MAINTENANCE MANUAL

ER SERIES

MODELS: ER-60A
ER-120A
ER-180A
ER-600C

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1-1 INTRODUCTION

This Maintenance Manual concerns four different models from the electronic precision analytical balances; ER-60A, ER-120A or 600C & ER-180A.

The ER series of high precision, analytical class balances is the product of years of research, design, development & in-field testing. Every component has been carefully chosen to permit optimum performance from the entire unit and each balance undergoes several levels of quality control before leaving the factory.

These computerized balances are housed in attractively styled cases with draught proof weighing chambers and have the following features:-

1. Ultra stable weighing.
2. Automatic calibration via an internal standard weight.
3. Convenient optional output interfaces, serial EIA-RS-232C/Current Loop or parallel BCD.
4. Ability to tare up to the max. capacity of the balance via soft-touch key switch or via remote contact closure.
5. Easy-to-read cobalt blue fluorescent display.
6. Clear annunciators to indicate the status of various functions.
7. Under-hook weighing capability.

SPECIFICATIONS

BALANCE	ER-180A	ER-120A	ER-60A
MAX. CAPACITY	180g	120g	60g
RESOLUTION	0.1mg	0.1mg	0.1mg
REPEATABILITY	0.1mg (Standard Deviation)		
NON-LINEARITY	±0.1mg(Δ10g) ±0.2mg(0-180g)	±0.1mg(Δ10g) ±0.2mg(0-120g)	±0.1mg(Δ10g) ±0.2mg(0-60g)
SENSITIVITY DRIFT	±2ppm/°C (10°C→30°C)		
STABILISATION TIME	APPROX. 5 sec.(typical)		
OPERATING TEMP.	5°C→40°C (41°F→104°F)		
PAN DIAMETER	85mm/3·3"		
WEIGHING CHAMBER	178mm(W) X 154mm(D) X 186mm(H) 7·0" X 6·1" X 7·3"		
EXT. DIMENSIONS	195mm(W) X 411mm(D) X 266mm(H) 7·7" X 16·2" X 10·5"		
WEIGHT	APPROX. 11kg/24¼lb		
AC INPUT/FACTORY SET	100,115,220,240,VAC (50/60Hz) 11VA		
CALIBRATION WEIGHT	100g	100g	50g

N. B. ER-600C is a version of ER-120A. Please read this manual & the instruction manual carefully before you start any maintenance work.

SEE IF THE BALANCE CAN BE CALIBRATED

Before starting any maintenance work, see if the balance can be calibrated for span and linearity and check that the location requirements have all been satisfied.

Calibration of the balance is required when it is initially installed, when changing the installation site and additionally whenever the location conditions change. "Weight" = Mass × acceleration due to Earth gravity. The internationally adopted value for gravitational acceleration is 9·806 65 m/s^2 in a vacuum however this varies by about ±0·3% depending on how far you are from the Earth's centre 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 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 attraction. Air buoyancy (at about 1·2mg ±10% of air displaced per cm^3) and various other factors also vary from location to location and from time to time.

PREPARATION

a) Check that the balance is horizontal and that the weighing pan is clean.

b) Connect the power cable, turn on and allow a warm-up period of at least 30 minutes.

c) Try to observe as many location requirements as possible.

PROCEDURE

a) With the display reading "*0.0000*" press the "CAL"/calibration key-switch.

b) The display will now show "*CAL in*"/in calibration mode, for about 1 second.

c) This will be followed by "*CAL . . .*", do nothing but wait.

d) The next display will be "*CAL dn*"/calibration weight down, at this time you should gently lower the calibration weight on to the weighing mechanism via the lever located on the right hand side of the balance.

e) The display will show "*CAL. . .*" again and you should wait as before.

f) The next display will be "*CAL up*"/calibration weight up and you should gently lift the internal weight off the weighing mechanism via the same lever.

g) Again the display will show "*CAL. . .*" and you should wait. After a pause the display will change to "*CAL End*" which will be displayed for about 1 second.

h) The display will revert to "*0.0000*" but this time the balance will be calibrated and another standard weight placed on the weighing pan should confirm this with an exact weight display. If there is a disagreement you might like to consider factors such as dirt or condensed moisture adding to the mass of your checking weight or alternatively a slight loss of mass over time due to wear. One possibly important factor is material density of the checking weight as the less dense a material is, the more it is affected by air buoyancy. The internal calibration weight is made of non-magnetic stainless steel. Platinum-Iridium has a density of about 21·5g/cm^3, Brass about 8·4g/cm^3 and Steel about 8·0g/cm^3 (100g volume ≒ 12·5cm^3 displacing about 15mg of air @ 1·2mg/cm^3).

POSSIBLE CAUSES OF A "CAL No" NO CALIBRATION DISPLAY

A display of "*CAL no*"/no calibration, indicates that there has been a failure in the calibration procedure due to some external factor. If this occurs you should turn the display off and then on again via the ON/OFF key, and start again. Make sure that all the location requirement conditions have been met.

If the problem continues check the following possible causes:-

1. The calibration lever is down when you enter calibration mode.
2. The weighing pan is not clear when you enter calibration mode.
3. One of the flexible pivots/bearings (part number 40 on the exploded diagram) has been damaged/bent/twisted.
4. The roller bearing (part number 15) has broken so that the calibration weight cannot be moved via the calibration lever.
5. The calibration weight (part number 8) is not properly seated on the calibration weight support (part number 16). This problem may occur if the balance is moved when the calibration lever is down so that the calibration weight is not held by the calibration weight holder (part number 6).
6. Check the inner count data value for the balance with no load. See the "Adjustment of Current" paragraph in section 2-3 Mechanical Adjustment.

MEET ALL THE LOCATION REQUIREMENTS

This analytical balance is a precision instrument and, like all precision instruments, must be treated with care.

a) The weighing table must be of a solid construction and preferably made of a dense non-resonant material. The table should not be used for any other purpose but weighing.

b) The table should preferably be located in a corner of the room away from doors and windows. Corners of rooms are structurally firm and less prone to floor and air movement. People use doors (!) and thereby cause vibrations and air movements. Windows should preferably face north in the northern hemisphere or south in the southern hemisphere so that sunshine will not enter the room directly or cause the walls to radiate heat. The table should not touch the walls as it might pick up extra vibrations.

c) The air temperature should be kept at about 20°C/68°F at all times with a relative humidity level of about 50→60% (install a thermometer & hygrometer), it would be clearly undesirable to have dew forming on the calibration weight! A barometer will be necessary to find the atmospheric pressure in order to calculate the degree of air buoyancy (from the air density) exerted upon a mass of a given density. A mass will suffer a loss in weight when weighed in a gas equal to the weight of gas it displaces and this loss must be added to the weight of the sample in order to find the quantity of mass present.

d) The air should be kept as clean as possible with all air cleaners, coolers and heaters kept as far away from the weighing table as possible. Keep objects containing magnets (like loudspeakers) or radiating electromagnetic waves away from the table. Use fluorescent artificial lights as they are relatively cool. The balance should be earthed and samples to be weighed should be electrostatically discharged before weighing; static electricity, like magnetism can exert an extra, unadjusted for, force of attraction or repulsion which will contaminate weighing results.

e) The balance must be as level as you can make it so that the mass on the weighing pan can accelerate straight downwards. If the weighing table is not level turn the adjustable feet on the balance until the level vial indicates that the balance is horizontal.

SEE IF THE BALANCE CAN ACCEPT LINEARITY ADJUSTMENT

Linearity adjustment means that when an ER-180A balance (for instance) has been calibrated with a weight of 100grams, an exact weight of 50grams will display 50.0000g and an exact weight of 150grams will display 150.0000g. That is, if you imagine a graph with the X axis representing the displayed weight and the Y axis the "true" weight of exact weight Standards on the pan, any Standard placed on the pan will plot a linear (straight line) path at 45° from zero to max. capacity. It goes without saying that linearity adjustment must only be carried out under the most carefully controlled conditions.

As the internal calibration weight is made of steel please make sure that your exact standard weights are made of austenitic steel with a density of about 8000kg/m³ (8·0g/cm³). Air density at 20°C (68°F) is normally around 1·2kg/m³ (1·2mg/cm³) ±10%. Thus 100 grams of steel will occupy a volume of about 12·5cm³ and displace about 15mg of air. However 100g of brass (at ≒8·4g/cm³) will occupy about 11·9cm³ and displace only 14·28mg of air. A mass of 100g of brass will therefore seem to weigh 0·72mg more than a mass of 100g of steel. A mass of 100g of platinum-iridium (21·5g/cm³, volume 4·65cm³) displacing 5·58mg of air would seem to weigh 9·42mg more than an equal mass of steel.

METHOD OF LINEARITY ADJUSTMENT:-

1. Switch on and warm the balance up for at least 30 minutes.
2. Press the ON/OFF switch to switch off the display.
3. While pressing both CAL and TARE with your right hand, press the ON/OFF switch with your left hand in order to switch the display on.
4. Keep pressing TARE with your second finger and now press CAL two times with your index finger. After this you may release both switches and the display should change to read "*8.8.8.8.8.8.8*".
5. Press CAL once more and the display should change to "*Lnr in*" (linearity in), do nothing but wait.
6. The next display should be "*Lnr ...*", do nothing but wait.
7. The next display should be "*Lnr 50*" and at this point in time you should place your Standard accurate to 50.0000g ±0.9mg (when weighed in air) on the weighing pan and close the chamber door.
8. Press TARE and the display will change to "*Lnr ...*" followed by "*Lnr 100*" at which point in time you should remove the 50g weight and replace it with the internal 100g weight (lower the internal weight via the lever). *N.B.* ER-60 will display 50g again for this step as the internal weight is 50g. Remove the external weight and lower the internal weight.
9. Press TARE and the display will change to "*Lnr ...*" followed by "*Lnr 150*" for ER-180A and ER-120A balances. ER-60A will display "*Lnr 100*".
10. Place the 50g weight on the pan, with the 100g internal wt. =150g or with the 50g internal wt. =100g, and press TARE. The display will change to "*Lnr ...*" and then "*Lnr End*". After linearity adjustment is at an end you may remove the weights and then recalibrate the balance with the internal calibration weight. Afterwards check balance linearity with steps of 10grams; specifications are ±0.2mg from zero to maximum capacity.

PRINCIPLE OF OPERATION FOR ER ANALYTICAL BALANCES

PULSE -WIDTH (PULSE-DURATION) MODULATION (PWM)

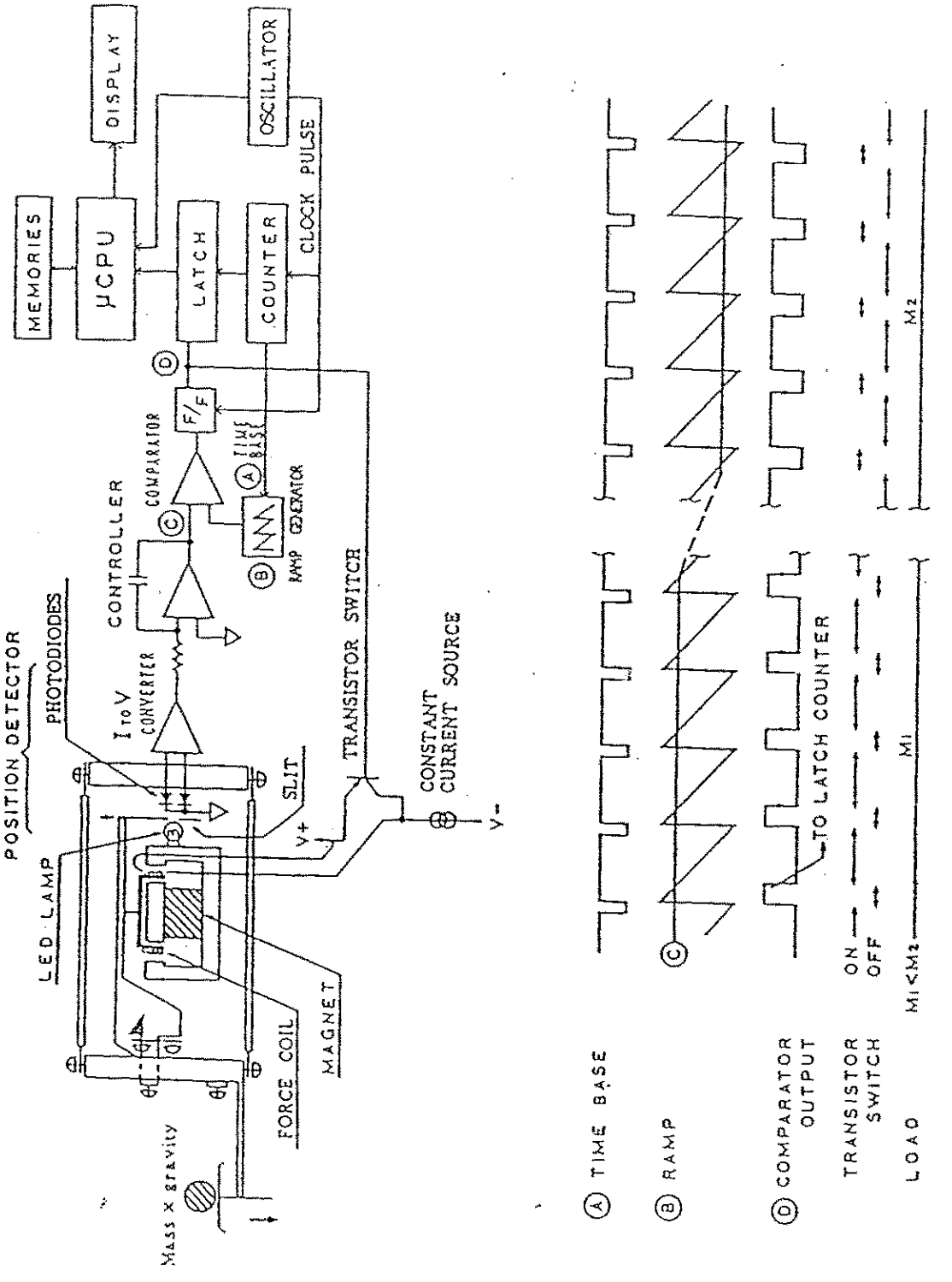
a) This balance system weighs on the principle of restoring a force coil within a magnet assembly to the position at which it started before a mass placed on the weighing pan moved it out of position under the action of gravity. This method of weighing may be known as "electromagnetic force compensation". The weighing system employs an optical device consisting of a fixed light source/photodetectors and a moving slit (connected to the force coil) to determine when force coil movement has taken place. A sawtooth ramp regulator signal is compared with the (converted/controlled) output of the position indicator (movement detector) in the "Comparator" and a square wave signal (a modulated pulse train with pulses of variable duration) is employed to indirectly increase or decrease the level of power to the force coil which will thus move either down or up respectively.

b) This section concerns the relationship between the output from the Controller at location C on the attached diagram and the two photodetecting photodiodes of the position indication/detection assembly.

Briefly if the upper photodiode is exposed to more light then the output at C will be reduced and if the lower one is exposed to more light then the output will be increased. If the photocurrent output from the two photodiodes is in a state of equilibrium then the output at C will remain constant. This output from C indirectly controls a transistor switch which in turn controls the power level to the force coil. A simultaneous calculation of the width or duration of each pulse in the modulated pulse train is made by calculating the duration of each square wave pulse at point D through counting the number of clock intervals for each pulse.

c) If a load is placed on the weighing pan, the force coil and slit will move up to expose the upper photodiode to more light from the LED. The output at C will be thus reduced, the duration or width of each comparator output pulse will be longer and thus the transistor switch will be off for longer. This means that the force coil will receive more power with a consequential increase in downward magnetic force which will restore the force coil to the starting position. The level of C and pulse width at D will now be held constant and the "weight" can be calculated for display from the number of clock intervals for each pulse. The number of clock/time intervals is clearly proportional to downward force exerted by the mass on the weighing pan which is being accelerated by gravity.

PRINCIPLE OF OPERATION FOR ER ANALYTICAL BALANCES



REAR PANEL DIP-SWITCH FUNCTIONS

This section concerns a group of 6 dip-switch segments located on a dip-switch assembly found on the rear panel of the balance. When the balance is shipped all these segments are switched OFF. In addition to having an effect on the various functions listed in the table below, these 6 segments may be used to redefine the value of the internal calibration weight. It is possible that over a period of time the internal calibration weight could permanently acquire or lose a small quantity of mass. Obviously you should be certain that any change is a permanent one and not transient (e. g. condensed water) and that the mass of the checking weights (test with at least two) has not altered. Observe all of the location requirement conditions before concluding that any change has taken place.

SEGMENT	FUNCTION	SWITCH OFF	CAL DISPLAY	SWITCH ON	CAL DISPLAY
1	PRINT COMMAND	CONTINUOUS	*1*	AUTO-PRINT	*0*
2	DISPLAY RATE	3 per sec.	*1*	10 per sec.	*0*
3	NO-MOTION SYM	ON=STABLE	*1*	OFF=STABLE	*0*
4	NO-MOTION BAND	±2 DIGITS	*2*	±4 DIGITS	*4*
5	CAL.WT.RE-DEF.	NOT ACTIVE	*1*	ACTIVE	*0*
6	AVERAGING TIME	6 seconds	*6*	3 seconds	*3*

The "CAL DISPLAY" is to indicate the condition (ON/OFF) of the dip-switch segments after the the internal calibration weight has been re-defined (CAL.WT.RE-DEF.) when segment number 5 was switched ON with the display *ON*. This dip-switch may also be used to illuminate/run-in the display segments if it is switched ON when the display is *OFF* or indicating P-FAIL. If all the dip-switch segments (6-5-4-3-2-1) are OFF then the "CAL DISPLAY" will be "*d 6 1 2 1 1 1*" and if ON then "*d 3 0 4 0 0 0*" (*d*=dip-switch).

