HV-CS Chair Scale Maintenance Manual

A&D MERCURY PTY. LTD.

Contents

General Description

Mechanical

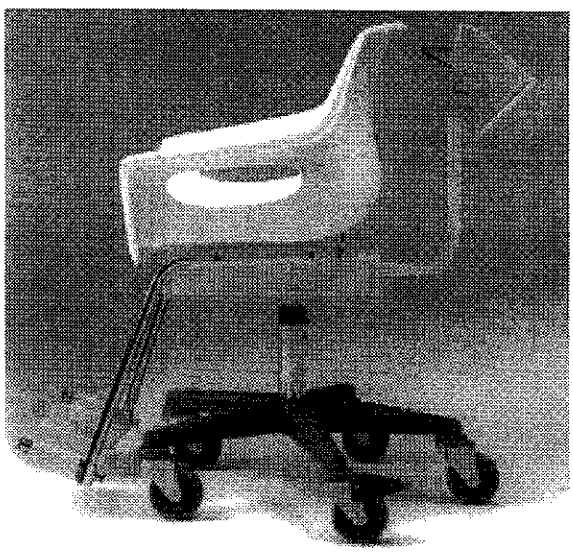
The HV-CS electronic chair scale is designed to weigh a person when seated on the chair.

The assembly comprises a 5 wheel aluminium alloy spider with a central column supporting a loadcell. Onto the loadcell is mounted a plastic seat upon which the subject sits. Footrests are provided to ensure that the subject is comfortably seated and that all parts of the body are weighed. A rear column supports the electronic digital indicator and an operator handle. The rear column may take one of two forms, either a two part assembly with an extruded column and support bracket or a single part bent steel column. Safety brakes are fitted to 2 of the wheels.

Electronic

The HV-CS utilises an LC-4103-150K aluminium single point loadcell of 150kg capacity. The loadcell is connected to a digital indicator identical to that provided on the HV-150 industrial platform scale. Special labels are applied to the digital indicator to identify it as an HV-CS model.

Two part column



Single part column

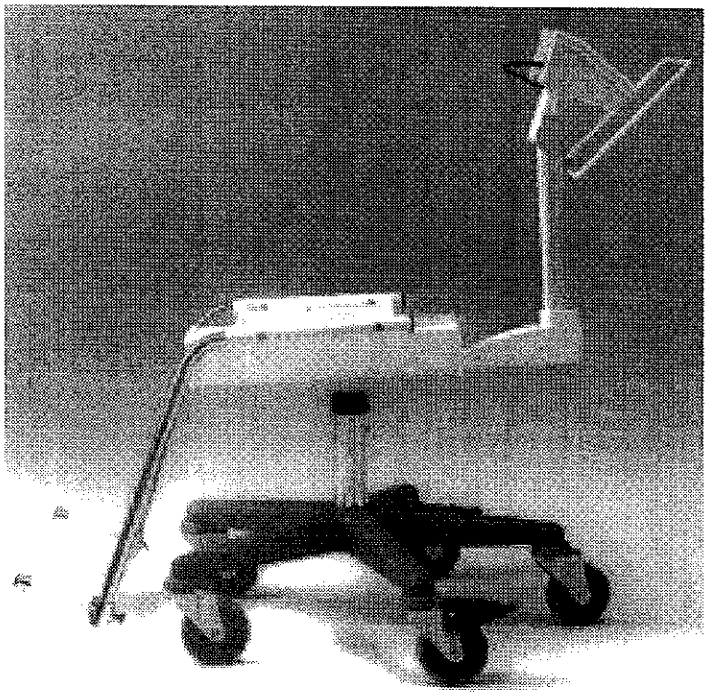
Note: *The pictures, in this manual, show the two part column, but the methods apply equally to both types. Any variations in disassembly instructions are noted in the text.*

Disassembly

Mechanical

1. Remove the plastic seat

   The chair is secured to the frame by 4 cross head screws positioned 2 at the front, 2 at the rear, under the seat.

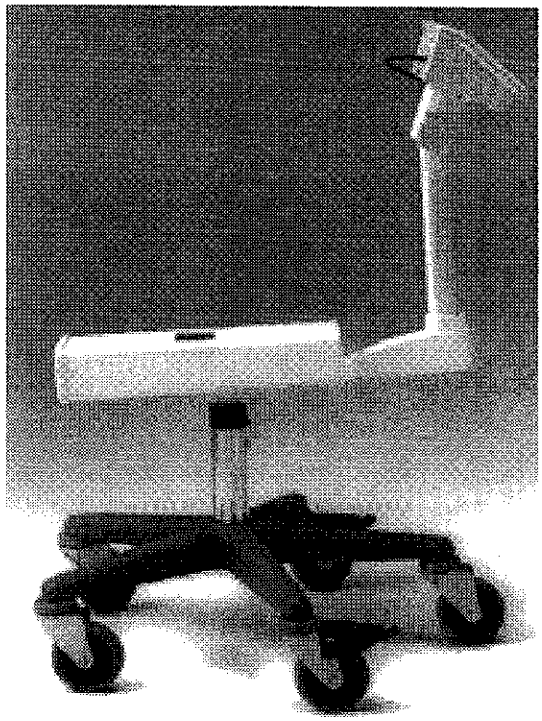


2. *Two part column only* - Remove the handle

   The handle is secured by 2 Allen screws onto the column.

3. Remove the support frame

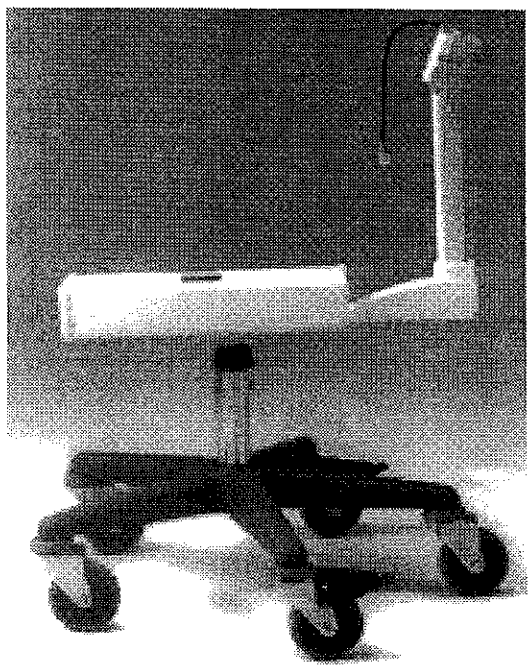
The support frame is secured to the loadcell by 3 Allen bolts.



4. Remove the indicator

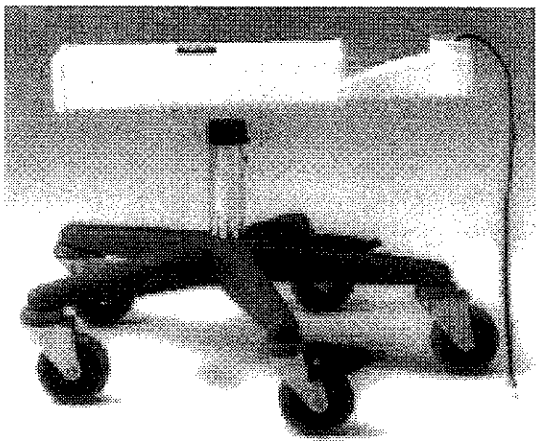
Remove the indicator to loadcell connector - at the rear of the indicator assembly.

The indicator is held to the column by 2 cross head screws.

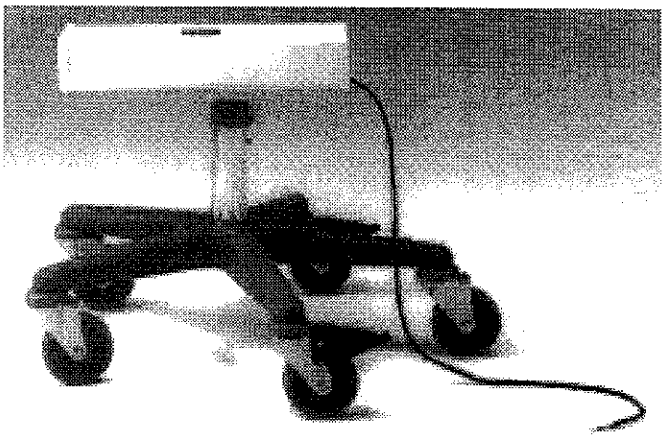


5. Remove the column

Be careful not to damage the loadcell cable when pulling it through the column.
Two part column - The column is held into the support bracket by 2 Allen screws.
Single part column - The column is held into the loadcell cover by 4 Allen bolts.



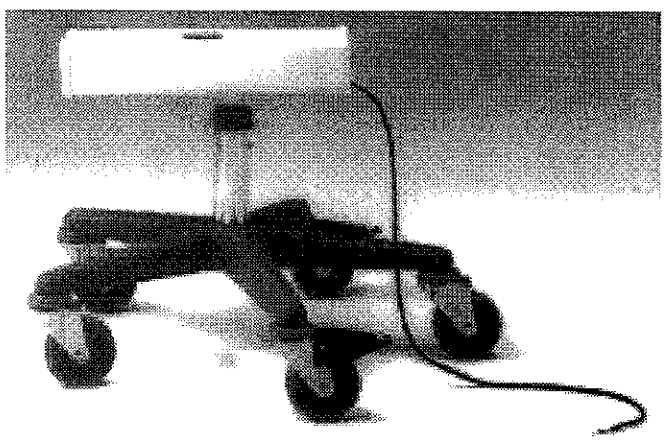
Two part column



Single part column

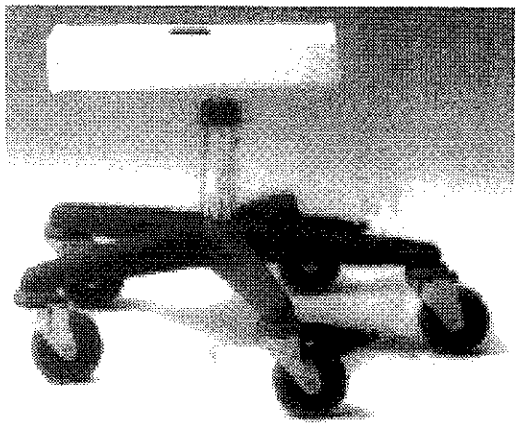
6. *Two part column* - Remove the column support bracket

The column support bracket is secured to the loadcell cover by 4 Allen bolts.



7. Remove the loadcell

The loadcell is secured to the loadcell cover by 4 Allen bolts.



