value displayed is incorrect, repeat zero and span adjustments.
Change the display to ounces avoirdupois and check the conversion.
1 gram = about 0.03527oz avoir.

The display will be to 2 decimal places with D33 connected/D34 disconnected and to 1 decimal place with D33 disconnected/D34 connected.
Minimum divisions are set as follows:

60g	D34, D35 cut	10 digit x 2
300g	D33 cut	10 digit x 1
600g	D33, D35 cut	10 digit x 2
3000g	no cut	x 1

(D: Linearity)

Next, check linearity by using the following metric weights.

60

Weight	Display
0	
30	
60	
30	
0	
60	

300

Weight	Display
0	
150	
300	
150	
0	
300	

600

Weight	Display
0	
300	
600	
300	
0	
600	

3000

Weight	Display
0	
1,500	
3,000	
1,500	
0	
3,000	

Measure in accordance with these tables and then check that the following standards are satisfied.

Span (max. capacity) ± 0 count (Within ± 1 count, use the span trimmer but if outside this range, repeat span adjustment.)

Linearity (½ capacity) ± 1 count

* When adjusting span by turning the span trimmer, the zero point tends to shift. Zero the display with the zero key and repeat the calibration procedure until you obtain an exact maximum capacity display and a clean return to zero. After completing span adjustment, attach D37 (span check LED) and recalibrate the zero point as before.

Adjust the span trimmer within the range shown below. If it is necessary to go outside this range, recalibrate span as before. This trimmer is provided for correcting possible differences in gravitational acceleration, air buoyancy etc. at different locations. Such differences are quite small, for instance gravitational acceleration deviates from $9{\cdot}80665\ m/s^2$ by only about $\pm0{\cdot}3\%$.

○If the trimmer is turned fully clockwise or anticlockwise, span will deviate by ±9 counts and the zero point by about ±30 counts.

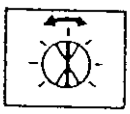


Fig. 1

(E: Corner load check)

Place a mass which weighs ¼ the maximum capacity at each point shown in the figures below and check that any deviation from a center load value is ≤±1 count. Use stacked "weights" so that there is only one loading point.

EW60	30g weight
EW300	150g weight
600	300g weight
3000	1, 500g weight

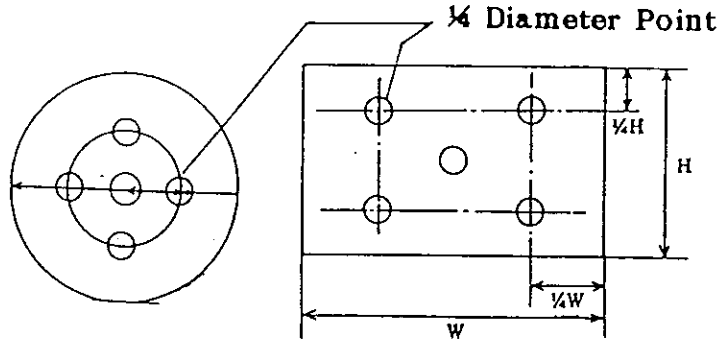


Fig. 2

(F: Reproducibility)

Repeatedly place a maximum capacity mass on the pan 5 or 6 times, and check that any error is within ±1 count.

EW60	60g
300	300g
600	600g
3000	3000g

(G: Keys)

Check that the ZERO switch (SW 2 of PZ690) works within 2% of max. capacity.

EW60	1.20g	With a 1g weight, "0" is displayed and the CENTER OF ZERO annunciator will switch on.
300	6.0g	With a 5g weight, "0" is displayed and the CENTER OF ZERO annunciator will switch on.
600	12.0g	With a 10g weight, "0" is displayed and the CENTER OF ZERO annunciator will switch on.
3000	60.0g	With a 50g weight, "0" is displayed and the CENTER OF ZERO annunciator will switch on.

Check that the TARE switch (SW 1 of PZ690) works between +1 minimum división and maximum capacity when the display is stable.

EW60	With a 50g weight, "0" should be displayed and the NET annunciator should switch on.
300	With a 200g weight, "0" should be displayed and the NET annunciator should switch on.
600	With a 500g weight, "0" should be displayed and the NET annunciator should switch on.
3000	With a 2, 000g weight, "0" should be displayed and the NET annunciator should switch on.

Zero resetting is carried out by turning on the power with a weight greater than 2% of the max. capacity of the balance on the weighing pan.

Parts List

MAIN BOARD

ANY PRICES QUOTED WILL BE IN JAPANESE YEN (¥)

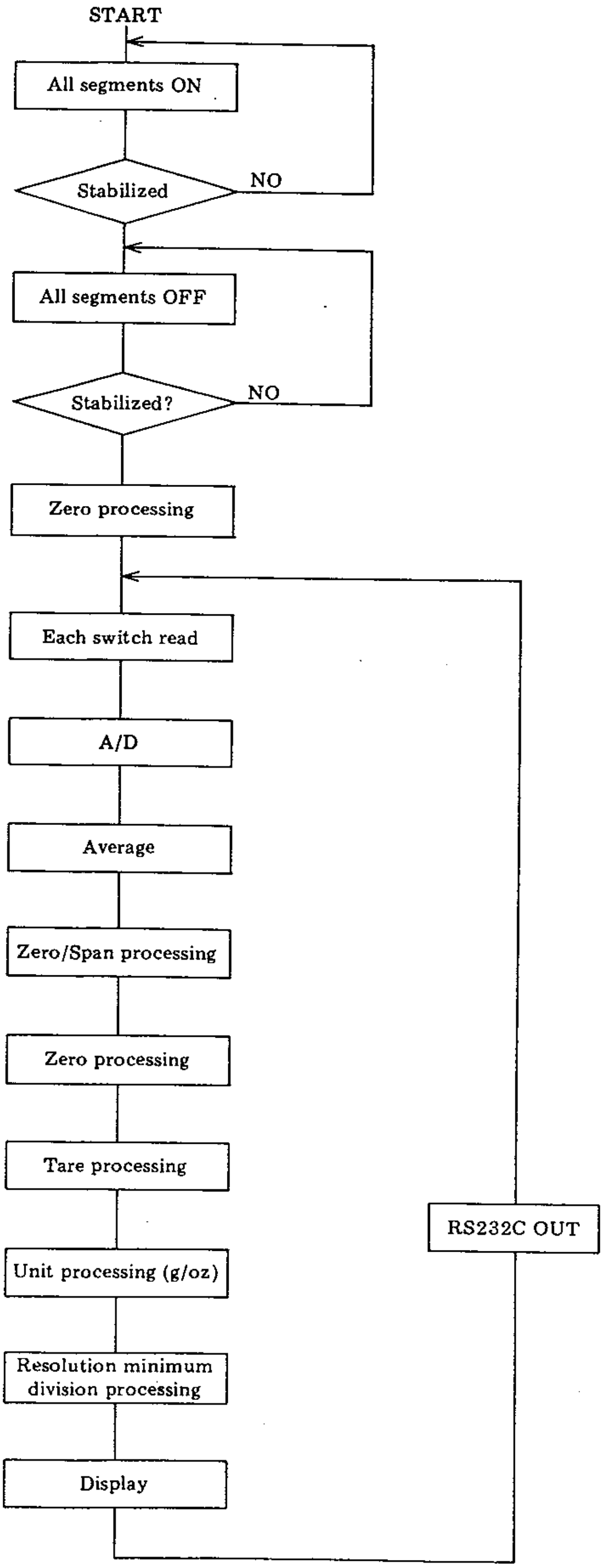
CIRCUIT SYMBOL OR DRWG. NO.	LOCATION	PARTS NAME	DESCRIPTION	UNIT COST	Q'TY
PZ:689	PZ:689	PZ:689	MAIN BOARD FULLY ASSEMBLED		
"	"	PC:689E	PRINTED CIRCUIT BOARD		
MF	"	MF:AMZ-14	HYBRID		
C3	"	CC:0.0022U	CAPACITOR 0.0022μF 50V		
C2,5,11,12,13	"	CC:0.022U	" 0.022μF 50V		
C6	"	CK:SM10VB47	" 47μF 10V		
C4	"	CK:SM25VB220	" 220μF 25V		
C1		CK:SM35VB470	" 470μF 35V		
C7		CM:E1105KN	" 1μF 100V		
C9,10		CM:E1225KN	" 2.2μF 100V		
C8		CS:08S0.068U50V	" 0.068μF 50V		
D1〜37		DI:1S2473	DIODE		
LCD		ED:LT5064-35P3	DISPLAY PANEL		
J3		EJ:0470-01-230	DISPLAY PANEL HOLDER		
FH		FH:85PN0819	FUSE HOLDER		
FS		FS:EAWK-200MA	FUSE		
J4,5		JD:230-05-30	CONNECTOR		
J1,2		JT:171825-3	"		
Q1		QT:A473Y	TRANSISTOR		
Q2		QT:C1815Y	"		
R8		RC:2.7K	RESISTOR 2.7K ¼W		
R5		RC:22K	" 22K ¼W		
R7		RC:27K	" 27K ¼W		
R2		RC:3.9K	" 3.9K ¼W		
R1		RC:33K	" 33K ¼W		
R9		RM:31.6KF	" 31.6K ¼W ± 100 ppm/°C		
R10		RM:4.64KF	" 4.64K ¼W ± 100 ppm/°C		
R6		RV:H101	POTENTIOMETER		
R4		RV:2K102	POTENTIOMETER		
SW1,2		SD:KSD10	SWITCH		
SW3		SP:PSFOP-A2K	"		
U1		UA:MB3761	VOLTAGE COMPARATOR		
X1		XT:HC18/U2MHZ	CRYSTAL 2MHz		
		04:A44676	HEAT SINK		
		07:A44234	DISPLAY PANEL HOLDER		