1. PRINT COMMAND
   If "CONTINUOUS" is selected (segment 1=OFF) then a print command will be sent once every display cycle (3 or 10 per second).
   If "AUTO-PRINT" is selected (segment 1=ON) then the balance will transmit one print command only when the object placed on the weighing pan renders a stable/not-in-motion weight display. It will not be ready to transmit another print command unless the display has returned to within ±10 digits of zero and thereby reset the auto-print function. The balance will then send one print command as before when the next object weighed renders a stable display.
2. DISPLAY RATE (display update rate, 3 or 10 updates per second)
   Will be automatically 3 per second if the load (or balance) is not oscillating.
3. NO-MOTION SYMBOL (normally set so that ▽ = Stable weight display)
   If dip-switch segment number 3 is OFF then the no-motion symbol will come on to indicate that the display reading is stable. If dip-switch segment number 3 is ON, the no-motion symbol will remain on until a stable reading has been reached, and only then will it go off (i. e. it becomes an in-motion symbol).
4. NO-MOTION BAND (how much weight oscillation can be considered "stable"?)
   If dip-switch segment number 4 is OFF then the balance will consider a display reading stable if the reading is not oscillating by more than ±0·2mg per second. If segment number 4 is ON, the balance will consider a reading stable if the amount of oscillation is not more than ±0·4mg per second.
5. CALIBRATION WEIGHT RE-DEFINED
   Only re-define the value of the internal weight if it is absolutely necessary!!
6. AVERAGING TIME (6 or 3 seconds at about 10 weight samples per second)
   Balance can be set to find the average weight from about 30 or 60 samples. If segment 6 is OFF the balance will calculate, for a display reading, the average (or mean) weight of the object from about 60 internal digital weight samples.

RE-DEFINING THE VALUE OF THE INTERNAL CALIBRATION WEIGHT

ER-180A and ER-120A have internal Calibration Weights of 100grams and ER-60A has an internal Calibration Weight of 50grams. If, over a period of time, these Weights either gain or lose a small amount of mass (±1·5mg maximum) it is possible to re-program the balance so that the balance bases its calculations on the fact that the new weight value of the internal mass is, for instance, 100.0008g instead of the old value of 100.0004g.

"Standard Weights" are seldom exact to 0·1mg so you will need to know the exact mass (× g) of your alternative Standard (which should be made of steel) before you can set about re-defining the mass (× g) of the internal Calibration Weight. Thus it is essential that your alternative Standard should have its exact "weight" established to 0·01mg by means of another, more accurate, balance located near the ER balance so that the alternative Standard mass is weighed by ER and the other balance under identical air-density conditions.

Having established the exact weight value for your alternative Standard mass, which might be, for example 100.00059g, you can set about re-defining the exact weight value for the internal mass. The first thing you will find when you go through the procedure outlined later, is the old value for the internal mass "C100.0004g", this must be changed to show the value of the alternative Standard mass which is 100.0006g. Refer to page 4 for the Calibration procedure and you should next recalibrate the ER balance with the alternative Standard . . . i.e. when the display reads "CAL dn" you should put the alternative Standard on the weighing pan and you should not touch the lever on the right hand side of the balance. After re-calibration is complete you can weigh the internal mass by gently lowering it onto the weighing assembly and at this point you will find that it now weighs 100.0008g (an increase in mass of 0.4mg). You should again go through the procedure outlined on the next page and change the memorized value for the external Standard mass (100.0006g) to the newly found value for the internal mass . . . 100.0008g.

The balance will now remember and base its calculations on the fact that the weight value for the internal calibration mass is 100.0008g. Recalibrate the balance with the internal Calibration Weight and then re-weigh the alternative Standard, the display should read 100.0006g.

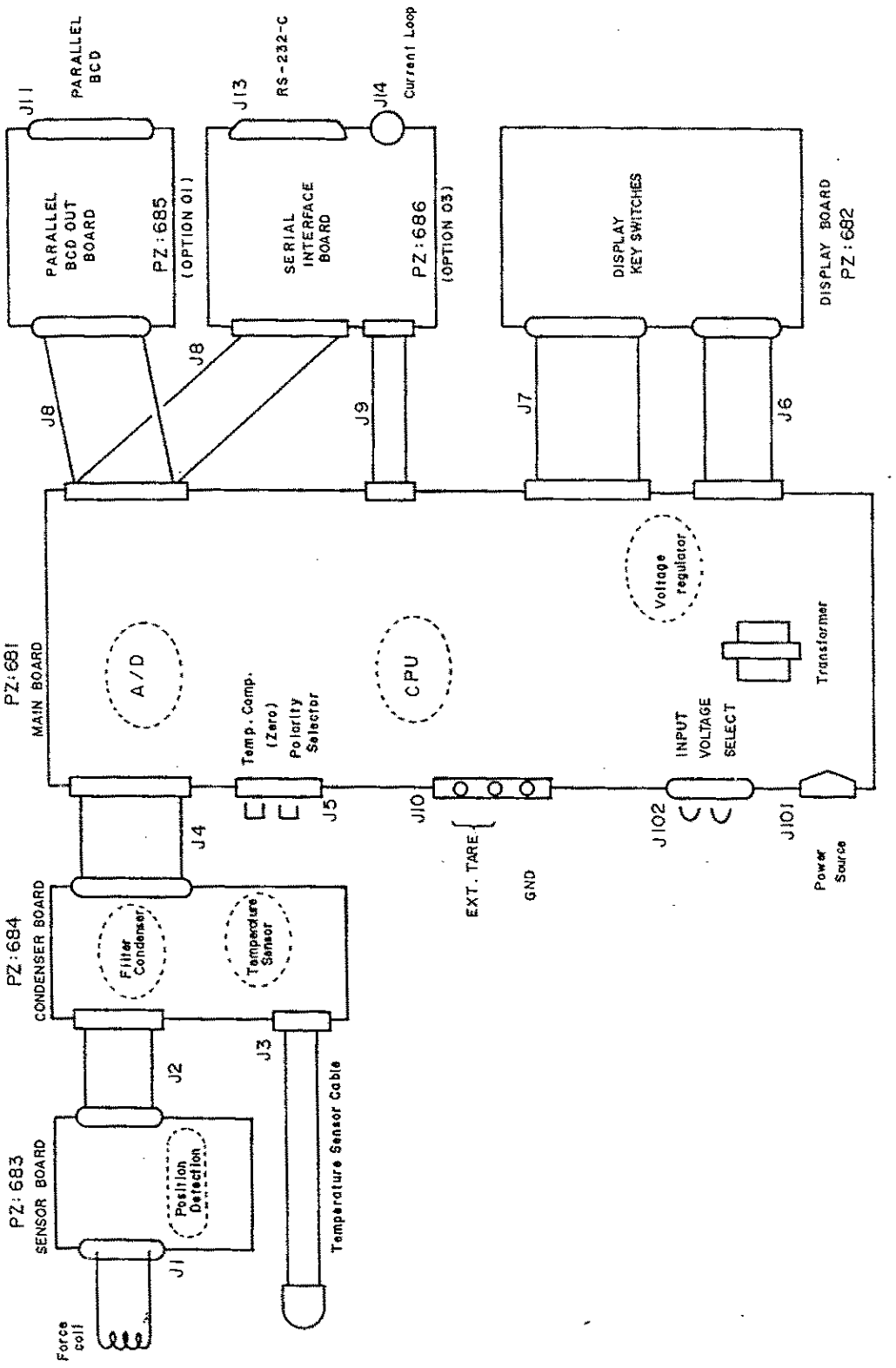
PROCEDURE FOR CHANGING THE VALUE STORED IN MEMORY

With the display ON, switch dip-switch segment number 5 ON. The display will then show the compensated value for the internal weight which had been previously committed to the non-volatile memory in the balance. If the "CAL" key-switch is now pressed, the display will flash, show the current state of the dip-switches with a "CAL DISPLAY" and the remaining dip-switch segments 1→4 & 6 will change their functions to permit the re-setting of the stored weight value within the parameters of 99.9985g and 100.0015g, a deviation of ±1.5mg maximum. Setting dip-switch segment 6 ON will give you correction in the area less than 100.0000g (99.9999g to 99.9985g) and setting it OFF will give you correction in the area greater than 100.0000g (100.0000g to 100.0015g).

Set the dip-switches 1→4 with reference to the table below. If, for instance, you wish to change the weight value in memory from 100.0006g to 100.0008g you will have to switch 6 OFF---- 1, 2 & 3 ON and 4 OFF. After you have correctly set the dip-switches 1→4 & 6 you should switch OFF dip-switch segment number 5. The display will stop flashing, will display the new value "C100.0008g" and will then revert to showing the state of the dip-switches with a "CAL DISPLAY". Reset the normal functions you require from the balance via the dip-switches with reference to the table on page 10. Next press "TARE", the display will read "0.0000g" and the balance will be ready for re-calibration with the internal Calibration Weight, the weight value for which has just been re-defined.

COMPENSATION	SWITCH 1	SWITCH 2	SWITCH 3	SWITCH 4
0.0mg	ON	ON	ON	ON
0.1mg	OFF	ON	ON	ON
0.2mg	ON	OFF	ON	ON
0.3mg	OFF	OFF	ON	ON
0.4mg	ON	ON	OFF	ON
0.5mg	OFF	ON	OFF	ON
0.6mg	ON	OFF	OFF	ON
0.7mg	OFF	OFF	OFF	ON
0.8mg	ON	ON	ON	OFF
0.9mg	OFF	ON	ON	OFF
1.0mg	ON	OFF	ON	OFF
1.1mg	OFF	OFF	ON	OFF
1.2mg	ON	ON	OFF	OFF
1.3mg	OFF	ON	OFF	OFF
1.4mg	ON	OFF	OFF	OFF
1.5mg	OFF	OFF	OFF	OFF

