

MAINTENANCE MANUAL

DW SERIES

MODELS: DW-3000E, DW-6000E, DW-15KE, and DW-30KE

CONTENTS

1. INTRODUCTION

2. SPECIFICATIONS

- 2.1 SYSTEM BLOCK DIAGRAM
- 2.2 PHYSICAL LAYOUT OF ELECTRICAL CONNECTION
- 2.3 GENERAL SPECIFICATIONS

3. INITIAL SETUP

- 3.1 INTERNAL FUNCTION AND SETTING METHODS
- 3.2 AUTO AND DEALER CALIBRATION PROCEDURES
- 3.3 DISABLE CALIBRATION WITH DIP SW. (S1)
- 3.4 OFFSET AND SPAN VALUE DATA
- 3.5 FLOW CHART

4. TROUBLE SHOOTING

- 4.1 TROUBLE SHOOTING LOOP
- 4.2 PARTS AND COMPONENTS TROUBLE SHOOTING

5. ELECTRICAL CIRCUITRY

- 5.1 SCHEMATICS
- 5.2 PCB LAYOUT

6. BILL OF MATERIAL

7. APPENDIX

MAY 2001 REV 1

Specifications and Function Subject to Change without Notice

1. INTRODUCTION

The **DW** series is designed according to IP-66 protection requirements that can give ability of working properly under the toughest environment.

End users should be advised not to undertake any trouble shooting except those listed on the operation manual.

This maintenance manual contains of certain information that may result in fraudulent use. Do not release any part of this manual to any end users or un-authorized persons.

The internal DIP S/W should be so set to prevent un-authorized settings or alternations.

Should a load cell has been replaced, make sure that the protection devices are properly set.

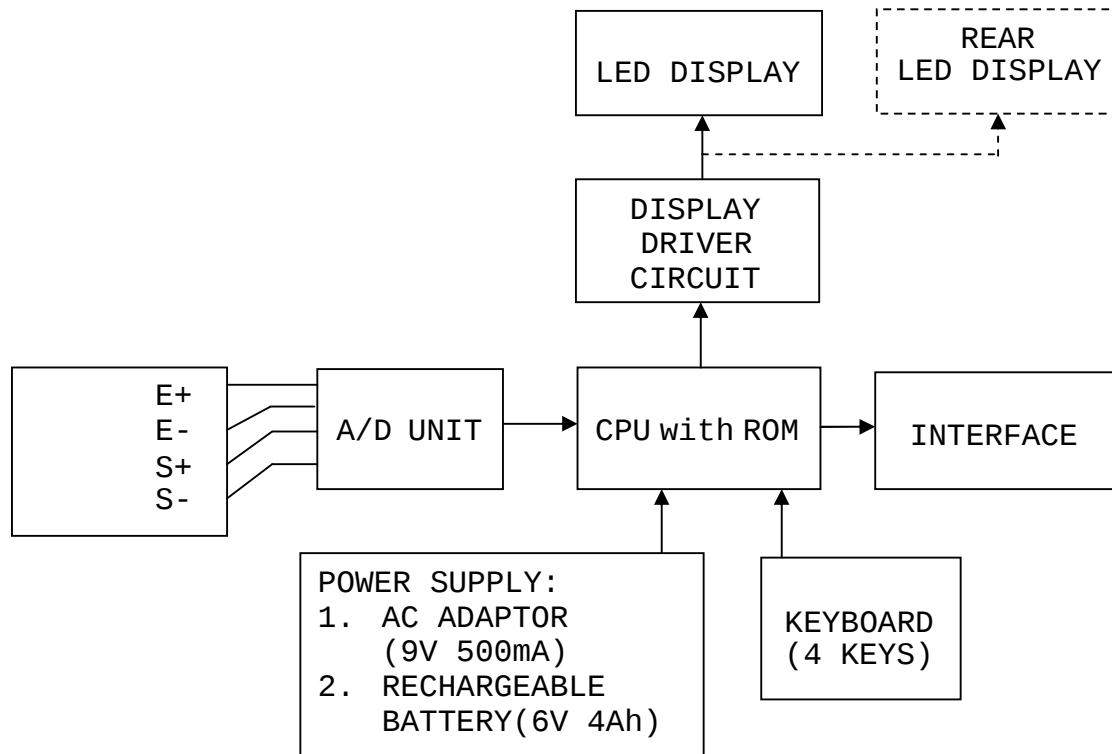
After servicing, it is necessary to go through all tests and procedures to ensure the scale meets all the metrological and approval requirements.

