

MAINTENANCE MANUAL

HGS SERIES

**MODELS: HGS-300 HGS-600 HGS-1500
HGS-3000 HGS-6000 HGS-7500
HGS-15K**

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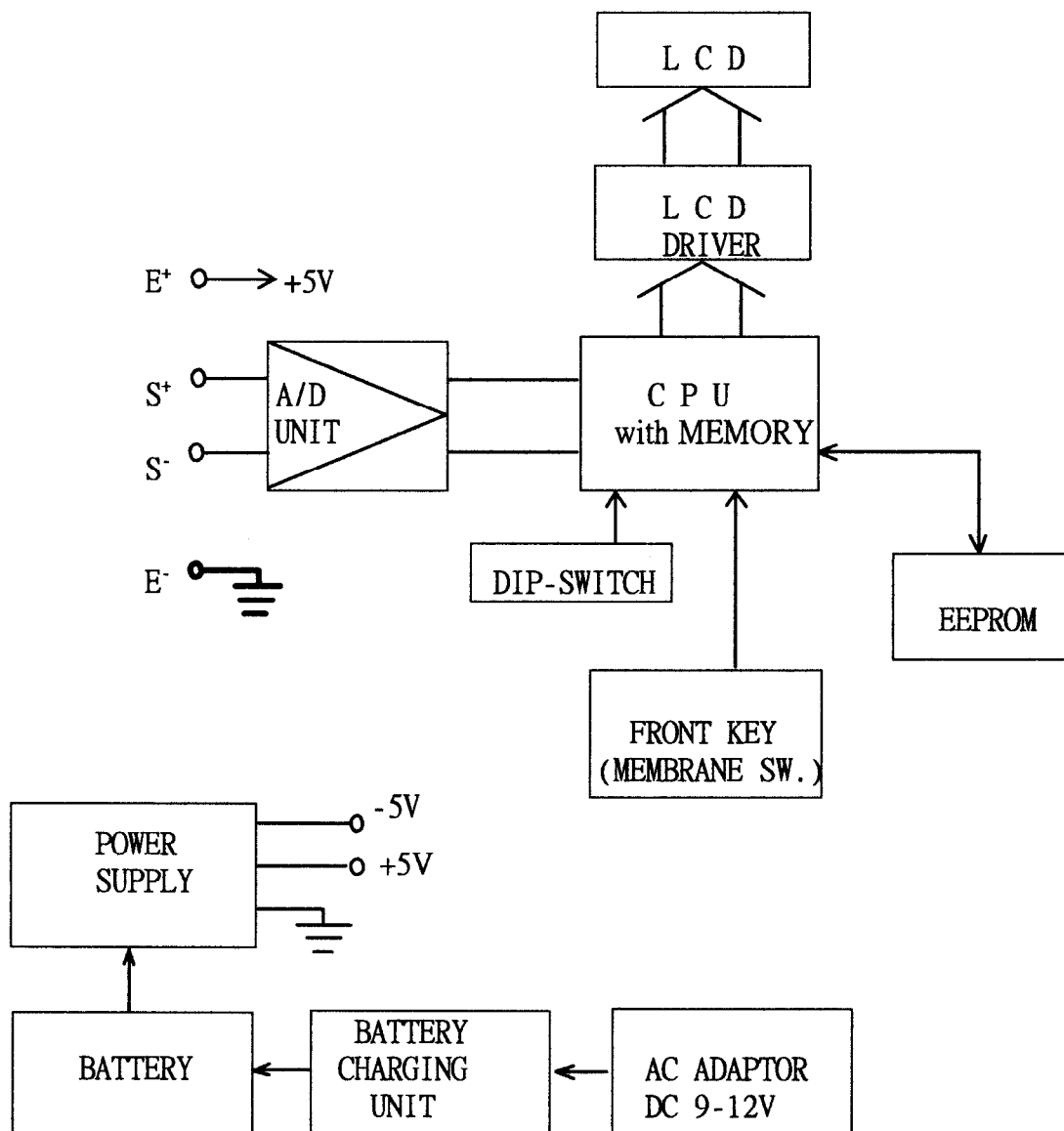
HGS SERIES - ALL STAINLESS STEEL HOUSING ELECTRONIC BALANCE

1. FEATURES:

- * All Stainless Steel Housing
- * 1/15000 & 1/30000 display resolution
- * Power on auto zero tracking and manual zero setting
- * Auto calibration
- * Dip switch to prevent end-user calibration
- * Metric unit + 12 user programmable weight units: Metric Carat, Pound(Avoirdupois), Dram(Avoirdupois), Grain(U.K.), Troy Ounce, Penny Weight, Momme(Japan), Tael(Taiwan), Tael (China), Troy Tael, Tola(India)
- * Bubble level included
- * Adjustable feet
- * Optional backlighting
- * Built-in rechargeable battery operated or external AC/DC power adaptor(Included)
- * Low-battery signal
- * Auto power saving function
- * Percentage function included
- * Counting function included
- * Overload protection devices against positive and negative force
- * Wind shield included(HGS-300 and HGS-600 only)
- * Capacity and division: As page 5

2. SPECIFICATION

1. SYSTEM BLOCK DIAGRAM



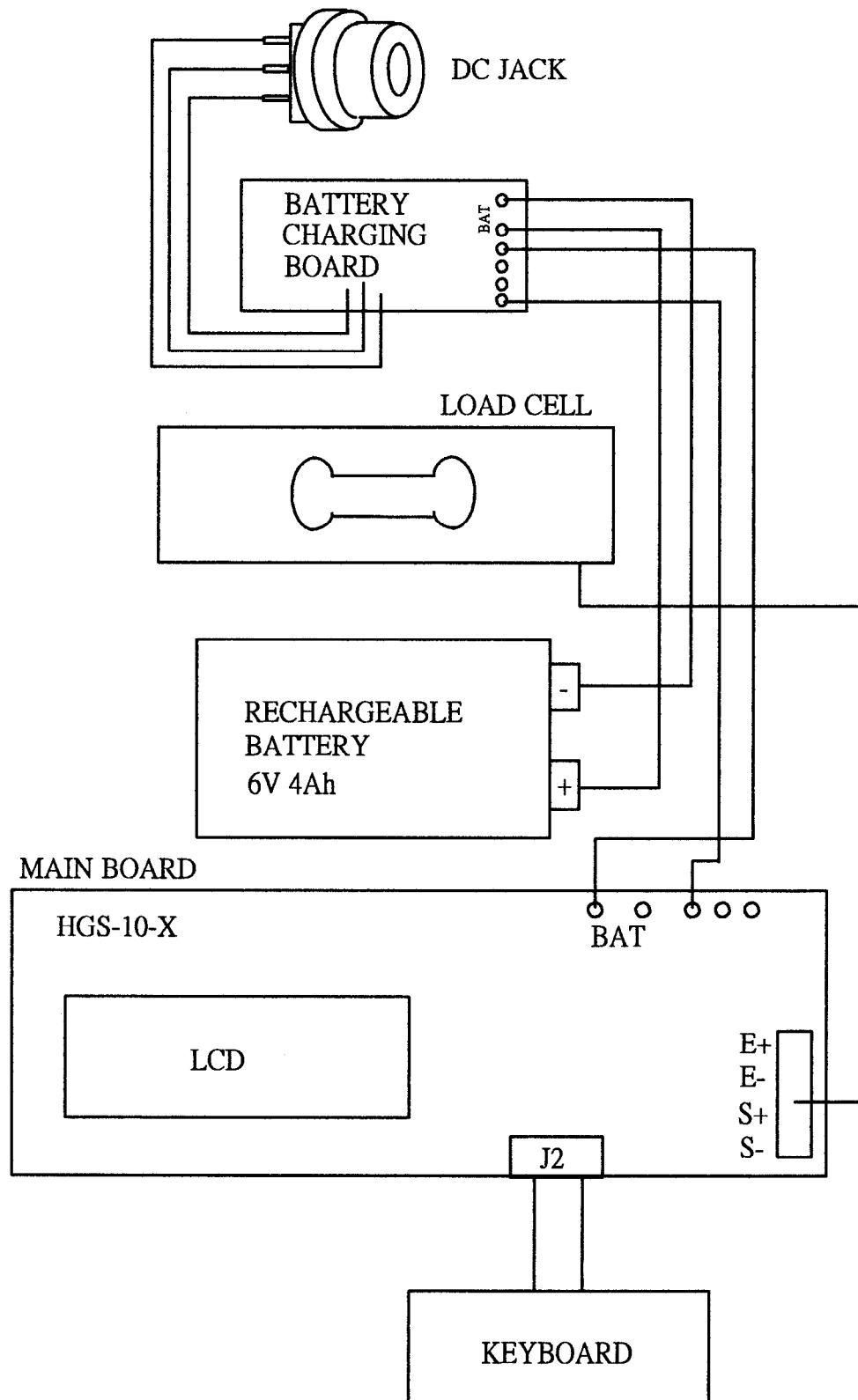
DESCRIPTION:

When a load is applied to the load cell. The resistance to the excitation current in the strain gauge changes and the analog output signal varies.

It is amplified and sampled continuously by the A/D converter into a digital signal.

Subsequently, the resulting count is processed and managed by the CPU. The CPU refers to the instructions from the keyboard, and then conveys the output data to LCD driver which formats the data into a readout for the display.

2. PHYSICAL LAYOUT OF ELECTRICAL CONNECTION

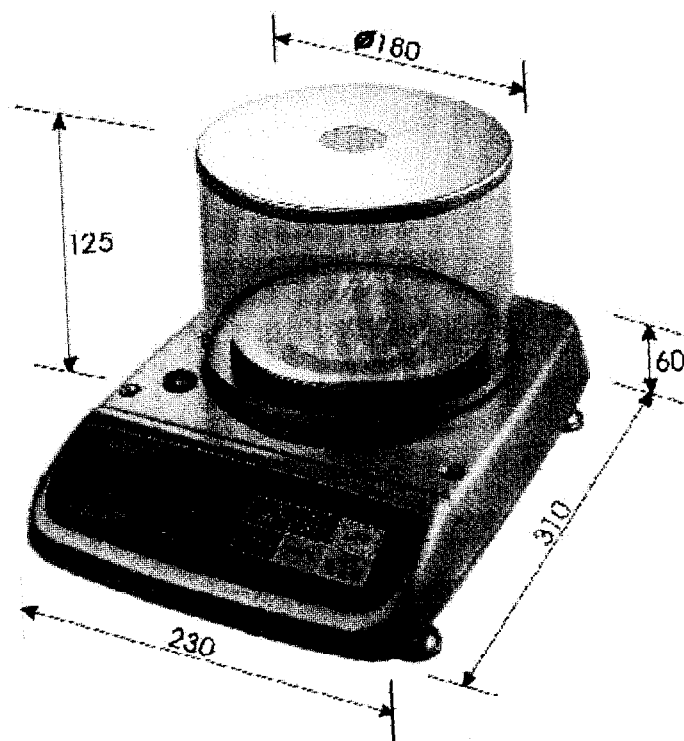


2. SPECIFICATION

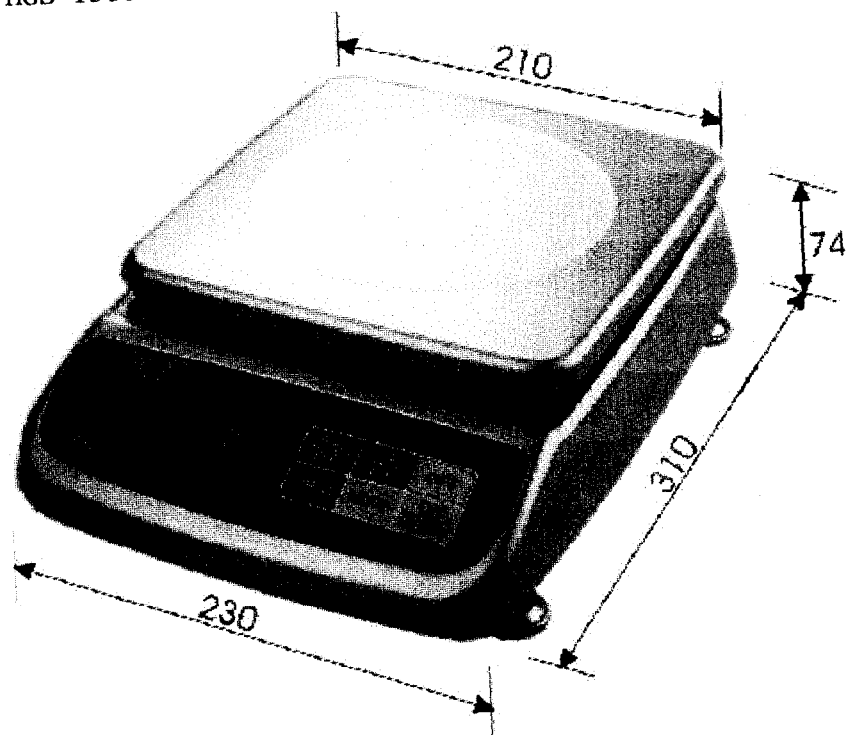
3. GENERAL SPECIFICATION

3.1 Overall View

A. HGS-300,600



B. HGS-1500 ~ HGS-15K



3. GENERAL SPECIFICATION

3.2 Dimension

- * Platter size: 210 x 210mm
- * Overall size: 310 x 230 x 74mm

3.3 Model specification

- Model name: HGS-series
- Display resolution: 1/15000(1500g,3000g,7500g,15K)
1/30000(300g,600g,1500g,3000g,6000g,15K)
- Internal resolution: 1/120000
- Display: WTN LCD 6 x 19mm numeric digits plus 3 x 10mm dot matrix digits

3.4 Operation condition

- * Power source: Rechargeable battery(6V 4Ah) or AC adaptor (DC 9-12V,500mA)
- * Operating temperature: 0 °C ~ 40 °C
- * Power consumption : 0.1W
5W when charge

3.5 Main Components used

- * Micro Processor : 89C52
- * Crystal Oscillator : 11.0592 MHz
- * Display device : Liquid Crystal Display(LCD)
- * Loadcell : 350 resistance loadcell

3.6 Analog Specification

- * INPUT SENSITIVITY : 2mV/V(1mV/V for HGS-300,600)
- * ZERO ADJUST RANGE : 2% R.O.
- * ZERO BALANCE RANGE : +/-5% R.O.
- * EXCITATION VOLTAGE : DC 5V
- * SPEED OF A/D CONVERSION : 4 times/sec
- * INTERNAL RESOLUTION : 120000

3.7 Model available

MODEL NO.	CAPACITY	EXTERNAL DIVISION	
		1/15000	1/30000
HGS-1500	1500g	0.1g	0.05g
HGS-3000	3000g	0.2g	0.1g
HGS-7500	7500g	0.5g	
HGS-15K	15kg	1g	0.5g
HGS-300	300g		0.01g
HGS-600	600g		0.02g
HGS-6000	6000g		0.2g

3. INITIAL SETUP

1. INTERNAL FUNCTIONS AND ALTERNATE DIVISION

INTERNAL FUNCTION TABLE

Function	Symbol	Description
1	F.1	Span value reading and dealer calibration
2	F.2	Full display segment and max. capacity check
3	F.3	Scale configuration(Weighing Units)
4	F.4	Auto power off setting

HOW TO ENTER THE REQUIRED FUNCTION MODE

- a. Turn scale off.
- b. Press and hold "%/WT.", then turn scale on. Scale display F.1
- c. Press "%/WT." until the required function number appears.
- d. Press "PCS/WT."
- e. Press "PCS/WT." until the required setting appears.
- f. Press "%/WT." to confirm.
- g. Repeat step c to f for other function setting, or
- h. Press "ON/RE-ZERO" to save settings and return to normal operation.