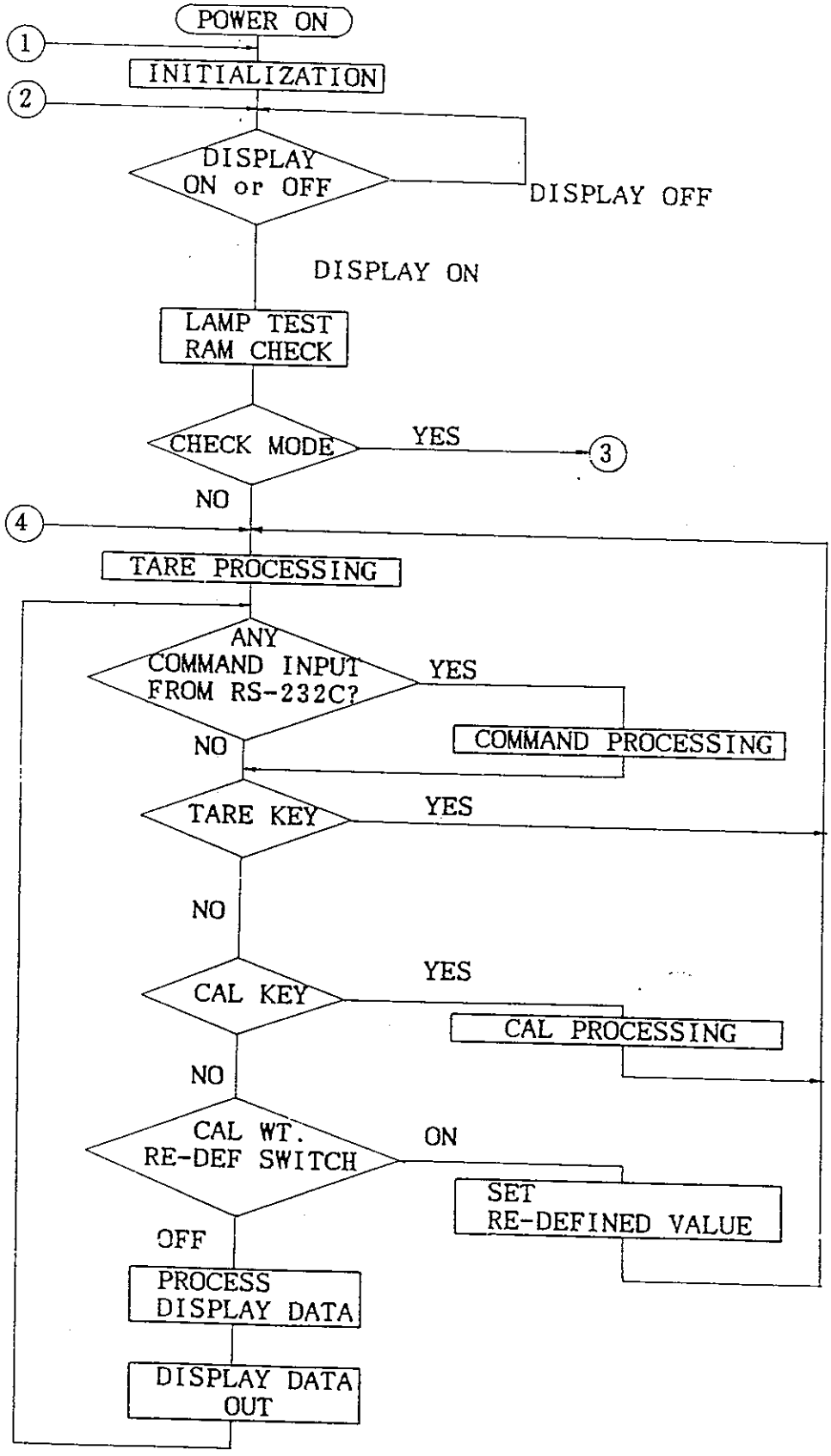
1-2 BLOCK DIAGRAM



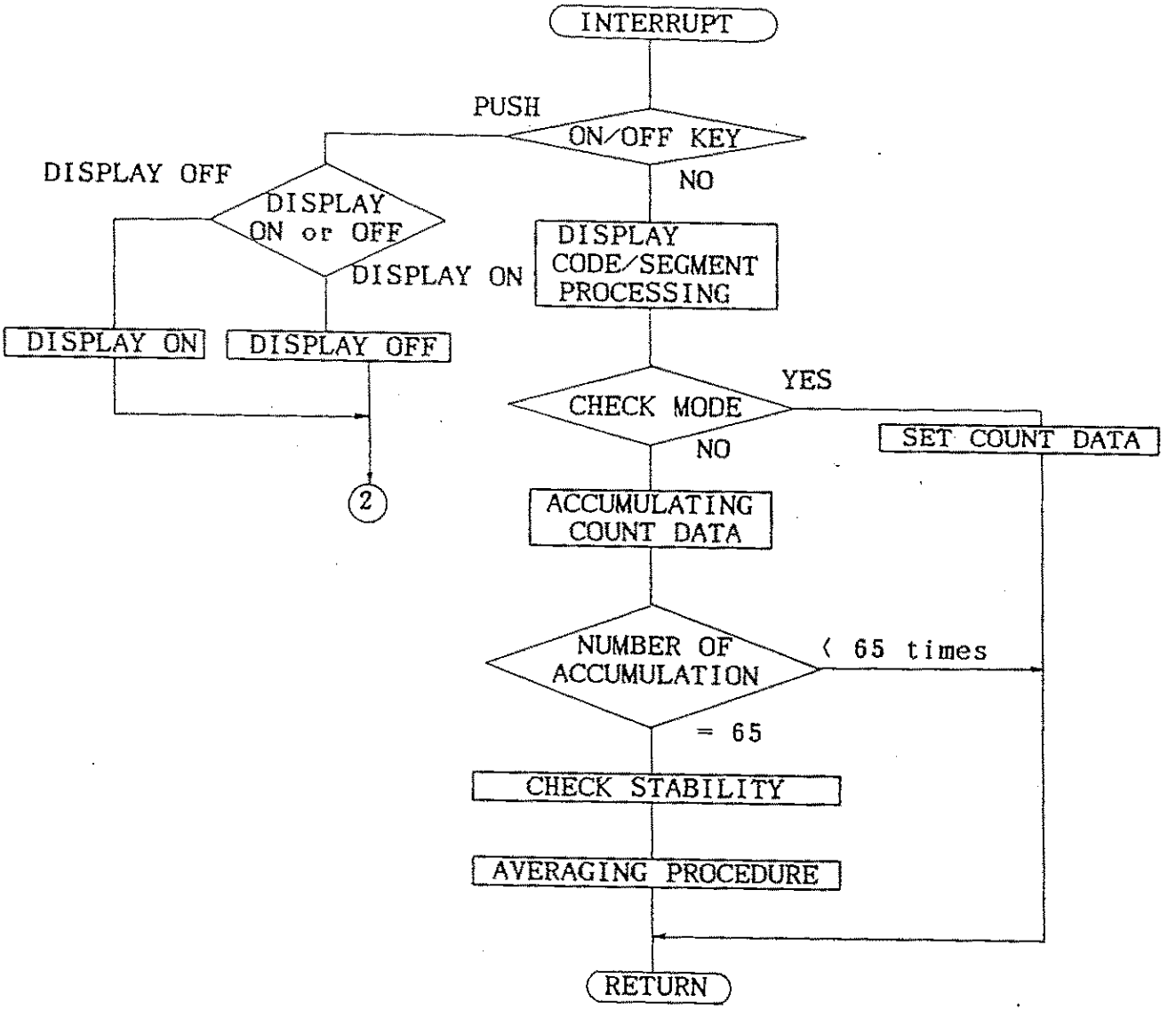
ER-A TYPE BLOCK DIAGRAM

1-3 SOFTWARE FLOW CHART

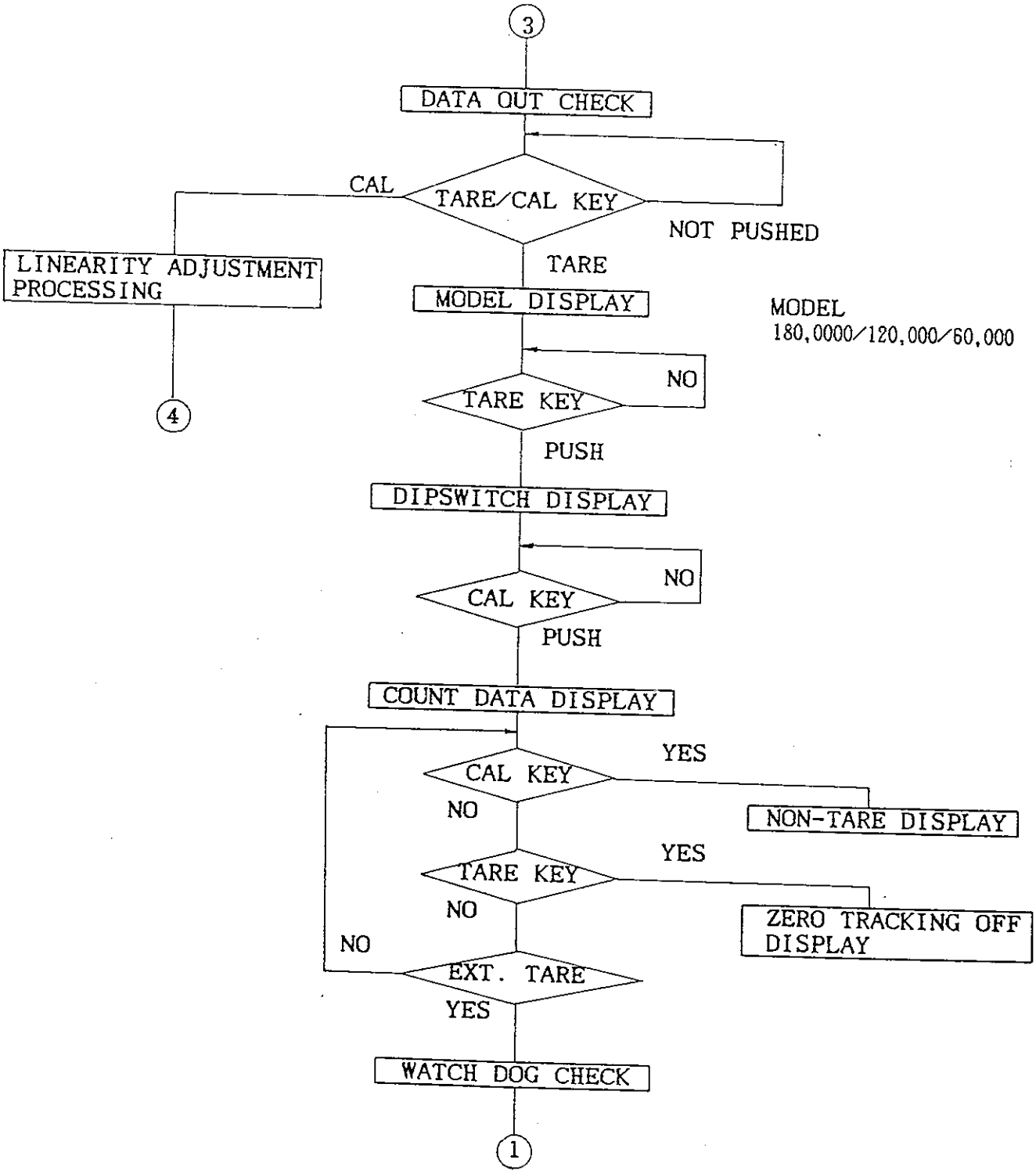
main routine



interrupt routine



check mode routine



2-1 ELECTRIC SYSTEM CHECKING METHOD

I. Board Single Unit Check

I-1 Main Board PZ-681

1) Insulation check

Electrical insulation between the heat sink fins (U1, U2 and U3) and rear heat sink plate : 500 V, 100 M or more

2) Voltage check

Test Pin	Reference Point	Voltage Range
U22 No. 8 pin	GND	+ 4.75 ~ + 5.25
Vss	GND	-36.5 ~ -40.5
V^+	COM	+14.25 ~ +15.75
V^-	COM	-14.25 ~ +15.75

3) Board adjustment

Device required ..... Multimeter

Note) Check that the CPU and ROM (2732) are not inserted into their sockets.

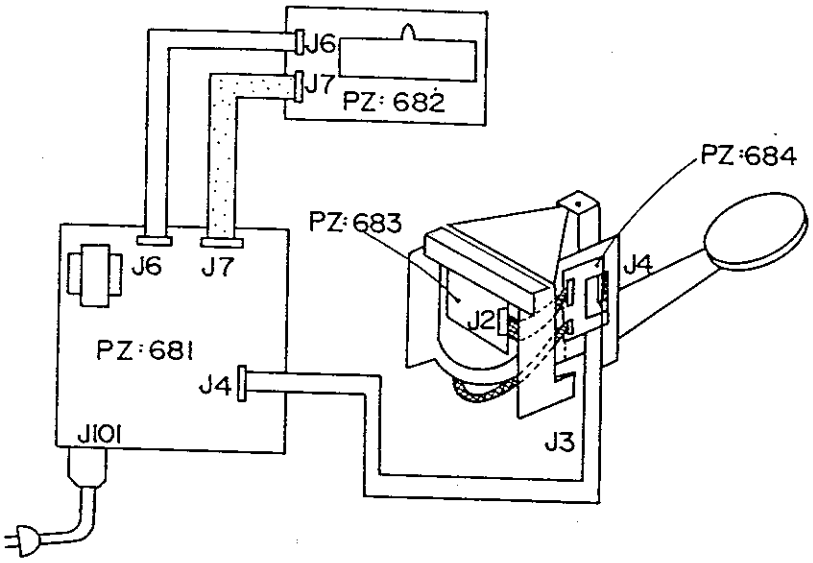
1. Connect the Common terminal of the multimeter to TP (GND).
2. Set the multimeter range to 200 V DC.
3. Connect the plus (+) side of the multimeter to TP (Vss).
4. Turn on the power (-36.5 V ~ -40.5 V).
5. Connect the plus (+) side of the multimeter to the U22 No. 8 pin.
6. Set the multimeter range to 20 V DC. (+4.75 V ~ +5.25 V)
7. Connect the Common terminal of the multimeter to TP (COM).
8. Connect the plus (+) side of the multimeter to TP (V^+). (+14.25 V ~ 15.75 V)
9. Connect the plus (+) side of the multimeter to TP (V^-). (-14.25 V ~ -15.75 V)
10. Turn off the power.
11. Insert the CPU (Z-80A) and ROM (2732).

I-2 Other Boards

Visual check only

II. Overall Adjustment

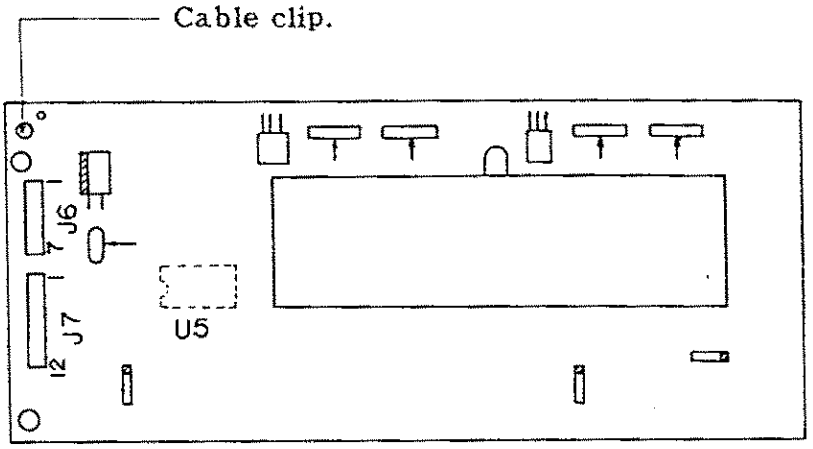
II-1 Connection



Power Source Cable

2. PZ-682 Single Unit Adjustment(Display Unit)

Visual check



All ICs(4 pcs) oriented so that pin 1 points to the left.

Transistor A1015... 2 pcs (character side upward)

Diode..... 3 pcs

Chemical conductor 1 pc

Tantalum..... 1 pc

Resistor network..... 4 pcs

NOTE: see page 44

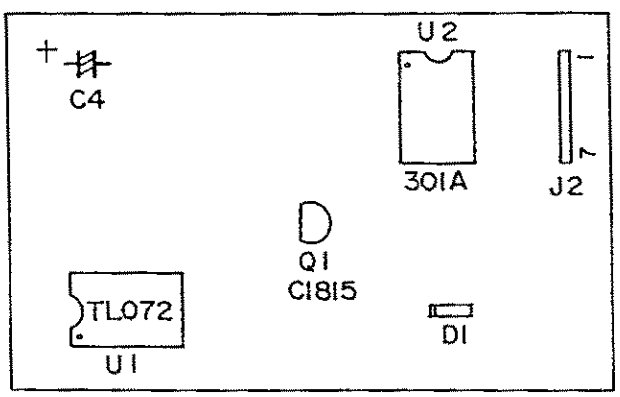
Check whether or not the cable joints are correct.

Check whether or not J6 and J7 are correctly connected.

1	2	3	4	5	6	7	8	9	10	11	12
Brown	Red	Orange	Yellow	Green	Blue	Purple	Gray	White	Black	Pink	Light blue

3. PZ-683 Single Unit Adjustment(Sensor Unit)

Visual check



Pay attention to the direction of the ICs.

Transistor C1815..... 1 pc

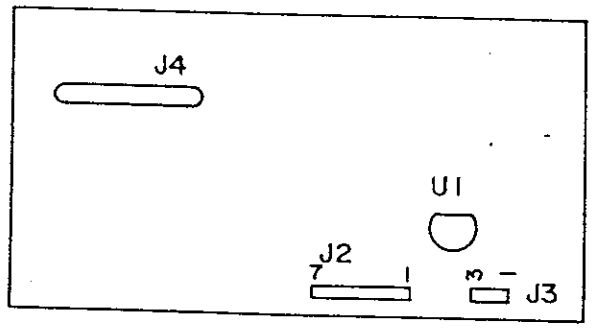
Diode..... 1 pc

Tantalum..... 1 pc

Check whether or not J2 is correctly connected.

4. PZ-684 Single Unit Adjustment(Condenser Unit)

Visual check



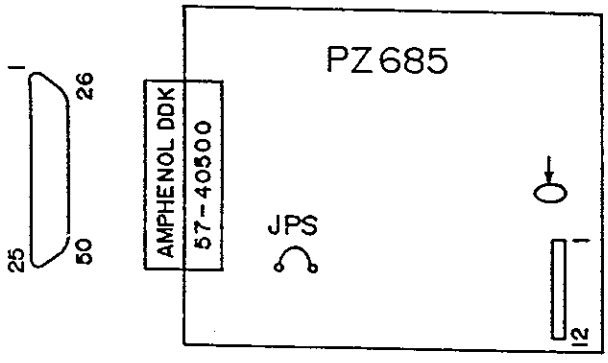
IC(LM334).....1 pc

Check whether or not J4 is correctly connected.

5. ER-A, OP-01 Single Unit Adjustment(Parallel BCD Data Out)

1 Devices required

AD-8114 (AD-8111) B, ER-A electronic balance and 50-core amphenol 1:1 cable (KO:145)



All ICs oriented with pin 1 pointing left.

Jumper..... 1 pc

Tantalum..... 1 pc

Be careful of the amphenol connector's mounting direction and the EI cable's connection.

2 Connection

Connect the EI cable (12-pin) of PZ-685 to J8 of PZ-681.

Connect the 50-core amphenol cable to PRINTER INPUT A.

3 Function check

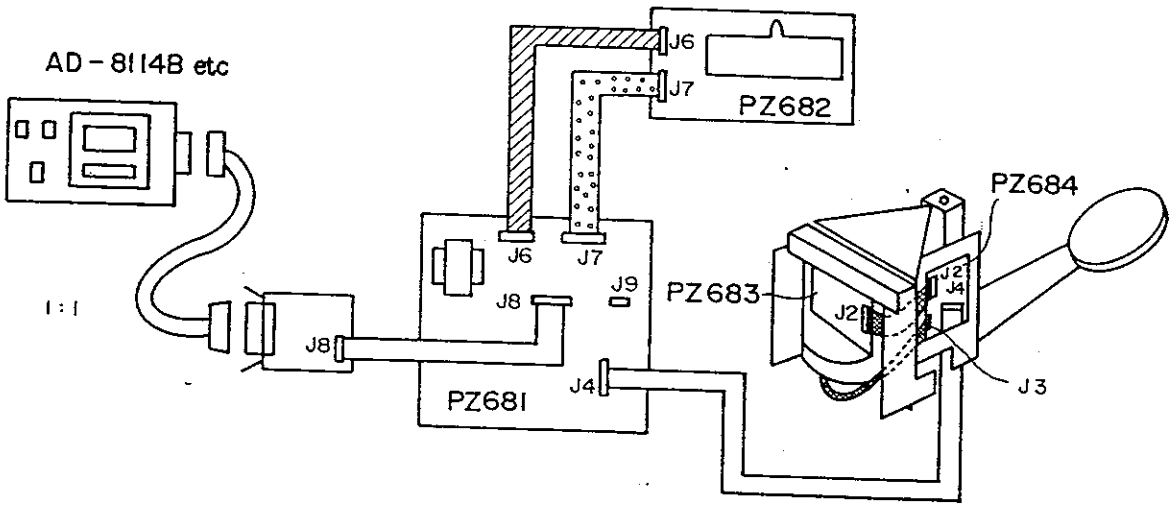
1) Turn on the power to the balance and the printer.
2) Set the printer in EXT mode (front switch).
3) With the CAL and TARE keys pressed, press the ON/OFF key. Then, with the TARE key kept pressed, press the CAL key twice and release it.
4) Check whether or not printing is performed the same as an printing example in CHECK mode.

2-2 ELECTRIC SYSTEM OVERALL ADJUSTMNT

1 Devices required

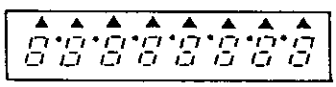
Force motor unit for adjusting the electronic system, tweezers (which can be opened to short-circuit between points 3 cm apart) and standard ICs (CPU Z80A and ROM 2764)

2 Connection diagram



3 Logic check

1) With the TARE and CAL keys pressed, press the ON/OFF key.
With the TARE key kept pressed, press the CAL key twice and release it.



(Check) whether or not all segments other than "." light up uniformly in brightness, and whether it is too bright or dark.

(In case of abnormality) ;

They do not light up at all. — Check whether or not a display tube filament is out of order.

"▼" does not light up. — Check around PZ-681 U9 (LS

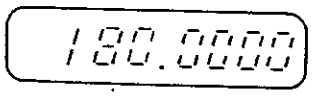
166).

"Error r" ——→ Turn off the power once and repeat step 1). If the condition does not change, RAM (PZ-618, U14) is defective.

"Error n" ——→ NOVRAM (PZ-681, U22) is defective.

Random display ——→ The CPU or ROM socket has a contact failure.

2) Press the [TARE] key.
Model display



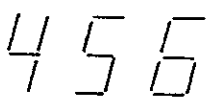
3) Press the [TARE] key again.
The ON/OFF status of the dip switches are displayed.

No.	6	5	4	3	2	1
ON	3	0	4	0	0	0
OFF	8	1	2	1	1	1

(Check) Turn ON/OFF all dip switches of PZ-681 and check whether the above-mentioned is displayed. Finally, "d612111" should be displayed. (all OFF; Up)

(In case of abnormality) ;

Wrong digit or numeral unchanged Check around PZ-681 U8 (LS 367).

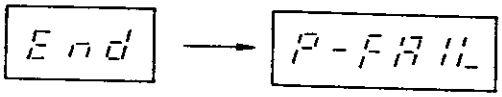
4) Press the [CAL] key.
A value is displayed.
Example) 

(Check) Check whether or not the value is greatly different from other ones, and whether or not a negative display appears when the pan is removed. Also, check whether ". 16257" (or ". 16256") is displayed with "." lighting up when the pan is pressed down to overload point (this is an error message).

(In case of abnormality) ;

The display does not change. ——→ Check around the analog units (PZ-681 U5, U6 and U7, and PZ-683 U1 and U2)

5) Short-circuit between the center and exterior (EXT. TARE) of the terminal block of PZ-681.



(Check) Check whether or not the display is changed over as the above-mentioned.

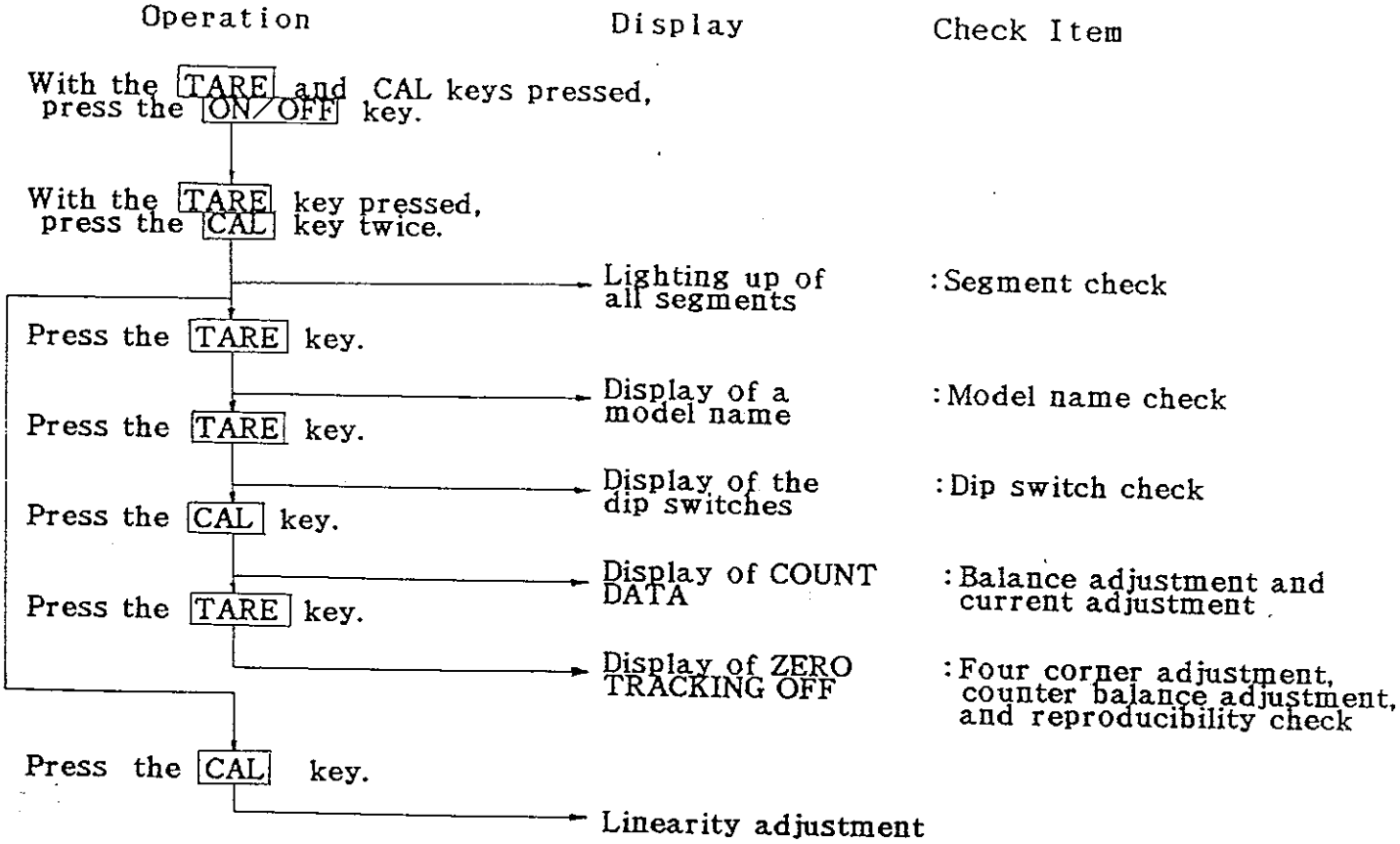
If the ON/OFF key is pressed, weighing will become ready, shifting from LAMP TEST mode to TARE mode. If stabilized, " " in the highest digit will light up.