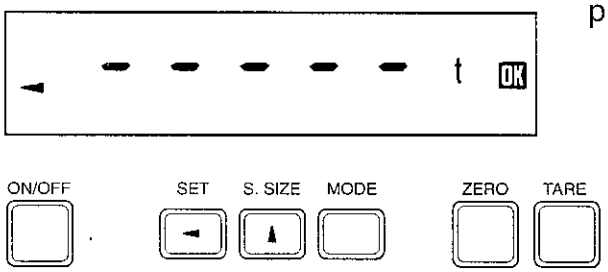
8. Remove the wheel assembly (spider)

It would not generally be necessary to detach the spider from the central column.

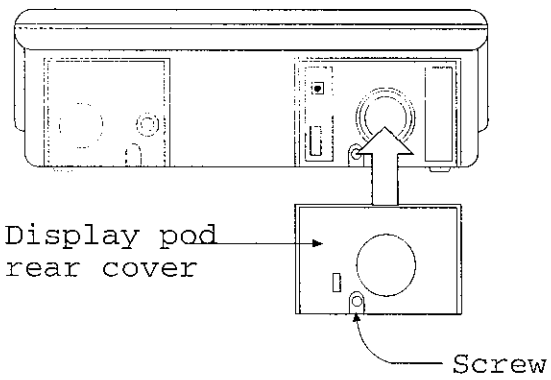
The central column is a press fit into the spider. Great care should be taken when attempting to separate the 2 parts.

Gravity Setting

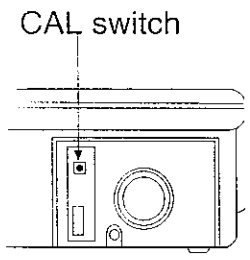
In the HV-CS scale, in order to obtain the correct weight, a correction function for the acceleration due to gravity is provided. To perform accurate weighing, it is necessary to set the acceleration due to gravity to match that of the area where the scale is being used. (Refer to the Technical section: Values of acceleration due to gravity.)



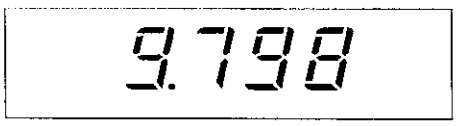
(1) Switch the power on.
After the display check, if the bar display is shown, press the MODE switch to display the weighing result, etc. (including E and -E displays).



(2) Remove the rear cover.



(3) Press the CAL switch.
By pressing the CAL switch, the calibration mode is entered and a four-figure numerical value 9. *** is displayed.



(4) Acceleration due to gravity
The four-figure number displayed when the calibration mode is entered, is the currently set gravity acceleration value.

If the gravity value matches the area it is being calibrated in, press MODE and move to the calibration procedure.

If the calibration has been completed and the scale is to be used in another area, reset the gravity value to that of the area where the scale is to be used.

Example: For setting the gravity acceleration from 9.798 (the factory setting) to 9.806 (the value for Milan or Ottawa). (See appendix)

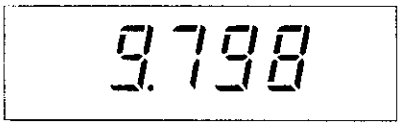
Functions of the keys used:

S.SIZE Adds 1 to the value of the digit that is flashing. After pressing this key, the value stops flashing.

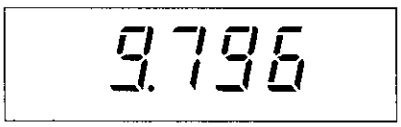
SET The digit to be changed moves one figure to the left and flashes.

ZERO Stores the data in memory.

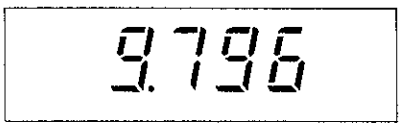
MODE Data is not changed and the mode progresses to the zero adjustment mode.

(1) 

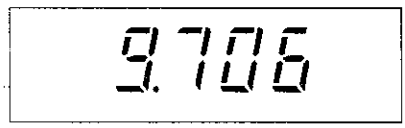
Press the SET switch to select the first figure. (The first figure flashes.)

(2) 

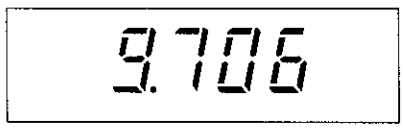
Press the S.SIZE switch to change the number of the first figure to "6".

(3) 

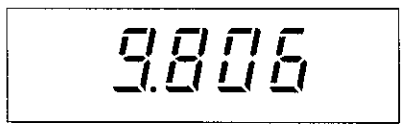
Press the SET switch to select the second figure. (The second figure flashes.)

(4) 

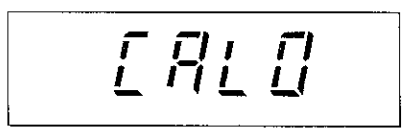
Press the S.SIZE switch to change the number of the second figure to "0".

(5) 

Press the SET switch once to select the third figure. (The third figure flashes.)

(6) 

Press the S.SIZE switch to change the number of the third figure to "8".

(7) 

Using the above procedure, the gravity acceleration setting has been completed. Press the ZERO switch to store the data in memory.

If the scale requires calibration, continue with the calibration procedure step 3.

If the calibration has been completed and the gravity value is being set to that of another area, press the CAL key to exit the setting procedure.

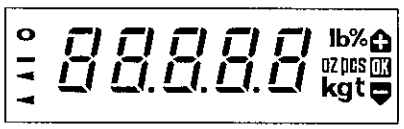
Calibration Introduction

Calibration of the scale is required when it is initially installed, if the scale is moved a substantial distance, or in accordance with local regulations. This is necessary because the weight of a mass in one location is not necessarily the same in another location. Also, with time and use, mechanical deviations can occur.

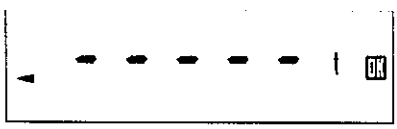
"Weight" equals mass times acceleration due to Earth's field of gravity. The internationally adopted value for gravitational acceleration is 9.80665 m/s2 (32.174 ft/s2) in a vacuum. However, this varies by about ±0.3 percent depending on how far you are from the Earth's center of mass. Mass distorts space in such a way that the gravitational power of attraction is inversely proportional to the square of the distance between material objects (if non-gravitational forces are ignored). So, gravitational acceleration, "g" is greatest at the poles, least at the equator and decreases with altitude.

When we weigh a mass we are trying to find its weight expressed as pounds or kilograms. Because "g" and other factors vary from location to location, we must calibrate the scale whenever we move it, otherwise a mass of 30kg might display 30.00kg in one location and 30.08kg in another (i.e.: "g" may have changed by +0.267%. w=m X g). This would be an error but it can be prevented by placing an accurate mass on the scale (say 30kg) and then telling the scale, in effect, "this is what 30kg weighs at this location so please display 30.00kg"..... this is calibration.

The HV/HW series is also equipped with a gravity compensation function which means that it can be calibrated in one location and then adjusted to match the acceleration of gravity at another location. We call this "setting the value of 'g". If you wish to take advantage of this feature, please read the Gravity Compensation Function section.



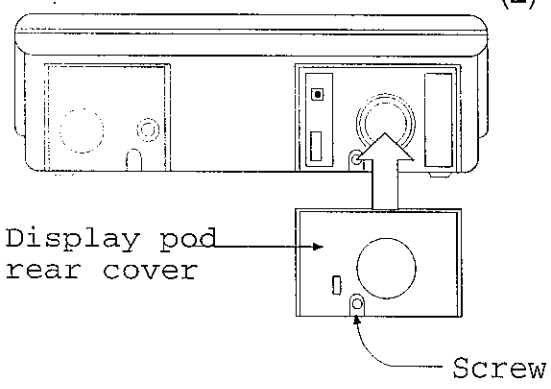
Zero and span calibrations

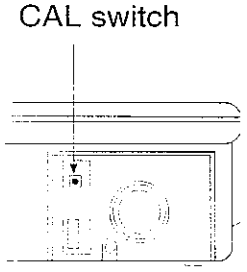


Ensuring that there is nothing on the chair, switch on the power. If the bar display is shown after the display check, the zero point is displaced. In this situation, carry out the zero point calibration.

(1) Press the ON/OFF key and allow an adequate amount of time for warming up (10 minutes or longer) During warming up, disable the auto power off function, or place an object on the chair so that the display is not zero.

(2) Remove the rear cover.





(3) Press the CAL switch.
By pressing the CAL switch, the calibration mode is entered and a four-digit value 9. *** is displayed.

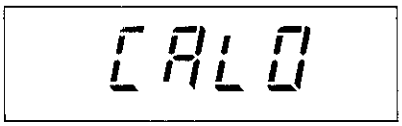
(2) Set the gravity acceleration according to the procedure "Correction for acceleration due to gravity". Set this to the gravity where the scale is being calibrated. After finishing this setting, Press ZERO , the display enters the zero point calibration.

(3) Zero adjustment

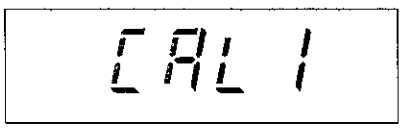
Functions of the key switches used:

ZERO Stores the zero adjusting value in memory.

SET The data is not changed, and the machine moves forward to the span adjustment.



With nothing on the chair, wait for the "o" stable mark to be displayed.



When this stable mark is displayed, press ZERO to store the zero data. When the data has been stored, the calibration mode moves forward to the span adjusting procedure.
If only the zero point is to be calibrated, press the CAL switch to exit from the calibration mode after the above procedure.

(4) Span adjustment

In span adjustment, there is a full scale adjusting mode and a 2/3 scale adjusting mode. Perform one or other of the procedures.

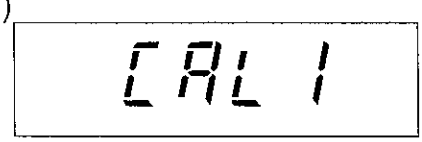
Carry out the adjustment using the full scale, 150kg, weights.

Functions of the key switches used:

ZERO Stores the span data in memory.

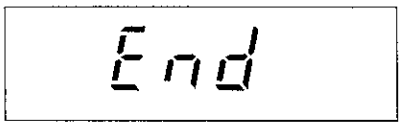
MODE The data is not changed, and the span adjusting mode changes.
Each time the switch is pressed, the mode changes as follows:

(5) Span adjustment (Full scale - 150kg)

(1) 

By pressing the MODE switch, select the CAL1 (Kg) mode.

Place the full scale weights on the chair and wait until the "o" stable mark is shown.

(2) 

When the stable mark is shown, press ZERO to record the span adjusting data. After the data has been recorded, "End" is automatically displayed.

(6) Ending the calibration

After the zero and span adjustment is finished and "End" is displayed, if the calibration has been completed, press the CAL switch. This exits from the calibration mode and returns to the normal weighing display mode.