F.1 Span Value Reading and Dealer Calibration

Simply enter F.1, then put on the designated mass to check span value or enter dealer calibration process (Refer to page 7 Dealer Calibration Procedure).

F.2 Display Segment and Rated Capacity & Division Check

When function is entered, scales will first display the rated capacity and division, then display all segments. Check and make sure that no segment is missed.

F.3 Check and Set Up the Scale Configuration

- 1 Enter F.3, scale displays employed weighing units.
- 2 Press MODE, the weighing units will be shown one by one.
- 3 Until the desired weighing unit appears, press "PCS/WT." to enable(U=ON) or disable(U=OFF) it. Press SAMPLE after choosing the desired weighing unit, scale displays "InIt=", that would be the default weighing unit when powering on.
Note: In some countries, only the metric weight unit would be available.

4 Press "ON/RE-ZERO", scale displays "End-Go" to save settings and return to normal operation.

F.4 Auto Power Off Setting

Two modes are available: (Default=4_OFF)

0._OFF = Auto Power Off function is disabled.

4._OFF = Scale will automatically turned off after 4 minutes not used.

2. AUTO AND DEALER CALIBRATION

ACCEPTABLE LOAD FOR AUTO AND DEALER CALIBRATION

Model Number	External Division	Acceptable Auto and Dealer Calibration Load	
HGS-1500	1/15000	500g	1kg
HGS-3000	1/15000	1kg	2kg
HGS-7500	1/15000	2.5kg	5kg
HGS-15K	1/15000	5kg	10kg
HGS-300	1/30000	100g	200g
HGS-600	1/30000	200g	500g
HGS-1500	1/30000	500g	1kg
HGS-3000	1/30000	1kg	2kg
HGS-6000	1/30000	2kg	5kg
HGS-15K	1/30000	5kg	10kg

Dealer Calibration Procedure:

- 1 Turn scale off.
- 2 Press and hold "%/WT.", then turn scale on.
- 3 Scale displays F.1
- 4 Press "PCS/WT."
- 5 Press MODE to check the offset value.
- 6 Press MODE again, return to calibration procedure.
- 7 Press "PCS/WT.", scale displays "CAL ZRO".
- 8 Wait until scale displays "CAL SPN", load calibration either load as listed on above table.
- 9 Wait until the scale start count down.
- 10 Calibration completed and scale is ready for operation.

3. INITIAL SETUP

Auto Calibration Procedure:

- 1 Turn scale off
- 2 Press and hold "PCS/WT.", then turn scale on.
- 3 scale displays "CAL zro".
- 4 Wait until scale displays "CAL SPN", load calibration either load as listed on above table.
- 5 Wait until the scale start count down.
- 6 Calibration completed and scale is ready for operation.

3. DISABLE CALIBRATION WITH DIP SW.(S1)

The DIP SW.#1 is used to control calibration. Push this switch to ON position to disable calibration.

4. OFFSET AND SPAN VALUE DATA

OFFSET AND SPAN VALUE DATA TABLE

Model Number	External Division	Offset Value (Thousand)	Span Value(Thousand) at Various Load Applied	Offset Control	Span Control(Ohm)	
					R1A	R1B
HGS-1500	1/15000	10~14	40~80 at 500g 80~120 at 1kg	VR1 Trimmer	51.7K	X
HGS-3000	1/15000	10~14	40~80 at 1kg 80~120 at 2kg	VR1 Trimmer	52.6K	X
HGS-7500	1/15000	10~14	40~80 at 2.5kg 80~120 at 5kg	VR1 Trimmer	33K	X
HGS-15K	1/15000	10~14	40~80 at 5kg 80~120 at 10kg	VR1 Trimmer	35K	X
HGS-300	1/30000	10~14	40~80 at 100g 80~120 at 200g	VR1 Trimmer	60K	X
HGS-600	1/30000	10~14	40~80 at 200g 100~120 at 500g	VR1 Trimmer	58K	X
HGS-1500	1/30000	10~14	40~80 at 500g 80~120 at 1kg	VR1 Trimmer	51.7K	X
HGS-3000	1/30000	10~14	40~80 at 1kg 80~120 at 2kg	VR1 Trimmer	52.6K	X
HGS-6000	1/30000	10~14	40~80 at 2kg 100~120 at 5kg	VR1 Trimmer	41K	X
HGS-15K	1/30000	10~14	40~80 at 5kg 80~120 at 10kg	VR1 Trimmer	35K	X

READING OFFSET VALUE

- 1 Turn scale off
- 2 Remove all load from platter
- 3 Enter F.1
- 4 Press "PCS/WT." then "MODE" to read the offset value

READING SPAN VALUE

- 1 Turn scale off
- 2 Remove all load from platter
- 3 Enter F.1
- 4 Press "PCS/WT." then "ON/RE-ZERO"
- 5 Apply load to platter. Span value according to load applied will be displayed.

HOW TO ADJUST OFFSET VALUE

In case the offset value is out of range, adjust the trimmer located at VR1 on the mainboard to obtain correct offset value.

HOW TO ADJUST SPAN VALUE

The span value is controlled by resistor located on R1A/R1B, standard resistor value of R1A/R1B is listed on the above table. If the required span value is not attained, then change R1A/R1B resistor according to either case below:

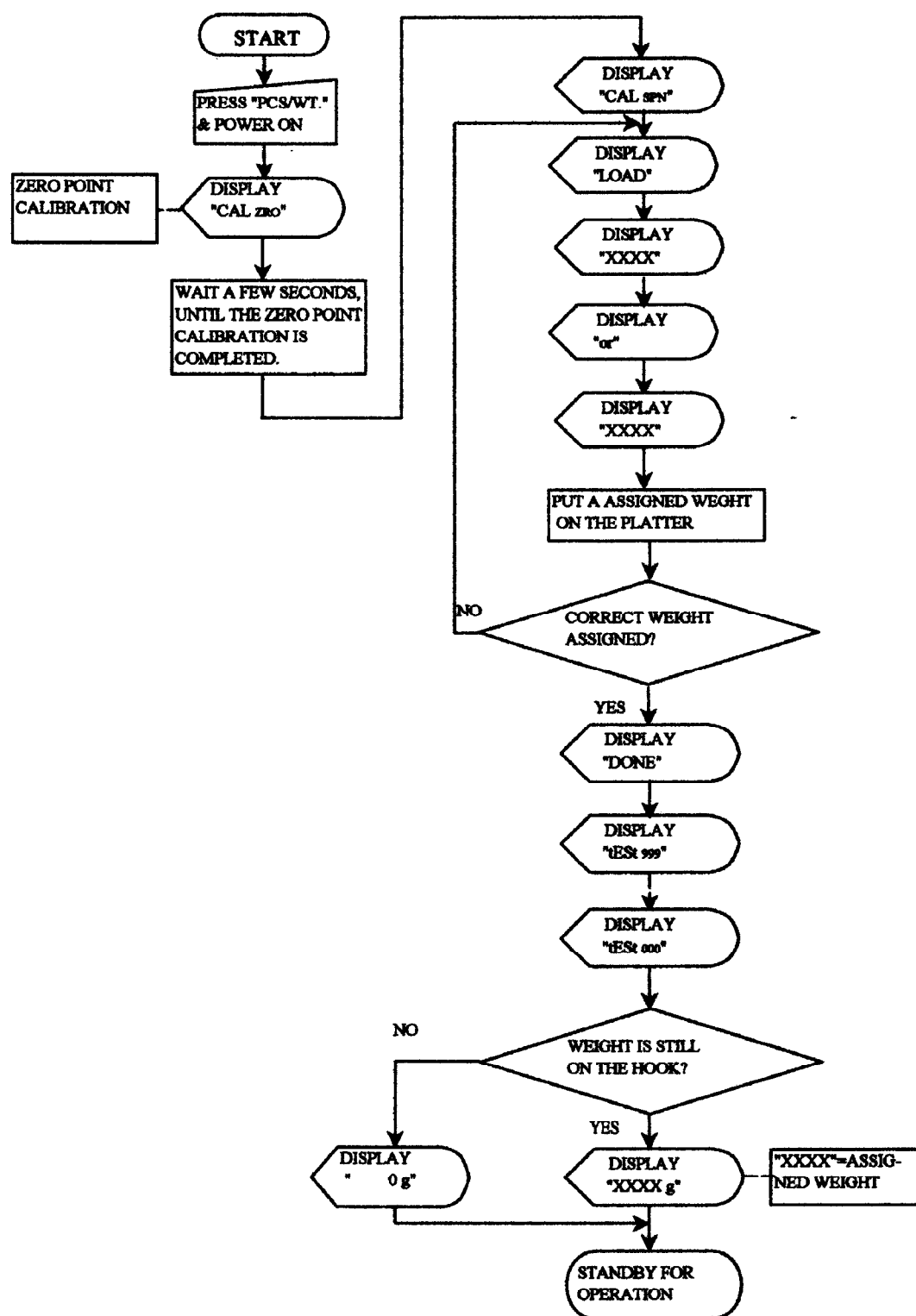
Span value too low : Increase the resistance of R1A/R1B.

Span value too high : Decrease the resistance of R1A/R1B.