(In case of abnormality) ;

"P-FAIL" is not displayed. ——→ Check around PZ-681 U10 (LS 123).

2-3 MECHANICAL ADJUSTMENT

1. Carry out each adjustment and check in the following display status.

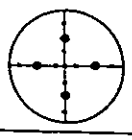


2. Adjustment of Four Corners

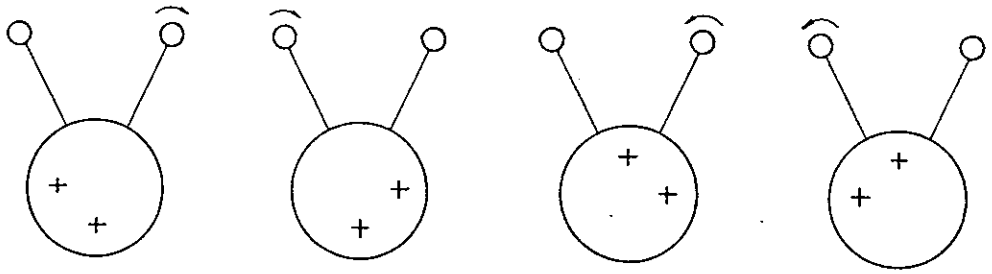
When adjusting four corners, it is desired that the ambient temperature of the mechanical unit becomes equal to the operating one. That is, keep both the rear case and inner case mounted as much as possible. Although it is inevitable to remove them when turning screws, keep them mounted when making a check, even though it is troublesome.

If the equipment is left for 5 minutes without the cases, the temperature of the mechanical unit (sub-beam, etc.) will become equal to the ambient temperature, and as a result, it will take more than 40 minutes to warm up.

Weights Used for Four Corner Adjustment and Specifications for Adjustment

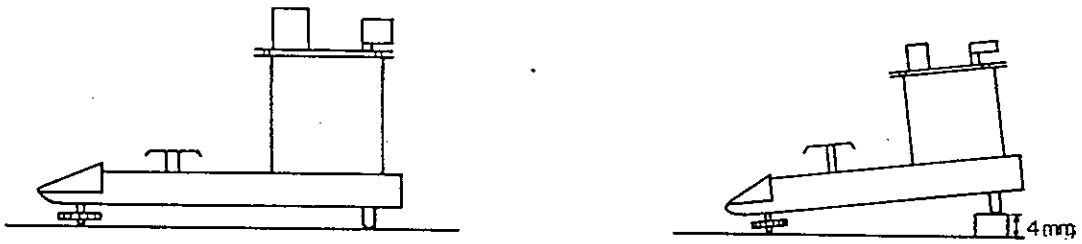
Weights Value	Weight Used	Specifications for Adjustment
180g	100g	 An indication at each point on the weighting pan shown on the left should be within + 0.2 dgt(mg) of that at the center.
120g	100g	
60g	50g	

※ Values without calibration or linearity adjustment will do.



Depending on a sign of a difference from the indication at the center of the weighting pan, turn the above-mentioned screw in the direction indicated by the arrows .

3. Adjustment of Counter Balances (Common for All Models)



(a) Horizontal State (b) Raise rear leg by 4 mm.

With ZERO TRACKING OFF displayed, or in a regular display mode, observe a change of a zero point value. See to it that the difference in values between th above-mentioned states (a) and (b) will be within + 30 dgt.
Make a coarse adjustment (as far as about + 80dgt.) with a coarse adjustment counter balance (part number 48) so that it will stay within specifications. When adjusting, be fully careful not to break the sub-beam, flat spring, etc. by applying an unnecessary force. Especially when turnin the screw of the coarse adjustment counter balance , it is necessary to hol the beam with hand lest it should move.
When the value indicated in the state (a) is larger than that in the state (b), lower the counter balance .
When moving the coarse adjustment counter balance, check the zero-poi COUNT DATA value because it may change.

4. Adjustment of Balance

Use COUNT DATA For this adjustment. In this case, record the following two data.

1) Zero point value (hereinafter called "a")
2) Value when an incorporated weight (100 g) lowered (hereinafter called "b")

Balance to come closer to the value "c" which is obtained from the following formula using the values "a" and "b". (Add a weight to the beam, if necessary.)

$$C = \frac{1}{385} (18b - 8a)$$

After this, since the counter balance may have been shifted, adjust it.

5. Adjustment of Current

Obtain R from the following formula using the above-mentioned values "a" and "b", and add a resistor close to the value of R to R25 (or between V and TP of CUR) of PZ-681.

(It is not necessary to perfectly conform to the value by combination such as EX/EY. One resistor will do. It is safer to use one lower than a calculated value.)

$$R = \frac{5,929,000 \times 250}{711b - 701a - 5,929,000} \ (\Omega)$$

When this is done, remove the front case once, and check whether the zero point value is 350 ~ 450 and 15,200 ~ 15,550 (COUNT DATA value) at 180g, after adding R.

If these conditions are met, attach the front case with screws.

3-1 INSPECTION PROCEDURE FOR ER-120A/-60A

1. Basically, an inspection procedure is the same as that for ER-180A.

2. Differences in appearance are;
   1) Model name of the key sheet
   2) As for ER-60A, a weight label value is 49.9985 ~ 50.0015.
   3) First two characters of the serial name plate

3. Span calibration

4. Differences in the performance test are;
   1) Weights used for a four corner check
      ER-120A 50g Spec. : Within ± 2 counts of the center
      ER- 60A 20g Spec. : Within ± 2 counts of the center
   2) Weights used for a linearity check (same specifications as those for ER-180A)
      ER-120A 20g Offset: 50-g and incorporated (100-g) weights
      ER- 60A 20g Offset: 20-g and incorporated (50-g) weights
      ※ When the incorporated weight is offset, if "E" is displayed, use a 10-g weight.
   3) Overrange values
      ER-120A 22g After pressing the TARE key with the incorporated weight (100 g) used
      ER- 60A 12g 12g after pressing the TARE key with the incorporated weight (50g) used

3-2 INSPECTION PROCEDURE FOR ER-180A

1. Appearance Check
   1) Check that the case, filter, weighing pan and glass are free from scratch.
   2) Check that the serial name plate (power consumption: about 11 VA) and weight label are stuck on the left side inside the lower case.
   3) Check that filter's inscribed characters ("AD", "g") are correct.
   4) Check that "ER-180A" is inscribed on the key sheet.
   5) Check that the sliding glass can be opened and closed smoothly.
   6) Check that the weighing pan is not greatly slanted.
   7) When leveling the equipment with the level vial check that the case is not greatly slanted.
   8) When turning on the power, check that the LED (green) on the upper right side of the ON/OFF key lights up.
   9) Check that the LED is not greatly shifted from the window in 8), and that it is not dirty.

2. Performance Check
   1) Shift to ON the dip switch NO. 5 (CAL DATA) located on the back to turn on the power. Press the ON/OFF key when nothing is displayed (or when "P-FALL" is displayed).
      A lamp test will continue. Leave the equipment 5 hours or more in this state, and thereafter, carry out a performance check.
   2) In the state 1), if the dip switch No. 5 is turned off, weighing will be enabled with a tare applied. (Turn off all dip switches.)
   3) Four corner error check
      Use on 50-g weight. A difference between the center of the weighing pan and each half-radius point in the front/back and right/left directions should be within ± 0.2 mg.
   4) Linearity check
      Use two 50-g weights.

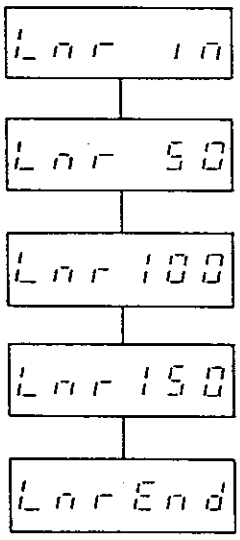
      Procedure: 1 Press the TARE key with nothing placed on the weighing pan.
      2 Place one 50-g weight (hereinafter called " A ") and adjust a display value to X.
      3 Remove A , place the other weight B and press the TARE key. (Do not place B at the center of the weighing pan.)

3. Reproducibility (Within ± 1 dgt of Specification)
Read the display value, slowly lifting and lowering the internal weight.
Lower the internal weight and make a check with a 50-g weight placed and the TARE key pressed.

Adjustment of Linearity

Make this adjustment in accordance with the following chart. Although the displays shown in Fig. 1 appear as for ER-180A and ER-120A, these will differ in the case of ER-60A (Fig. 2).

Fig. 1 Linearity Adjustment Method for ER-180A/-120A



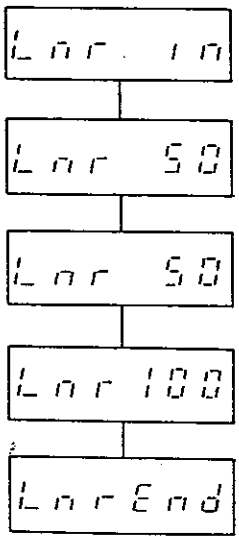
;Place a 50-g weight and press the TARE key.

;Place a 100-g weight (internal weight) and press the TARE key. (Remove the 50-g weight.)

;Place the 50-g and 100-g weights, and press the TARE key.

;After displaying this for several seconds, weighing becomes ready.

Fig. 2 Linearity Adjustment Method for ER-60A



;Place the 50-g weight (1) and press the TARE key.

;Remove the 50-g weight (1) and place another 50-g weight (2) (internal weight), and then, press the TARE key.

;Place two 50-g weights (1) and (2), and press the TARE key.

4 Place A at the center of the weighing pan and read a display value Y.

5 Remove both A and B , lower the internal weight and press the TARE key.

6 Place A at the center of the weighing pan and read a display value Z.

Criterion: Values obtained by X - Y and X - Z should be within ± 0. 3mg.

5) Lower the internal weight and press the TARE key.
When a weight of 81-g is put on, "E" should not be displayed.

6) Keep pressing the weighing pan for 5 seconds (with "E" displayed). When released, a display value should return within ± 0. 5 mg within 10 seconds.

7) When the dip switch No. 5 is turned on in the weighing mode, a display value should coincide with a numeral incribed on the weight label. After a check, be sure to turn off the switch. (Upon shipment, all dip switches have been set to OFF (shifted upward).)

4. PARTS LIST

MAIN BOARD-1

CIRCUIT SYMBOL OR DRWG. NO.	LOCATION	PARTS NAME	DESCRIPTION	Q'TY
	PZ:681-P	PZ:681-P	MAIN BOARD FULLY ASSEMBLED	
	"	PC:681 B	PRINTED CIRCUIT BOARD	
C19	"	CC:0.001U	CAPACITOR 0.001uF 50V	
C20	"	CC:0.01U	" 0.01uF 50V	
C101,102,104,105	"	CC:0.01U500V	" 0.01uF 500V	
C29~34,38~41, 46~52	"	CC:0.022U	" 0.022uF 50V	
C7,9,11	"	CC:0.1U25V	" 0.1uF 25V	
C36	"	CC:10P	" 10pF 50V	
C17,56	"	CC:100P	" 100pF 50V	
C55	"	CC:150P	" 150pF 50V	
C26	"	CC:33P	" 33pF 50V	
C21	"	CC:470P	" 470pF 50V	
C15,53	"	CC:68P	" 68pF 50V	
C14	"	CK:SM10VB220	" 220uF 10V	
C3,4	"	CK:SM16VB3300	" 3300uF 16V	
C12,13	"	CK:SM25VB100	" 100uF 25V	
C1,2	"	CK:SM35VB1000	" 1000uF 35V	
C37	"	CK:SM50VB10	" 10uF 50V	
C5	"	CK:SM50VB100	" 100uF 50V	
C24	"	CM:E1105KN	" 1uF 100V	
C16	"	CM:E1474KN	" 0.47uF 100V	
C22,23,25	"	CM:5002103K1	" 0.001uF 50V	
C103	"	CM:6003104K	" 0.1uF 600V	
C42~45	"	CT:1A4R7	" 4.7uF 10V	
C27,35	"	CT:1D2R2	" 2.2UF 20V	
C6,8,10,56	"	CT:1VR33	" 0.33uF 35V	
C28,57	"	CT:1V010	" 1uF 35V	
D1,2,4	"	DI:W02	DIODE BRIDGE	
D9,10	"	DI:1SS53	DIODE	
D6,7,8	"	DI:1S1588	"	
D3	"	DI:3B4B41	DIODE BRIDGE	
D5	"	DZ:05Z5.6	ZENER DIODE	
	"	FH:FH-B02	FUSE HOLDER	
	"	FS:EAWK-200MA	FUSE (For AC100~120V)	
	"	FS:EAWK-100MA	FUSE (For AC 220~240V)	
	"	JE:66464-102	CONNECTOR	
J101	"	JS:NC-174	"	
U13	"	JS:10328-01-445	"	
U12	"	JS:10340-01-445	"	
J4,7,8	"	JT:1-171825-2	CONNECTOR	
J9	"	JT:171825-3	"	
J6	"	JT:171825-7	"	
J103	"	JT:61134-1	"	
J5	"	JT:65507-406	"	
J102	"	KO:280A-08BL	"	
	"	KO:280A-08BR	"	
L101,102	"	LL:SF-T8-40S	COIL	
	"	QA:AC256-1674	INSULATING PLATE	
	"	QA:AC316A	PLATE GROMMET	

MAIN BOARD-2

CIRCUIT SYMBOL OR DRWG. NO.	LOCATION	PARTS NAME	DESCRIPTION	Q'TY
Q4	"	QF:K30ATM-Y	FET	
Q3	"	QF:VN66AF	"	
Q2,6,7	"	QT:A1015Y	TRANSISTOR	
Q1	"	QT:A1153	"	
Q5	"	QT:C1815Y	TRANSISTOR	
R39	"	RC:1.5K	RESISTOR 1.5K 1/4W	
R27	"	RC:1/21M	" 1M 1/2W	
R2,6,7	"	RC:1K	" 1K 1/4W	
R16,20,21,22	"	RC:100R	" 100 1/4W	
R33	"	RC:12K	" 12K 1/4W	
R29	"	RC:120K	" 120K 1/4W	
R1,40	"	RC:15K	" 15K 1/4W	
R34,38,50,51,52	"	RC:2.2K	" 2.2K 1/4W	
R54	"	RC:22K	" 22K 1/4W	
R55,56	"	RC:220K	" 220K 1/4W	
R35~37,42,46,47	"	RC:4.7K	" 4.7K 1/4W	
R3	"	RC:470R	" 470 1/4W	
R26	"	RC:560K	" 560K 1/4W	
R41,53	"	RC:560R	" 560 1/4W	
R8,49	"	RC:6.8K	" 6.8K 1/4W	
R28	"	RC:68K	" 68K 1/4W	
R19	"	RF:100KSF	" 100K 1/8W, ±50PPM/℃	
R13	"	RF:1KSF	" 1K 1/8W, ±50PPM/℃	
R4	"	RF:200RSF	" 200 1/8W, ±50PPM/℃	
R15	"	RF:22KSF	" 22K 1/8W, ±50PPM/℃	
R12	"	RF:3.6KSF	" 3.6K 1/8W, ±50PPM/℃	
R18	"	RF:470RSF	" 470 1/8W, ±50PPM/℃	
R17	"	RF:6.8KSF	" 6.8K 1/8W, ±50PPM/℃	
R23,24	"	RL:5000B	" 500 ,3/10W, ±5PPM/℃	
R31	"	RM:12.1KF	RESISTOR 12.1K 1/4W, ±100PPM/℃	
R32	"	RM:17.8KF	" 17.8K 1/4W, ±100PPM/℃	
R30	"	RM:68.1KF	" 68.1K 1/4W, ±100PPM/℃	
R43,44	"	RN:INR-4-223MA	RESISTOR NETWORK 22K ×4, 1/8W	
R45	"	RN:INR-4-472MA	RESISTOR NETWORK 4.7K×4, 1/8W	
R48	"	RN:INR-8-103MA	RESISTOR NETWORK 10K ×8, 1/8W	
R5,14	"	RV:3299X-1-202	POTENTIOMETER 2K	
S1	"	SD:KSP06	DIP SWITCH	
TF	"	TF:251C	TRANSFORMER	
CUR,V^-,V^+ COM,GND,V_{SS}	"	TM:CP-10	TEST TERMINAL	
J10	"	TM:F2066A-3P	TERMINAL	
U7	"	UA:C311C	VOLTAGE COMPARATOR	
U4	"	UA:LM399H	VOLTAGE REFERENCE	
U5	"	UA:OP07DP	OP AMP	
U11	"	UA:PST518B	VOLTAGE COMPARATER	
U6	"	UA:TL072CP	DUAL OP AMPS	
U14	"	UC:MB8416A-SK	STATIC RAM	