Here are some features of the DW series

1. Designed according to IP-66 protection requirements.
2. Moisture detection desiccant inside
3. Zero, Tare, Negative value indicators
4. Subtractive tare function.
5. Power on zero function.
6. Manual zero function.
7. Auto Power Saving Function
8. Dual '7-segment' LED display at both operator and rear side (optional).
9. Dual power: - By built-in rechargeable battery and external AC/DC power adaptor.
10. Dual (Metric and Avoirdupois) weight units
11. Weight check function with HI-OK-LO indicators and buzzer output
12. Low battery warning signal.
13. Dual color charge status indicator.
14. 2 Types of Calibration
15. Overload protection against positive and negative force
16. AC/DC power adaptor, adjustable feet, bubble level and S/S platter cover included.
17. Dip Switch to prevent end-user calibration
18. Optional Rear Display

2. SPECIFICATION

2.1 SYSTEM BLOCK DIAGRAM



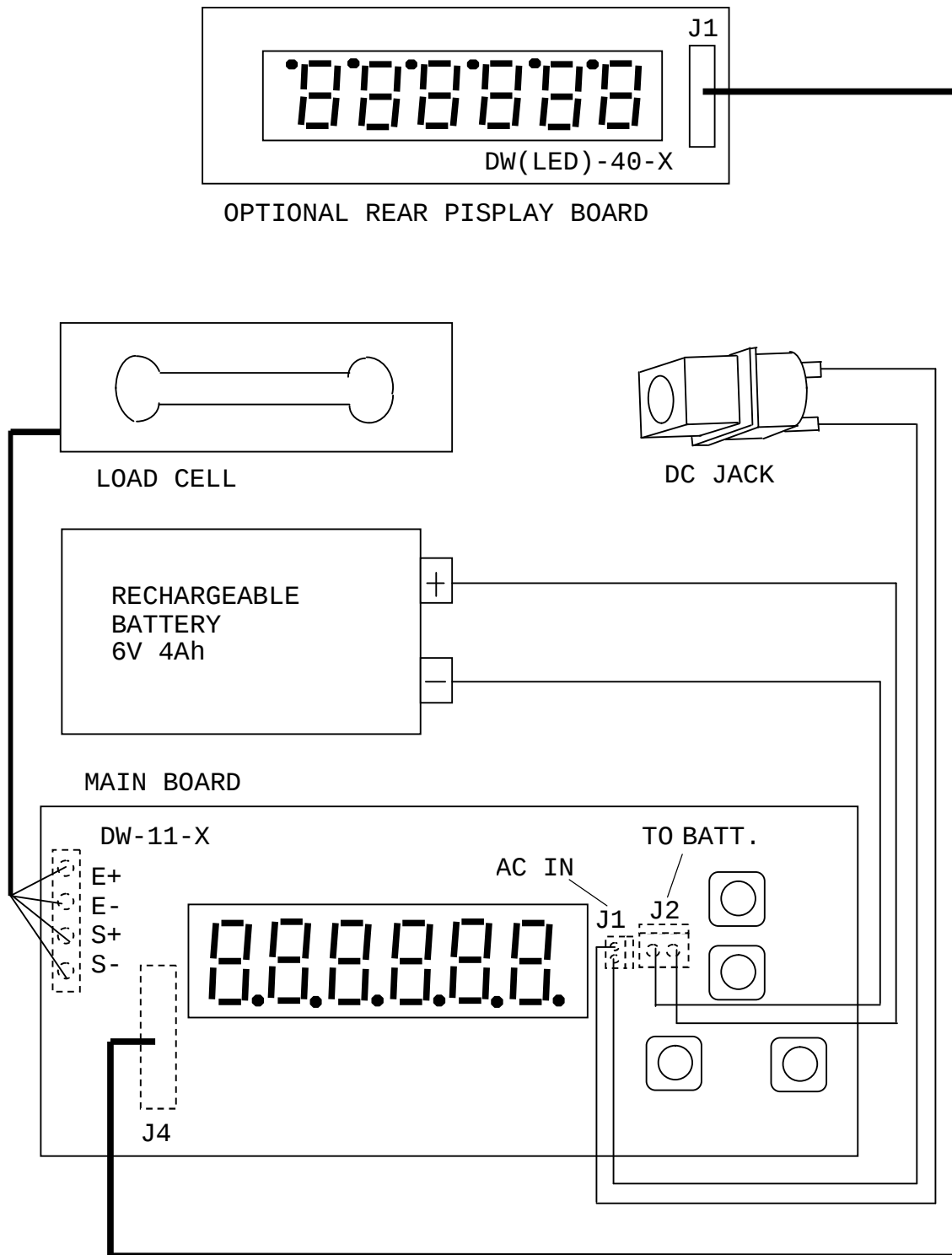
Description:

When an article is placed on the platter, the load of the article is applied to the load cell inside the scale.