3. INITIAL SETUP

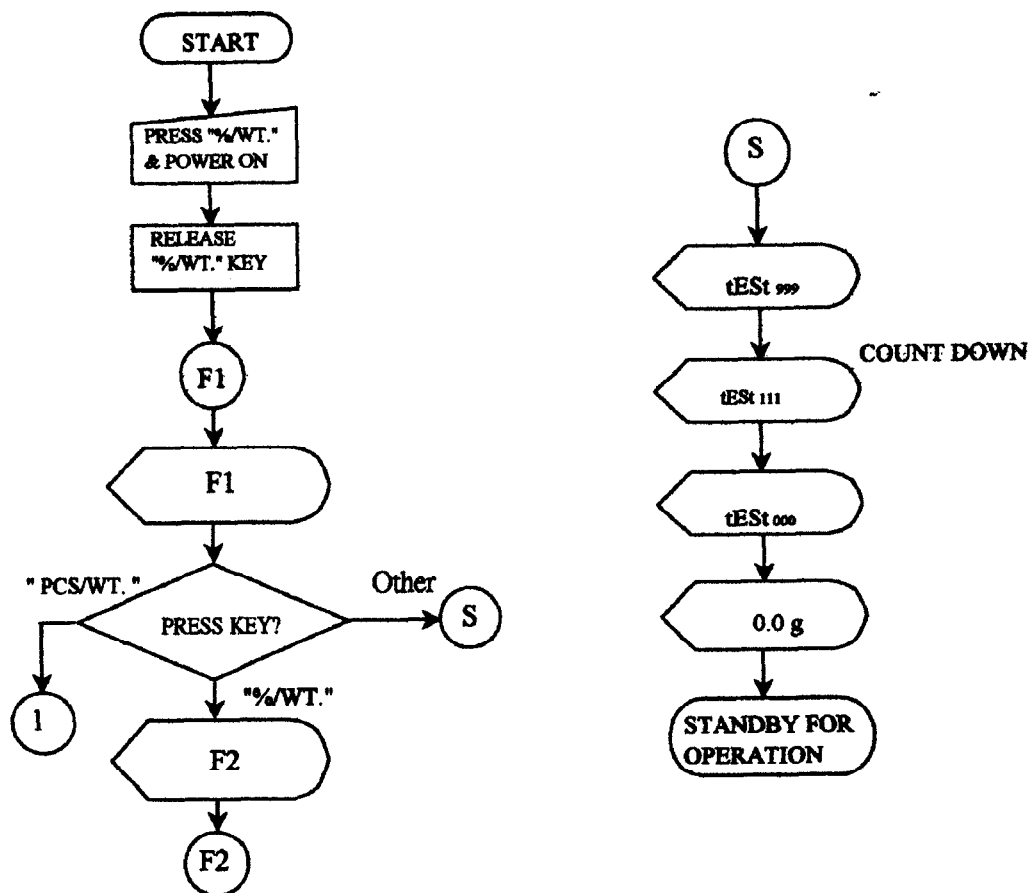
5. FLOW CHART

5.1 Auto Calibration(for end-user)

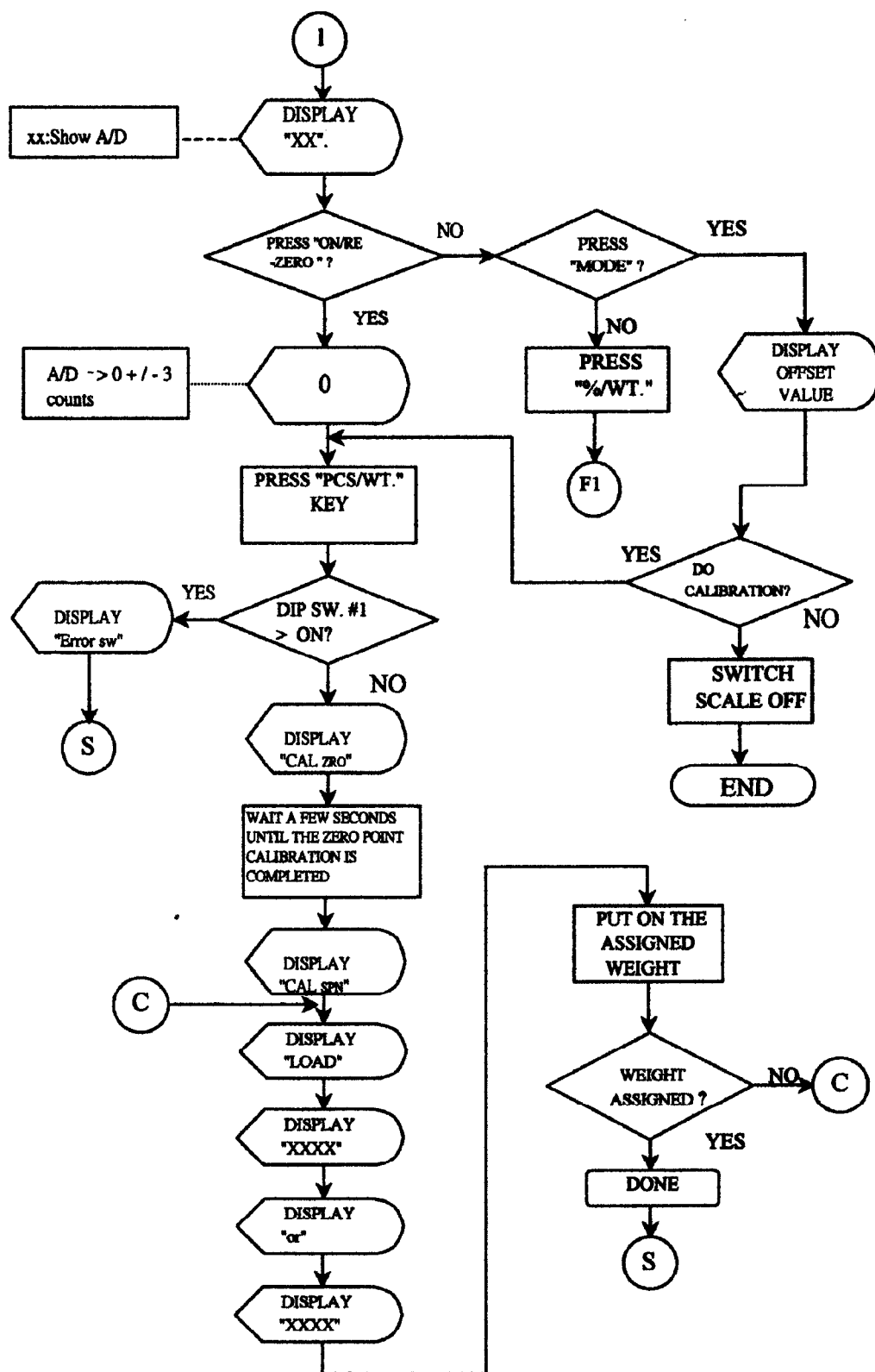


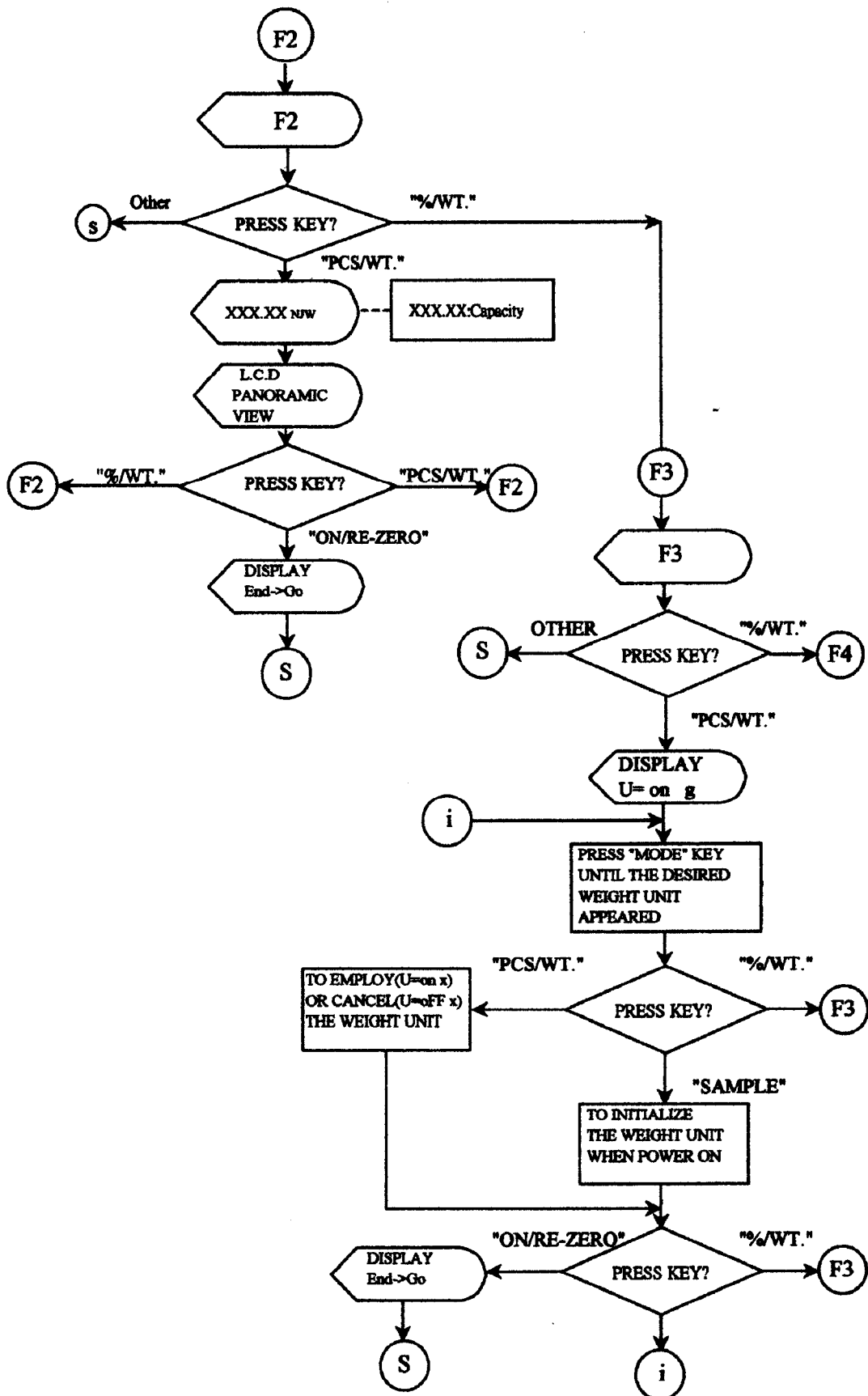
5. FLOW CHART

5.2 Function Test(for technicians only)

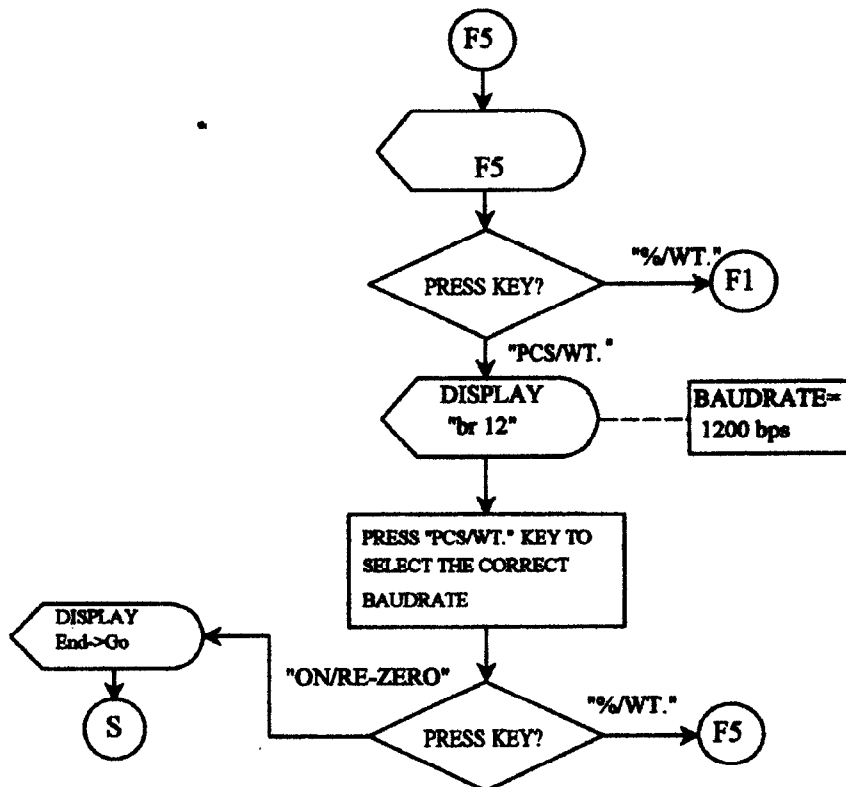
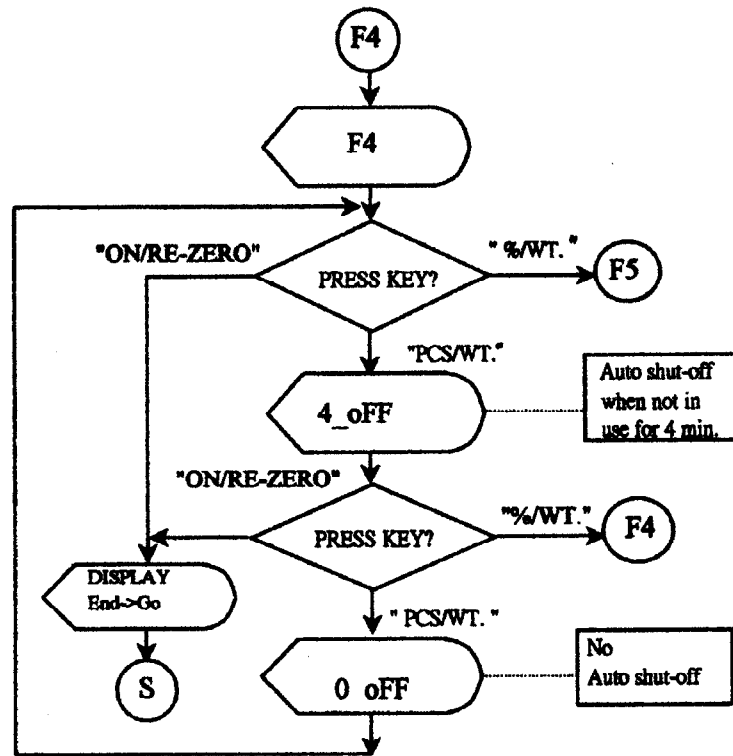


3. INITIAL SETUP

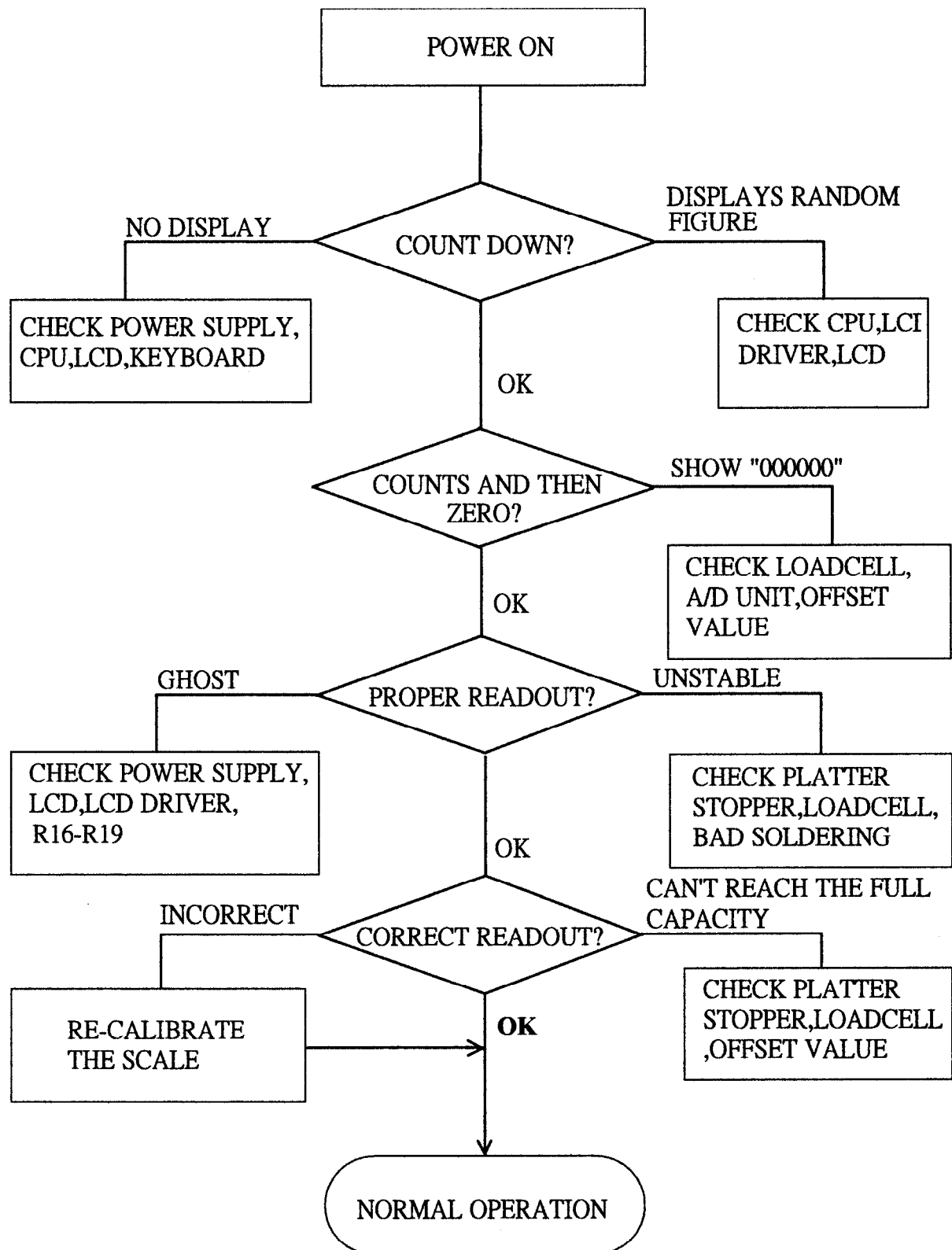




3. INITIAL SETUP



1. TROUBLE SHOOTING LOOP



4. TROUBLE SHOOTING

2. PARTS AND COMPONENTS TROUBLE SHOOTING

2.1 Power Supply Checking

2.1.1 Relevant parts:

Power Board(HGS-20-X)