MAIN BOARD-3

CIRCUIT SYMBOL OR DRWG. NO.	LOCATION	PARTS NAME	DESCRIPTION	Q'TY
U20	"	UC:4050	C MOS	
U22	"	UN:X2444	NOV RAM	
U3	"	UR:TA78005AP	VOLTAGE REGULATOR 5V, 1A	
U1,2	"	UR:TA78015AP	VOLTAGE REGULATOR 15V, 1A	
U16	"	UT:LS00	TTL	
U18	"	UT:LS04	"	
U10	"	UT:LS123	"	
U17	"	UT:LS125	TTL	
U19	"	UT:LS138	"	
U9	"	UT:LS166	"	
U8	"	UT:LS367	"	
U21	"	UT:LS75	"	
U15	"	UT:MB111S105	TTL GATE ARRAY	
XT	"	XT:HC18/U12MHZ	CRYSTAL 12MHz	
	"	05:A40481	11.5MM SPACER	

DISPLAY BOARD

CIRCUIT SYMBOL OR DRWG. NO.	LOCATION	PARTS NAME	DESCRIPTION	Q'TY
	PZ:682-P	PZ:682-P	DISPLAY BOARD FULLY ASSEMBLED	
	"	PC:682	PRINTED CIRCUIT BOARD	
C4	"	CC:0.022U	CAPACITOR 0.022uF 50V	
C1	"	CK:SM50VB10	" 10uF 50V	
C2	"	CT:1A4R7	" 4.7uF 10V	
D1,2,6	"	DI:1S1588	DIODE	
D13	"	DL:TLUG144	LED LAMP	
FLD	"	ED:FIP8811	DISPLAY TUBE	
J7	"	KO:102-12S50	CONNECTOR CABLE	
J6	"	KO:102-7S50	"	
Q1,2	"	QT:A1015Y	TRANSISTOR	
R12	"	RC:1K	RESISTOR 1K 1/4W	
R5,6	"	RC:2.2K	" 2.2K 1/4W	
R1~4	"	RN:IHR-4-223MA	RESISTOR NETWORK 22K×4, 1/8W	
SW1,2,6	"	SK:TM1-01/0010	KEY SWITCH	
U1,2	"	UC:40H374	CMOS	
U3,4	"	UC:5067	"	
	"	06:A44081A	DISPLAY PANEL CUSHION	

SENSOR BOARD

	PZ:683-P	PZ:683-P	SENSOR BOARD FULLY ASSEMBLED	
	"	PC:683B	PRINTED CIRCUIT BOARD	
C2,5~9	"	CC:0.022U	CAPACITOR 0.022uF 50V	
C1	"	CC:100P	" 100pF 50V	
C3	"	CC:33P	" 33pF 50V	
C4	"	CT:1D2R2	" 2.2uF 20V	
D3	"	DI:MI-33H-2D	PHOTO DIODE	
D1	"	DI:1S1588	DIODE	
D2	"	DL:TLN108	LED	
J2	"	KO:102-7S20	CONNECTOR CABLE	
Q1	"	QT:C1815Y	TRANSISTOR	
R2	"	RC:1/2680K	RESISTOR 680K 1/2W	
R1	"	RC:1K	" 1K 1/4W	
R10	"	RC:10K	" 10K 1/4W	
R4	"	RC:220R	" 220 1/4W	
R3	"	RC:3.3K	" 3.3K 1/4W	
R9	"	RC:33K	" 33K 1/4W	
R8	"	RM:10KF	" 10K 1/4W, ±100PPM/℃	
R7	"	RM:21.5KF	" 21.5K 1/4W, ±100PPM/℃	
R5,6	"	RM:681KF	" 681K 1/4W, ±100PPM/℃	
U2	"	UA:C301AC	OP AMP	
U1	"	UA:TL072CP	DUAL OP AMPS	

CONDENSER BOARD

	PZ:684-P	PZ:684-P	CONDENSER BOARD FULLY ASSEMBLED	
	"	PC:684A	PRINTED CIRCUIT BOARD	
C1	"	CC:100P	CAPACITOR 100pF 50V	
C2~4	"	CN:E1106KN	" 10uF 100V	
J3	"	JT:171825-3	CONNECTOR	
J2	"	JT:171825-7	"	
J4	"	KO:102-12S30	CONNECTOR CABLE	
U1	"	UA:LM334Z	CURRENT SOURCE	

BCD OUT UNIT BOARD (OP-01)

CIRCUIT SYMBOL OR DRWG. NO.	LOCATION	PARTS NAME	DESCRIPTION	Q'TY
	PZ:685	PZ:685	OPTION-01 FULLY ASSEMBLED	
	"	PC:685A	PRINTED CIRCUIT BOARD	
C2~17	"	CC:0.022U	CAPACITOR 0.022μF 50V	
C1	"	CT:1A4R7	" 4.7μF 10V	
J11	"	JA:57-40500-D39	CONNECTOR	
J8	"	KO:102-12S20	CONNECTOR CABLE	
R1,3	"	RC:270R	RESISTOR 270Ω 1/4W	
R2,4~9	"	RC:4.7K	" 4.7K 1/4W	
U2,7	"	UC:4015	CMOS	
U5,10~16	"	UT:LS0.4	TTL	
U4	"	UT:LS125	"	
U1,6,8,9	"	UT:LS164	"	
U3	"	UT:LS174	"	
	"	04:A43762B	BOARD MOUNT PLATE	

SERIAL INTERFACE BOARD OP-03

CIRCUIT SYMBOL OR DRWG. NO.	LOCATION	PARTS NAME	DESCRIPTION	Q'TY
	PZ:686	PZ:686	OPTION-03 FULLY ASSEMBLED	
	"	PC:686A	PRINTED CIRCUIT BOARD	
C8,11~14	"	CC:0.022U	CAPACITOR 0.022 F 50V	
C5,6	"	CC:22P	" 22pF 50V	
C9,10	"	CC:330P	" 330pF 50V	
C1,2	"	CK:SM25VB47	" 47 F 25V	
C15,16,17	"	CT:1A4R7	" 4.7 F 10V	
C3,4	"	CT:1D2R2	" 2.2 F 20V	
C7	"	CT:1V010	" 1 F 35V	
D5	"	DF:TLP521-1	PHOTO COUPLER	
D6	"	DI:W02	DIODE BRIDGE	
D3,4	"	DI:1S1588	DIODE	
D1,2	"	DZ:05Z11	ZENER DIODE	
J14	"	JA:TCS0270	CONNECTOR	
J13	"	JA:25-30-335S	"	
U5	"	JS:10340-01-445	IC SOCKET	
J8	"	JT:1-171836-2	CONNECTOR	
J9	"	JT:171826-3	"	
Q2	"	QT:A1015Y	TRANSISTOR	
Q1,3	"	QT:C1815Y	"	
R5	"	RC:220R	RESISTOR 220 1/4W	
R7,9	"	RC:270R	" 270 1/4W	
R4	"	RC:330R	" 330 1/4W	
R3,6,8	"	RC:4.7K	" 4.7K 1/4W	
R1,2	"	RC:680R	" 680 1/4W	
SW1	"	SD:KSP06	DIP SWITCH	
GND, V++, V--	"	TM:CP-10	TEST TERMINAL	
U1	"	UC:4013	CMOS	
U3	"	UT:LS174	TTL	
U2,4	"	UT:LS368	"	
U7	"	UT:75188	"	
U6	"	UT:75189A	"	
XT	"	XT:HC18/U6MHZ	X TAL 6MHz	
	"	04:A32977D	BOARD MOUNT PLATE	

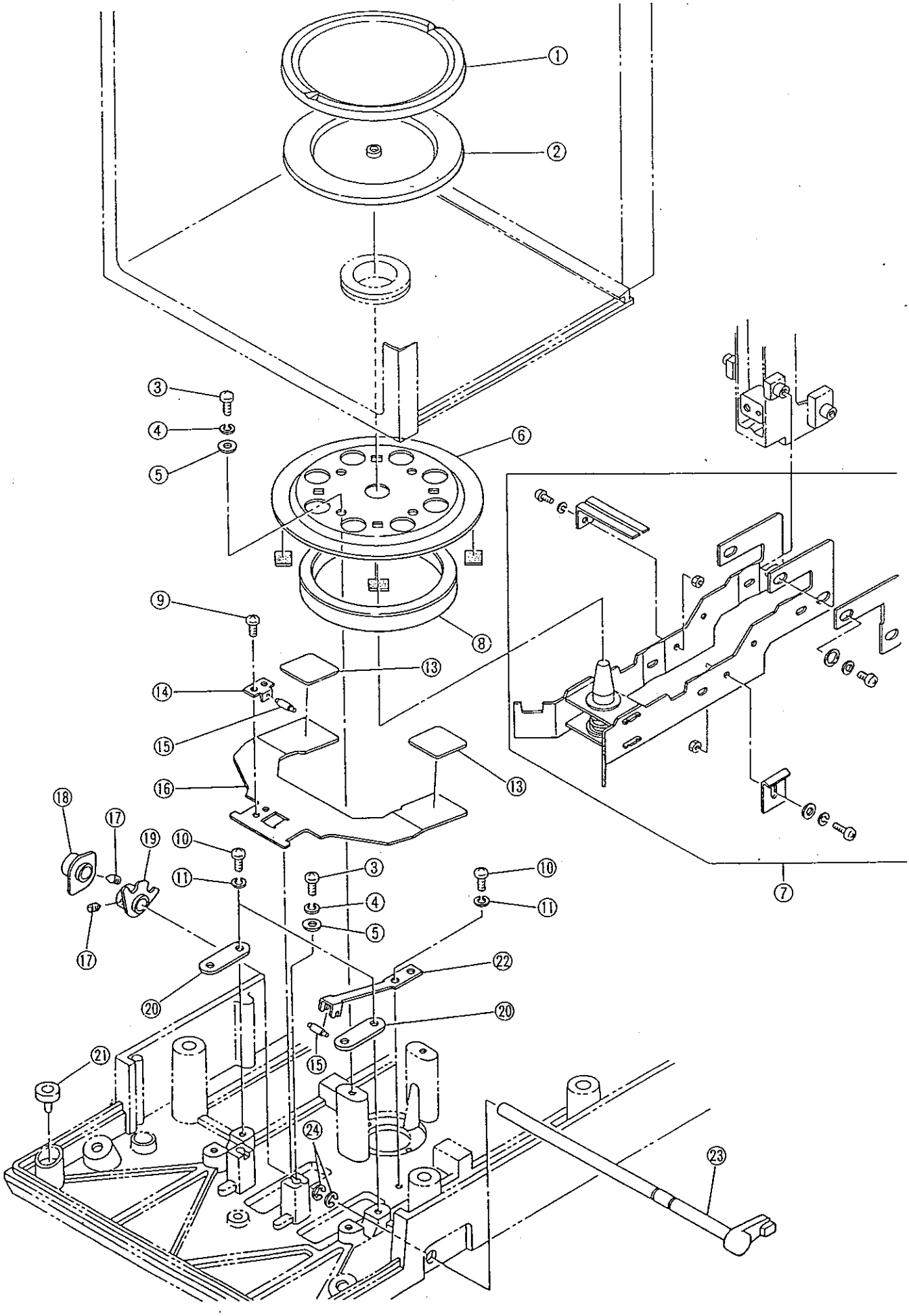
EXPLODED VIEW

CIRCUIT SYMBOL OR DRWG. NO.	LOCATION	PARTS NAME	DESCRIPTION	Q'TY
1		04:A43580	WEIGHING PAN	
2		PB:ER-180A-7	PAN SUPPORT	
3			SCREW M4×6	
4			SPRING WASHER M4	
5			WASHER M4	
6		04:A43648C	CAL.WT.HOLDER	
7		PB:ER180A-4		
8		05:A43574A;B	CALIBRATION WEIGHT FOR ER180A,120A CALIBRATION WEIGHT FOR ER60A	
9			SCREW M3×4	
10			SCREW M3×6	
11			SPRING WASHER M3	
12			WASHER M3	
13		07:A44639	CUSHION	
14		04:A44678	ROLLER HOLDER	
15		07:A44231B	ROLLER BEARING	
16		04:A44016B	CAL.WT.SUPPORT	
17			M3×3	
18		04:A44233	CAM	
19		04:A44232	RATCHET CAM	
20		04:A43612A	AXLE BRACKET	
21		10:7D-D11	LEVEL VIAL	
22		04:A44230B	RATCHET SPRING	
23		09:A44135B	LEVEL & AXLE	
24			E RING	
25			FLAT SCREW M3×8	
26			SCREW M3×8	
27			SCREW M4×10	
28			SCREW M4×15	
29			BOLT M5×12	
30			SPRING WASHER M5	
31			WASHER M5	
32		10:S-NO-1-SUS	CONVEX WASHER	
33		04:A4482-2	FITTING PLATE	
34		04:A44249;C	FLEXIBLE BEARING	
35		PB:ER180A-2	FLEXIBLE BEARING ASS'Y	
36		03:A32655C	RISER BEAM	
37		05:A44845A	ADJUSTMENT BOLT	
38		05:A44844	FLEXIBLE BEARING BRACKET	
39		03:A20366C	FORCE MOTOR FRAME	
40		04:A44665;C	FLEXIBLE BEARING	
41		PB:ER180A-3	FLEXIBLE BEARING ASS'Y	
42		05:A43630C	STOP BOLT	
43			NUT M3	
44		04:A43632d	YOKE PLATE	
45			SCREW M3×8	
46			WEIGHTED WASHER	
47		03:A32656C	FORCE COIL BEAM	
48		09:A44466	COUNTER BALANCE	
49		05:A43270B	COUNTER BALANCE WT.	
50		05:A43271	COUNTER BALANCE	
51		08:A44953	FLEXIBLE WIRE	
52		04:A41746B	STOPPER PLATE	
53		09:A20350d	FORCE COIL BEAM	
54				

EXPLODED VIEW

CIRCUIT SYMBOL OR DRWG. NO.	LOCATION	PARTS NAME	DESCRIPTION	Q'TY
55		05:A43296B	FORCE MOTOR PILLAR	
56		07:A43749D	DOORKNOB	
57		07:A44229C	CUSHION	
58		00:A43755C	UPPER DOOR	
59		07:A44793	DOOR GUIDE	
60		07:A44150B	OPTION BLANKING PANEL	
61		07:A33072B-2	DOOR/CASE GUIDE(LEFT)	
62		00:A44796	SIDE DOOR	
63		07:A44904	DOOR STOP	
64		07:A44226A	DOOR STOP	
65		07:A43407	FLASHING STRIP	
66		02:A20418B	REAR PANEL	
67		00:A43754A	FRONT WINDOW	
68		07:A44090B	PLATE HOLDER	
69		07:A44792A-2	PLASTIC DOOR RUNNER(LEFT)	
70		07:A44792A-1	PLASTIC DOOR RUNNER(RIGHT)	
71		02:A20417B	WEIGHING CHAMBER CASE	
72		01:A43760B	ACRYIC PLATE	
73		01:A32842B	KEYBOARD FASCIA FOR ER-180A	
		01:A33095	" FOR ER-120A	
		01:A33096	" FOR ER-60A	
74		07:A20373B	PLASTIC DISPLAY CASE	
75		07:A33072B-1	DOOR/CASE GUIDE(RIGHT)	
76		00:A44085B;B	GLASS FLOOR PLATE	
77		05:A44087B	PAN WELL	
78		07:A44084A	WASHER	
79		05:A44086B	NUT	
80		05:A43763C	SPACER	
81		04:A44082D	SHIELD	
82		05:A43277B	SUPPORT PILLER	
83		04:A43230A	PILLAR GUIDE PLATE	
84		04:A32710F	UPPER SCREEN	
85		04:A32711E	LOWER SCREEN	
86		04:A41899A	METAL COVER	
87		03:A10028B	LOWER CASE	
88		07:A42588A	ADJUSTABLE FOOT	
89			PLASTIC DOOR STOPPERS	