SWITCH BOARD

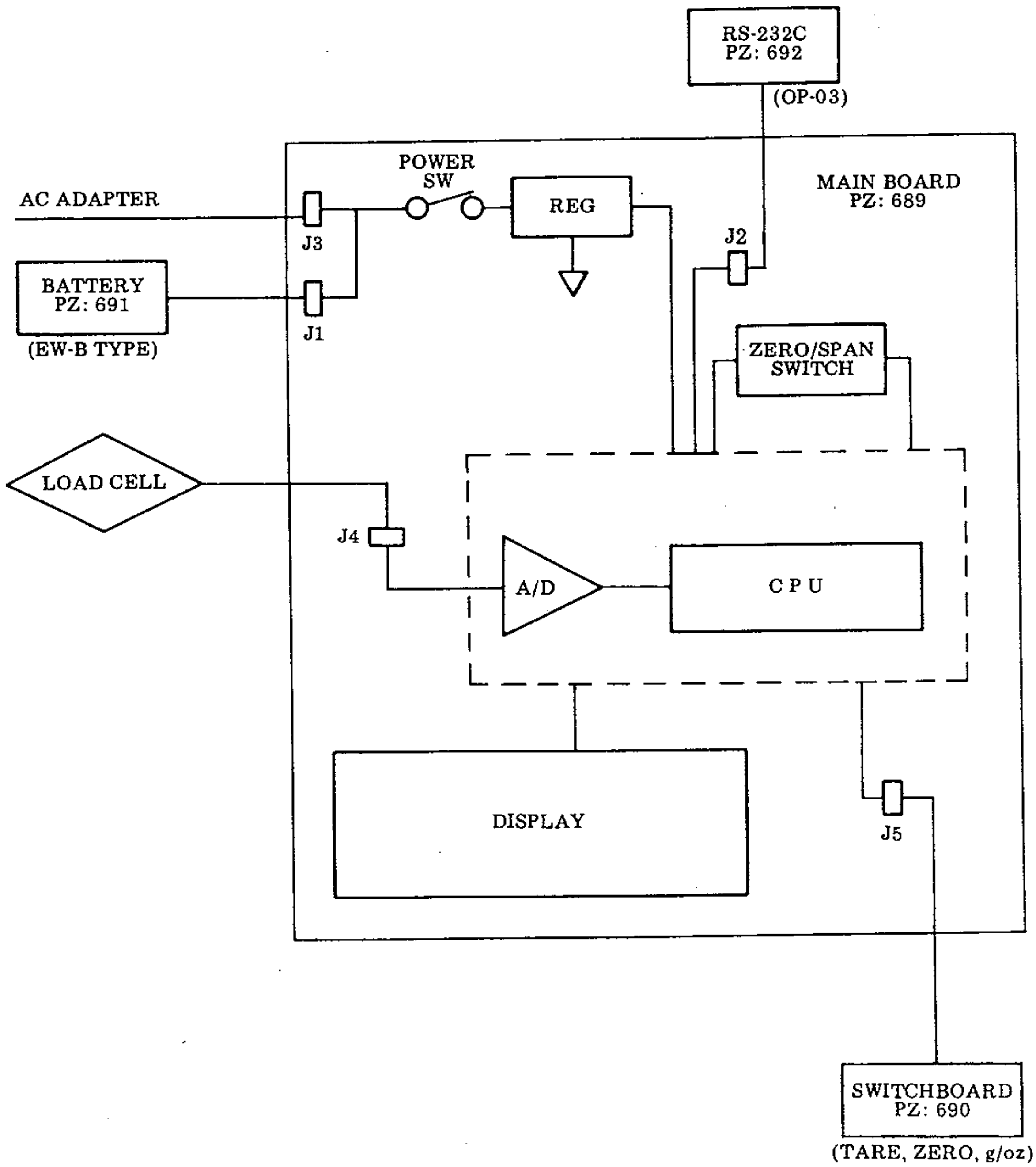
ANY PRICES QUOTED WILL BE IN JAPANESE YEN (¥)