The resistance to the excitation current in the strain gauge will then changed and the analog output signal varies.

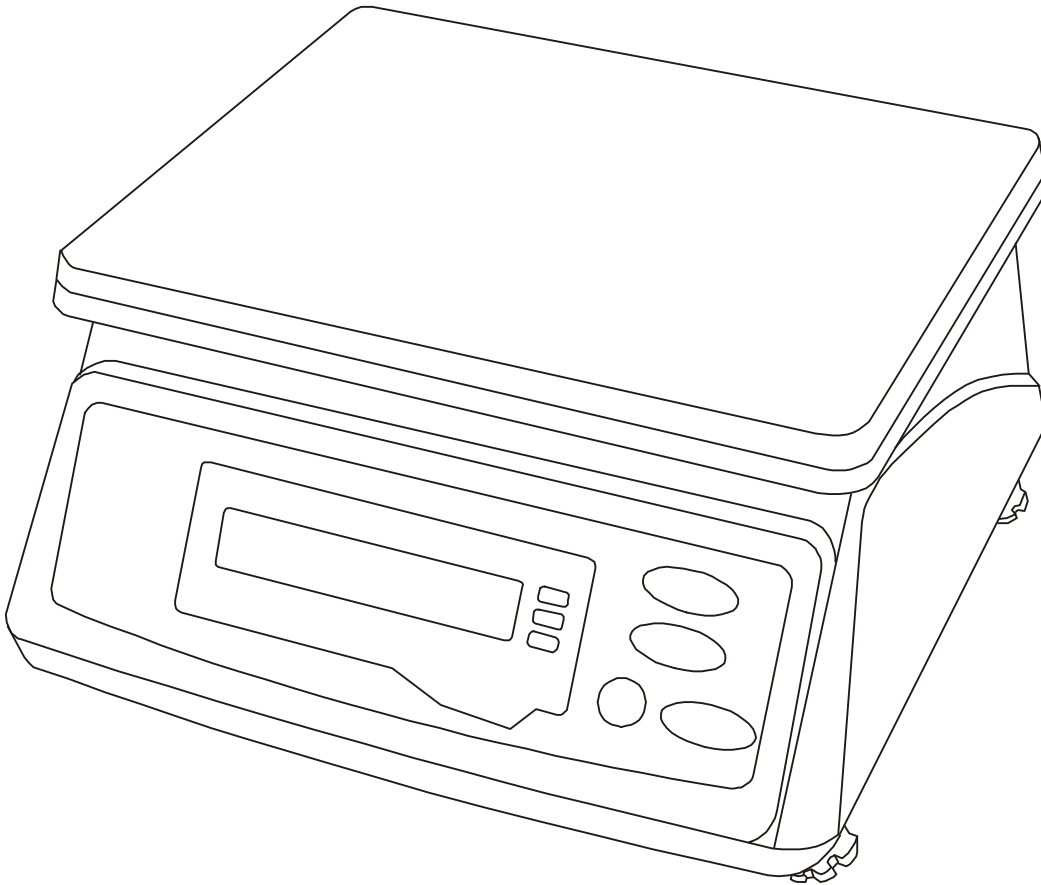
It is amplified and digitized continuously by the A/D converter into a digital signal. Subsequently, the resulting count is processed and managed by the CPU. The CPU refers to the instructions from the keyboard, and then conveys the output data to LCD driver, which formats the data into readout on the display panels.

2.2 PHYSICAL LAYOUT OF ELECTRICAL CONNECTION



2.3 GENERAL SPECIFICATION

2.3.1 Overall View



2.3.2 Overall Dimension:

270(W) X 278(D) X 145(H) mm

2.3.3 Platter Size:

215 X 250 mm

2.3.4 Model Specifications

Model Number	DW-3000E	DW-6000E	DW-15KE	DW-30KE
Capacity	3000g	6000g	15kg	30kg
External Resolution	1g	2g	0.005kg	0.01kg
Tare Range	Full Tare Range			
Platter	215 x 250 mm			
Display Type	LED Display			
Power Source	By Built-in rechargeable battery or power adaptor			
Operation Environment	0°~40°C (32°~104°F), Non-condensed. R.H.≤ 95%			
Standard Package	Individually Packed Dimension: 370(W) x 365(L) x 250(H) mm Net/Gross Weight: 3.7/5.0 kg			