5. ASSEMBLY



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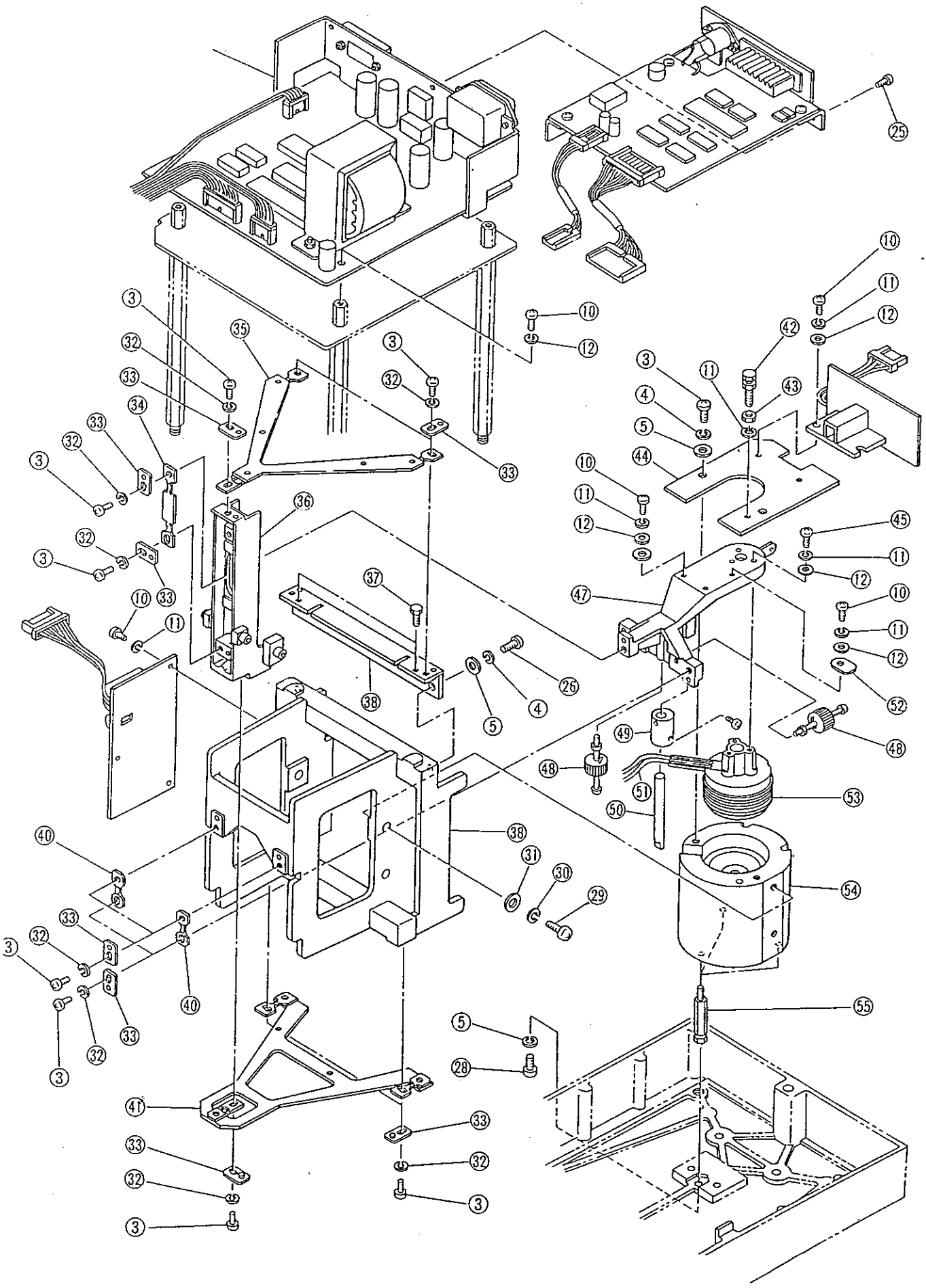
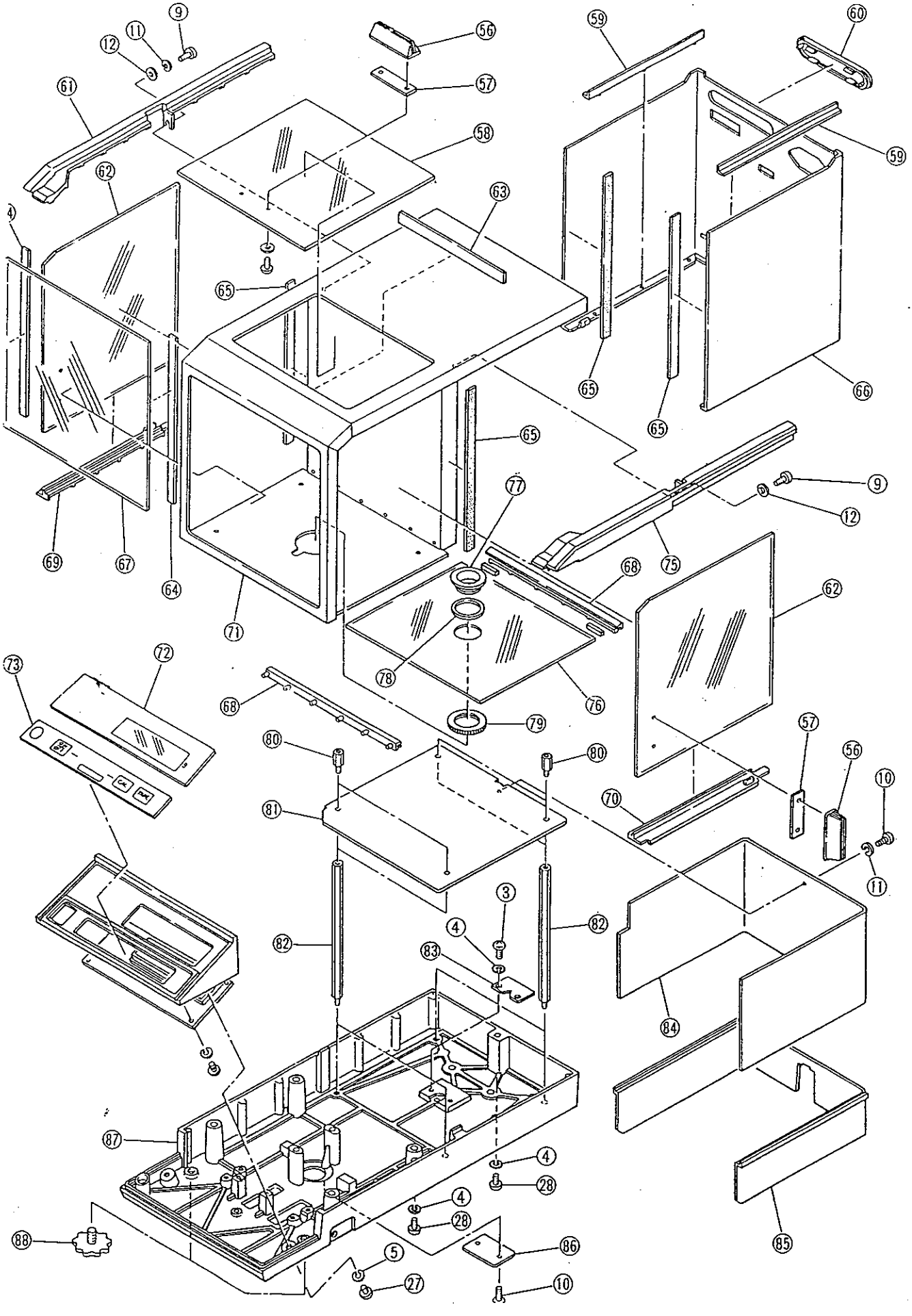
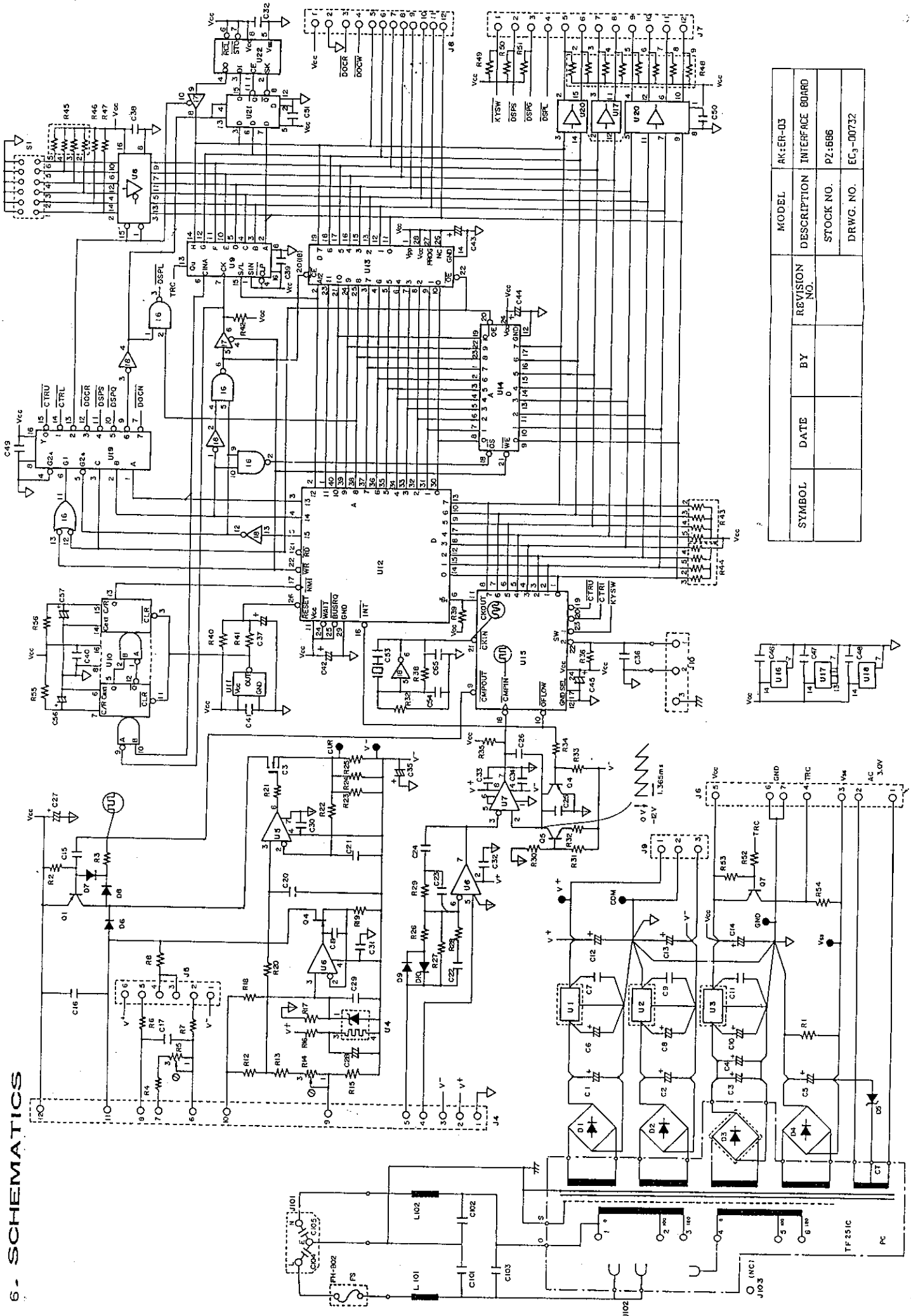
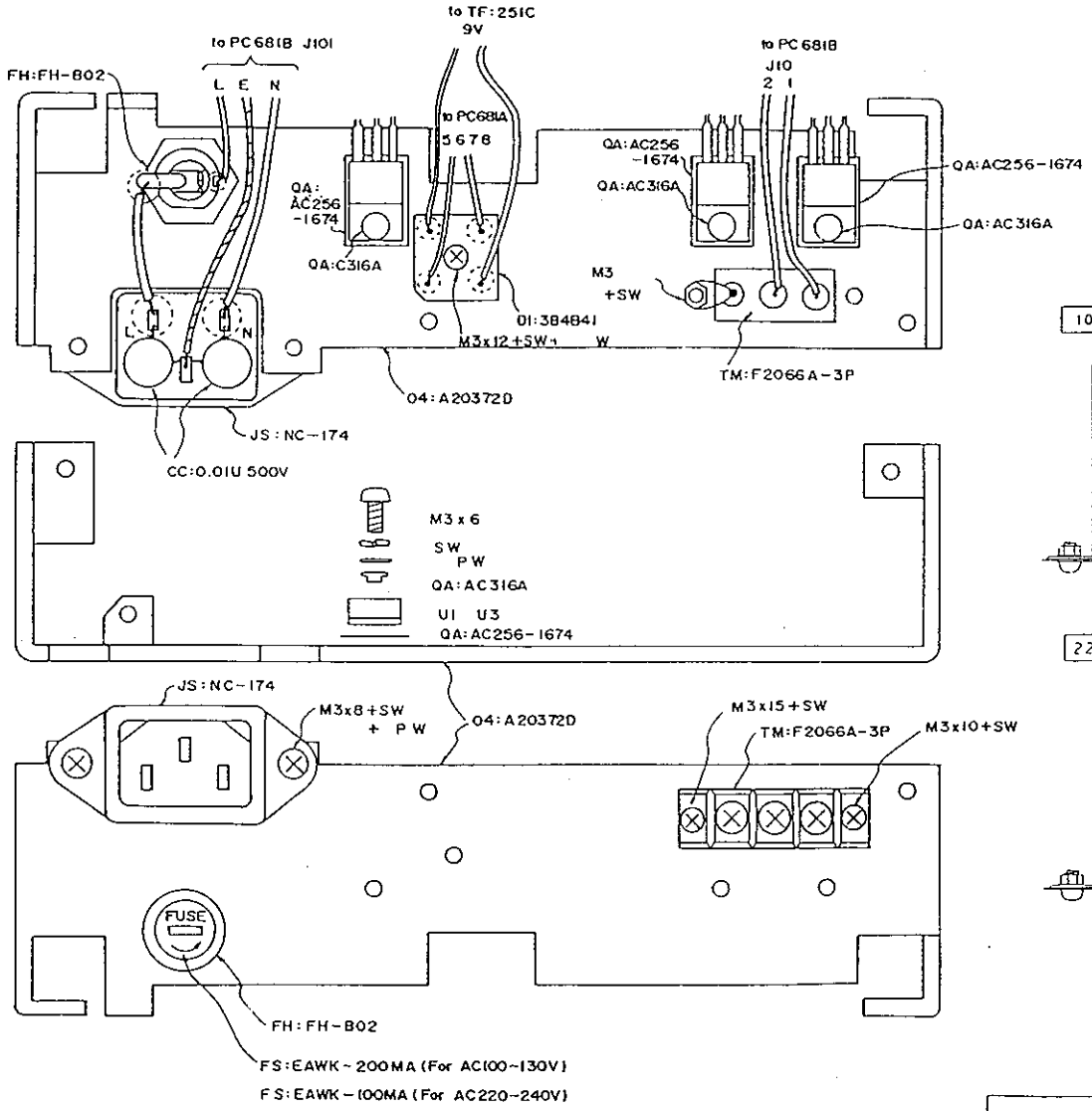


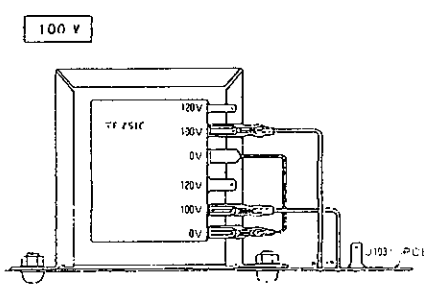
ASSEMBLY (CONTINUED)

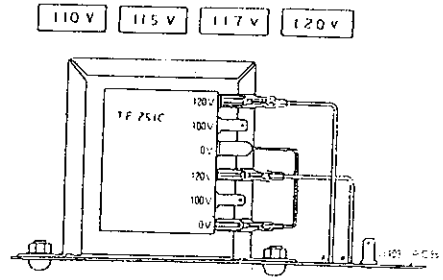


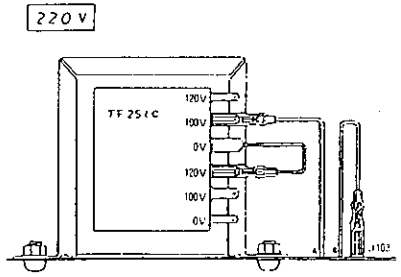

SYMBOL
DATE
BY
REVISION NO.
DESCRIPTION
MODEL
AK-ER-03
INTERFACE BOARD
STOCK NO.
P2:686
DRWG. NO.
EC3-00732

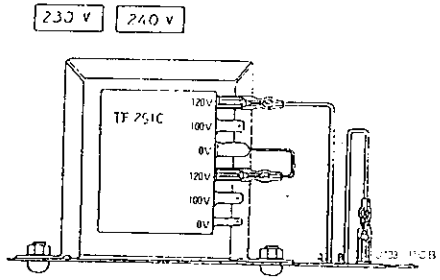
SCHEMATICS (CONTINUED)