CIRCUIT SYMBOL OR DRWG. NO.	LOCATION	PARTS NAME	DESCRIPTION	UNIT COST	Q'TY
PZ:690	PZ:690	PZ:690	SWITCH BOARD FULLY ASSEMBLED		
"	"	PC:690A	PRINTED CIRCUIT BOARD		
SW1~3	"	SK:KHC10902	SWITCH		
BATTERY BOARD					
PZ:691	PZ:691	PZ:691C	BATTERY BOARD FULLY ASSEMBLED		
	"	PC:691C	PRINTED CIRCUIT BOARD		
D1		DI:F14A	DIODE		
BAT		EB:10N-500AA	NiCd BATTERY PACK		
J2		KO:276	CONNECTOR CABLE		
R1		RC:1/2100R	RESISTOR 100 ½W		
R2		RE:MOR2B15RJ	" 15 2W		
SW1		SS:SSP1x2NB5x8	SLIDE SWITCH		
OPTION-03					
PZ:692	PZ:692	PZ:692	OP-03 BOARD FULLY ASSEMBLED		
	"	PC:692A	PRINTED CIRCUIT BOARD		
C1	"	CC:470P	CAPACITOR 470pF 50V		
C2,3	"	CK:SM25VB22	" 22μF 25V		
D1,2	"	DI:1S2473	DIODE		
D3	"	DZ:05Z13	ZENER DIODE		
J1	"	JA:25-30-335S	CONNECTOR		
J3	"	KO:277	CONNECTOR CABLE		
Q1	"	QT:C1815Y	TRANSISTOR		
R3	"	RC:1K	RESISTOR 1K ¼W		
R2	"	RC:5.6K	" 5.6K ¼W		
R1	"	RC:56K	" 56K ¼W		
U1	"	UC:4049	CMOS		
U2	"	UT:75188	TTL		

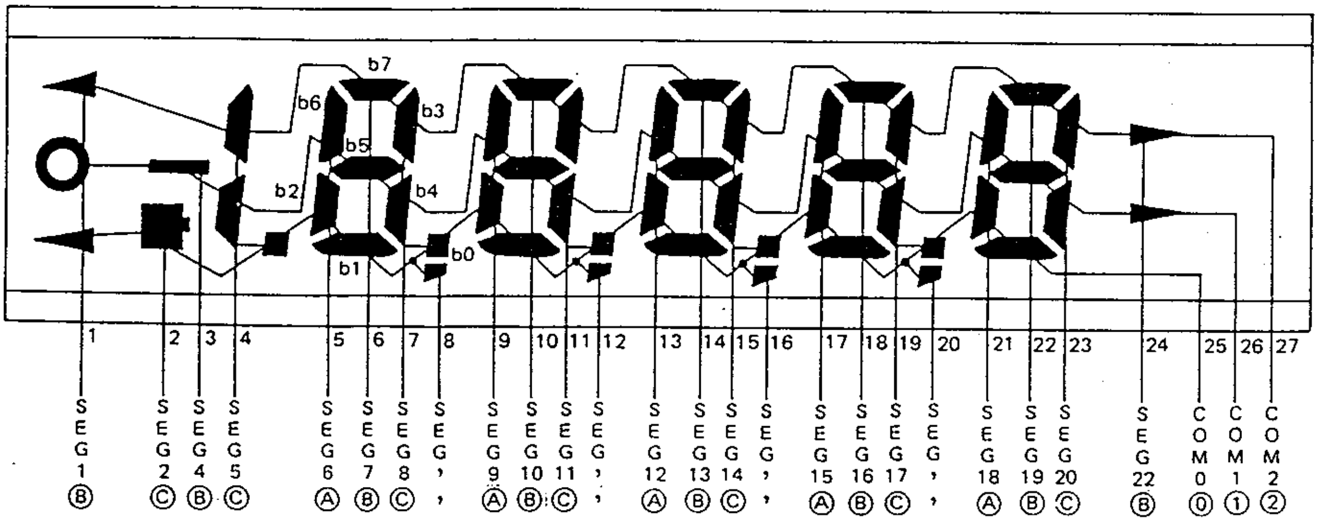
A-2 EW Main Flow Chart



A-3 EW Block Diagram

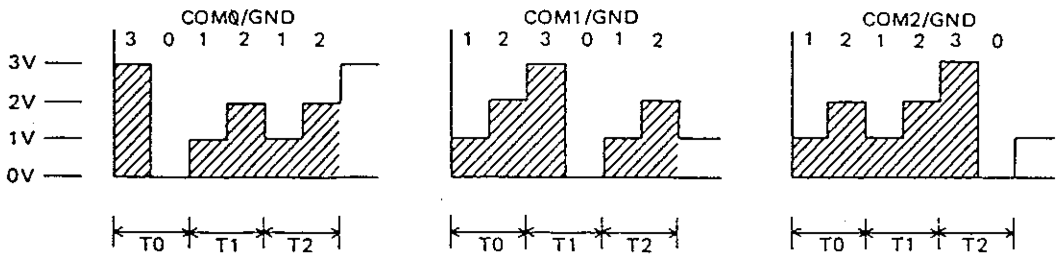


A-4 LCP Pattern Timing Chart



LCD: Each display appears by means of 3 COMMON wires and 3 segment wires per digit.

COMMON: Stepped wave forms at intervals of 24 msec are output with their phases shifted by 1/3.

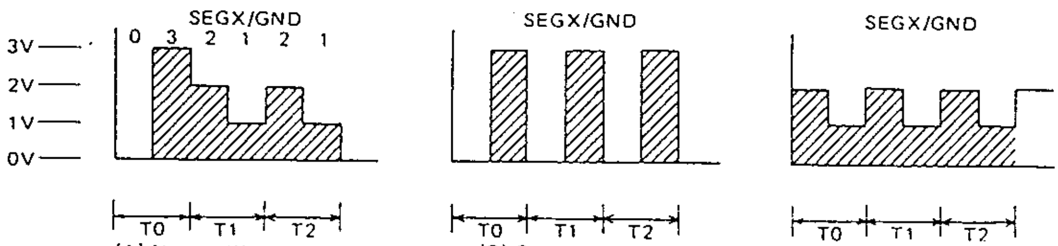


COM 0 is selected for T0 for about 8 msec.

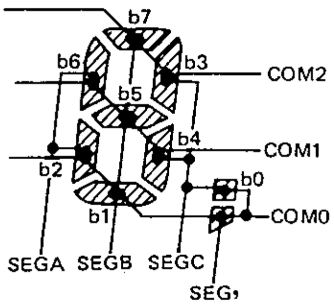
COM 1 is selected for T1 for about 8 msec.

COM 2 is selected for T2 for about 8 msec.

Although the segments also output stepped waves at intervals of 24 msec, their wave forms vary depending on characters displayed (combination of ON/OFF wave forms).



(A) Normal Wave Form (B) ON Wave Form (C) OFF Wave Form



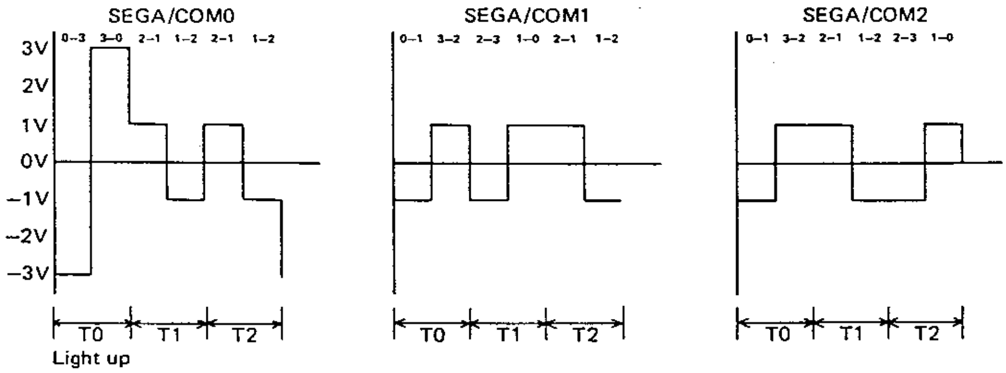
Assuming that the crossing positions of each COMMON and segment are b0 through b7;

COM 2: B7 and B3 (one short)
COM 1: b6, b5 and b4
COM 0: b2, b1 and b0
SEG-A: b6 and b2 (one short)
SEG-B: b7, b5 and b1
SEG-C: b3, b4 and b0

When displaying the decimal point " , ", short-circuit "SEG," with "SEG C" and activate together with "b0". When not displaying " , ", short-circuit with "COM 0" and deactivate.