2.3.5 Main Components Used

Microprocessors: 89C52

Crystal Oscillator: 11.0592MHz

Display Device: Common Anode type 7-Segment LED Display

Load Cell Used: NMB C2X1 type load cell

Load Cell Capacity: DW-3000E= 6kg

DW-6000E= 10kg

DW-15KE= 20kg

DW-30KE= 35kg

2.3.6 Analog Specification

Input sensitivity: 2mV/V

Zero Drift: 0.3% R.O./10 °C

Zero Balance Range: ±5% of rate capacity

Load Cell Excitation Voltage: DV5V

A/D Conversion Speed: 10 times/second

Internal Resolution: 30000

3. INITIAL SETUP

3.1 INTERNAL FUNCTIONS AND SETTING METHODS

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	Check offset value and scale configuration
4	F.4	Auto power off setting

HOW TO ENTER THE REQUIRED FUNCTION MODE

- Turn scale off.
- Press and hold TARE, then turn scale on. Scale display F.1
- Press TARE until the required function number appears.
- Press MODE
- Press MODE until the required setting appears.
- Press TARE to confirm.
- Repeat step c to f for other function setting, or
- Press ON/ZERO to save settings and return to normal operation.

F.1 Span Value Reading and Dealer Calibration

- Simply enter F.1 to read the A/D counts.
- Press ON/ZERO to clear the A/D counts, apply test mass onto platter, the span value of test mass will be displayed.
- Refer to Dealer Calibration procedures for dealer calibration.

F.2 Display Segment and Rated Capacity & Division Check

When function is entered, all segments will be displayed.
Check and make sure that no segments are missed.

F.3 Total Internal Count Checking and Scale Configuration

- Enter F.3, scale displays the Offset Value when unloaded.
- Apply extra load onto platter, the total internal count value will be displayed.

SELECT WEIGHT UNITS

- Press and hold MODE until the scale configuration appears.
- To employ all (metric and pound/oz) weight units, press MODE until 'HI', 'OK', 'LO' indicators appear. To disable pound/oz weight units, press MODE until 'HI' indicator appears only.
- Press ON/ZERO to save setting and back to normal operation status.

SELECT SCALE INTERVAL

- a. Press and hold MODE until the scale configuration appears.
- b. Press MODE until the required scale interval appears.
- c. Press ON/ZERO to save setting and back to normal operation status.

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 be turned off after 4 minutes unused.

3.2 AUTO AND DEALER CALIBRATION PROCEDURES

ACCEPTABLE LOAD FOR AUTO AND DEALER CALIBRATION

Model Number	External Division	Acceptable Auto and Dealer Calibration Load	
DW-3000E	1/3000	*2kg	1kg
DW-6000E	1/3000	*5kg	2kg
DW-15KE	1/3000	*10kg	5kg
DW-30KE	1/3000	*20kg	10kg

* Recommended calibration load

Dealer Calibration Procedures:

1. Turn scale off.
2. Press and hold TARE, then turn scale on.
3. Scale displays F.1
4. Press MODE
5. Scale displays offset value
6. Press ON/ZERO
7. Press TARE
8. Press ON/ZERO
9. Press TARE
10. Press ON/ZERO, the OK indicator will be lighted up. It means the scale is ready for dealer calibration. Make sure that the figure being displayed is =0 or 1, If not, press ZERO again.
11. Load calibration either load as listed on above table.
12. When value displayed is stable, press MODE.
13. Wait until the scale starts countdown.
14. Calibration completed and scale is ready for operation.

Auto Calibration Procedures:

1. Turn scale off
2. Press and hold MODE, then turn scale on.
3. Scale displays CAL?
4. Press MODE

5. Scale displays LOAD XXXX or XXXX
6. Load calibration load according to above table.
7. Wait until the scale display DONE and starts count down.
8. Calibration completed and scale is ready for operation.

3.3 DISABLE CALIBRATION AND AVOIRDUPOIS WEIGHT UNITS WITH MINI JUMPER. (JP2)

The mini jumper(JP2) is used to control calibration and avoirdupois weight units. Insert a mini jumper between ON position to disable calibration.

3.4 OFFSET AND SPAN VALUE DATA

OFFSET AND SPAN VALUE DATA TABLE

Model Number	Offset Value (Thousand)	Span Value(Thousand) at Various Load Applied		Offset Control	Span Control(Ohm) R1A
DW-3000E	10~14	10~15 at 1kg	20~30 at 2kg	VR1 Trimmer	35K
DW-6000E	10~14	10~15 at 2kg	20~30 at 4kg	VR1 Trimmer	23.2K
DW-15KE	10~14	10~15 at 5kg	20~30 at 10kg	VR1 Trimmer	25K
DW-30KE	10~14	10~15 at 10kg	20~30 at 20kg	VR1 Trimmer	15K

READING OFFSET VALUE

- 1 Turn scale off
- 2 Remove all load from platter
- 3 Enter F.3 and read the offset value

READING SPAN VALUE

- 1 Turn scale off
- 2 Remove all load from platter
- 3 Enter F.1
- 4 Press 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 main board to obtain correct offset value.