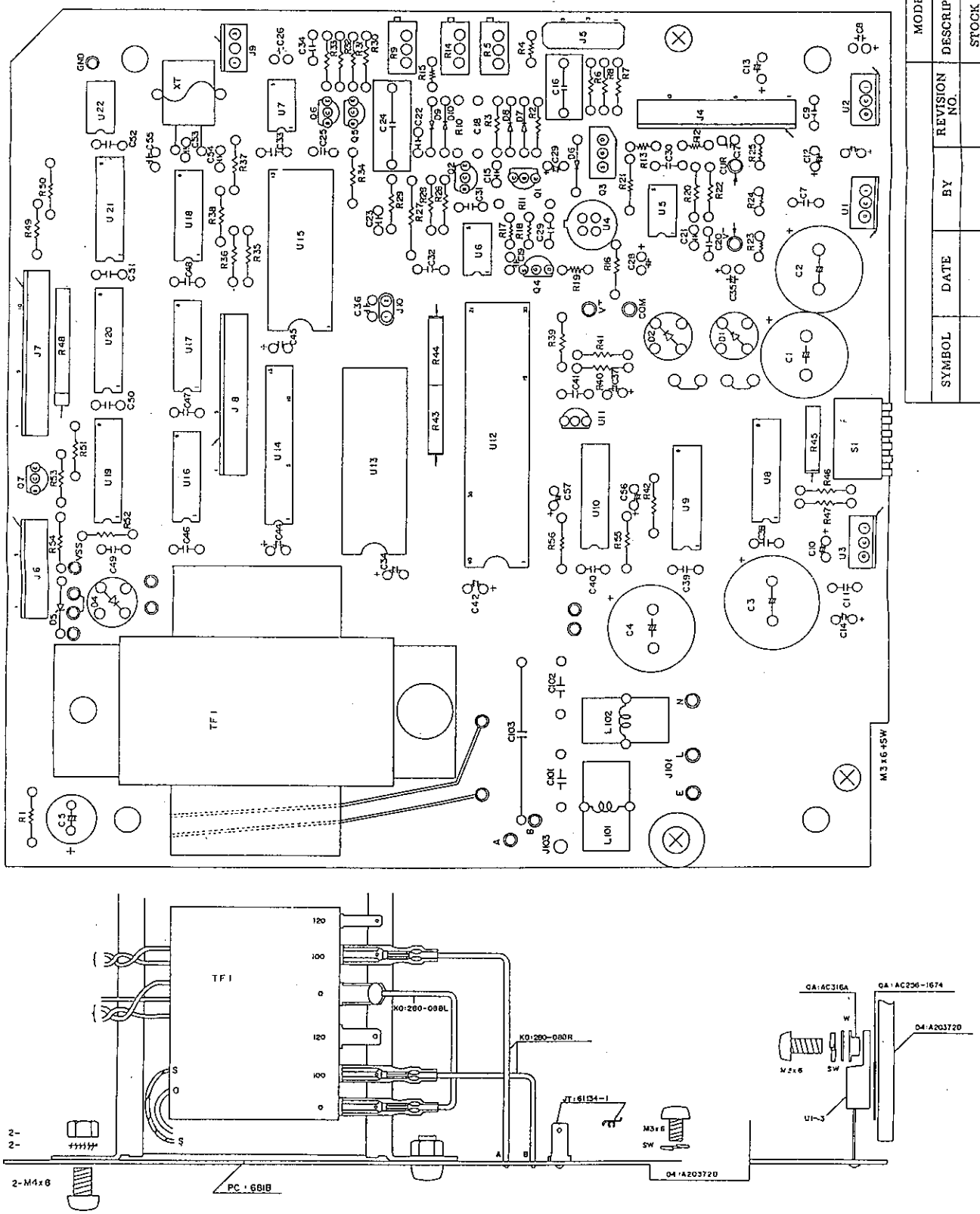


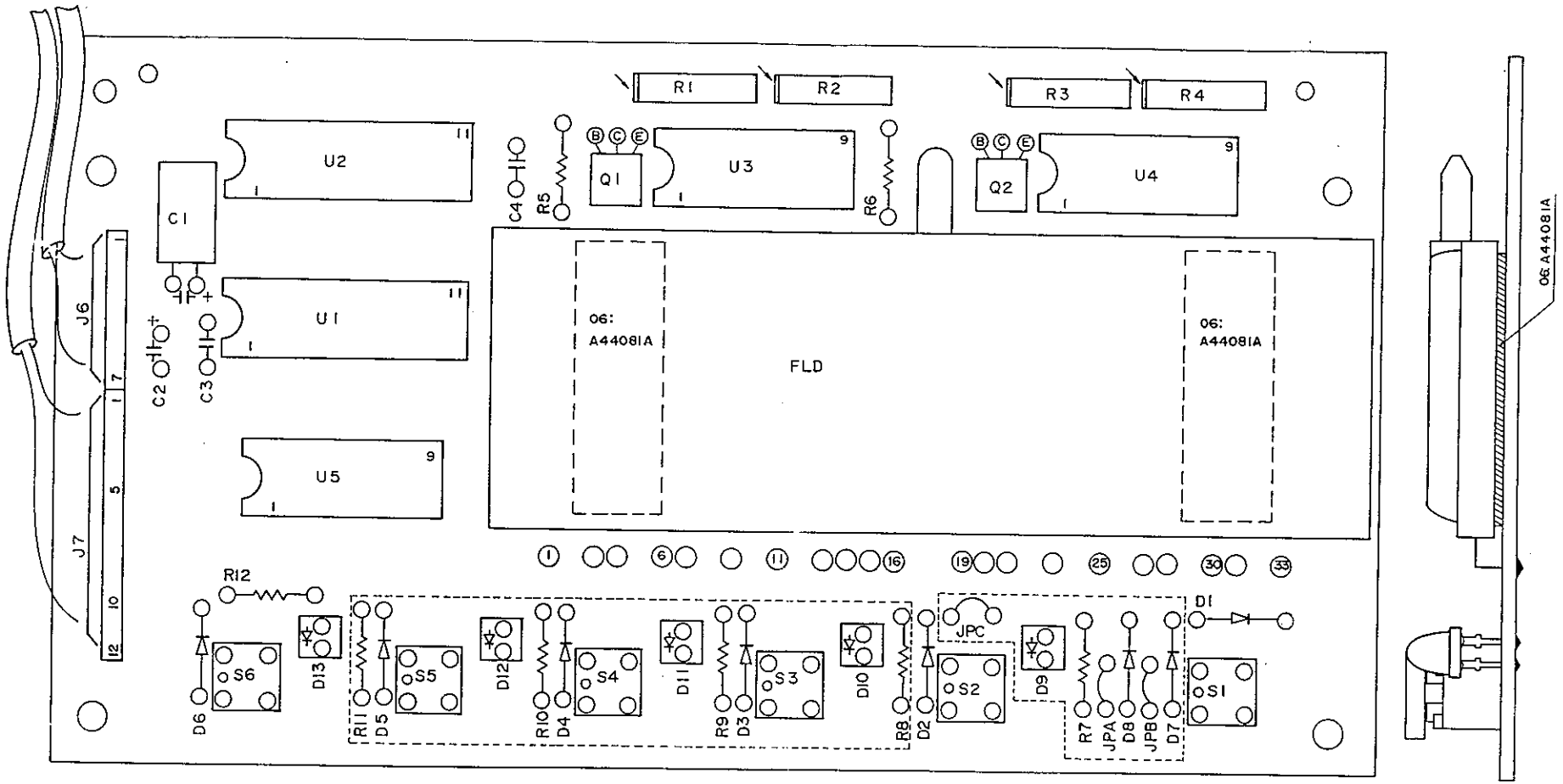




				MODEL	AK:ER-180A
SYMBOL	DATE	BY	REVISION NO.	DESCRIPTION	MAIN BOARD 1/2
				STOCK NO.	PZ:681
				DRWG. NO.	

SCHEMATICS (CONTINUED)





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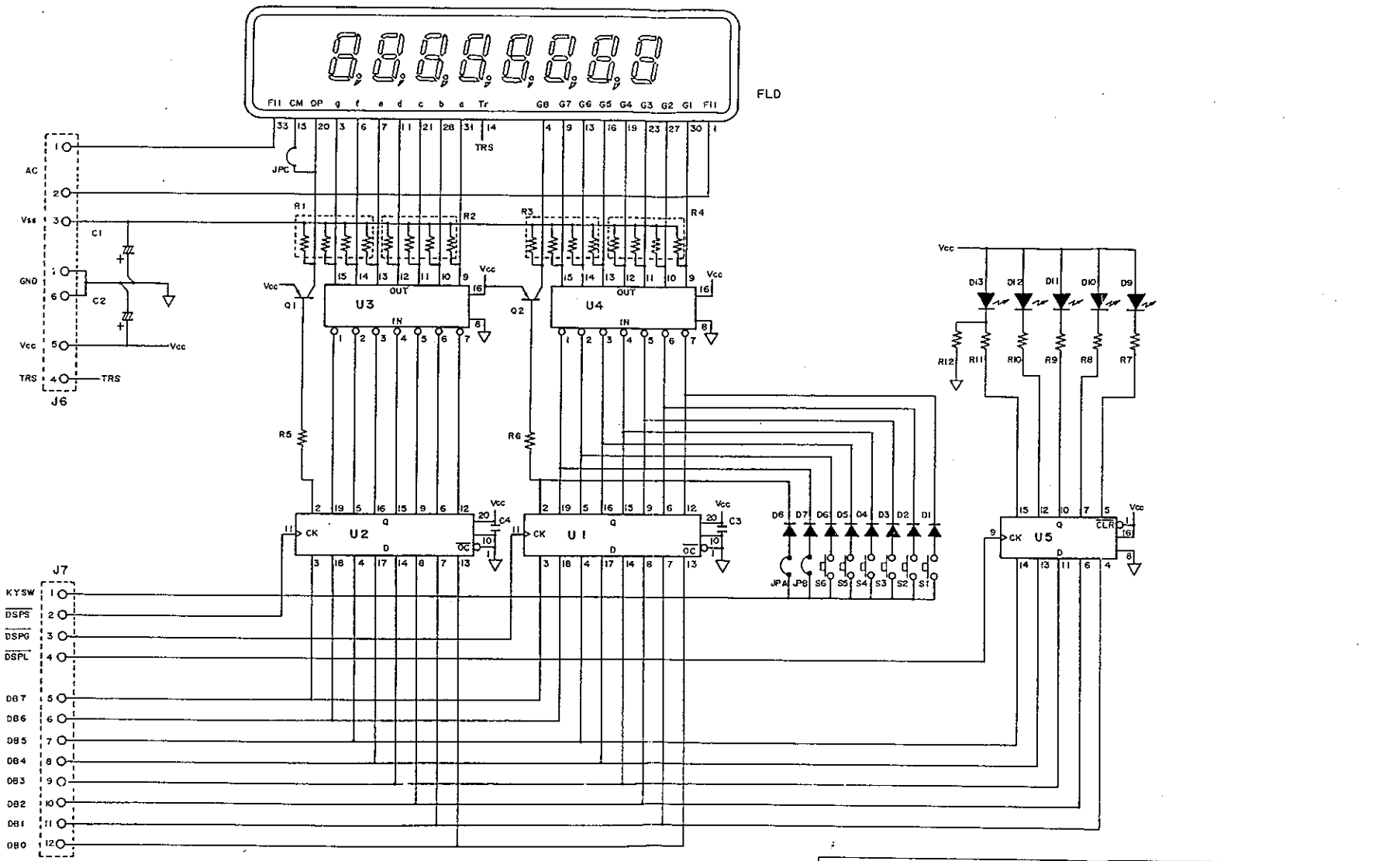

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SYMBOL	DATE	BY	REVISION NO.	DESCRIPTION	MAIN BOARD
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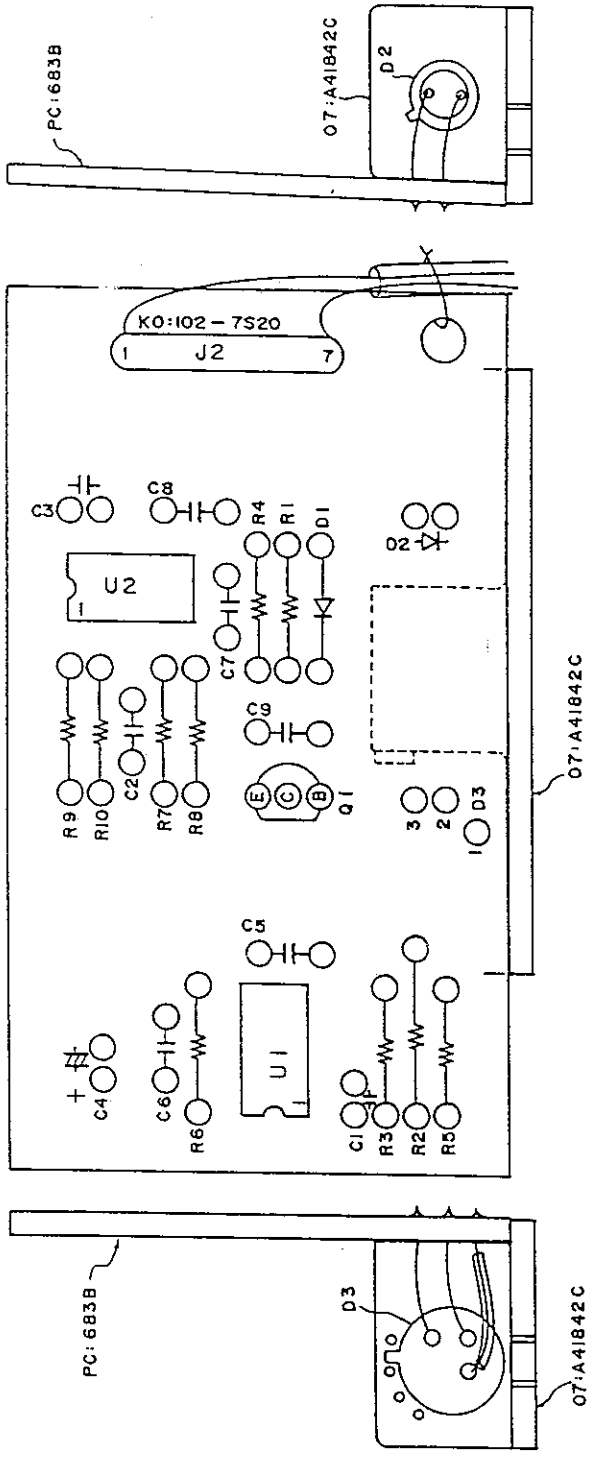
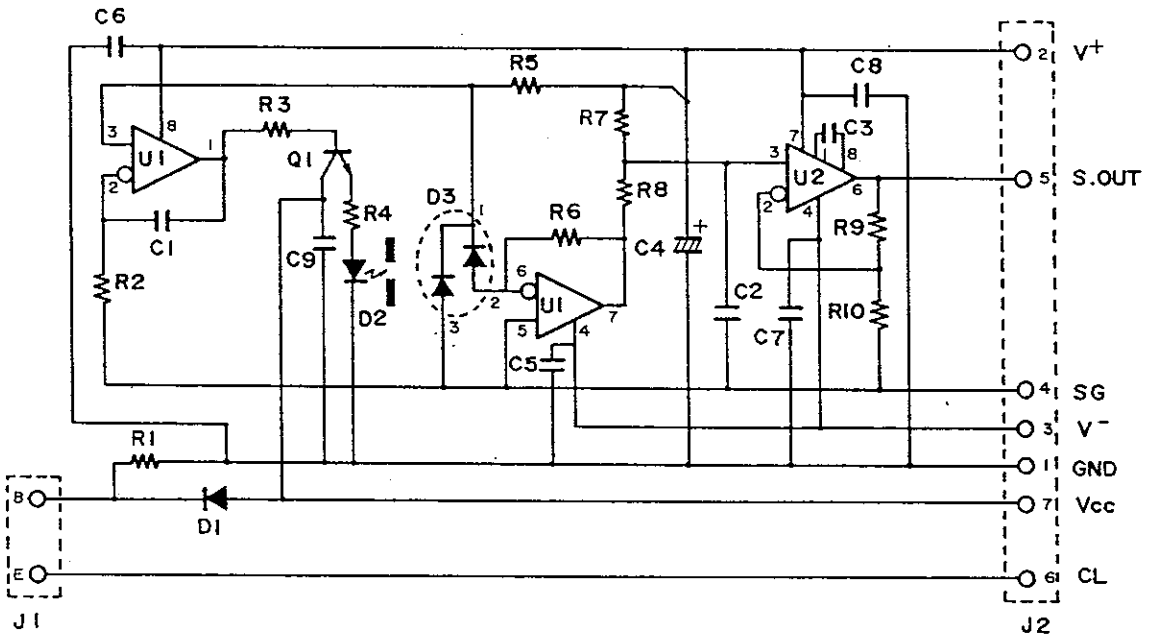
				DRWG. NO.	EC$_3$-00734

SCHEMATICS (CONTINUED)



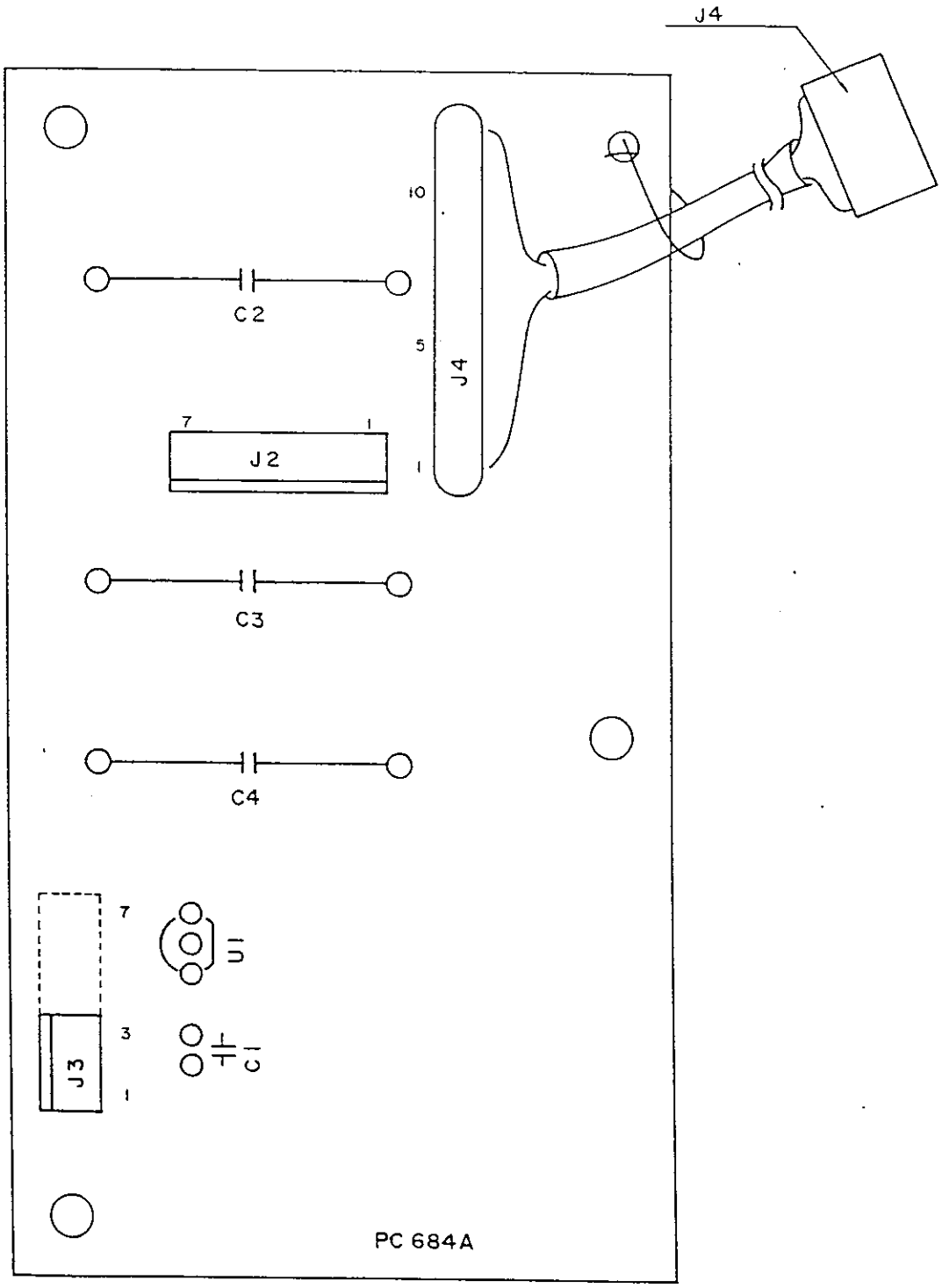
				MODEL	AK:ER-180A/120A/60A
SYMBOL	DATE	BY	REVISION NO.	DESCRIPTION	SENSOR BOARD
				STOCK NO.	PZ:683
				DRWG. NO.	KZ_4-00257

SCHEMATICS (CONTINUED)



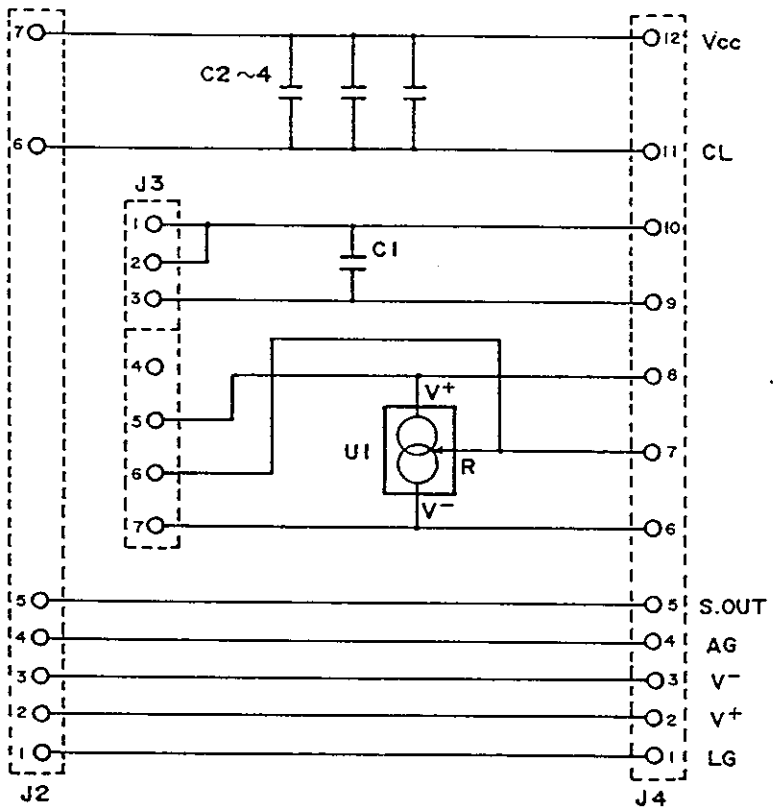
				MODEL	AK:ER180A/120A/60A
SYMBOL	DATE	BY	REVISION NO.	DESCRIPTION	SENSOR BOARD
				STOCK NO.	PZ:683
				DRWG. NO.	EC$_4$-00120

SCHEMATICS (CONTINUED)



				MODEL	AK:ER-180A
SYMBOL	DATE	BY	REVISION NO.	DESCRIPTION	CONDENSER BOARD
				STOCK NO.	PZ:684
				DRWG. NO.	