Example) If the wave form (A) is entered to "SEG A", only "b2" will activate.
If the wave form (B) is entered to "SEG B", "b7", "b5" and "b1" will activate.
If the form (C) is entered to "SEG C", none of "b3", "b4" and "b0" will activate.

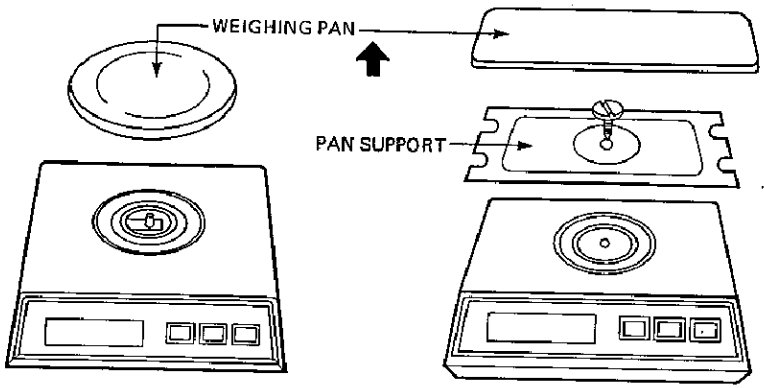
The following figures show voltages actually impressed to "b0" through "b7" of the LCD, when viewing each SEG terminal through a synchroscope with COM grounded.
Entering the wave form (A) to "SEG B" .



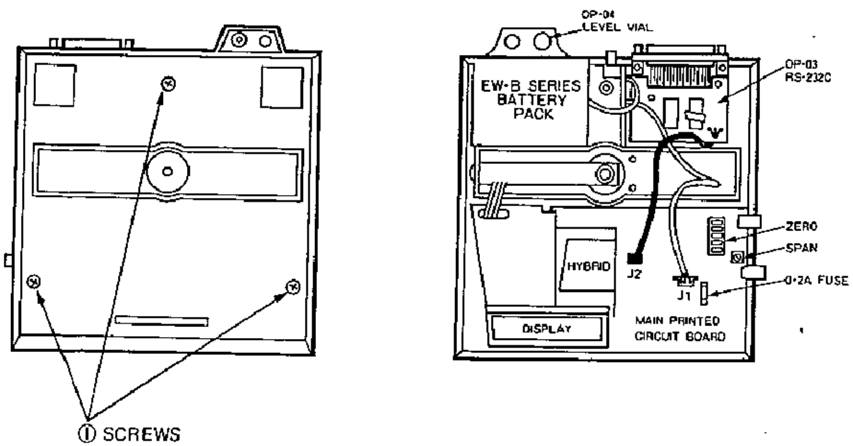
"SEG A" and "COM 0" will cross with each other.
Only "b2" will activate and the rest off.

B-1 DISASSEMBLY

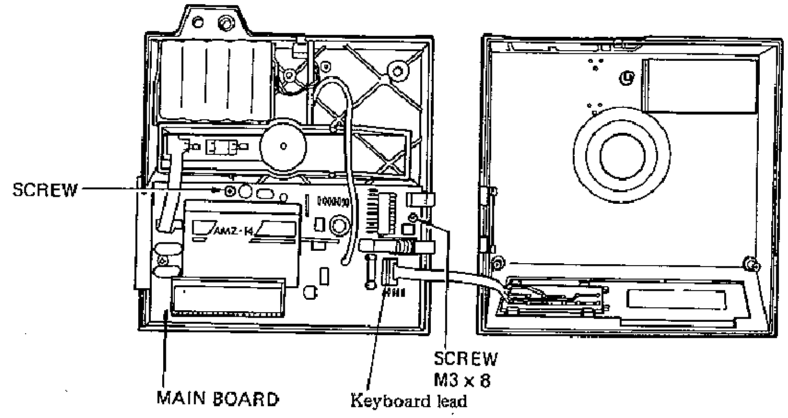
1 Removing the pan and pan support.



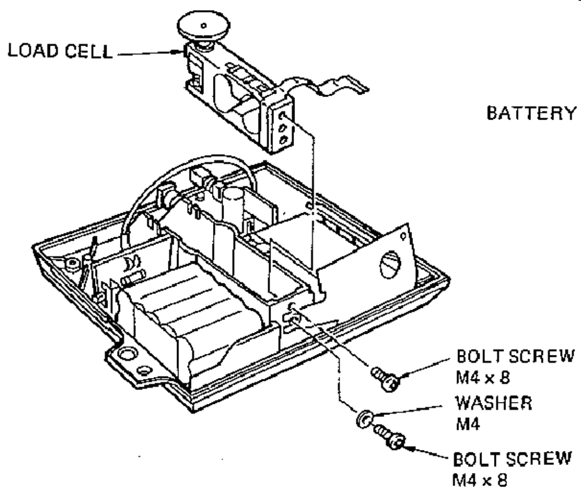
2 Opening the case.



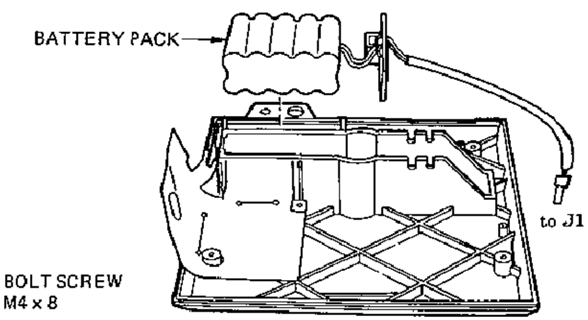
3 Removing the main board.