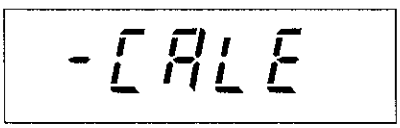
To complete the calibration, replace the display case rear cover that was previously removed.

Note: If the scale is to be used in a location other than where it was calibrated and the "g" setting for that area is different, re-enter the calibration procedure and set the "g" for that area. See Appendix for a list of gravity settings at various locations. If in doubt, contact your local Office of Weights and Measures for this data.

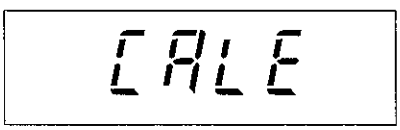
Error displays during calibration

(7) Error displays

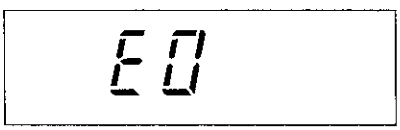
The following are the error displays that may be shown during calibration. If these displays are shown, confirm whether the operation has been mistaken and if the correct weights are being used, etc., then switch off and perform the procedure again.

(1) 

The output from the load cell is too small. When carrying out the span adjustment, if this error is only displayed when the ZERO switch is pressed, the load cell output is too small compared to the zero adjusting data.

(2) 

The load cell output is too large. Check the weight value of the calibration mass

(3) 

The data that was to be stored in memory has not been stored correctly.

For the span adjustment, use an accurate weight to carry out the procedures.

Fault Finding

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

Troubleshooting

- ✔ Check the Keyboard to see if it's okay. (see Keyboard Check)
- ✔ If the display remains "E", "-E", or is not stable - then do a full recalibration, including setting "g" if used (see Calibration section).
- ✔ If you are unable to calibrate:
  - Zero calibration may be needed if the ZERO key will not set the display to zero, or if "——" is displayed when the power is turned on .
  - If "-CAL E" is displayed when you press ZERO , the scale cannot enter the maximum capacity value because the calibration mass is under-weight (minus Calibration Error). Check everything is correctly set.
  - Check the analogue and main boards for broken leads, and the cable from the Load Cell to J2 of the analogue board.
- ✔ If "E0" is displayed, turn off the power and try again. If that does not work, change either U2, U3 of the main board or replace both boards, one at a time.

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

Battery Check

- ✔ Remove the battery pack, and the AC adaptor (if connected). Then, re-install the battery pack. Press the ON/OFF key. Does the display turn on?
- ✔ Check the connection between the analogue and the main boards. ❑ ok
- ✔ Check the output of the Battery/AC adaptor to see that it is at least 6.5 volts. ❑ ok
- ✔ When pressing the ON/OFF key, check the resistance between S1 pins to see if they read less than 10 Ω. If so, then it is okay. ❑ ok
  - If not, replace the switch. ❑ ok
  - If the resistance is correct and the problem isn't solved, try a different main board. If it checks out, then change the analogue board.
- ✔ When the ON/OFF key is pressed, the voltage at J1 pins 1 and 2 should be 5V ±10%, and pin 1 of U3 (RESET) at ≈5V (Hi). ❑ ok
- ✔ Check that transistors Q1, Q2, Q3 on the analogue board are working. ❑ ok

CPU Check

- ✔ Remove the battery pack, and the AC adaptor (if connected). Then, re-insert the battery pack. Press the ON/OFF key. Does the display turn on?
- ✔ Check all solder connections. ❑ ok
- ✔ Check that the voltage between pin 3 and 4 of J3 of the analogue board, it should be 5V ±10%. ❑ ok
- ✔ Is the HV RESET at the Hi level? [pin 1 of U3 (RESET) at ≈5V (Hi)] ❑ ok
- ✔ Is the HW RESET at the Hi level? [pin 8 of U6 (RESET) at ≈5V (Hi)] ❑ ok
- ✔ Check the voltage levels for the HW LCD at U5 pin 2 ≈1.6V, 1 ≈ 3.2V ❑ ok
- ✔ Check that the HV clock pulse is 4MHz (see #1 Waveform table).
- ✔ Check that the HW clock pulse is 12MHz (see #1 Waveform table).
- ✔ Check the waveform of EEPROM (see #9 ~ 12 Waveform table). ❑ ok

CPU Check

- ✔ Remove the battery pack, and the AC adaptor (if connected). Then, re-insert the battery pack. Press the ON/OFF key. Does the display turn on?
- ✔ Check all solder connections. ❑ ok
- ✔ Check that the voltage between pin 3 and 4 of J3 of the analogue board, it should be 5V ±10%. ❑ ok
- ✔ Is the HV RESET at the Hi level? [pin 1 of U3 (RESET) at ≈5V (Hi)] ❑ ok
- ✔ Is the HW RESET at the Hi level? [pin 8 of U6 (RESET) at ≈5V (Hi)] ❑ ok
- ✔ Check the voltage levels for the HW LCD at U5 pin 2 ≈1.6V, 1 ≈ 3.2V ❑ ok
- ✔ Check that the HV clock pulse is 4MHz (see #1 Waveform table).
- ✔ Check that the HW clock pulse is 12MHz (see #1 Waveform table).
- ✔ Check the waveform of EEPROM (see #9 ~ 12 Waveform table). ❑ ok

A/D Hybrid Check

- ✔ Check the voltage of U2 at pin 10 on the analogue board, it should be 5V ±10%. ❑ ok
- ✔ Check the following voltages from the Load Cell between U2 pin and:

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

- ✔ Check the A/D converter waveforms for: (see Waveform table)

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

LCD Check

- ✔ Check the glass for cracks (visible as dark spots). ❑ ok
- ✔ Check the soldering for breaks, and the flexible cable for cracks or tares between the main board and the LCD. ❑ ok
- ✔ Check for missing segments during the sequential and 'power on' tests ❑ ok

Load Cell Check

- ✔ Check the following cable assembly - pin to wire - connections of J2 on the analogue board:

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

- ✔ Check the voltage between pins 1 & 4 of J2 , it should be 5V ±10%. ❑ ok
- ✔ Check the voltage between pins 2 & 4 of J2 , it should be ≈ 3V. ❑ ok
- ✔ Check the voltage between pins 3 & 4 of J2 , it should be ≈ 3V. ❑ ok
- ✔ Check the voltage between pins 2 & 3 of J2 , it should be 0.5 ~ 2mV with no weight on the chair. ❑ ok
- ✔ Check the voltage between pins 2 & 3 of J2 , it should be 5 ~ 8mV with full span weight on the chair. ❑ ok

Keyboard Check

Key: • What should happen when pressed:

- ✔ ON/OFF • The power should go ON and OFF. ❑ ok
- ✔ MODE • The display should go from "kg" to "PCS". ❑ ok
- ✔ SET • In the "PCS" mode it should show "5 0 pcs". ❑ ok
- ✔ HI/LO • In the Counting Mode, the sample size should move from 5 to 10 to 20, etc. ❑ ok
- ✔ ZERO • It should cause the display to show zero when pressed. ❑ ok
- ✔ TARE • It should cause the display to show zero when pressed. ❑ ok
- ✔ Remove the battery pack, and the AC adaptor, if connected.
- ✔ Check that each individual key is working by measuring the resistance between the pins of the switches.

  The resistance with the key pressed should be less than 10 Ω for:

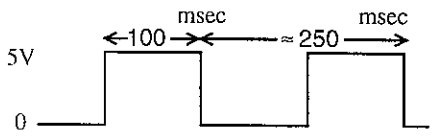
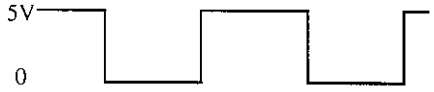
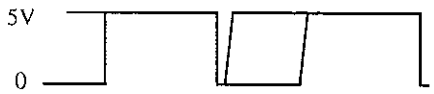
  - ON/OFF between pins of S1 ❑ ok
  - SET between pins of S2 ❑ ok
  - S.SIZE between pins of S3 ❑ ok
  - MODE between pins of S4 ❑ ok
  - ZERO between pins of S5 ❑ ok
  - TARE between pins of S6 ❑ ok

  If any of the above are out of the correct resistance range, that switch is defective.
- ✔ Re-install the battery pack, and the AC adaptor, if it was connected.

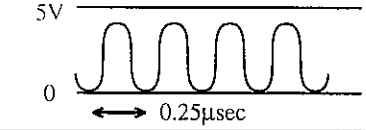
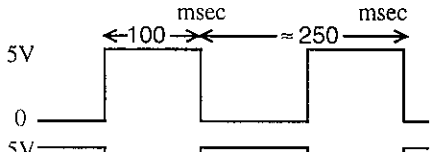
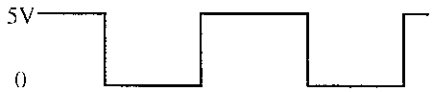
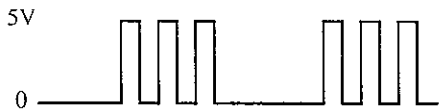
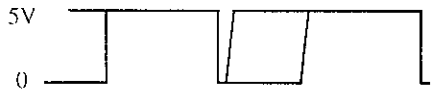
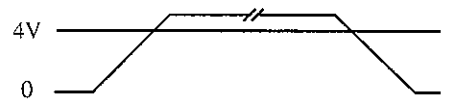
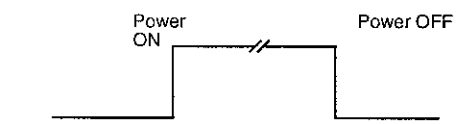
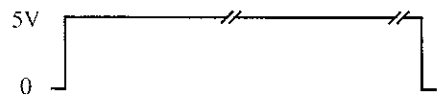
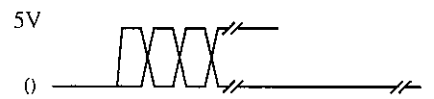
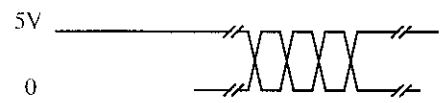
J1~J3 Checks, Analogue Board

- ✔ Check the voltage between pins 1 & 2 of J1 , it should be ≈ 9V. ❑ ok
- ✔ Check the voltage between pins 1 & 4 of J2 , it should be 5V. ❑ ok
- ✔ Check the voltage between pins 2, 3 & 4 of J3 , it should be 5V. ❑ ok
- ✔ Check the voltage between pins 2, 3 & 10 of J3 , it should be > 4V. ❑ ok
- ✔ Check the voltage between pins 2, 3 & 12 of J3 , it should be ≈ 9V if the ON/OFF key is not pressed. ❑ ok
- ✔ Check the voltage between pins 2, 3 & 12 of J3 , it should be ≈ 3V if the ON/OFF key is pressed. ❑ ok

Analogue Board Waveform Check

No.	Signal	Test Points		Comments
1	1st	J2 (9) ~ GND U1 (41)		A/D Control Input
2	$\overline{1st}$	J2 (8) ~ GND U1 (42)		
3	2nd	J2 (7) ~ GND U1 (43)		
4	AZ	J2 (6) ~ GND U1 (44)		
5	CMP	J2 (5) ~ GND U1 (48)		A/D Output

Main Board Waveform Check

No.	Signal	Test Points	Wave	Comments
1	X EX	X1, U1(46) ~ GND X1, U1(45)		CPU Clock 4 MHz
2	1st	J2 (9) U1 (41) ~ GND		A/D Control Input
3	$\overline{1st}$	J2 (8) U1 (42) ~ GND		
4	2nd	J2 (7) U1 (43) ~ GND		
5	AZ	J2 (6) U1 (44) ~ GND		
6	CMP	J2 (5) U1 (48) ~ GND		A/D Output
7	$\overline{RESET}$	U3 (2) ~ GND		+5V Input
8		U3 (1) U1 (47) ~ GND		Reset Output
9 *	CS	U2 (1) U1 (22) ~ GND		EEPROM Chip Select
10*	SK	U2 (2) U1 (23) ~ GND		Clock
11*	DI	U2 (3) U1 (24) ~ GND		Data
12*	DO	U2 (4) U1 (25) ~ GND		Data Output

* Waveforms 9-12 can only be observed at Power ON, Function and calibration data storage

HV Initialisation & Display Check

Initialisation:

The exploded view of the display and drawings of the main boards and the parts list may be helpful during disassembly and for the location of various parts.