HOW TO ADJUST SPAN VALUE

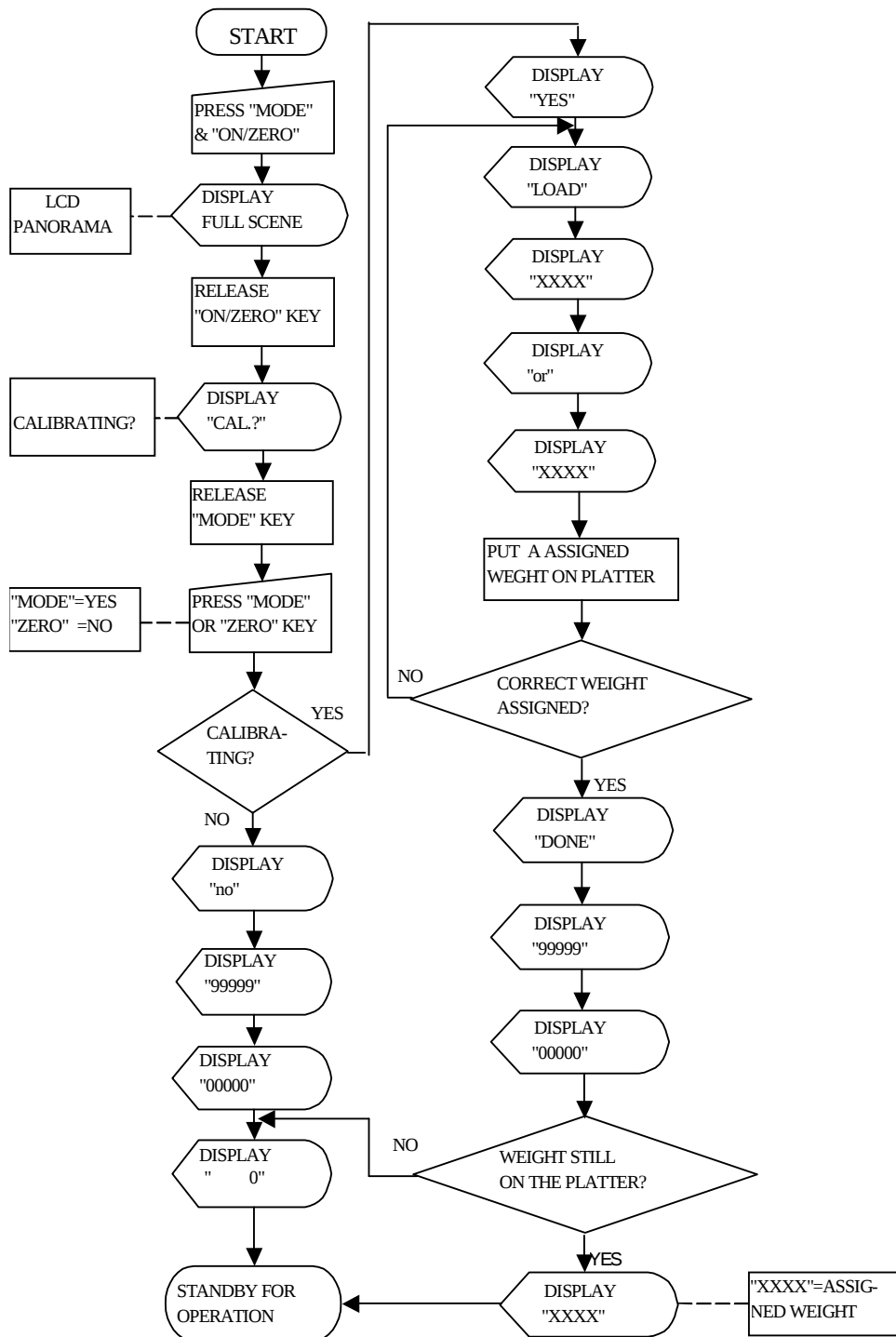
The span value is controlled by resistor located on R1, standard resistor value of R1 is listed on the above table. If the required span value is not attained, then change R1 resistor according to either case below:

Span value too low: Increase the resistance of R1.