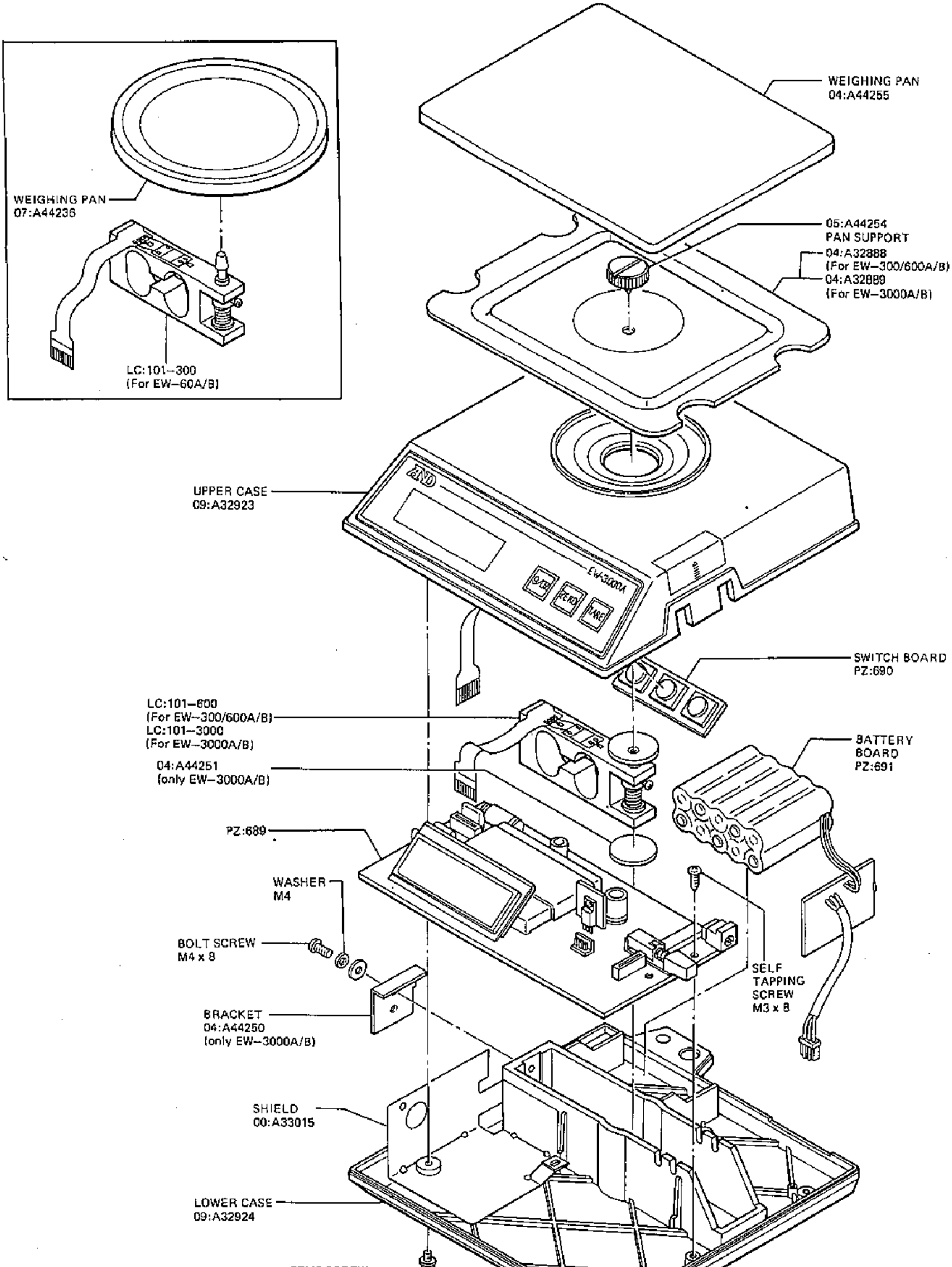
4 Removing the load cell



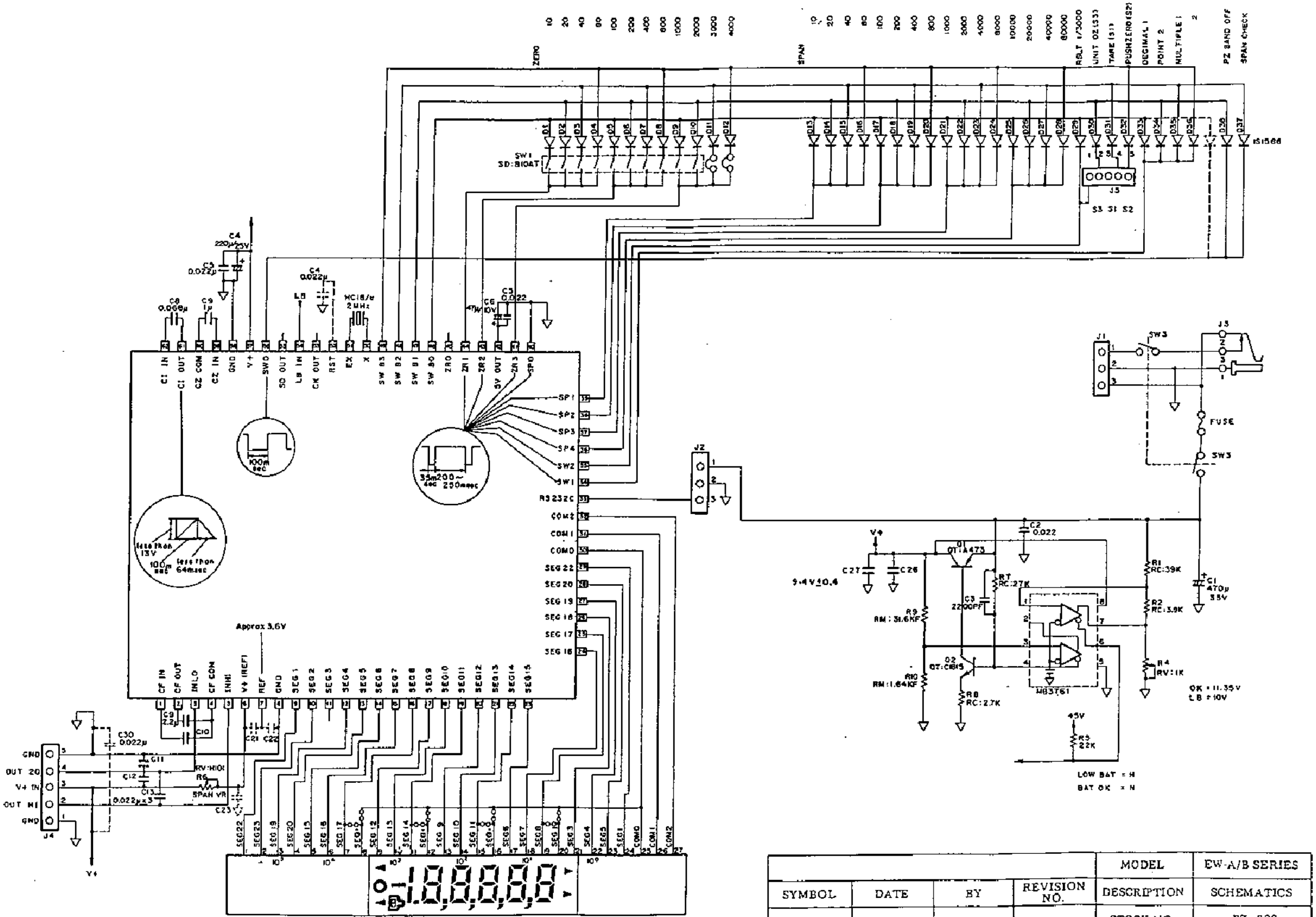
5 Removing the N.Cd battery pack.