Step 1. If the AC adapter is used, disconnect it.

Step 2. Remove the battery pack.

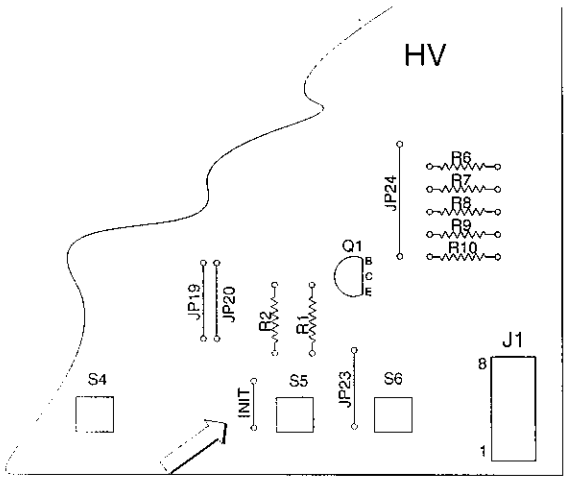
Step 3. Remove the calibration switch (panel A) and interface (panel B) covers.

Step 4. Disconnect the load cell cable.

Step 5. Remove the 4 screws that secure the front panel to the case.

Step 6. Carefully separate the front panel, and disconnect the cables.

Step 7. Locate where the jumper marked 'INIT' should be (arrow in drawing below).



Step 8. Install a jumper at this point or if the original is there, but cut, short it together.

Step 9. Reconnect the cables removed in steps 4 and 6 (it may be convenient to remove the analogue board from the case).

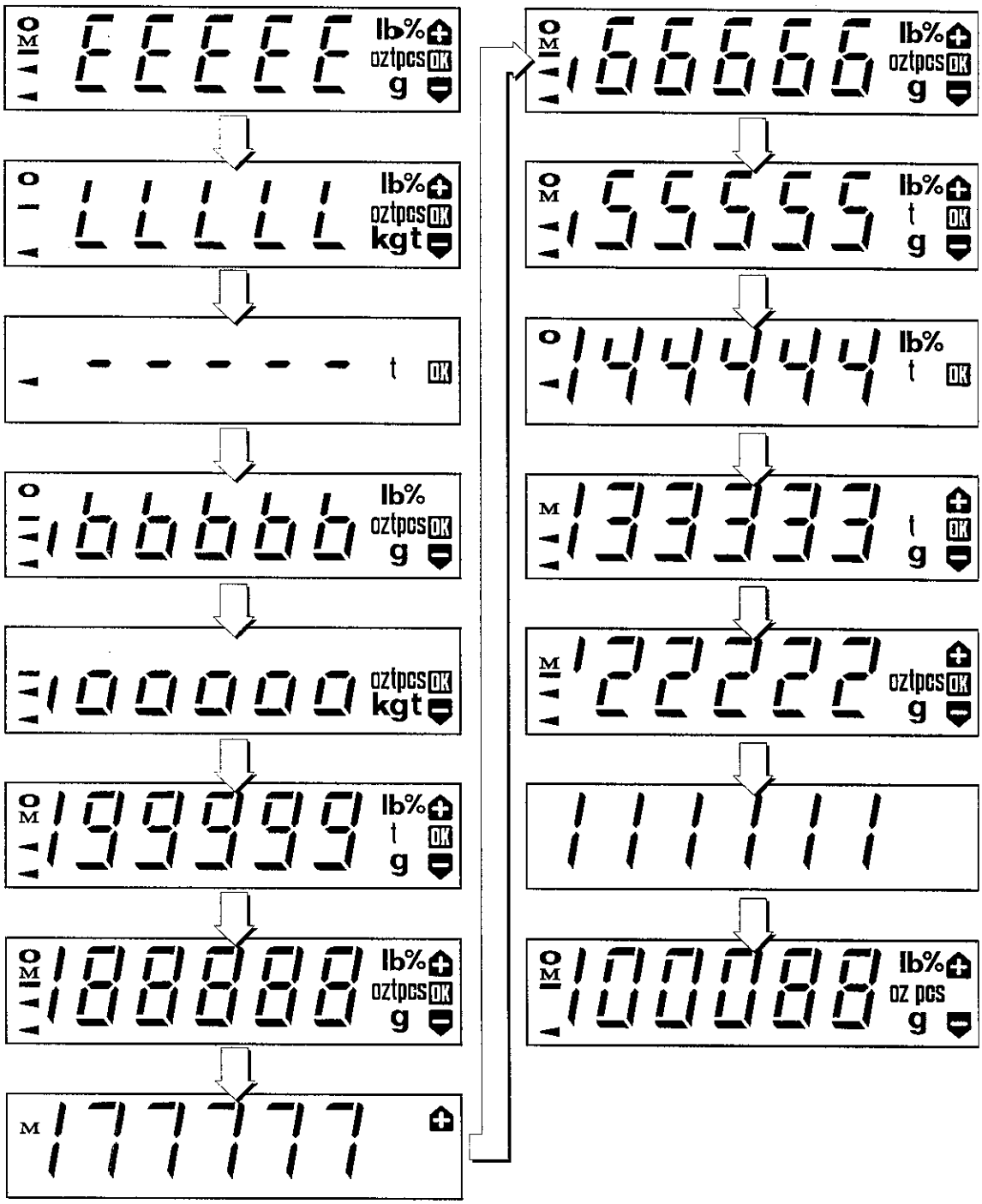
Step 10. Insert the battery or connect an AC adapter.

Step 11. With the display off, press and hold the calibration switch, then press the front panel OFF/ON key.

Step 12. After about 3 seconds the display will quickly sequence through the displays shown on the next page.

Step 13. Release the calibration switch (initialization is complete when the display starts to sequence).

Step 14. Try to note if all of the segments turn on (this is difficult as the display switches quickly).



Step 15. When the display stops at the last of the sequence, press the ON/OFF key and remove the power (battery or AC adapter).

Step 16. Cut the jumper at 'INIT' and reassemble the display.

Step 17. This procedure resets all F-functions back to factory settings and clears all data stored in the EEPROM (including model number and calibration data).

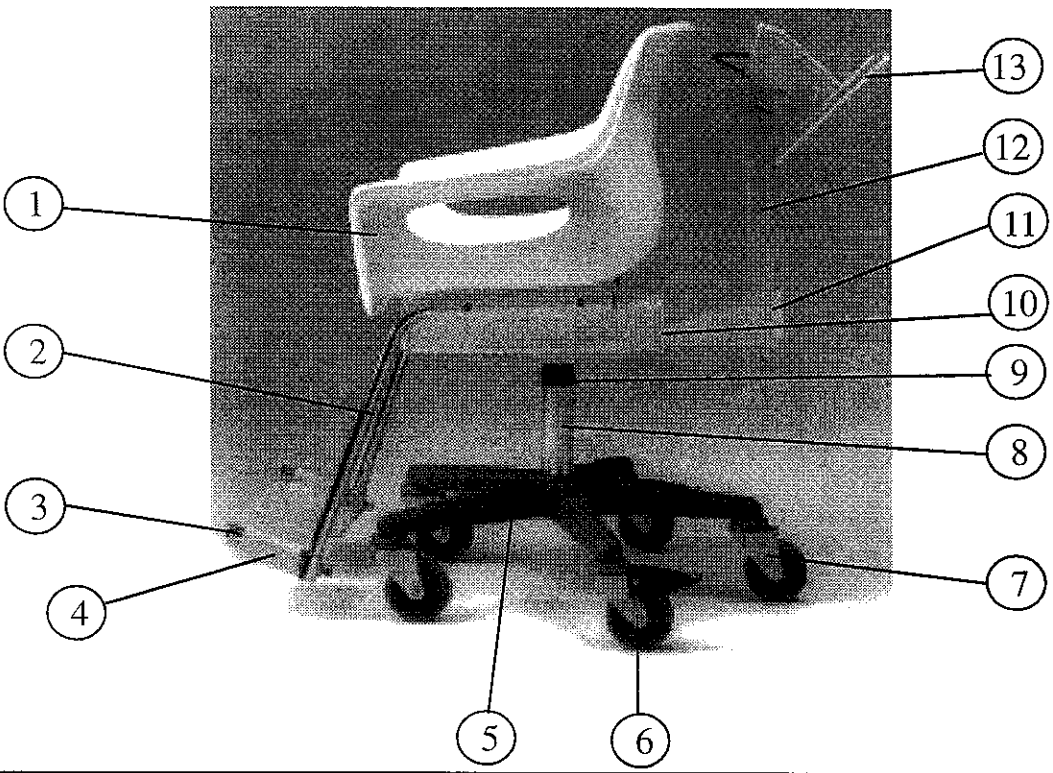
Step 23. Set the F-functions and recalibrate the scale.

Attention

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

End End of the initialization procedure for the HV-CS scale.