Q1(C1061)

ZD1(8.2V)

R3(1.2 ohm,1/2W)

Q2(C945)

DC-JACK(SCD-21)

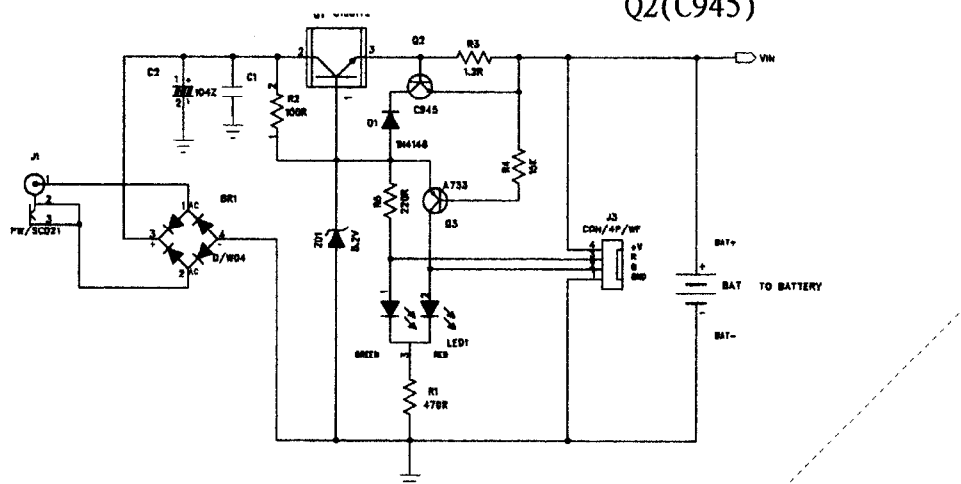
Main Board(HGS-10-X)

U12(HT7039)

U13(AIC1722-5)

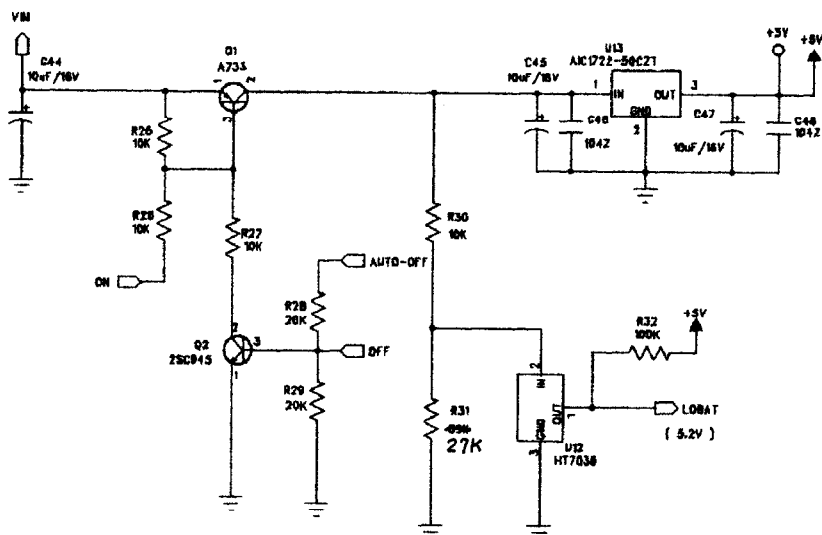
Q1(A733)

Q2(C945)



HGS-20-X

HGS-10-X



Description:

- 1) AC Adaptor: This AC adaptor provides about 9-12V dc power.
- 2) Battery: Built-in Rechargeable Battery 6V 4Ah.
- 3) How Battery is charged completely?
The charging voltage is regulated by Q1(C1061) and ZD1(8.2V) for about 7 volts.
The charging current will go down automatically If battery full charged when voltage reached.
Q2(C945) and R3(1.2R,1/2W) provide Over-Current protection.
- 4) +5V power drives both digital & analog circuits system.
U13(AIC1722-5) is a 5volts Voltage Regulator.
- 5) -5V power is to drive the A/D converter and O.P. Amp.
U4(7660) is a Voltage Inverter which generates -5V power.
- 6) Auto-off:
If the scale is set on 4_off or even under LO-BAT situation, after some minutes the CPU will release a low potential signal to cut Q2(C945) off, then Q1 will be also off, therefore the scale is shut down immediately.
- 7) Low Power Detection:
The U12(HT-7039) is designed to detect the power level.
When supplying power is less than 5.5V, it will release a low potential signal to CPU, and then CPU will instruct LCD display to show LO-BAT symbol.

2.1.2 Supplying voltage: 5.5V or higher

Check and recharge the battery.

Replace a new battery if voltage less than 5V and can't be recovered.

Check DC-JACK or AC adaptor if been defective.

4. TROUBLE SHOOTING

2.1.3 System voltage: 5V +/-10% (digital Section)

Check that the system voltage is within 5V +/- 10%

- a) less than 4.5V, the CPU may not work properly.
- b) more than 6V, ghost will appear on LCD.

2.2 Platter Stopper Checking

The platter device shall not touch anything around itself during operation. Check that the platter is not contacted with the upper(no load) and/or lower (with load) stopper.

2.3 LCD Display Checking

2.3.1 Check that it is soldered and connected properly between LCD and driver IC(uPD7225), driver IC(uPD7225) and CPU.

2.3.2 Check whether LCD is broken.

2.4 CPU Checking

2.4.1 Check that all pins are seated properly into the socket.

2.4.2 Check that the Crystal Oscillator works.

2.4.3 Check the RESET is normally low.

2.5 A/D Unit Checking

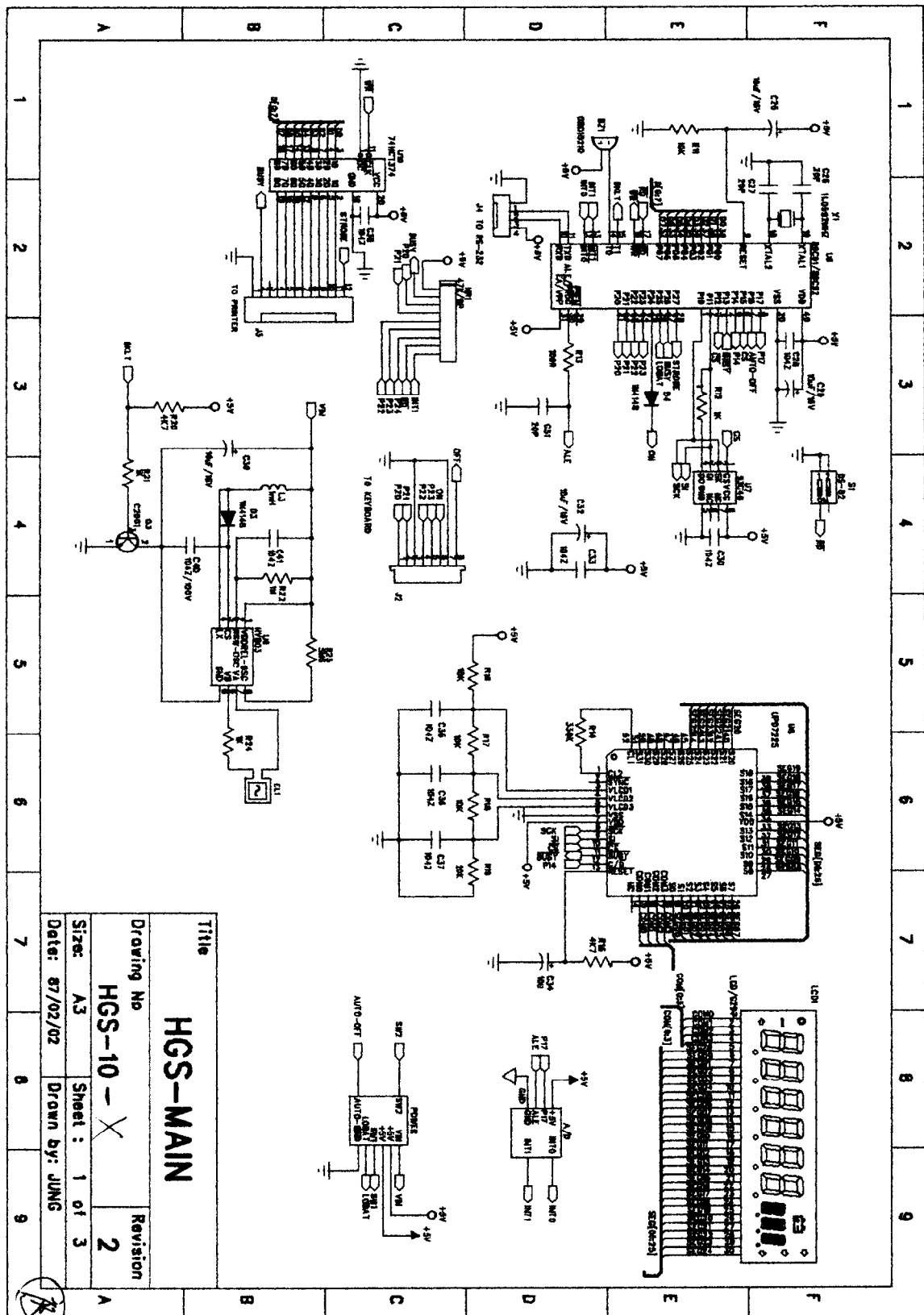
2.5.1 Check that the +5V/-5V power is correctly fed to the A/D unit.

2.5.2 Check that the signal output of loadcell is normal.

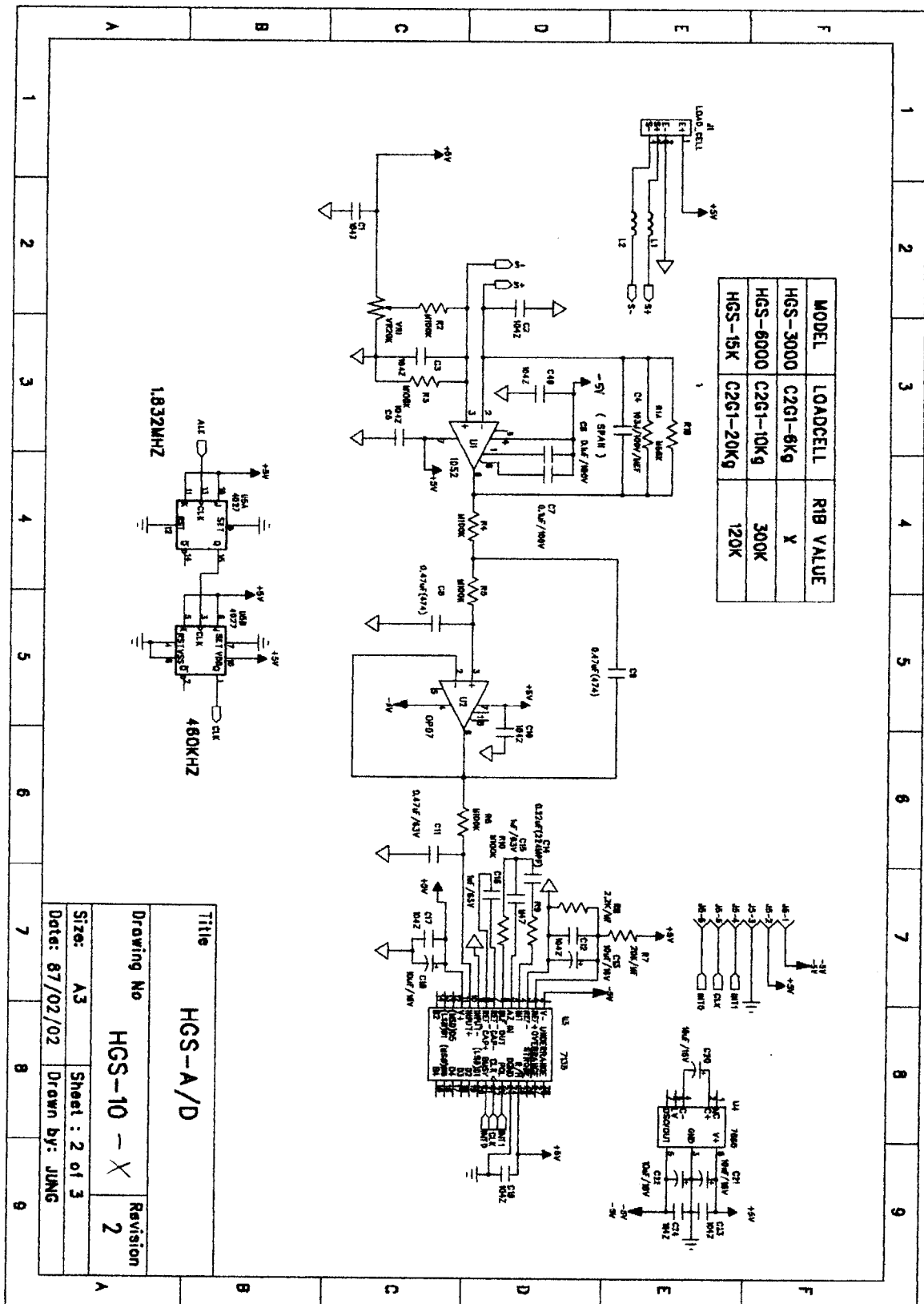
2.5.3 Check OP. Amplifier & A/D Converter(IC 7135).