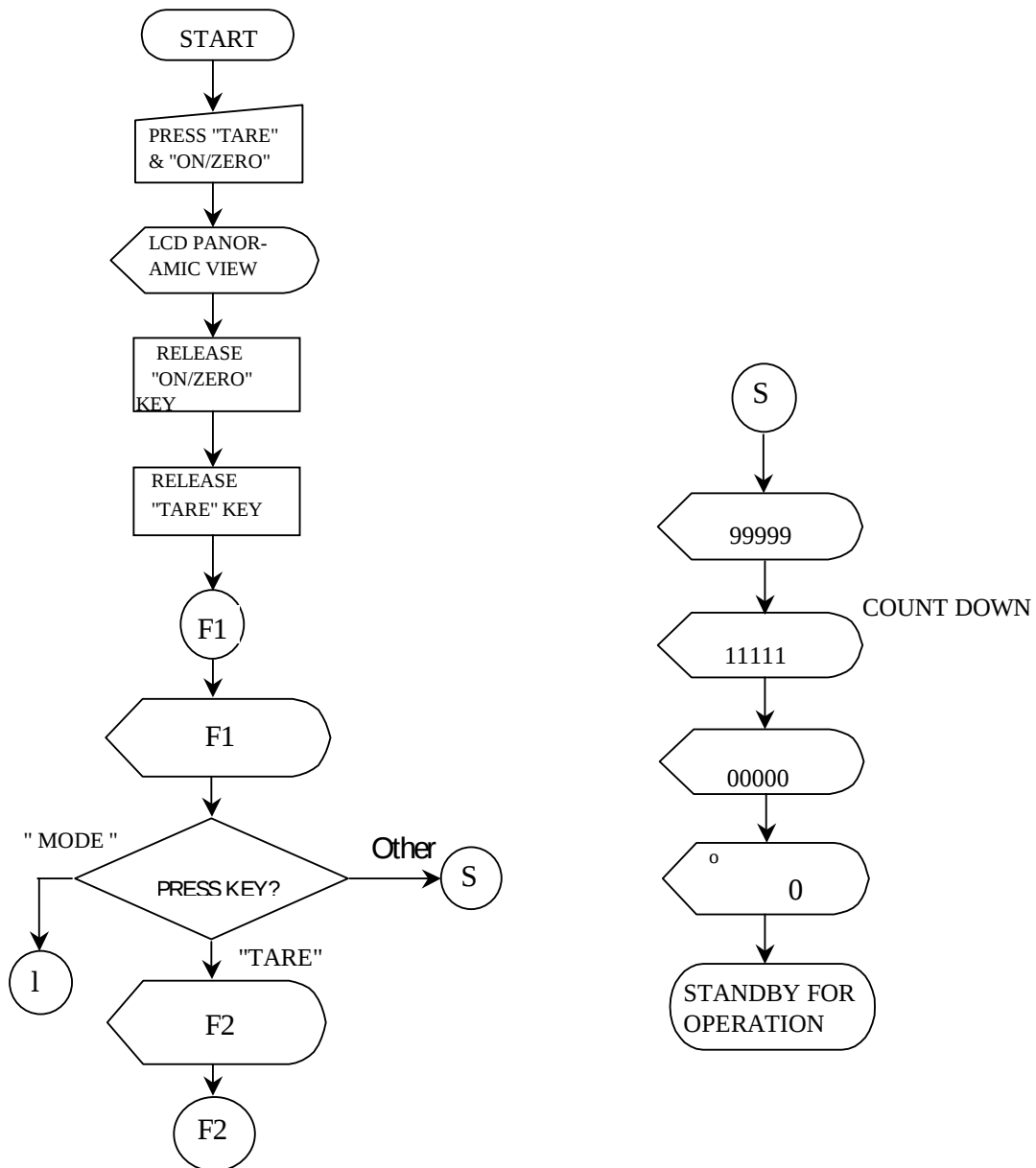
Span value too high: Decrease the resistance of R1.