HV-CS Parts Identification Section

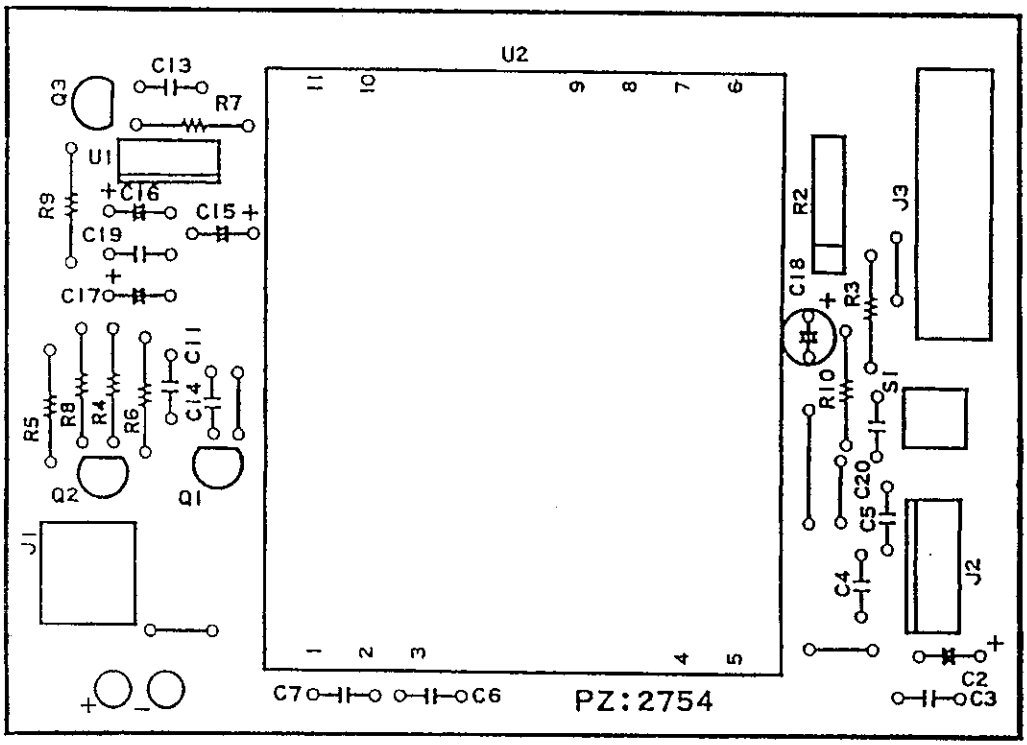


No.	Part Number	Description
1	MC14219.020	CHAIR 211CH
2	MM31329.000	CHAIR BRACKET COMPLETE
3	MC31342.001	FOOTREST STEM
4	MC31343.020	FOOTREST PEDAL
5	MC14244.000	ALUMINIUM BASE FRAME, GREY
6	MC14237.000	WHEEL WITH BRAKE
7	MC14238.000	WHEEL WITHOUT BRAKE
8	MM31302.000	MAIN TUBE & SPINDLE ASSY
9	MC31349.020	TUBE CAP P769 X 7/8" BLACK
10	MC07003.020	PLASTIC END CAP WHITE
*11	MC31316.014	COLUMN SUPPORT WHITE
*12	MC31315.014	COLUMN WHITE
*13	MC31312.002	HANDLE/CLAMP PLATE WHITE

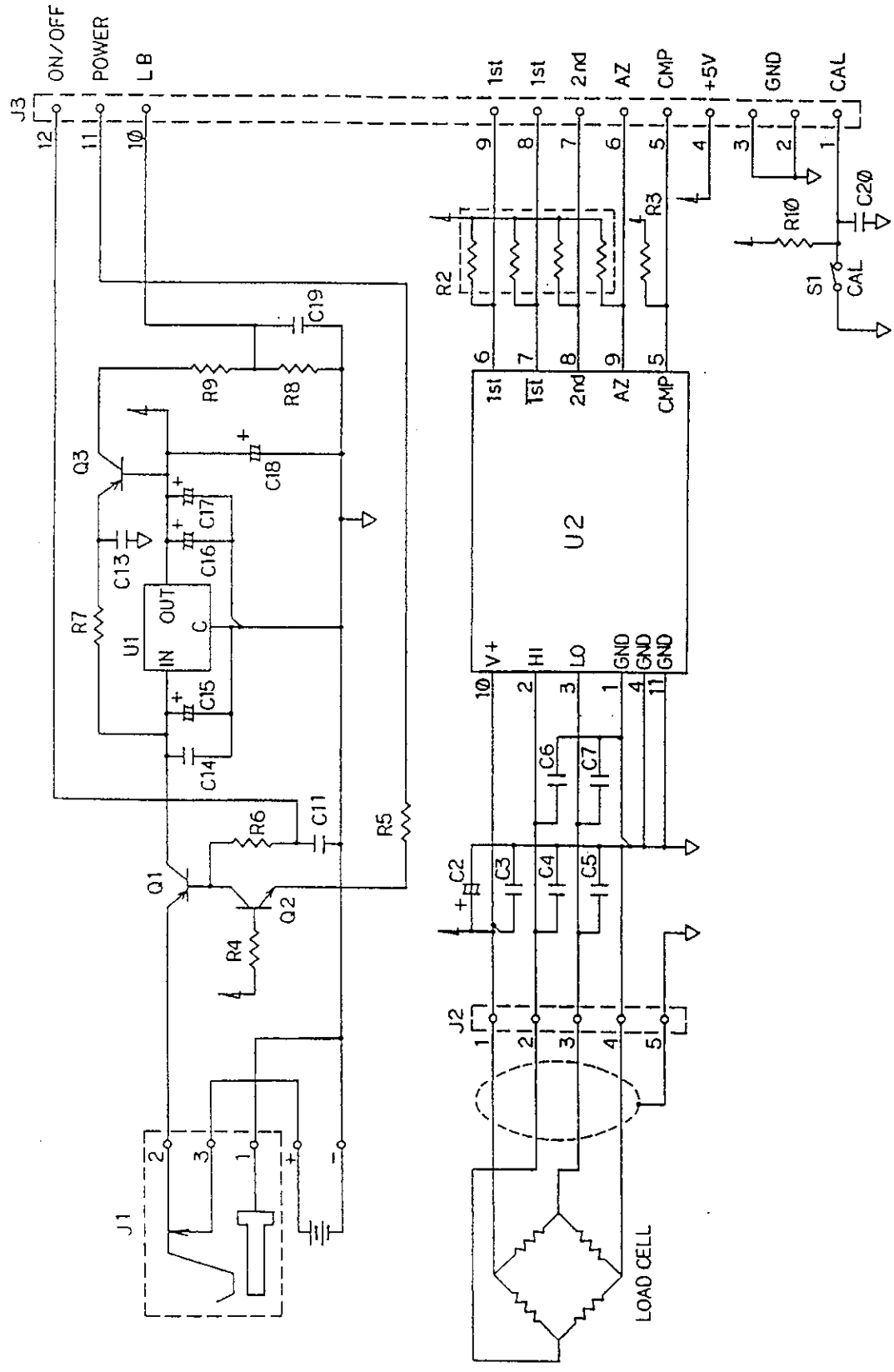
* REPLACED BY MC11602.001 BENT COLUMN WITH HANDLE ON LATER MODEL

PZ:2754 Analogue to Digital Convertor & Power Supply

CIRCUIT SYMBOL	PART NUMBER	DESCRIPTION	QTY.
C3~5; 11; 13; 14; 19; 20	CC:0.1U25V	CAPACITOR 0.1μF 25V	8
C6; 7	CC:0.33U50V	CAPACITOR O.33μF 50V	2
C18	CC:SME10VB47	CAPACITOR47μF 10V	1
C2; 15; 16;17	CT:1D2R2	CAPACITOR 2.2μF 20V	1
J1	JE:0486-01-010	POWER JACK	1
J2	JT:171825-5	CONNECTOR	1
J3	JI:12P-S2TS-EF	CONNECTOR	1
Q1	QT:A1020Y	TRANSISTOR 2SA1020Y	1
Q2	QT:C1815Y	TRANSISTOR 2SC1815Y	1
Q3	QT:A1015Y	TRANSISTOR 2SA1015Y	1
R2	RN:1HR-4-223MA	RESISTOR NETWORK 22K	1
R3; 10	RC:22K	RESISTOR 22KΩ 1/4W	2
R4	RC:3.9K	RESISTOR 3.9KΩ 1/4W	1
R5	RC:2.7K	RESISTOR 2.7KΩ 1/4W	1
R6	RC:1K	RESISTOR 1KΩ 1/4W	1
R7	RC:1.5K	RESISTOR 1.5KΩ 1/4W	1
R8	RC:47K	RESISTOR 47KΩ 1/4W	1
R9	RC:10K	RESISTOR 10KΩ 1/4W	1
S1	SK:SKHHAK	TACTILE SWITCH	1
U1	UR:TA78DL05S	VOLTAGE REGULATOR	1
U2	MF:AMZ24	A/D MODULE	1