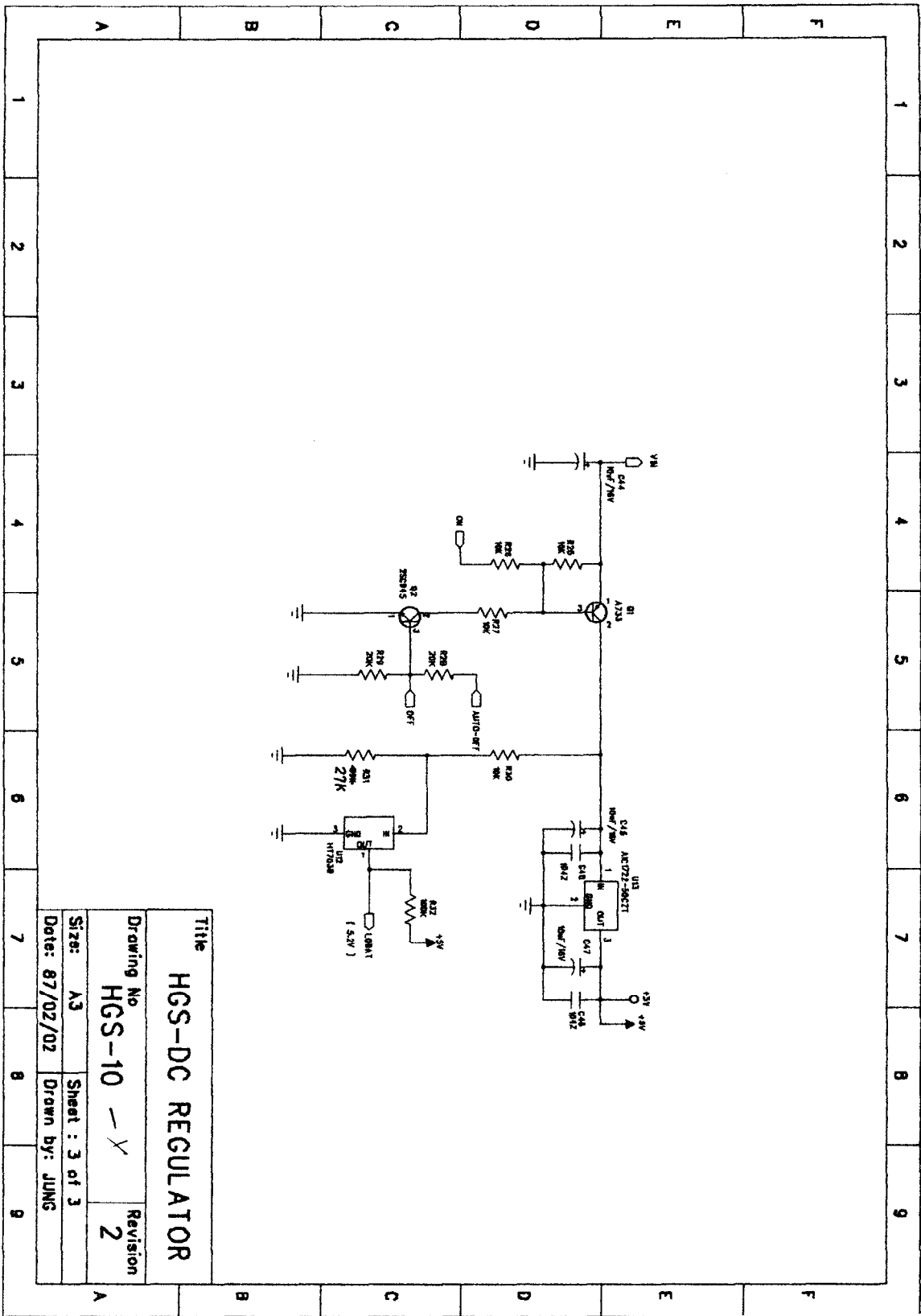
When no error is found with the above checking procedures, the trouble can be caused on the loadcell or the PCB itself. Replace a new one could be better to identify the defective. In this way, the readout of weight would be varied because of the output voltage of loadcell and defferent span value, so recalibration is required after this replacement.

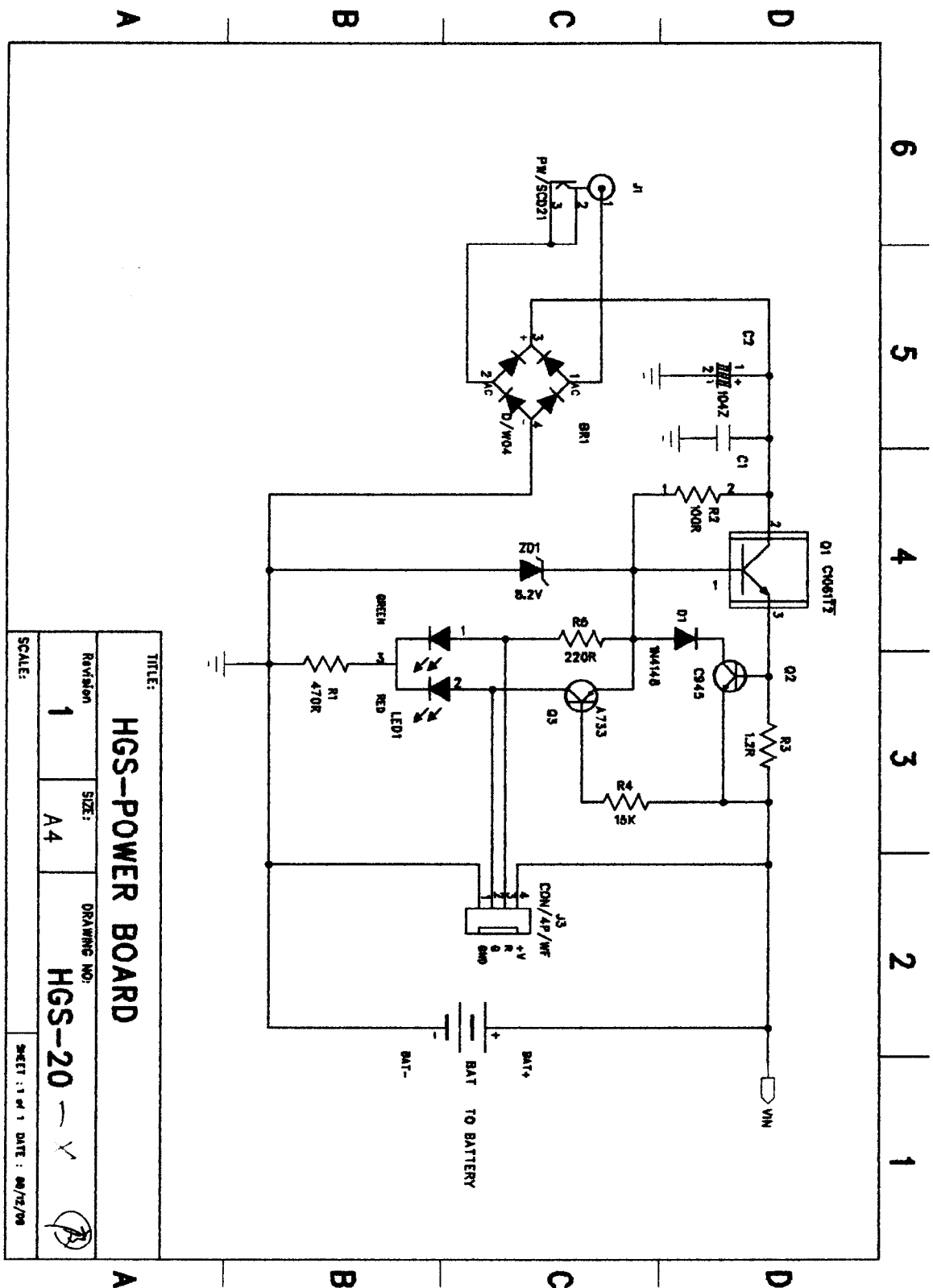
1. SCHEMATICS



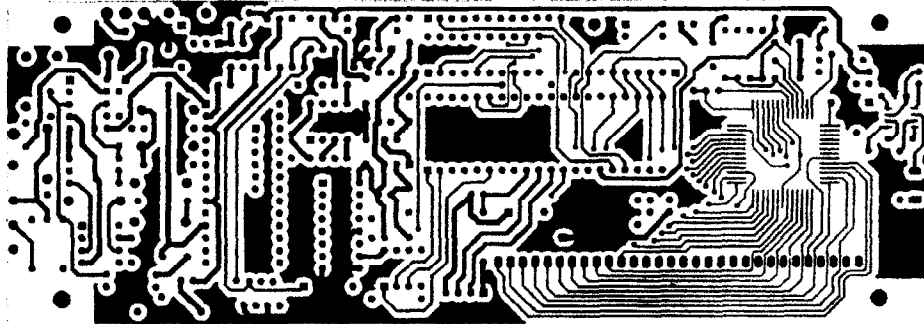
5. ELECTRICAL CIRCUITRY



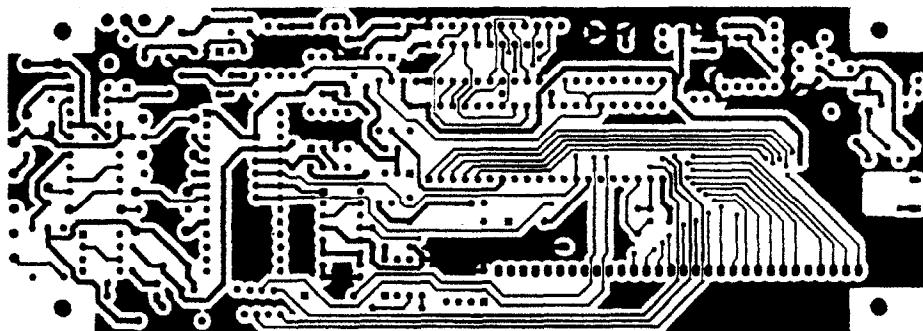




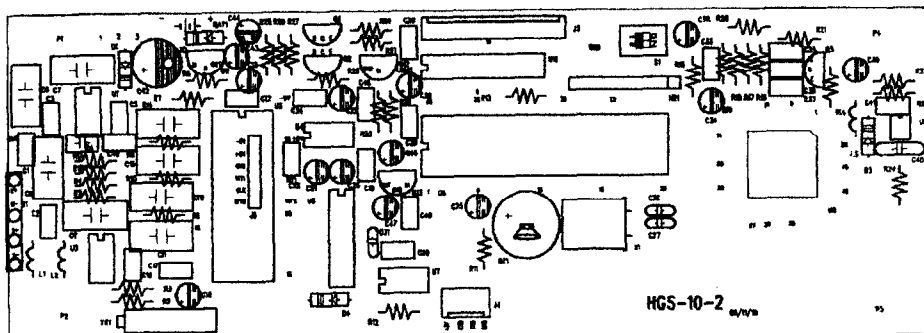
2. PCB LAYOUT



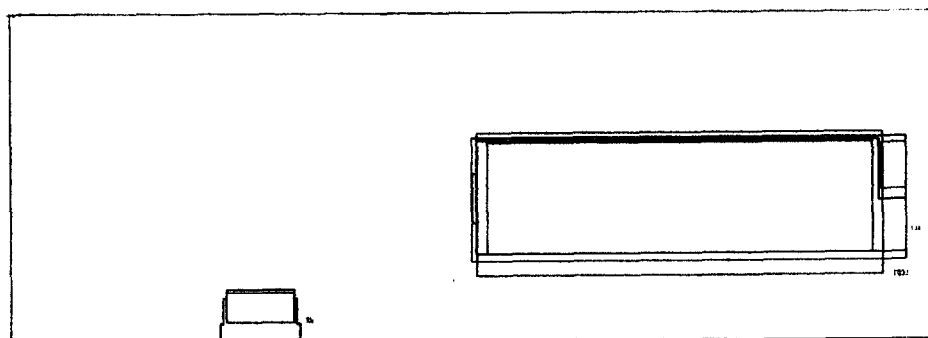
HGS-10-2 TOP LAYER



HGS-10-2 BOTTOM LAYER

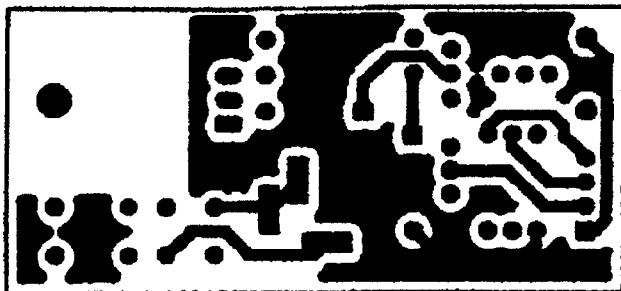


HGS-10-2 TOP OVER LAY

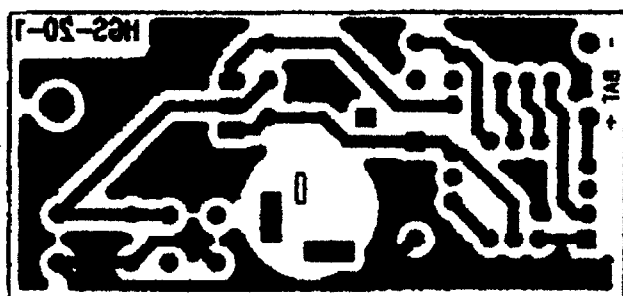


HGS-10-2 BOTTOM OVER LAY

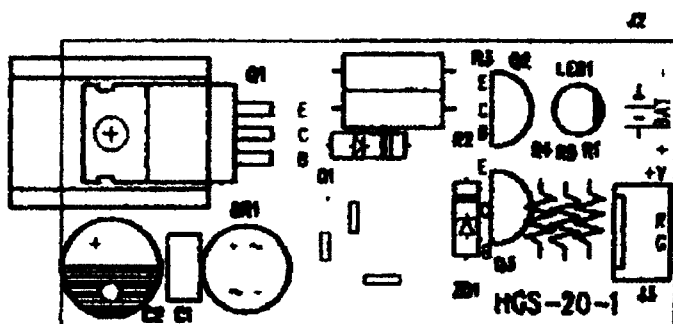
5. ELECTRICAL CIRCUITRY



**HGS-20-1
TOP LAYER**



**HGS-20-1
BOTTOM LAYER**



**HGS-20-1
TOP OVERLAY**

HGS SERIES PARTS LIST

STRUCTURE

Parts No.	Description	Specification	Qty	Remark
F0005GS0010	S/S HOUSING: UPPER	GS SERIES	1	
F0005GS0000	S/S HOUSING: LOWER	GS SERIES	1	
F0003GSP101	L/C ALUMINUM LOWER SUPPORT	G SERIES	1	
F0003GSP100	L/C ALUMINUM UPPER SUPPORT	G SERIES	1	
A00*****	LOADCELL	C2G1 OR EQUIVALENT	1	AS PER MODEL
F0022000000	ADJUSTABLE FEET	GS SERIES,S/S	4	
G0030GS0000	SEALING RUBBER	GS SERIES	1	
B0GS0000000	KEYBOARD	GS SERIES,6 KEYS	1	
C1HGS000***	PC FASCIA	HGS SERIES	1	AS PER MODEL
F0002GS0000	S/S PLATTER	GS SERIES	1	
A1600060400	RECHARGEABLE BATTERY	6V 4Ah	1	
A60*****	ADAPTOR	***V/9V,500mA	1	
Z6GS1000000	PACKAGE	GS SERIES	1	
E9HGS000000	P.C.B. KIT	HGS-10-X	1	
E9HGS010000	P.C.B. KIT	HGS-20-X	1	
A1204010370	CONDUCTIVE WIRE	37cm(BLACK)	1	
A1204010372	CONDUCTIVE WIRE	37cm(RED)	1	
A1205010300	CONDUCTIVE WIRE	30cm(BLACK)	1	
A1205010302	CONDUCTIVE WIRE	30cm(RED)	1	