SCHEMATICS (CONTINUED)



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SYMBOL	DATE	BY	REVISION NO.	DESCRIPTION	CONDENSER BOARD
				STOCK NO.	PZ:684
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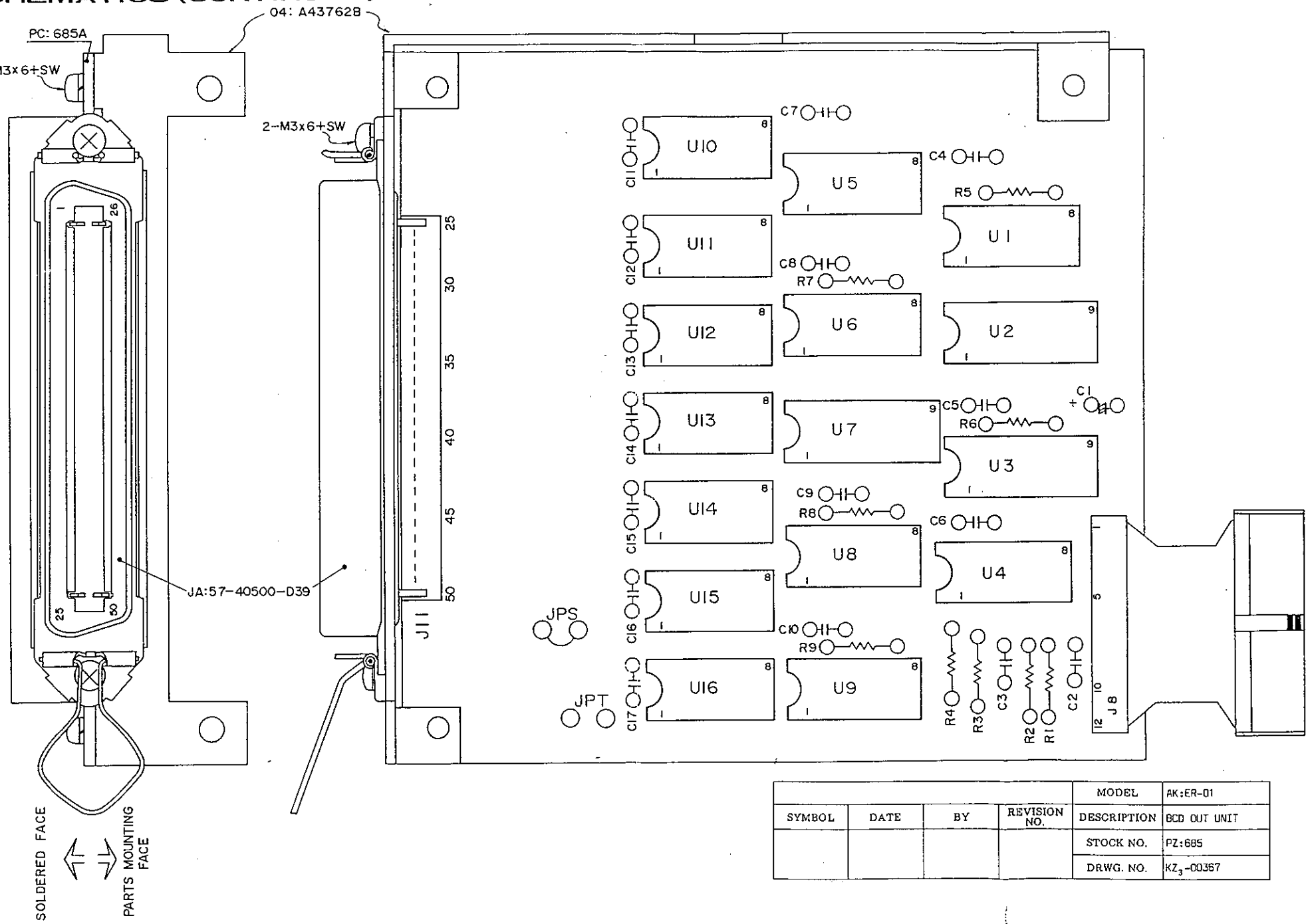
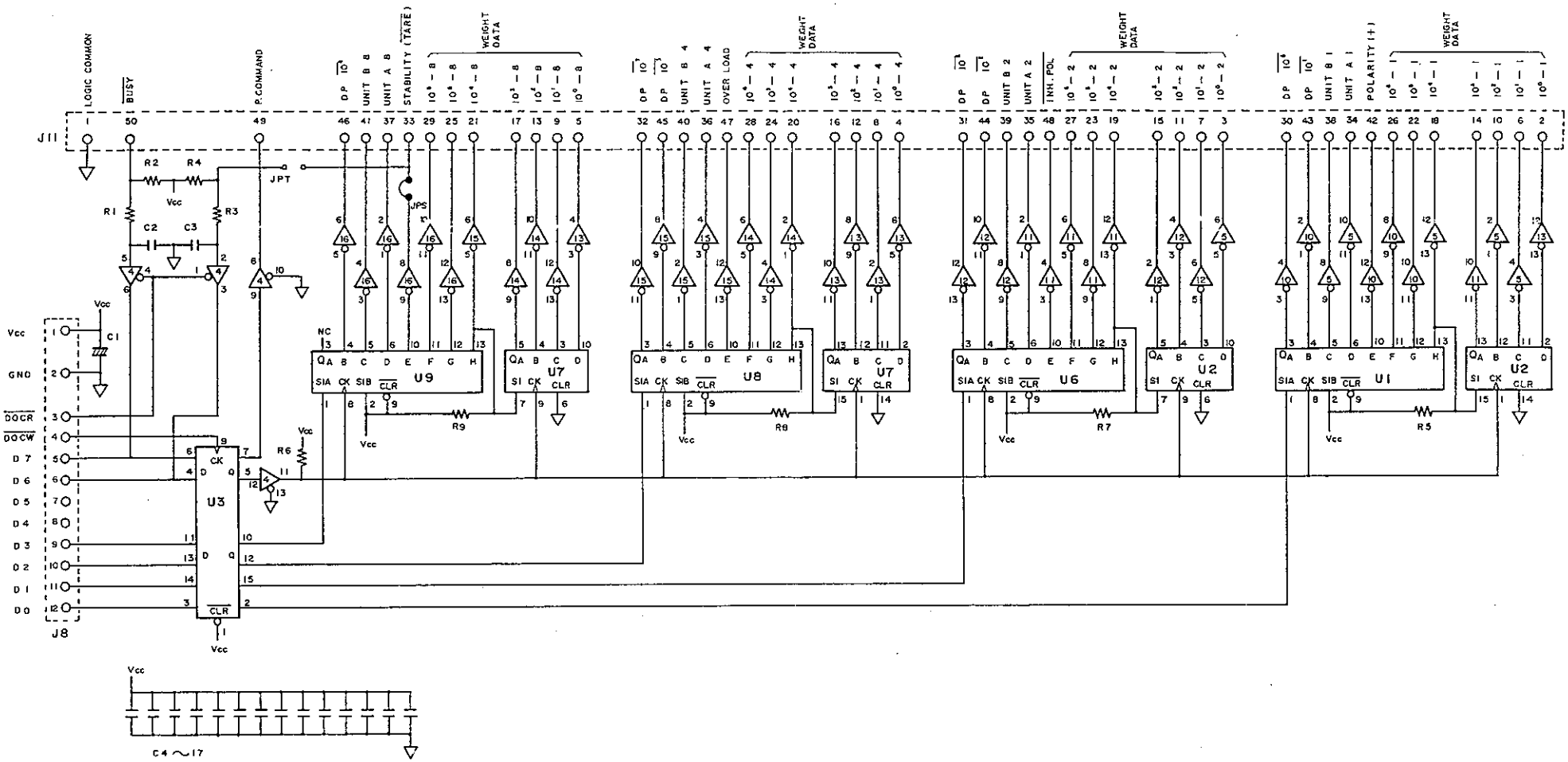


				MODEL	AK:ER-01
SYMBOL	DATE	BY	REVISION NO.	DESCRIPTION	BCD OUT UNIT
				STOCK NO.	PZ:685
				DRWG. NO.	KZ_3-00367



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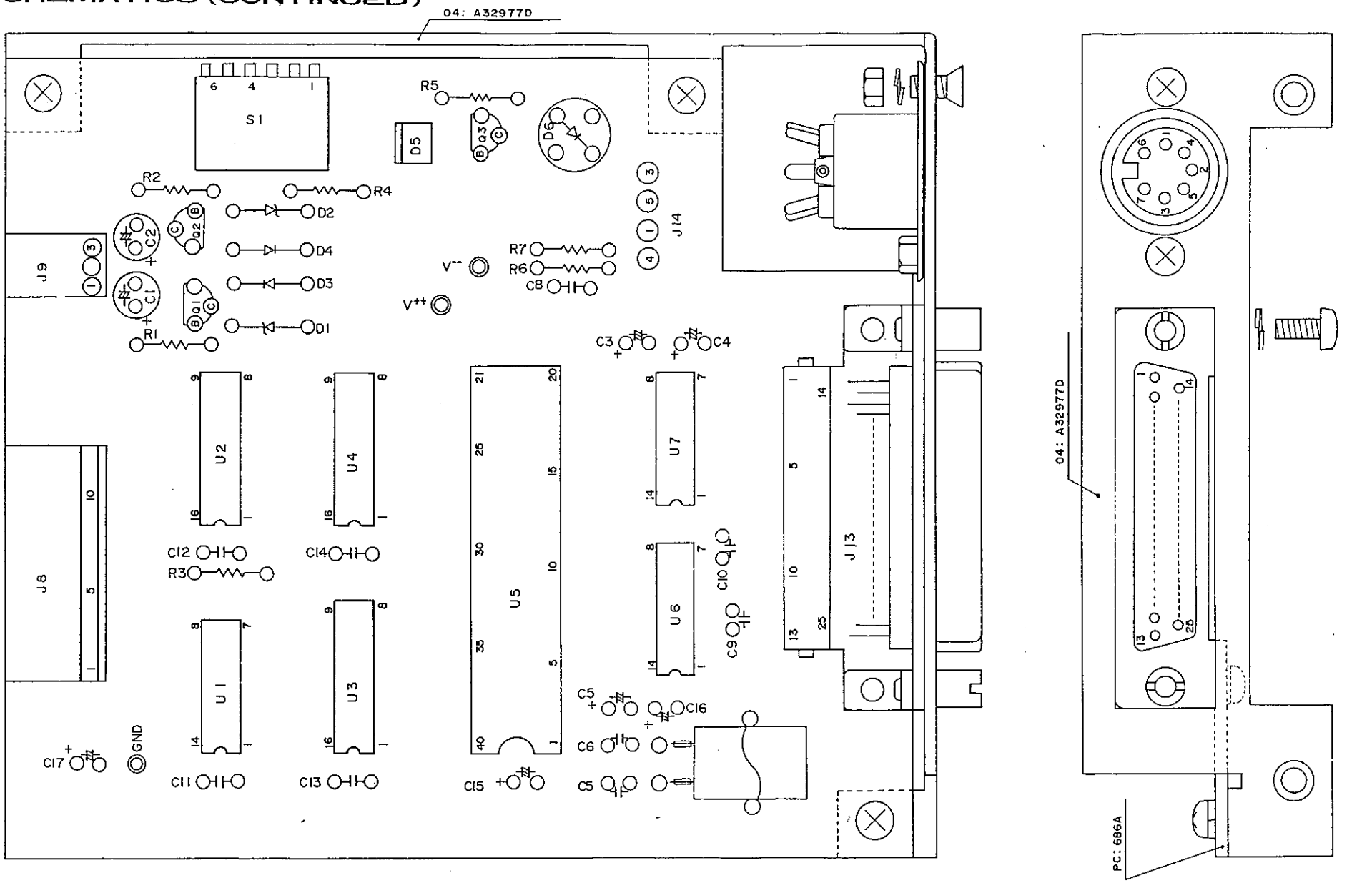
				MODEL	AK-ER-01
SYMBOL	DATE	BY	REVISION NO.	DESCRIPTION	BCD OUT UNIT
				STOCK NO.	P2-685
				DRWG. NO.	EC$_3$-00731



				MODEL	AK:ER-03
SYMBOL	DATE	BY	REVISION NO.	DESCRIPTION	INTERFACE BOARD
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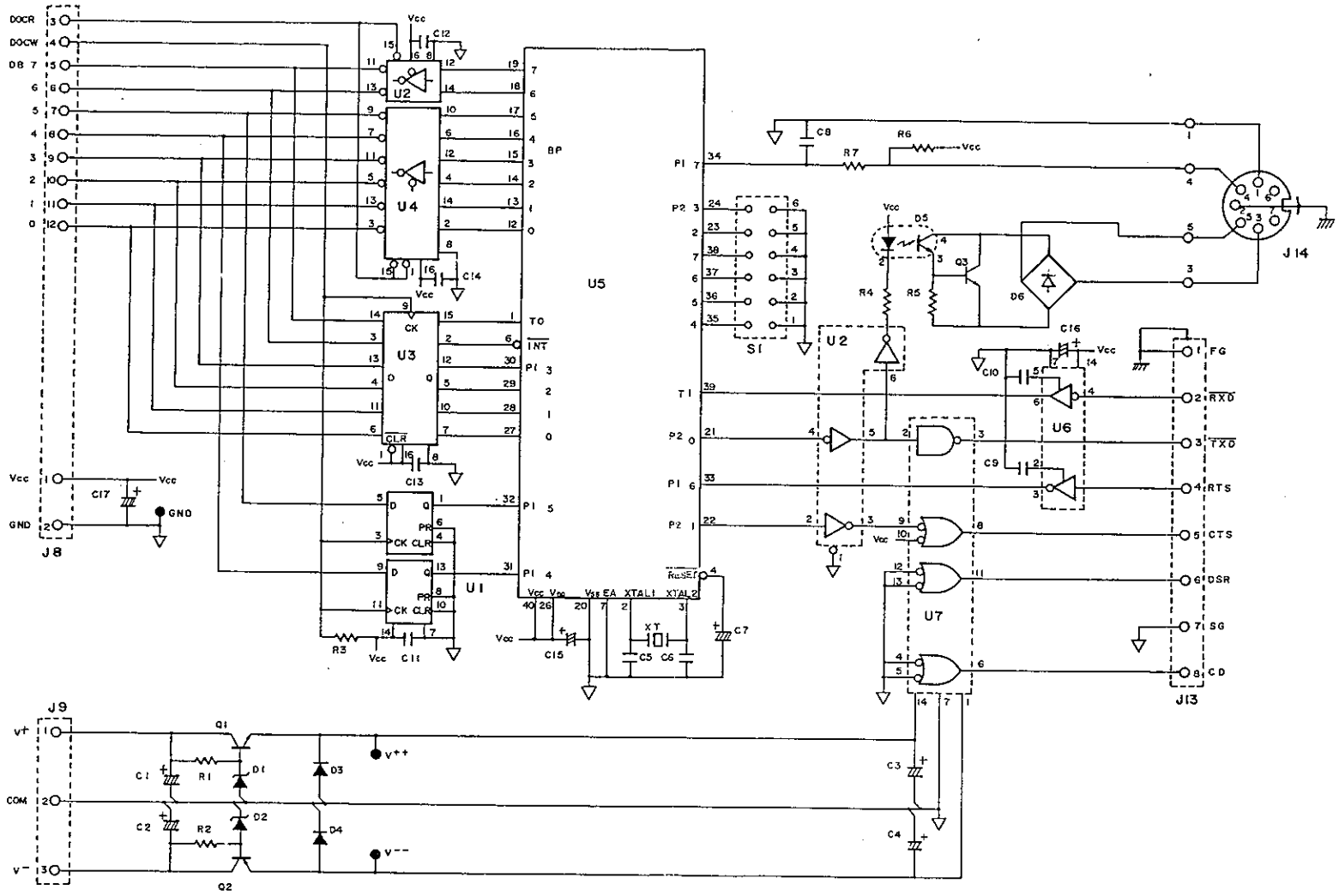

				MODEL	AK:ER-03
SYMBOL	DATE	BY	REVISION NO.	DESCRIPTION	INTERFACE BOARD
				STOCK NO.	PZ:686
				DRWG. NO.	EC_3-00732