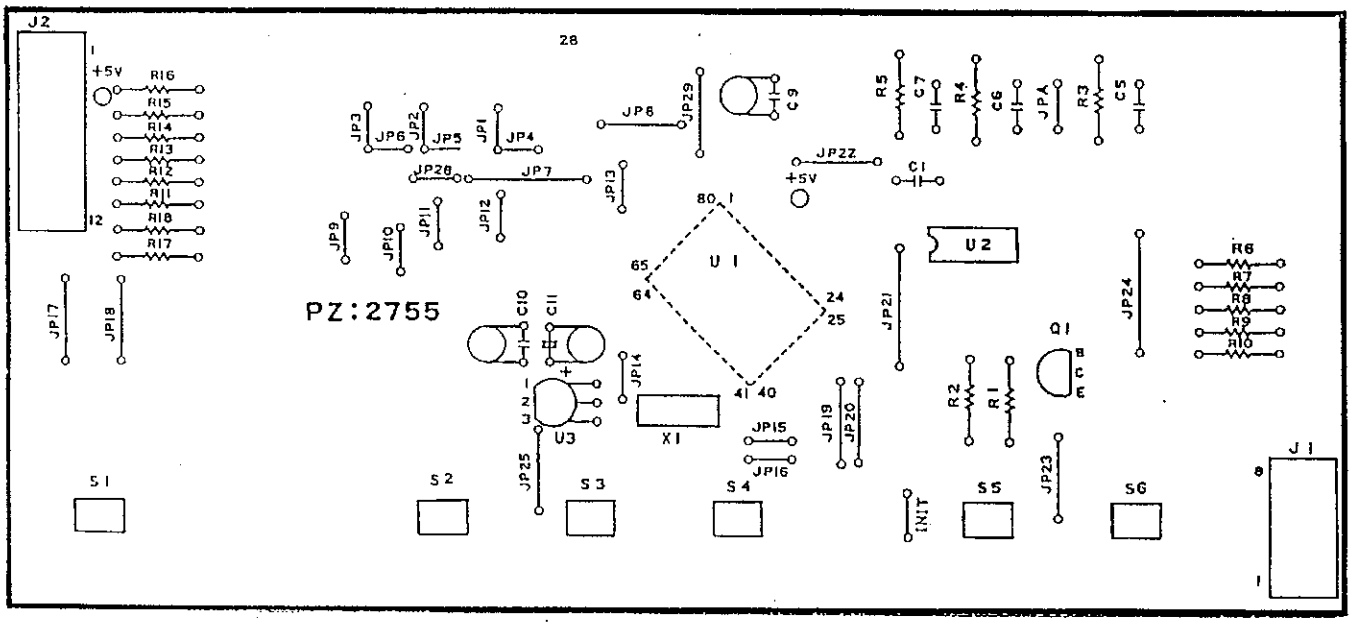


PZ:2754 Analogue to Digital Convertor & Power Supply

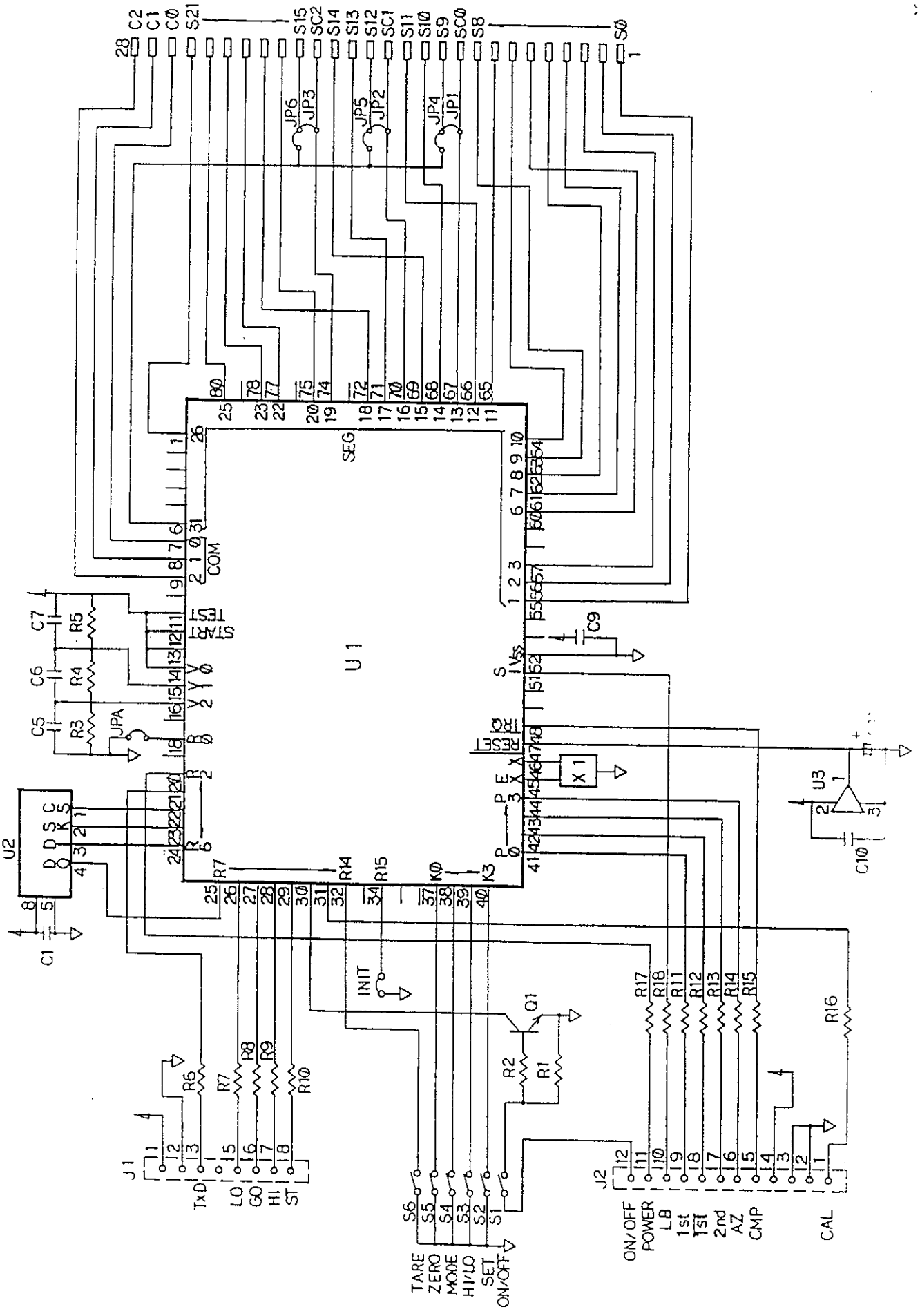


PZ:2755 Microprocessor board

CIRCUIT SYMBOL	PART NUMBER	DESCRIPTION	QTY.
C1; 5; 6; 7; 9; 10	CC:0.1U25V	CAPACITOR 0.1μF 25V	6
C6; 7	CC:0.33U50V	CAPACITOR O.33μF 50V	2
C18	CC:SME10VB47	CAPACITOR47μF 10V	1
C11	CT:1D2R2	CAPACITOR 2.2μF 20V	1
J1	JI:8P-S2L2-EF	CONNECTOR	1
J2	JI:12P-S2L2-EF	CONNECTOR	1
Q1	QT:C1815Y	TRANSISTOR 2SC1815Y	1
R1	RC:22K	RESISTOR 22KΩ	1
R2; 6~10	RC:2.2K	RESISTOR 2.2KΩ 1/4W	6
R3; 4; 5	RC:10K	RESISTOR 10KΩ 1/4W	1
R11~18	RC:1K	RESISTOR 1KΩ 1/4W	8
S1~6	SK:SKHHAK	TACTILE SWITCH	6
U1	UC:MB88543-334M	CPU	1
U2	UC:RP93C46	EEPROM	1
U3	UA:S-8054ALB	VOLTAGE COMPARATOR	1
X1	XT:C4SA-4M-M00	OSC	1