HGS-300,600:

F0005GS0012	S/S HOUSING: UPPER	HGS-300,600	1	
F0003GS0100	L/C ALUMINUM LOWER SUPPORT	HGS-300,600	1	
G0003JW0000	L/C PLASTIC UPPER SUPPORT	NJW SERIES	1	
F0002GS0010	S/S PLATTER	HGS-300,600	1	
G0002DB0000	PLASTIC PLATTER(14mm)	DB SERIES	1	
COGS0000000	ACRYLIC TUBE	180mm x 120mm x 3mm	1	
F0027GS0000	S/S WIND SHIELD COVER	180mm x 8mm x 0.5t	1	

MODEL

LOAD CELL

HGS-300	BCL-300g or equivalent
HGS-600	BCL-600g or equivalent
HGS-3000	C2G1-6kg or equivalent
HGS-6000	C2G1-10kg or equivalent
HGS-15K	C2G1-20kg or equivalent

MAINBOARD

E0HGS000000	P.C.B.	HGS-10-X	1	
A0205040270	I.C.	4027	1	U5
A0202093461	I.C.	93C46	1	U7
A0207078081	I.C.	78L08	1	U11
A0250070390	I.C.	HT7039	1	U12
A0206000071	I.C.	OP-07CP	1	U2
A0208072250	I.C.	uPD7225	1	U8

6. PARTS LIST

A0203076600	I.C.	7660	1	U4
A0206010521	I.C.	LT1052CN8	1	U1
A0207017220	VOLTAGE REGULATOR	AIC1722-50CZL	1	U13
A0300000040	I.C. SOCKET	40 PIN	1	U6
A0300000028	I.C. SOCKET	28 PIN	1	U3
A0401009450	TRANSISTOR	2SC945	1	Q2
A0401007330	TRANSISTOR	A733	1	Q1
A0501004148	DIODE	1N4148	3	D1,D2,D4
A0701477016	CAPACITOR (EC)	470uF/16V	1	C42
A0701106017	CAPACITOR (EC)	10uF/16V(SS TYPE)	13	C13,18,20-22 ,25,29,32,34 ,43-45,47
A0730104050	CAPACITOR (MLC)	104Z	19	C1-3,5,10,12 ,17,19,23-24, 28,30,33,35, 36-37,46,48, 49
A0710224101	POLYESTER FILM CAPACITOR(MEF)	0.22uF/100V(224)	1	C14
A0713105063	POLYESTER FILM CAPACITOR(MEF)	1uF/63V	2	C15,16
A0713474063	POLYESTER FILM CAPACITOR(MEF)	0.47uF(474)	3	C8,9,11
A0720103101	POLYESTER FILM CAPACITOR(PET)	0.01uF/100V(103J)	1	C4
A0720104101	POLYESTER FILM CAPACITOR(MEF)	0.1uF/100V(104J)	2	C6,7
A0740020050	CERAMIC CAPACITOR (CC)	20PF	3	C26,27,31
A0801001203	TRIMMER	3006P-001-203(20K)	1	VR1
A0802047309	RESISTOR NETWORK	47K ohm,9 PIN	1	NR1
A0804045602	METAL FILM RESISTOR	56K ohm,1/4W	1	R1A
A0804041003	METAL FILM RESISTOR	100K ohm,1/4W	6	R2-6,10
A0804042322	METAL FILM RESISTOR	23.2K ohm,1/4W	1	R31
A0804040100	METAL FILM RESISTOR	10 ohm,1/4W	1	R9
A0803042002	METAL FILM RESISTOR(10PPM)	20K ohm,1/4W	1	R7
A0803042201	METAL FILM RESISTOR(10PPM)	2.2K ohm,1/4W	1	R8
A0805041103	CARBON FILM RESISTOR	10K ohm,1/4W	8	R11,16-18,25 ,26-27,30
A0805041101	CARBON FILM RESISTOR	100 ohm,1/4W	1	R13
A0805041104	CARBON FILM RESISTOR	100K ohm,1/4W	1	R32
A0805041102	CARBON FILM RESISTOR	1K ohm,1/4W	1	R12
A0805041203	CARBON FILM RESISTOR	20K ohm,1/4W	3	R19,28-29
A0805041331	CARBON FILM RESISTOR	330K ohm,1/4W	1	R14
A0805041473	CARBON FILM RESISTOR	4.7K ohm,1/4W	1	R15
A1005030512	FERRITE BEAD	3.5 x 6 x 0.8 mm	2	L1,L2
A1301000002	DIP S/W	DS-02(4 PIN)	1	S1(OPTION)
A1100311059	CRYSTAL	11.0592MHz	1	X1
A1500000004	BUZZER	OBO-15210	1	BZ1
A0910001080	CONNECTOR (FPC)	8 PIN(ZIF) 90°	1	J2
COMMON PARTS				
A0102000297	L.C.D.	UTS-G297JV-W	1	LCD1
A0201089521	I.C.	89C52	1	U6
A0203071350	I.C.	7135	1	U3
E1GS0000000	P.C.B.	HGS-10-X	1	

6. PARTS LIST

EL BACKLIGHTING

A0250008030	I.C.	HV803	1	U9
A0401020010	TRANSISTOR	C2001	1	Q3
A0501004148	DIODE	1N4148	1	D3
A0701106017	CAPACITOR (EC)	10uF/16V(SS TYPE)	1	C39
A0740104100	CERAMIC CAPACITOR (CC)	0.1uF/100V	1	C40
A0730104050	CAPACITOR (MLC)	104Z	1	C41
A1002108000	INDUCTOR	1mH	1	L3
A1400000003	EL BACKLIGHT	89 x25 mm	1	EL1
A0805041102	CARBON FILM RESISTOR	1K ohm,1/4W	2	R21,24
A0805041105	CARBON FILM RESISTOR	1M ohm,1/4W	1	R22
A0805041472	CARBON FILM RESISTOR	4.7K ohm,1/4W	1	R20
A0805041565	CARBON FILM RESISTOR	5.6M ohm,1/4W	1	R23

PRINTER

A0204743742	I.C.	74HC374	1	U10(OPTION)
A0901010120	CONNECTOR (WIRE ARRAY)	12 PIN WAFER	1	J3(PRINTER OPTION)
A0730104050	CAPACITOR (MLC)	104Z	1	C38

RS-232C

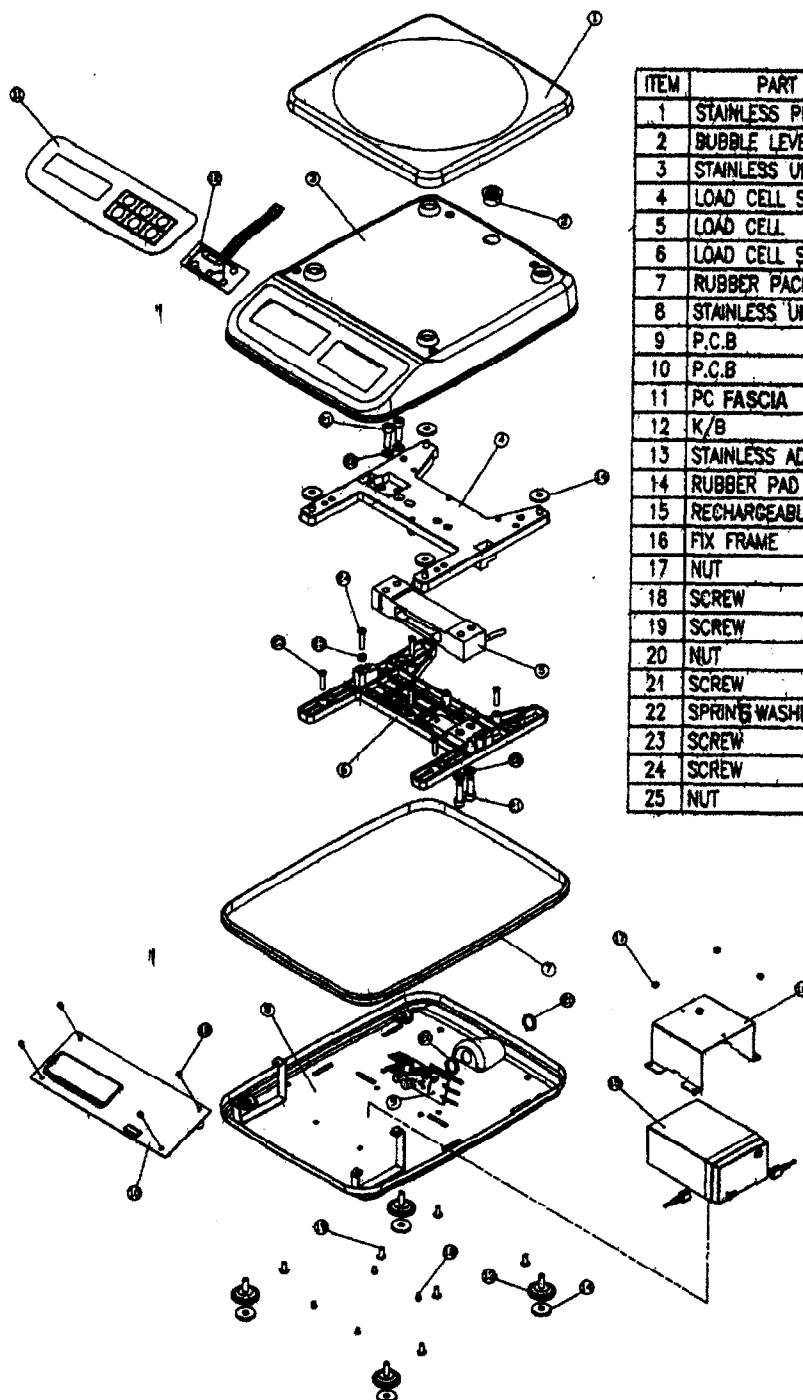
A0901010040	CONNECTOR (WIRE ARRAY)	4 PIN WAFER	1	J4(RS232 OPTION)
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HGS-20-X CHARGING BOARD

E0HGS010000	P.C.B.	HGS-20-X	1	
A0730104050	CAPACITOR (MLC)	0.1uF/50V(104)	1	C1
A0701477016	CAPACITOR (EC)	470uF/16V	1	C2
A0502000001	BRIDGE RECTIFIER	W04(1A)	1	BR1
A0501004148	DOODE	1N4148	1	D1
A0401009450	TRANSISTOR	2SC945	1	Q2
A0401010610	TRANSISTOR	H1061C OR D880	1	Q1
A0906000210	D.C. JACK	SCD-021 (BLACK)	1	J1
A0805020120	CARBON FILM RESISTOR	1.2 ohm,1/2W	1	R3
A0805021101	CARBON FILM RESISTOR	100 ohm,1/2W	1	R2
A0503020082	ZENER DIODE	1/2W 8.2V(9A3)	1	ZD1
A1204010370	PVC CONDUCTIVE WIRE	37cm (BLACK),26AWG	1	
A1204010372	PVC CONDUCTIVE WIRE	37cm (RED),26AWG	1	
A5004000002	HEAT SINK (U TYPE)	MB-204-20	1	Q1
Z0011000308	SCREW	M3 x 8	1	
Z0016000003	SCREW NUT	M3	1	
A0401007330	TRANSISTOR	A733	1	Q3(OPTION)
A0805041153	CARBON FILM RESISTOR	15K ohm,1/4W	1	R4(OPTION)
A0805041221	CARBON FILM RESISTOR	220 ohm,1/4W	1	R5(OPTION)
A0805041471	CARBON FILM RESISTOR	470 ohm,1/4W	1	R1(OPTION)
A0625050000	L.E.D.	RED/GREEN ROUND 5mm	1	LED1(OPTION)

6. PARTS LIST

PARTS EXPLOSION:



ITEM	PART NAME	DESCRIPTION	QTY
1	STAINLESS PLATTER	GS-SERIES	1
2	BUBBLE LEVEL	#14mm	1
3	STAINLESS UPPER CABINET	GS-SERIES	1
4	LOAD CELL SUPPORTS (U)	G-SERIES	1
5	LOAD CELL		1
6	LOAD CELL SUPPORTS (D)	GS-SERIES	1
7	RUBBER PACKING	GS-SERIES	1
8	STAINLESS UNDER CABINET	GS-SERIES	1
9	P.C.B	HGS-20-X	1
10	P.C.B	HGS-10-X	1
11	PC FASCIA	HGS SERIES	1
12	K/B	GS-SERIES, 6 KEYS	1
13	STAINLESS ADJ. FEET	GS-SERIES	1
14	RUBBER PAD	CFR-190803	4
15	RECHARGEABLE BATTERY	8V, 4AH	1
16	FIX FRAME	GS-SERIES	1
17	NUT	M3	4
18	SCREW	M3	8
19	SCREW	M4X10, ROUND	6
20	NUT	SCD-21	2
21	SCREW	M8X20	4
22	SPRING WASHER	M7	4
23	SCREW	M4X18, NYLOK	5
24	SCREW	M4X20, ROUND	1
25	NUT	M4	1

AT89C52**Features**

- Compatible with MCS-51™ Products
- 8 Kbytes of In-System Reprogrammable Flash Memory
Endurance: 1,000 Write/Erase Cycles
- Fully Static Operation: 0 Hz to 24 MHz
- Three-Level Program Memory Lock
- 256 x 8-Bit Internal RAM
- 32 Programmable I/O Lines
- Three 16-Bit Timer/Counters
- Eight Interrupt Sources
- Programmable Serial Channel
- Low Power Idle and Power Down Modes

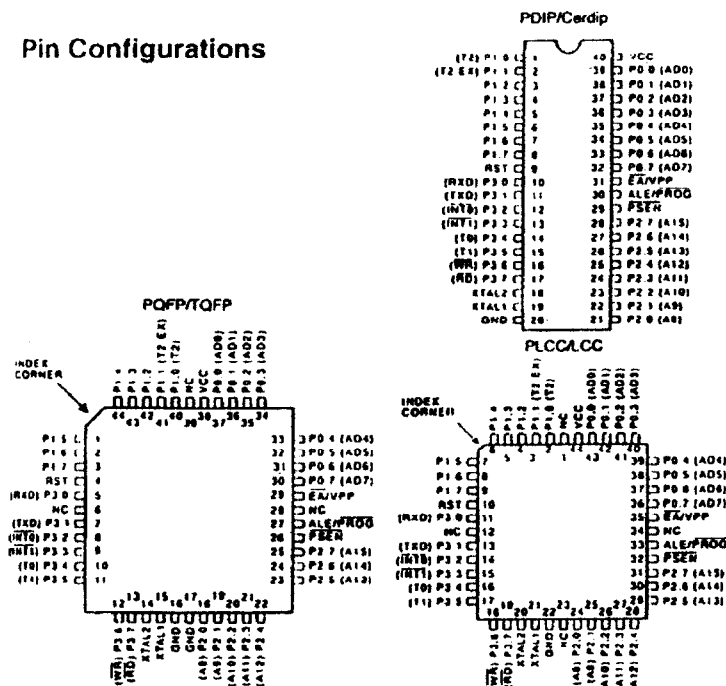
Description

The AT89C52 is a low-power, high-performance CMOS 8-bit microcomputer with 8 Kbytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high density nonvolatile memory technology and is compatible with the industry standard 80C51 and 80C52 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C52 is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded control applications.