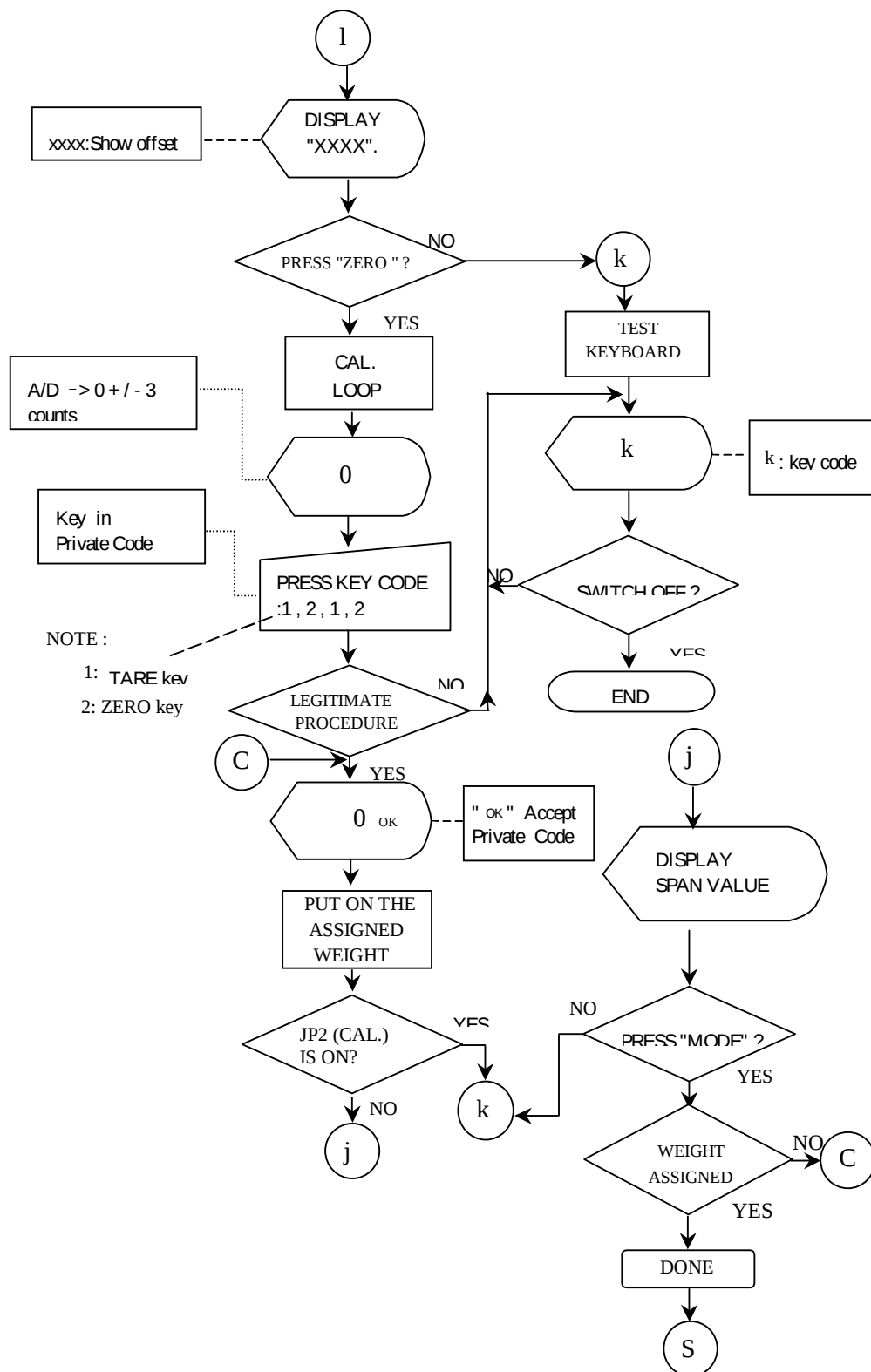
3.5 FLOW CHART

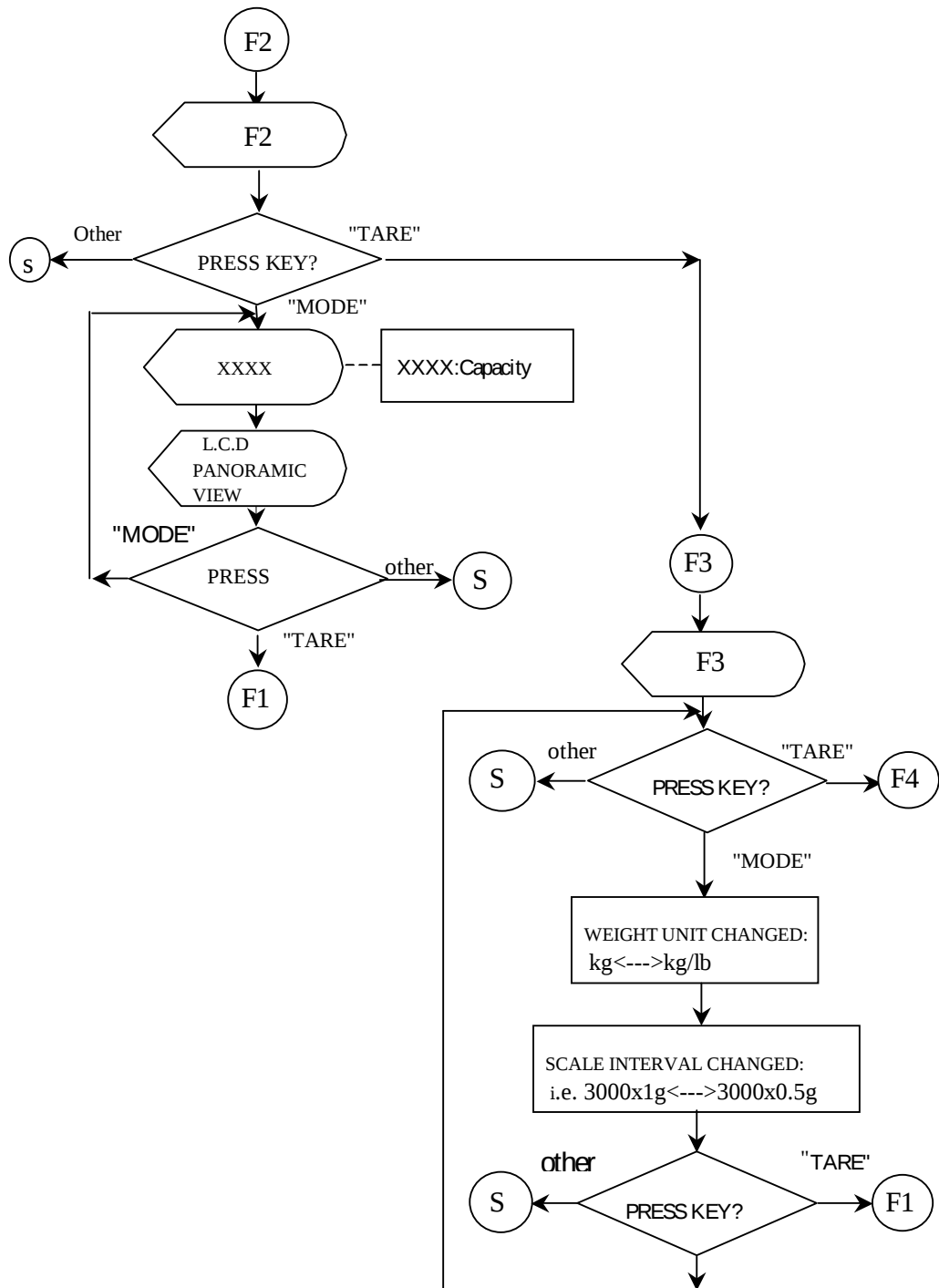