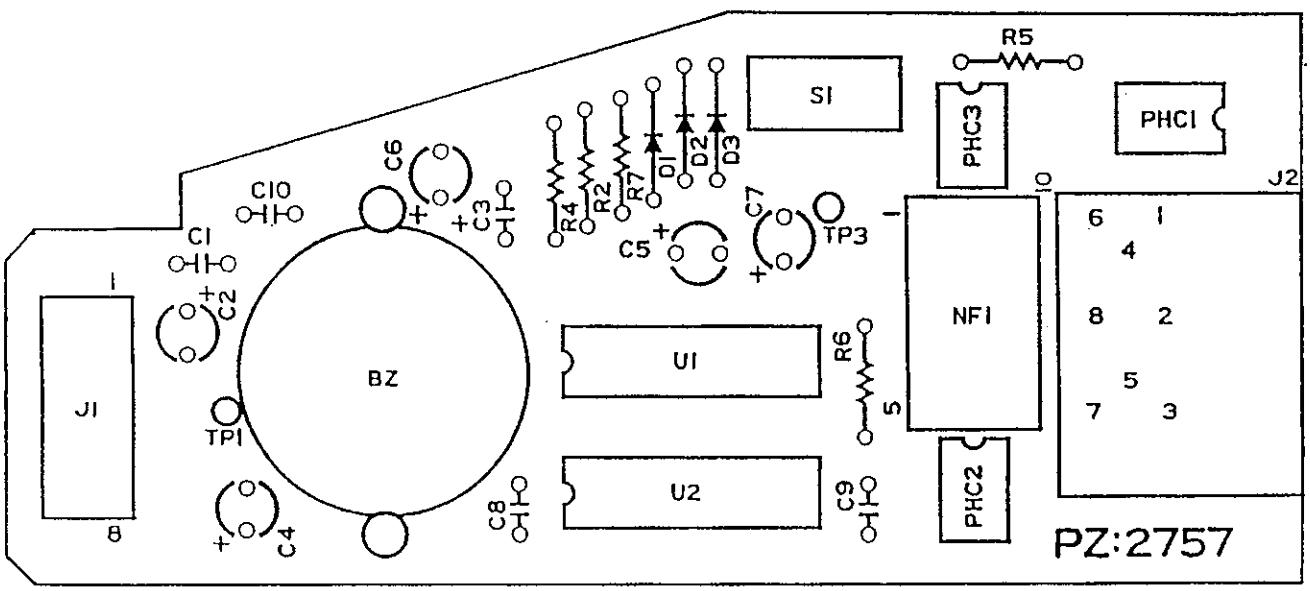


PZ:2755 Microprocessor board

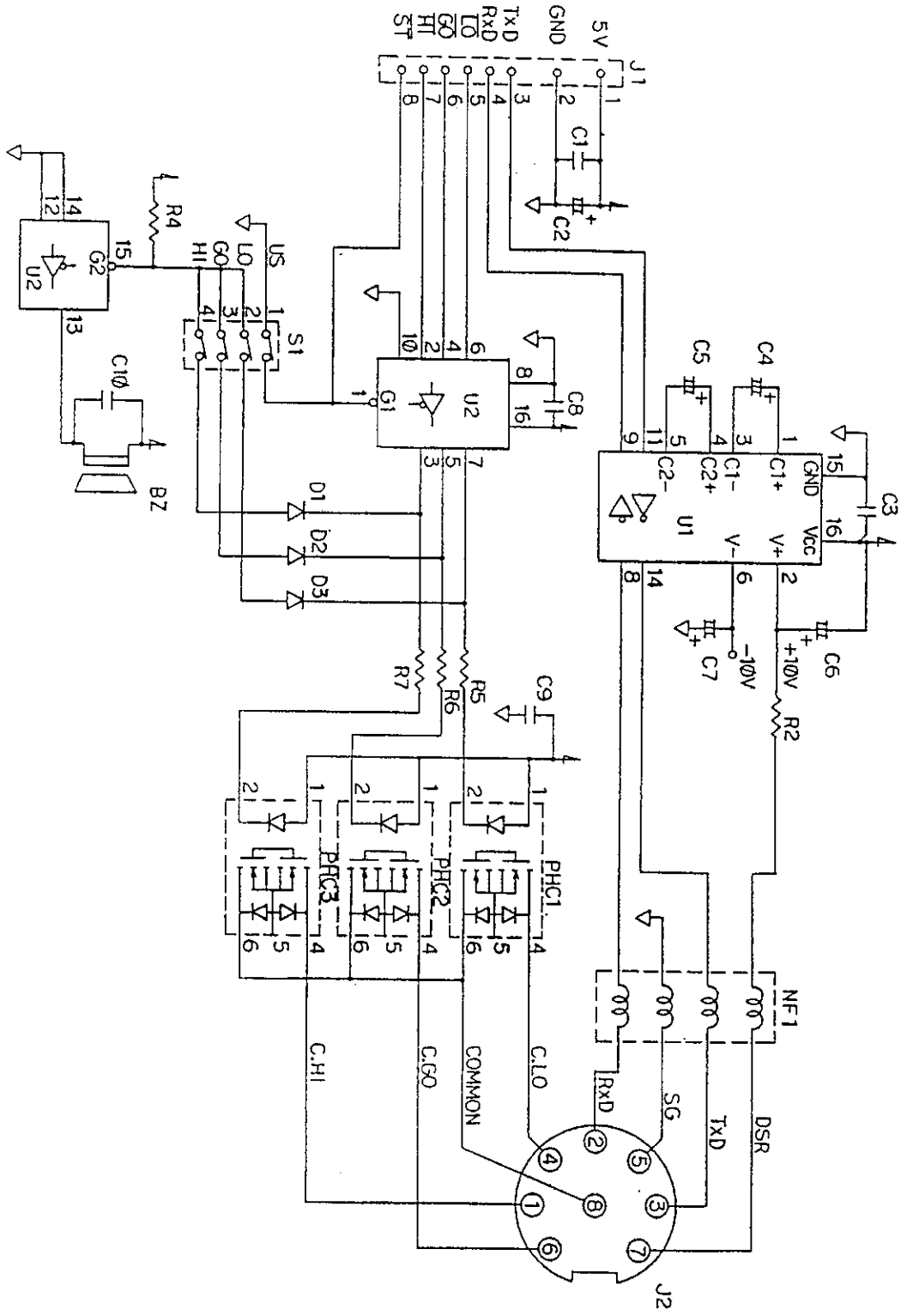


Option OP-03 board

CIRCUIT SYMBOL	PART NUMBER	DESCRIPTION	QTY.
C1; 3; 8; 9; 10	CC:0.1U25V	CAPACITOR 0.1μF 25V	5
C2; 4~7	CC:SME25VB22	CAPACITOR22μF 25V	5
PHC1; 2; 3	DF:A0V253	PHOTO MOS RELAY	3
D1~3	DI:1S1588	DIODE	3
BZ	ET:20Z-32C-5V-N	BUZZER	1
J1	JI:8P-S2L2-EF	CONNECTOR	1
J2	JA:TCS5380	CONNECTOR DIN8P	1
NF1	NF:D-42C	NOISE FILTER	1
R2	RC:3.3K	RESISTOR 3.3KΩ 1/4W	1
R4	RC:22K	RESISTOR 22KΩ 1/4W	1
R5; 6; 7	RC:1.5K	RESISTOR 1.5KΩ 1/4W	3
S1	SD:KSD04	DIP SWITCH	1
U1	UC:MAX232CPE	RS232C	1
U2	UC:HC367	HCMOS IC	1
	07:B30622-2	PANEL	1

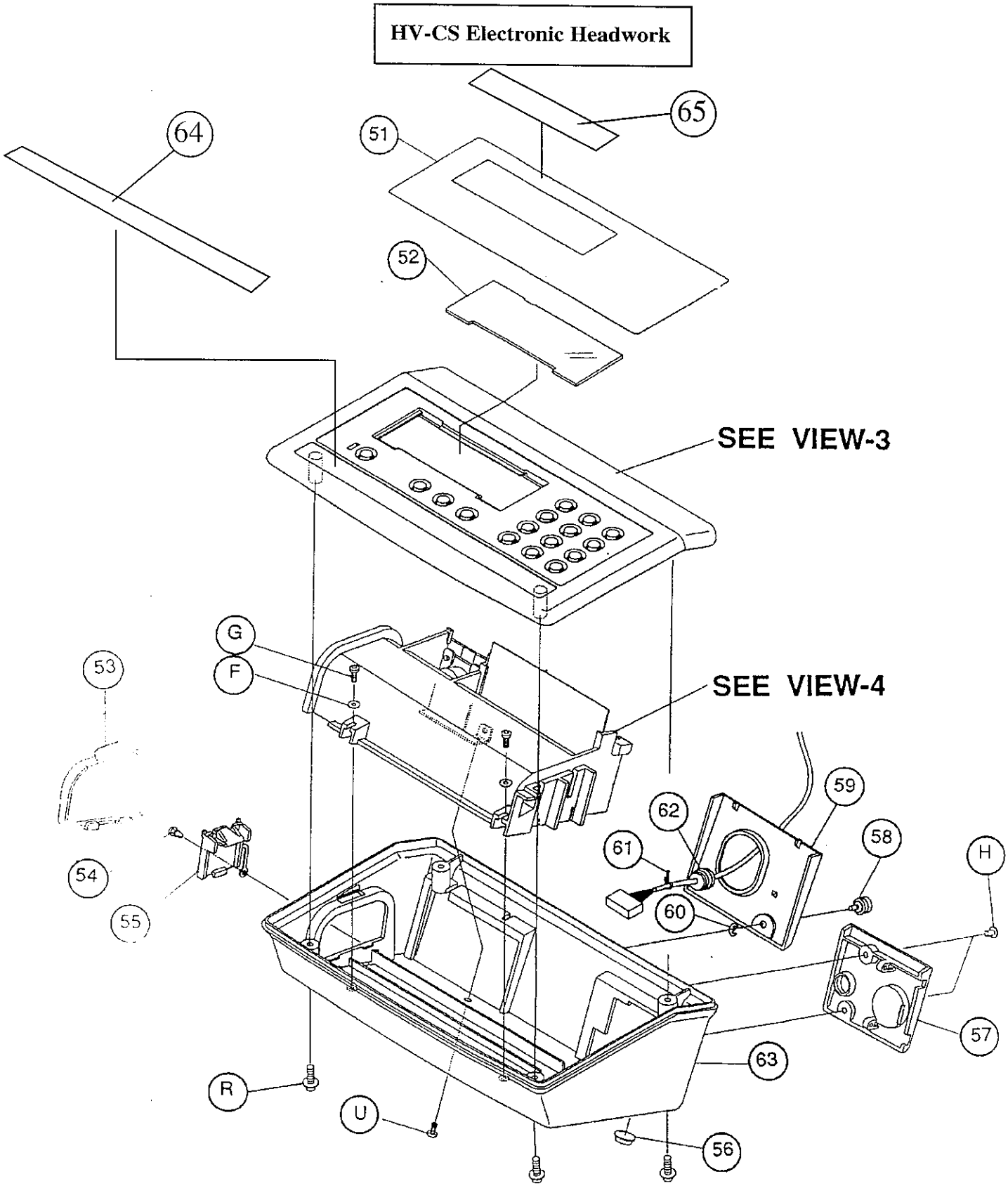


Option OP-03 board



HV-CS Electronic Headwork

No.	Part Number	Description
51	08:B31911	KEY SHEET
52	07:B49741	DISPLAY FILTER
53	07:B31047A-1	BATTERY COVER
54	10:NRP-345	NYLON RIVET
55	07:C42523A	BATTERY LOCK
56	10-SJ-5012	RUBBER FOOT
57	07:B30621-1	PANEL A
58	05:4004460	LOCK SCREW-L
59	07:B30622-1	PANEL B
60		E RING
61	PLT 1.5T	TIE BAND
62	ET:SR-6P-4	CABLE CLAMP
63	07:A10221-1	LOWER CASE
64	MC:50107.000	HEADWORK LABEL
65	MC:50157.000	OPERATION LABEL
F		WASHER M3
G		PAN HEAD SELF TAPPING SCREW M3 X 8
H		BINDING HEAD M3 X 6 SCREW
R		PAN HEAD SCREW WITH WASHERS M3 X 6
U		BINDING HEAD M3 X 6 SCREW

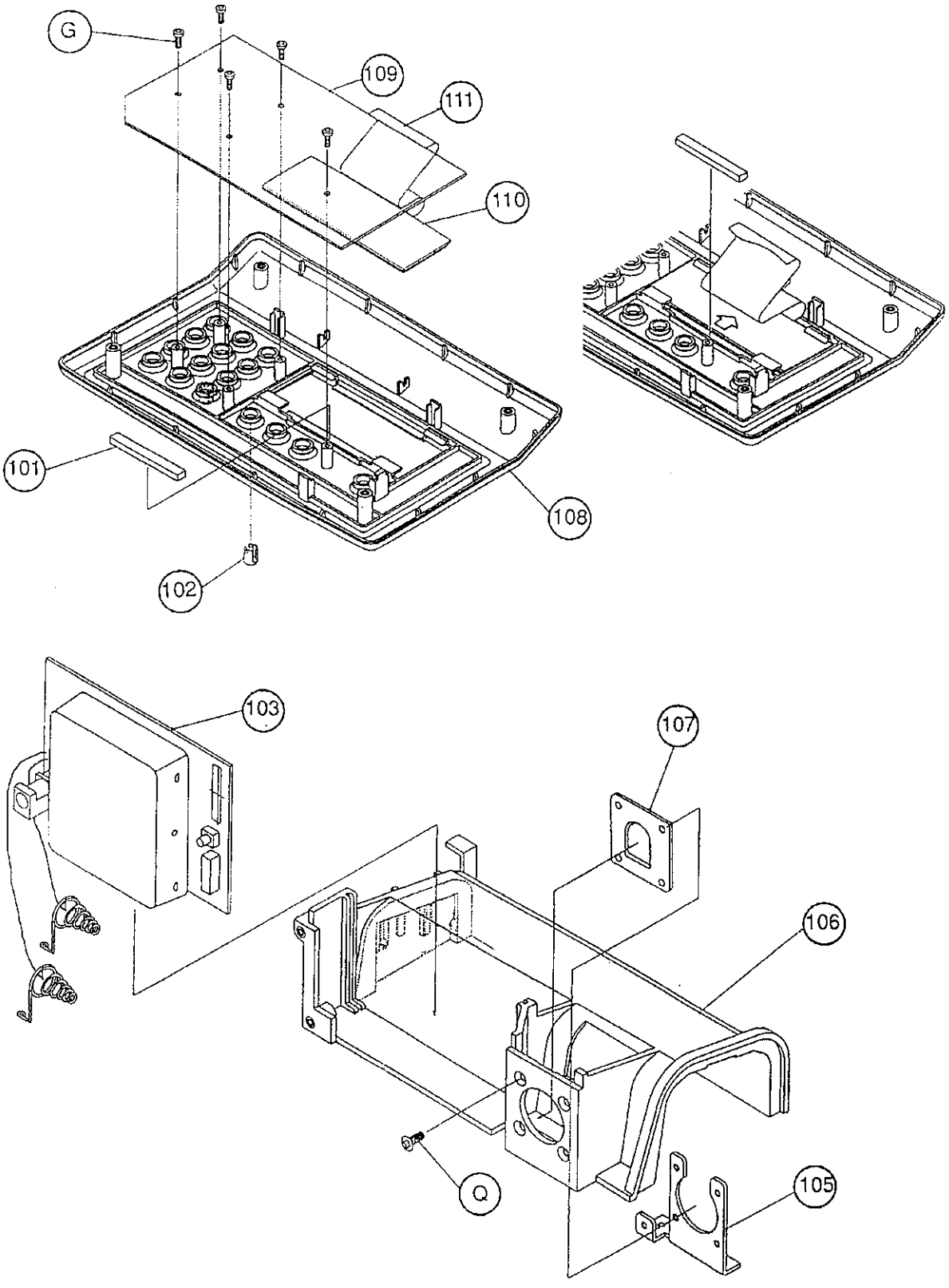


EXPLODED VIEW-2

Headwork Exploded Views 3&4

No.	Part Number	Description
101	06:C40296	DISPLAY STOP
102	07:C41320A	KEYTOP
103	7PZ:2754-ASSY	A/D BOARD
105	04:C42568	GROUND PLATE
106	07:A10223-1	INNER FRAME
107	04:C43041A	CABLE CLAMP PLATE
108	07:A10220-1	UPPER CASE
109	7PZ:2755-ASSY	MAIN BOARD
110	ED:DLC4946	LIQUID CRYSTAL DISPLAY
111	KO:1000	HEAT SEAL CABLE
G		PAN HEAD SELF TAPPING SCREW M3 X 8
Q		FLAT HEAD SCREW M3 X 8