C－1 EXPLODED VIEW

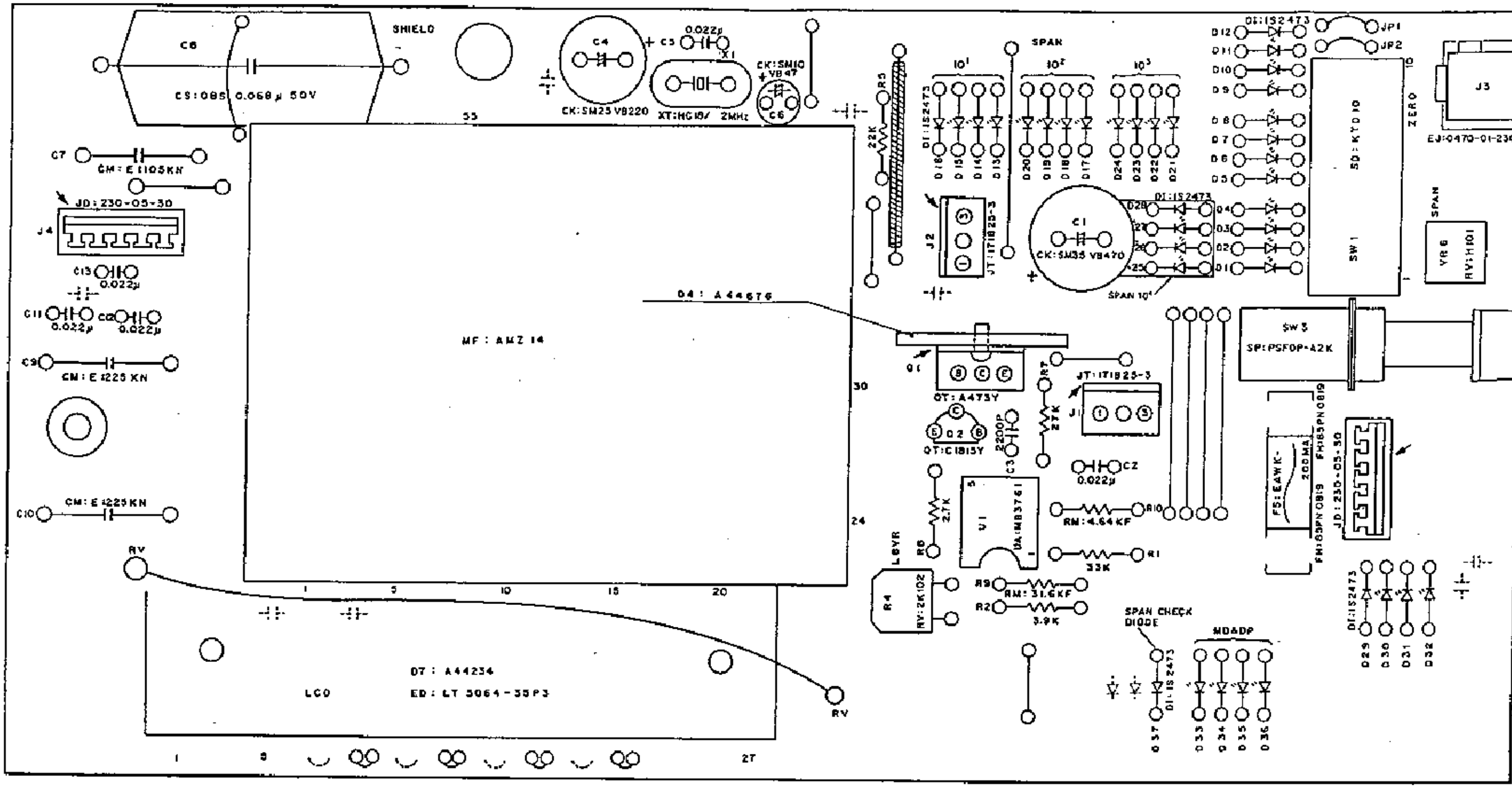


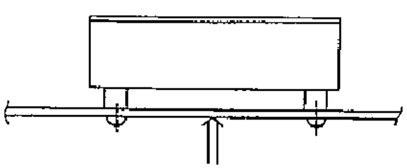
D SCHEMATICS

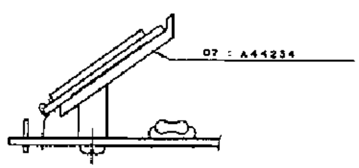


SYMBOL	DATE	BY	REVISION NO.	MODEL	EW-A/B SERIES
				DESCRIPTION	SCHEMATICS
				STOCK NO.	PZ: 689
				DRWG. NO.	

D SCHEMATICS

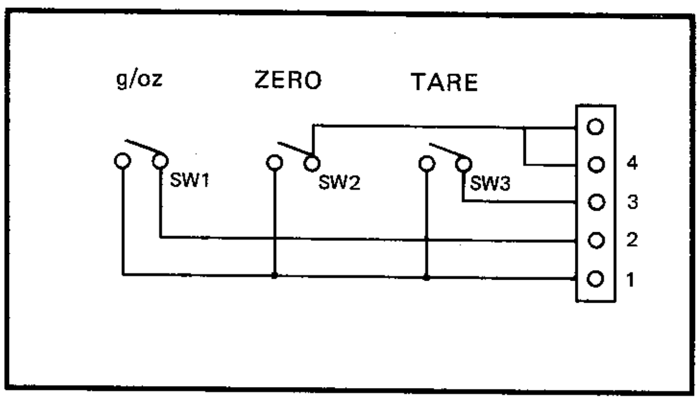


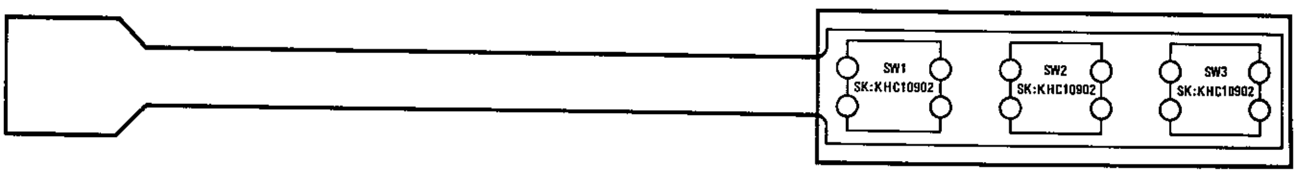




				MODEL	EW-A/B SERIES
SYMBOL	DATE	BY	REVISION NO.	DESCRIPTION	SCHEMATICS
				STOCK NO.	PZ:689
				DRWG. NO.	