The AT89C52 provides the following standard features: 8 Kbytes of Flash, 256 bytes of RAM, 32 I/O lines, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89C52 is

(continued)

8-Bit Microcontroller with 8 Kbytes Flash

Pin Configurations

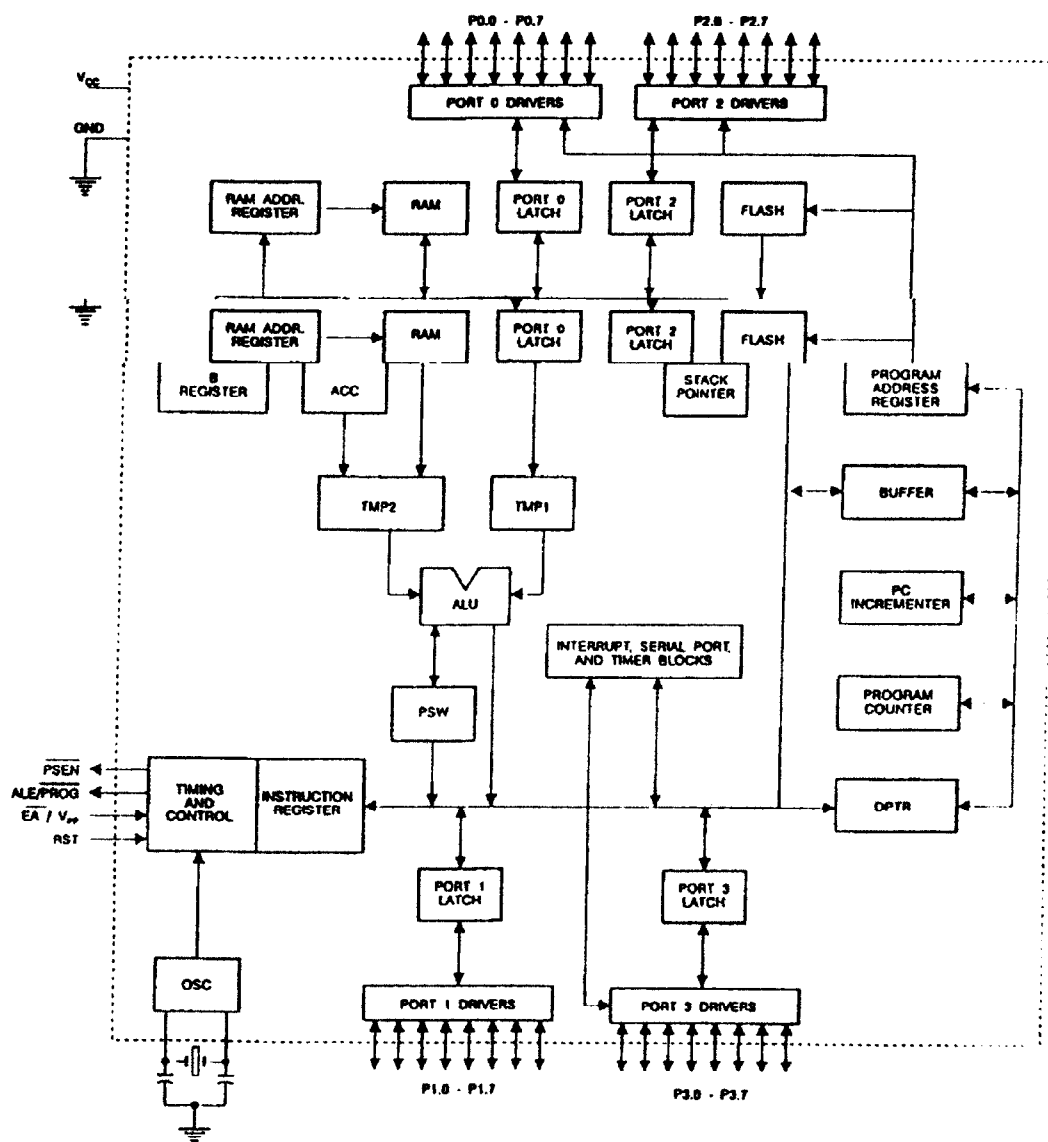
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3-65





Block Diagram



ICL7135

4½ Digit A/D Converter with Multiplexed BCD Outputs

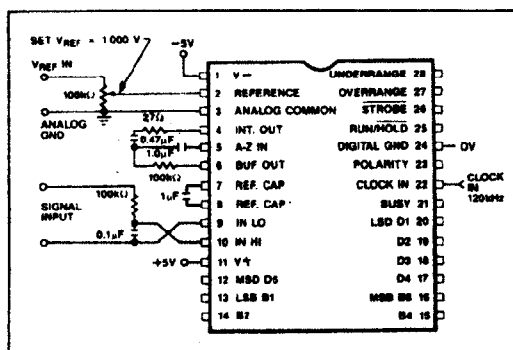


Figure 1. ICL7135 Test Circuit

Detailed Description

General Operation

The ICL7135 is divided into an Analog section and a Digital section. The digital section includes the counters, input and output interfaces, and control logic which controls the timing of each measurement cycle. Each measurement is divided into four phases: 1) auto-zero (AZ), 2) signal integrate (INT), 3) reference deintegrate (DE), and 4) zero integrator (ZI). The digital section controls the operation of the analog section during each of these phases, using counters and the state of the comparator to determine when to start each of the four phases.

Auto-Zero Phase

During auto-zero Input HI and Input LO are disconnected from the input pins and are internally shorted to Analog COMMON. The output of the comparator is connected to the inverting input of the integrator, and at the same time the non-inverting input of the integrator is connected to the input of the buffer. This feedback loop charges the autozero capacitor, C_{AZ} , to compensate for the offset voltages of the buffer amplifier, integrator, and comparator. Also during auto-zero, the reference capacitor is connected to the voltage reference and is charged to the reference voltage. The auto-zero cycle is a minimum of 9800 clock cycles, except after an over-range reading. After an over-range, the extended zero integrate phase reduces the auto-zero phase to 3800 clock cycles.

Signal Integrate Phase

At the end of the auto-zero phase the auto-zero loop is opened, and the Input High and Input Low are switched to the external pins IN-HI and IN-LO. The analog section integrates the differential voltage between Input High and Input Low. The differential voltage must be within the ICL7135's common mode range. The voltage on the inte-

grator capacitor at the end of signal integrate is directly proportional to the differential voltage between Input High and Input Low, and is also directly proportional to the length of the signal integrate phase. The signal integrate phase lasts precisely 10,000 clock cycles. At the end of this phase the input signal polarity is determined.

De-Integrate Phase

At the end of signal integrate, Input High and Input Low are disconnected from the external pins. The integrator non-inverting input pin is then internally connected to Analog Common and the buffer input is connected to one side of the reference capacitor. The other side of the reference capacitor is connected to Analog Common. The polarity at the output of the integrator (as detected by the comparator at the end of signal integrate phase) determines which terminal of the reference capacitor is connected to the buffer input. The reference capacitor polarity is chosen so that the integrator output will always return towards Analog Common. Since the reference capacitor was charged to the reference voltage during the auto-zero phase, the integrator input voltage is now the reference voltage. The De-integrate phase lasts for 20,001 counts, or until the comparator detects that the integrator output has crossed zero, whichever occurs first. The time required to return to zero is proportional to the input signal and is inversely proportional to the reference voltage. The number of clock cycles required to return to zero is counted by the digital section and is latched as the measurement result.

$$\text{Displayed reading} = 10,000 \times \frac{V_{IN}}{V_{REF}}$$

Zero Integrator Phase

The last of the four phases is the zero integrator phase. The non-inverting input of the integrator is internally shorted to Analog Common and the buffer input is internally connected to the output of the comparator. This closes a loop that forces the integrator output to zero. Normally this phase lasts only 100 to 200 counts, sufficient time to remove the small residual charge on the integrator capacitor caused by the comparator delay and the one count delay created by sampling the comparator output only once per clock cycle. However, an overrange condition will exist when the integrator output does not return to zero by the end of the De-Integrate phase, and can leave a residual voltage on the integrator capacitor. In this case, the Zero Integrator phase is increased to 6200 counts to ensure that the integrator capacitor is fully discharged before the next measurement cycle is started.

Analog Section

Analog COMMON

Analog COMMON is the Analog ground reference for the ICL7135. If Input Low is at a voltage other than Analog

μPD7225 CMOS, Intelligent, Alphanumeric LCD Controller/Driver

Description

The μPD7225 is an intelligent peripheral device designed to interface most microprocessors with a wide variety of alphanumeric LCDs. It can directly drive any static or multiplexed LCD containing up to 4 backplanes and up to 32 segments and is easily cascaded for larger LCD applications. The μPD7225 communicates with a host microprocessor through an 8-bit serial interface. It includes a 7-segment numeric and a 14-segment alphanumeric segment decoder to reduce system software requirements. The μPD7225 is manufactured with a low power consumption CMOS process allowing use of a single power supply between 2.7 V and 5.5 V. It is available in a space-saving 52-pin plastic flat package.

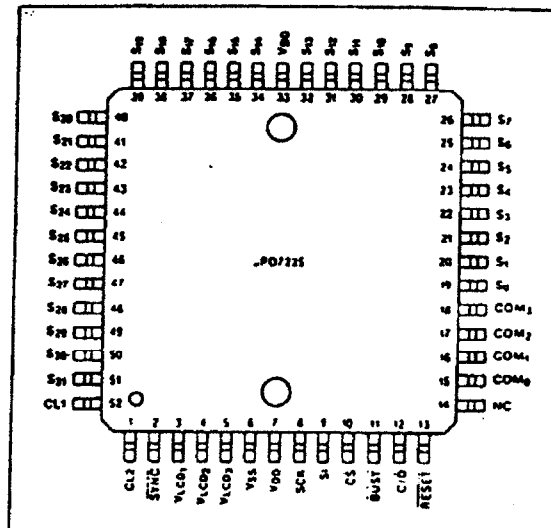
Features

- ☐ Single chip LCD controller with direct LCD drive
- ☐ Low cost serial interface to most microprocessors
- ☐ Compatible with
 - 7-segment numeric LCD configurations up to 16 digits
 - 14-segment alphanumeric LCD configurations up to 8 characters
- ☐ Selectable LCD drive configuration:
 - Static, biphased, triplexed, or quadruplexed
- ☐ 32-segment drivers
- ☐ Cascadable for larger LCD applications
- ☐ Selectable LCD bias voltage configuration:
 - Static, 1/2 or 1/3
- ☐ Hardware logic blocks reduce system software requirements
 - 8-bit serial interface
 - Two 32 × 4-bit static RAMs for display data and blinking data storage
 - Programmable segment decoding capability:
 - 16-character, 7-segment numeric decoder
 - 64-character, 14-segment USASCII alphanumeric decoder
 - Programmable segment blinking capability
 - Automatic synchronization of segment drivers with sequentially multiplexed backplane drivers
- ☐ Single power supply, variable from 2.7 V to 5.5 V
- ☐ Low power consumption CMOS technology
- ☐ Extended — 40°C to +85°C temperature range available