Headwork Exploded Views 3&4



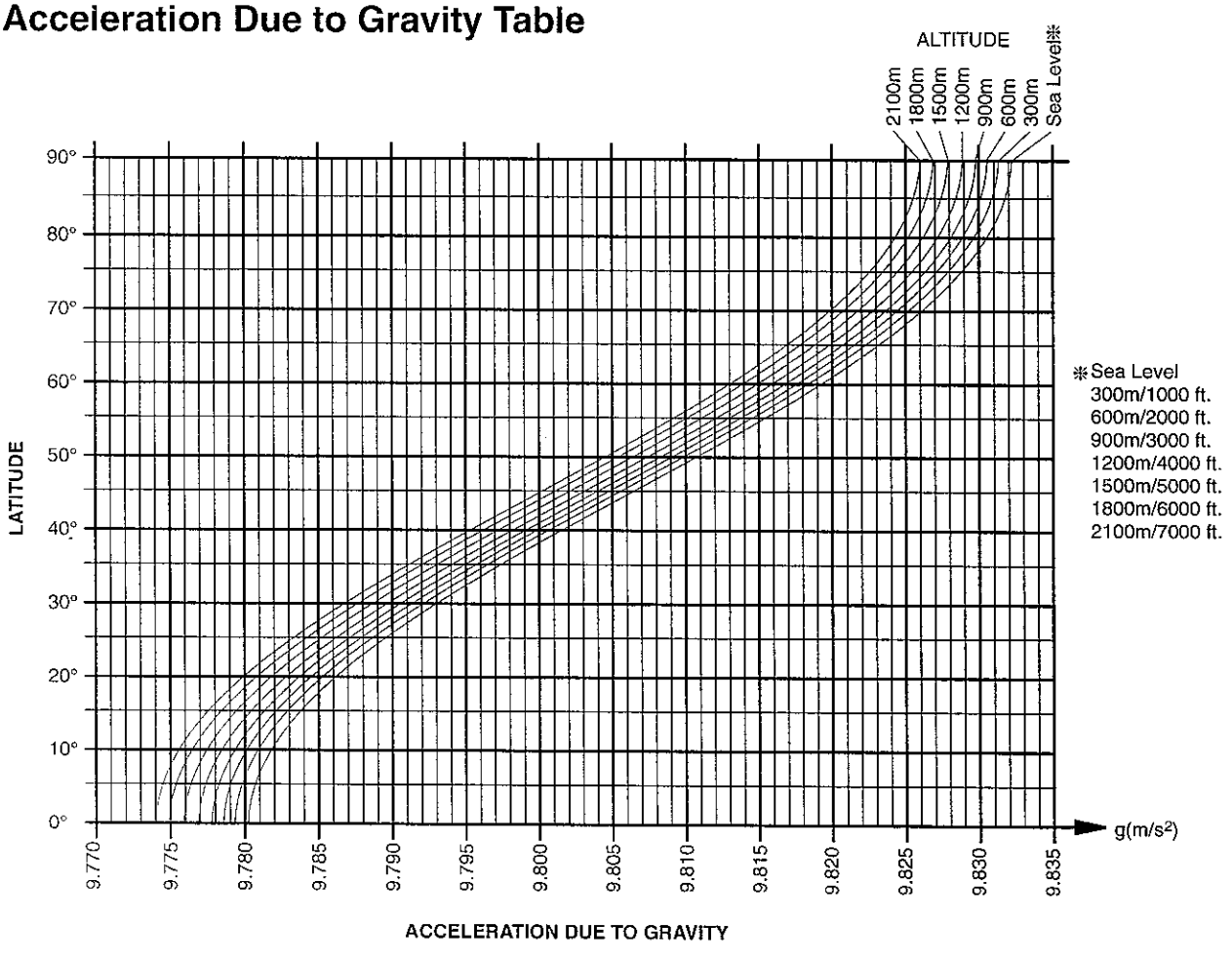
EXPLODED VIEW-3/4

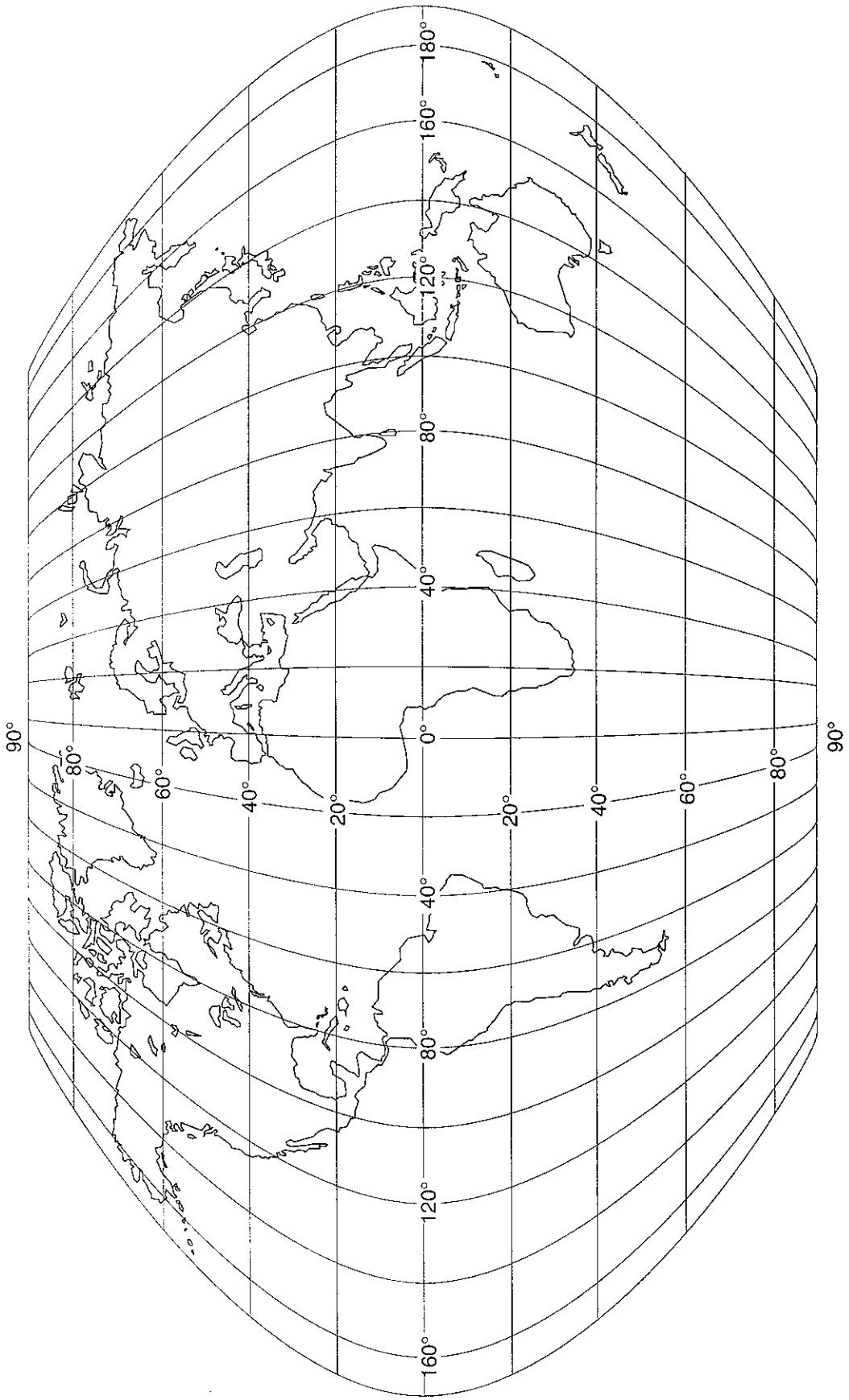
Appendix

Gravity Values at Various Locations

Calcutta	9.788	m/s²	Paris	9.809	m/s²
Capetown	9.796	m/s²	Rio de Janeiro	9.788	m/s²
Chicago	9.803	m/s²	Rome	9.803	m/s²
Amsterdam	9.813	m/s²	Manila	9.784	m/s²
Athens	9.800	m/s²	Melbourne	9.800	m/s²
Auckland NZ	9.799	m/s²	Mexico City	9.779	m/s²
Bangkok	9.783	m/s²	Milan	9.806	m/s²
Birmingham	9.813	m/s²	New York	9.802	m/s²
Brussels	9.811	m/s²	Oslo	9.819	m/s²
Buenos Aires	9.797	m/s²	Ottawa	9.806	m/s²
Copenhagen	9.815	m/s²	San Francisco	9.800	m/s²
Cyprus	9.797	m/s²	Singapore	9.781	m/s²
Djakarta	9.781	m/s²	Stockholm	9.818	m/s²
Frankfurt	9.810	m/s²	Sydney	9.797	m/s²
Glasgow	9.816	m/s²	Taichung	9.789	m/s²
Havana	9.788	m/s²	Taiwan	9.788	m/s²
Helsinki	9.819	m/s²	Taipei	9.790	m/s²
Kuwait	9.793	m/s²	Tokyo	9.798	m/s²
Lisbon	9.801	m/s²	Vancouver, BC	9.809	m/s²
London (Greenwich)	9.812	m/s²	Washington DC	9.801	m/s²
Los Angeles	9.796	m/s²	Wellington NZ	9.803	m/s²
Madrid	9.800	m/s²	Zurich	9.807	m/s²

Acceleration Due to Gravity Table




180°
160°
120°
80°
40°
0°
40°
80°
120°
160°
90°
80°
60°
40°
20°
20°
40°
60°
80°
90°

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