SWITCHBOARD

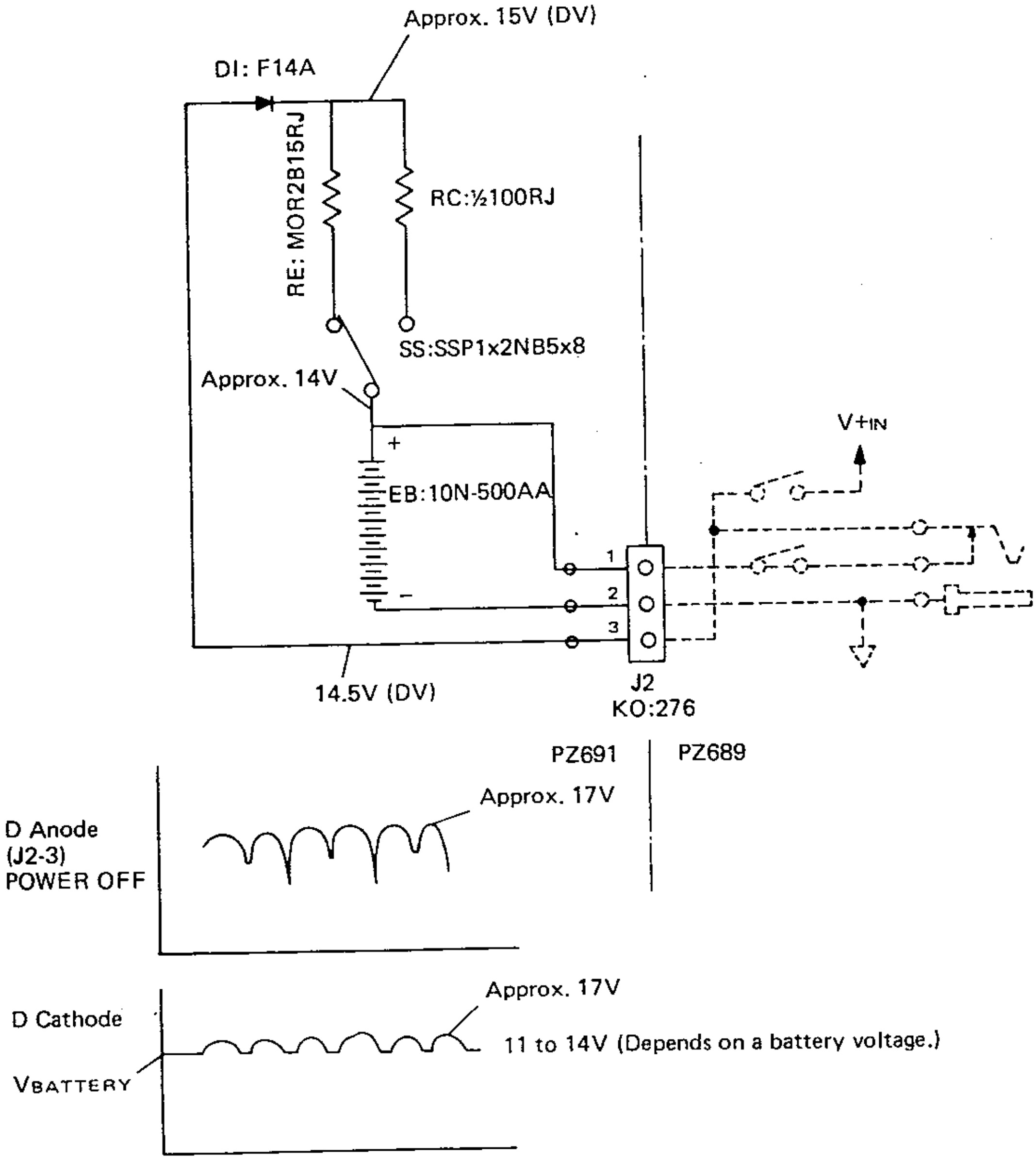




				MODEL	EW-A/B SERIES
SYMBOL	DATE	BY	REVISION NO.	DESCRIPTION	SCHEMATICS
				STOCK NO.	PZ:690
				DRWG. NO.	

BATTERY BOARD

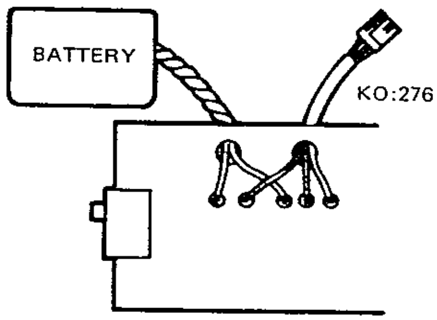
Voltage When Charging Battery with Power Turned OFF

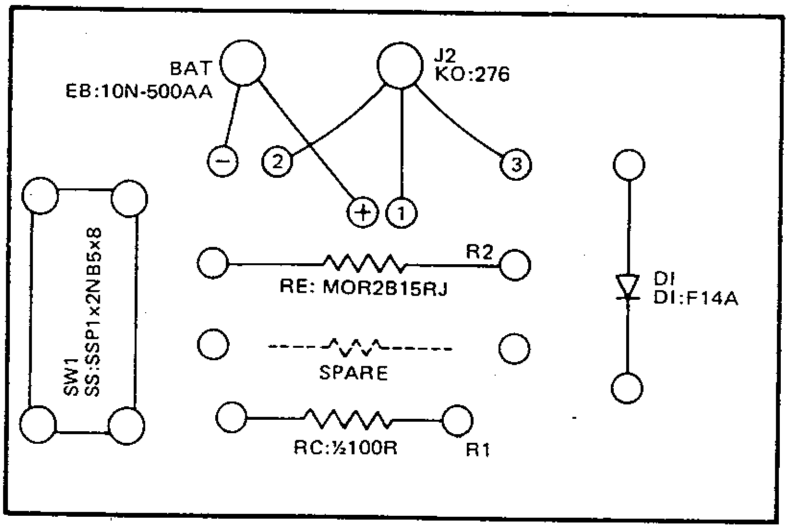


				MODEL	EW-A/B SERIES
SYMBOL	DATE	BY	REVISION NO.	DESCRIPTION	SCHEMATICS
				STOCK NO.	PZ:691
				DRWG. NO.	