Ordering Information

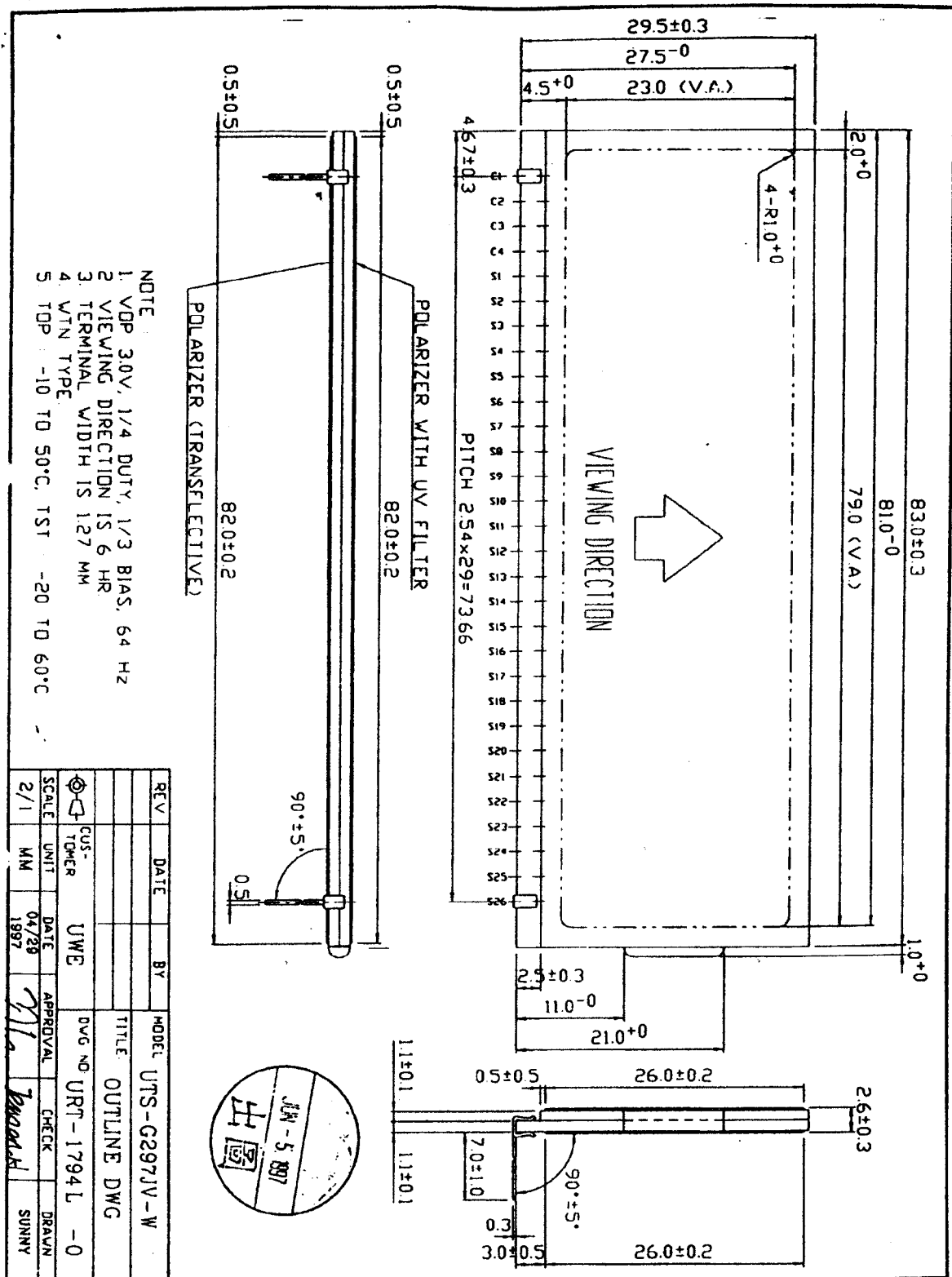
Part Number	Package Type	Max Frequency of Operation
μPD7225G-00	52-pin plastic miniflat	1 MHz

Pin Configuration

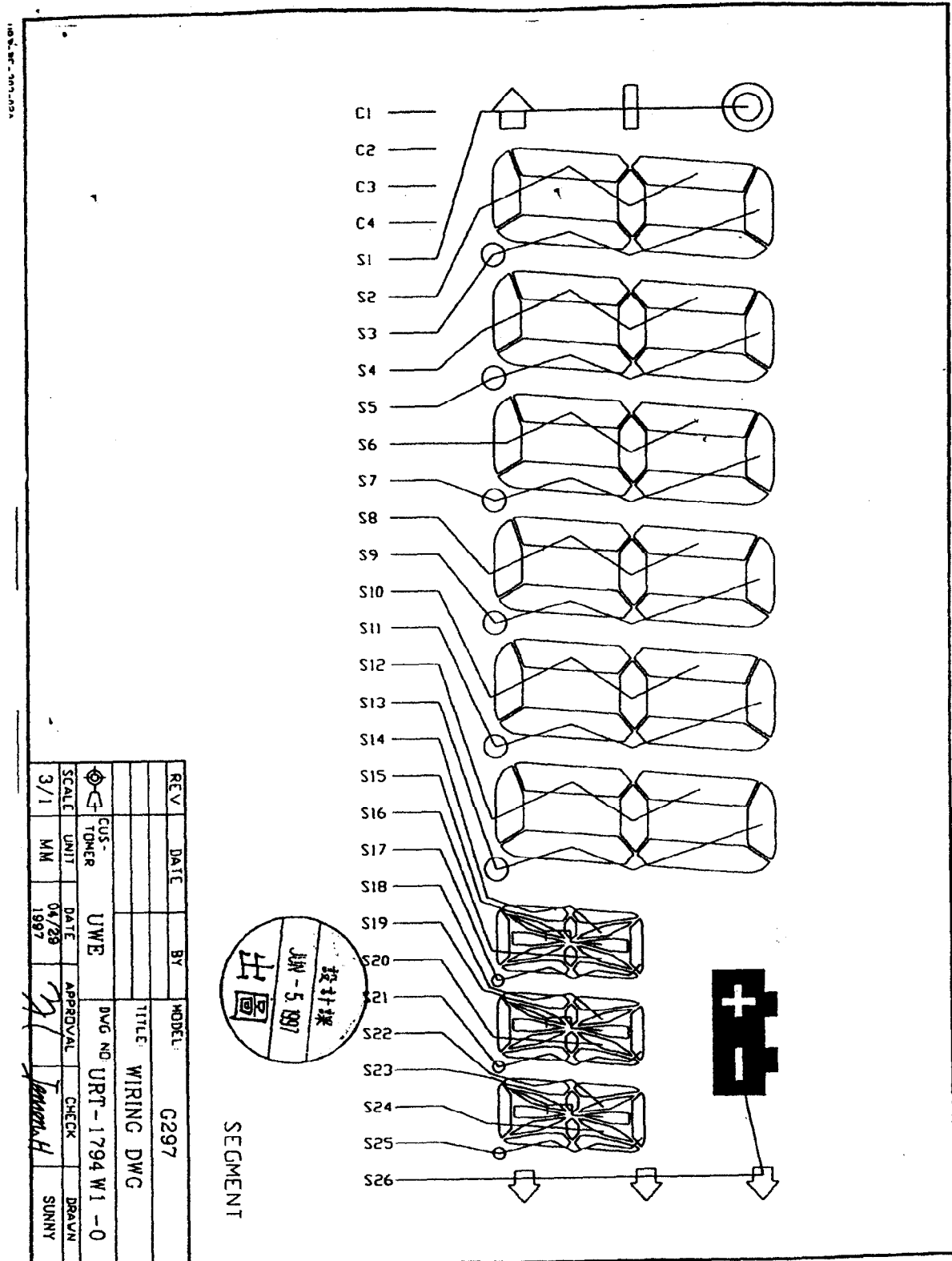


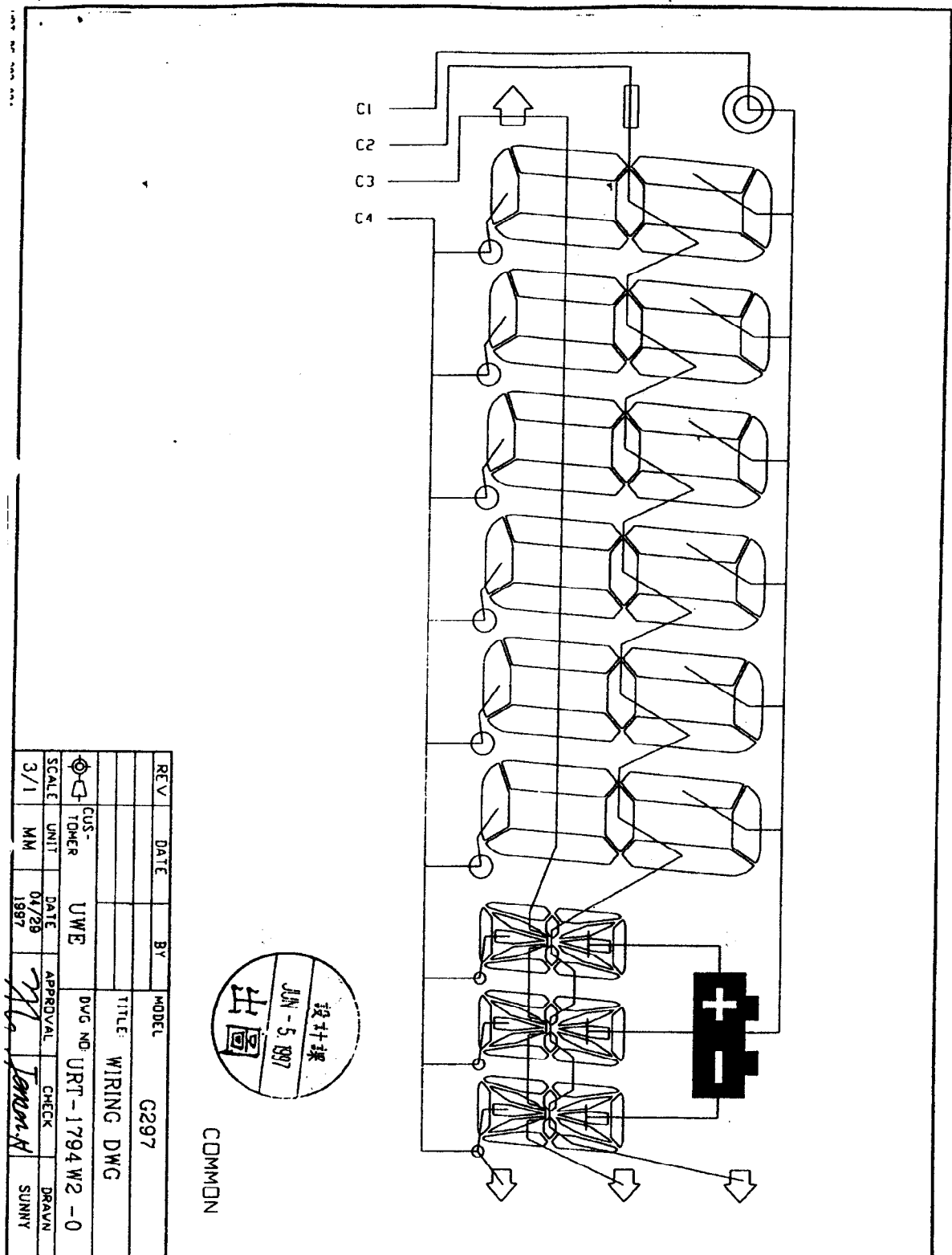
Pin Identification

No.	Symbol	Function
1	CL2	System clock output
2	SYNC	Synchronization port
3-5	V _{LCD1} V _{LCD2} V _{LCD3}	LCD bias voltage supply inputs
6	V _{SS}	Ground
7, 33	V _{DD}	Power
8	SCK	Serial clock input
9	SI	Serial input
10	CS	Chip select
11	BUSY	Busy output
12	C/D	Command or data select input
13	RESET	Reset input
14	NC	No connection
15-18	COM ₀ -COM ₃	LCD backplane driver outputs
19-32, 34-51	S ₀ -S ₃₁	LCD segment driver outputs
52	CL1	System clock input



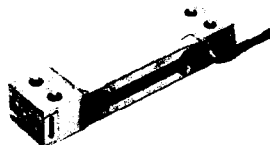
7. APPENDIX





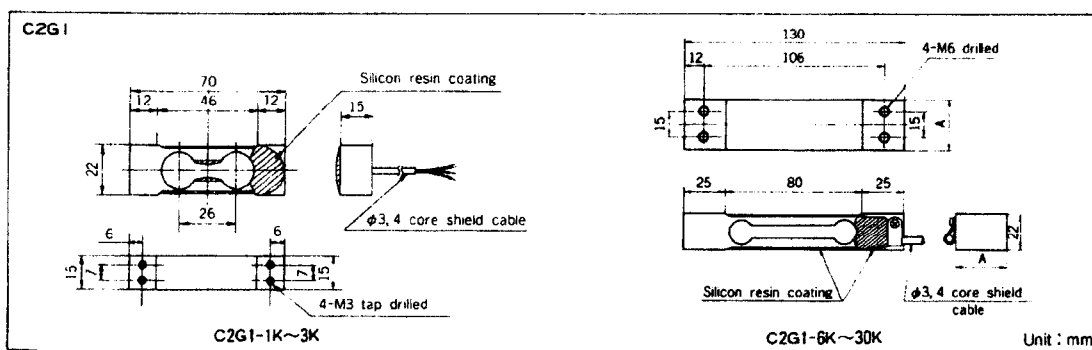
FOR ELECTRONIC SCALE

C2G1
Off-center
load cell



Specifications

MODEL	C2G1-1K~3K	C2G1-6K~30K
Rated capacity	1, 2, 3kgf	6, 10, 12, 15, 20, 25, 30kgf
Rated output	Approx. 1mV/V	Approx. 2mV/V
Non-linearity	0.02%R.O.	0.02%R.O.
Hysteresis	0.02%R.O.	0.02%R.O.
Repeatability	0.02%R.O.	0.02%R.O.
Creep	0.03%R.O./20min	0.02%R.O./20min
Creep Recovery	0.03%R.O./20min	0.02%R.O./20min
Excitation, recommended	10V	12V
Maximum	15V	20V
Zero balance	±5%R.O.	±5%R.O.
Terminal resistance, input	Approx. 400 Ω	Approx. 400 Ω
output	350 ± 5 Ω	350 ± 5 Ω
Length of cable	φ3, 40cm (4 core shield cable)	φ3, 40cm (4 core shield cable)
Insulation resistance	2000M Ω or more	2000M Ω or more
Temp. range, compensated	-10 ~ 50°C	-10 ~ 50°C
Safe	-10 ~ 50°C	-10 ~ 50°C
Temp. effect on zero balance	0.04%R.O./10°C	0.04%R.O./10°C
Temp. effect on output	0.012%LOAD/10°C	0.012%LOAD/10°C
Safe overload	300%R.C.	150%R.C.
Ultimate overload	400%R.C.	200%R.C.
Weight	Approx. 45g	



Model	(mm)	Rated C.	A	Weight Approx.(g)
C2G1-6K		6 kgf	30	200
C2G1-10K		10 kgf	30	200
C2G1-12K		12 kgf	30	200
C2G1-15K		15 kgf	30	200
C2G1-20K		20 kgf	30	200
C2G1-25K		25 kgf	40	260
C2G1-30K		30 kgf	40	260