D SCHEMATICS

PZ 691

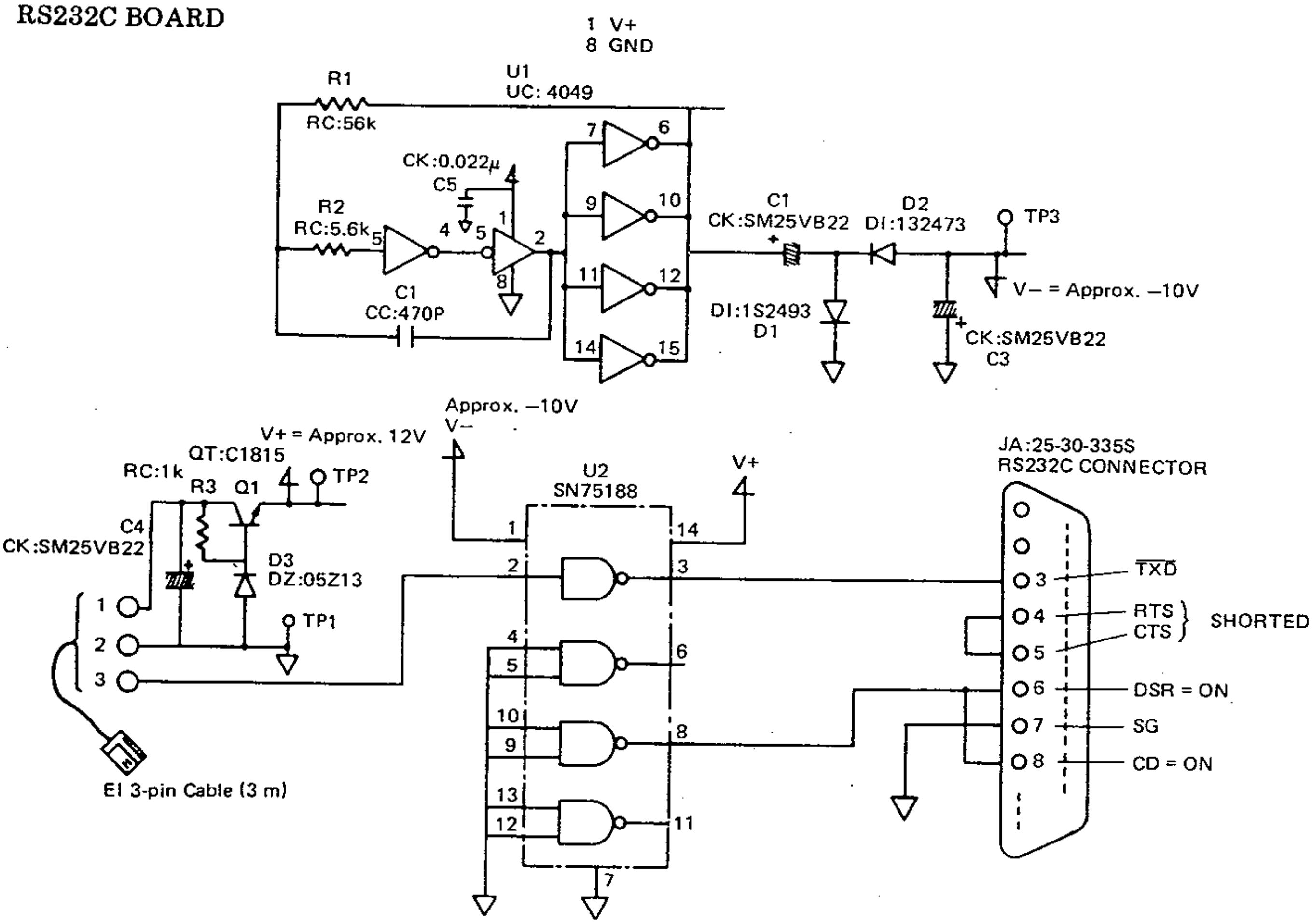




				MODEL	EW-A/B SERIES
SYMBOL	DATE	BY	REVISION NO.	DESCRIPTION	SCHEMATICS
				STOCK NO.	PZ:691
				DRWG. NO.	

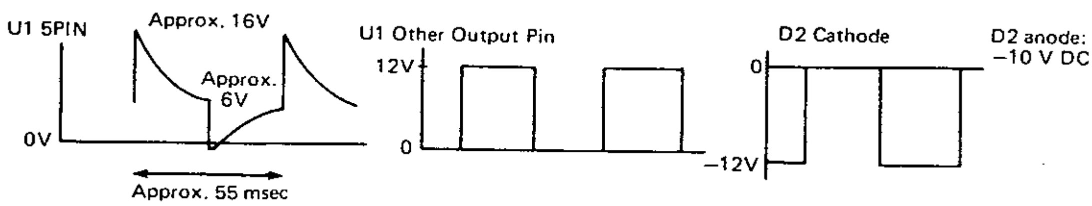
D SCHEMATICS

RS232C BOARD

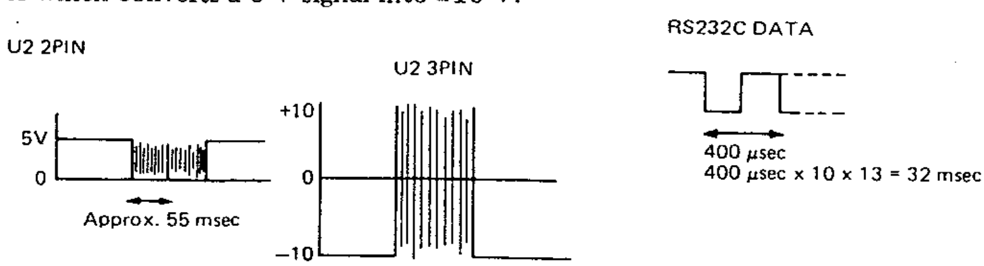


Control the "+" power supply to approximately 12 V with a regulator.

U_1 denotes an oscillator which generates the "—" power supply. (approx. —10 V at 15 kHz to 20 kHz) (approx. —10 V at 15 kHz to 20 kHz)

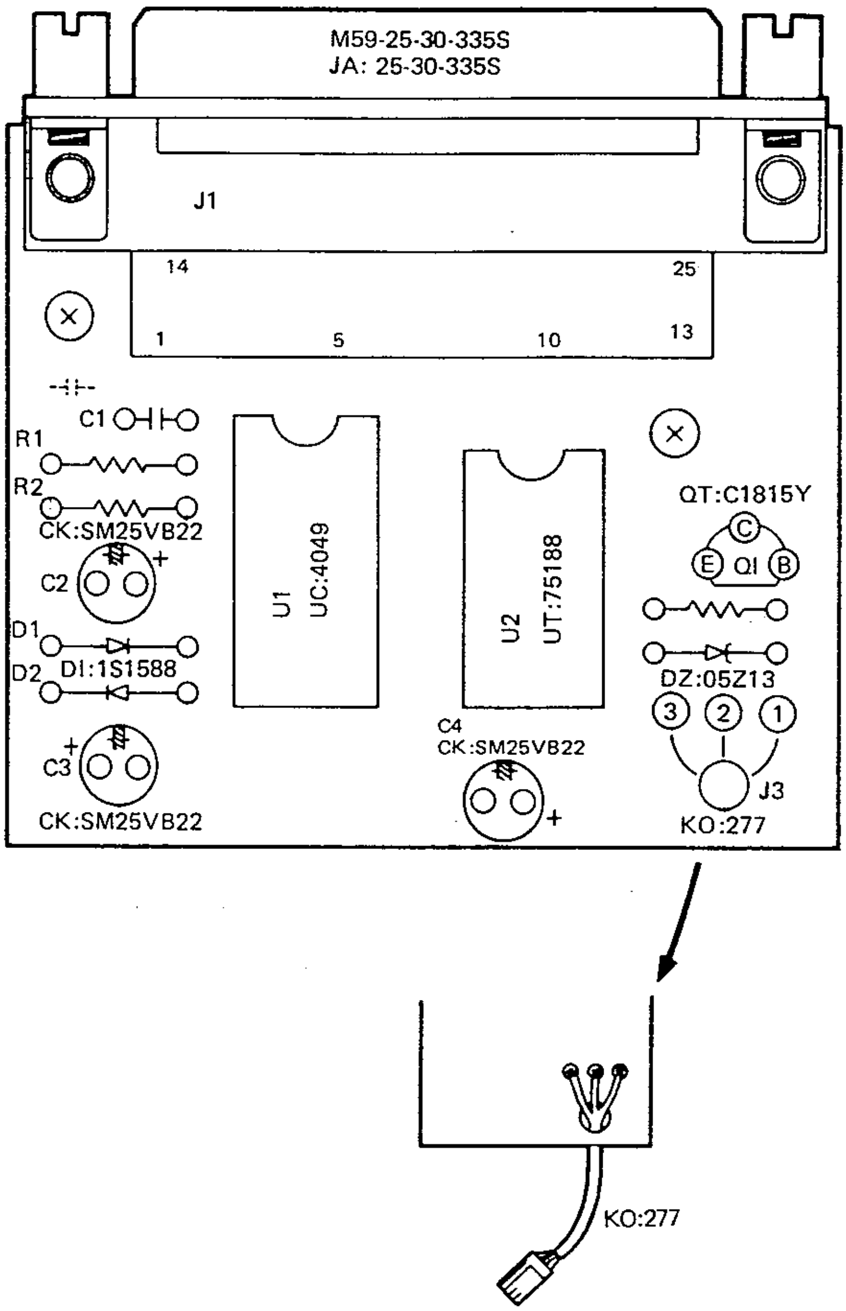


U_2 denotes a driver which converts a 5 V signal into ±10 V.



				MODEL	EW·A/B SERIES
SYMBOL	DATE	BY	REVISION NO.	DESCRIPTION	SCHEMATICS
				STOCK NO.	PZ:692
				DRWG. NO.	

D SCHEMATICS



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