3.5.1 Auto Calibration (for end-user)

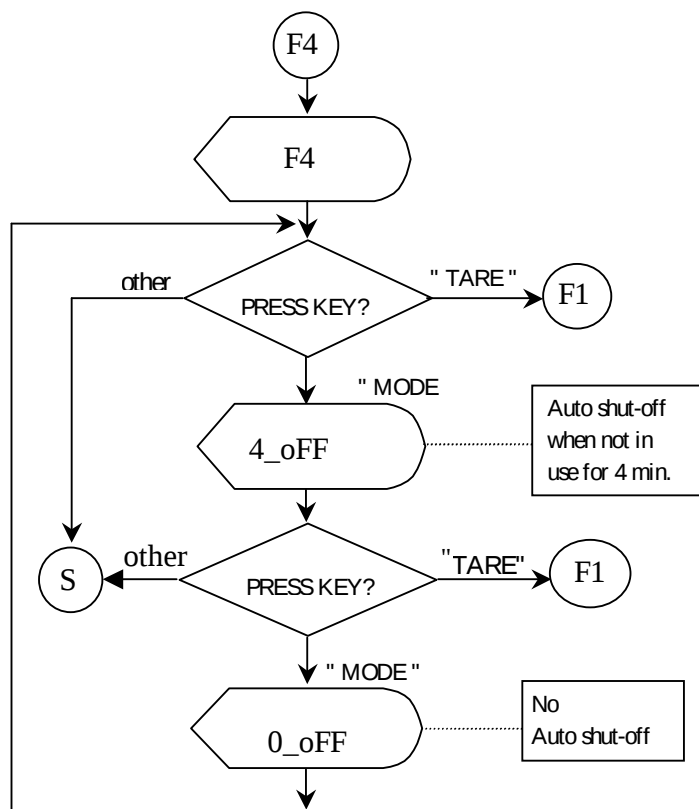


3.5.2 Function Test (for technicians only)



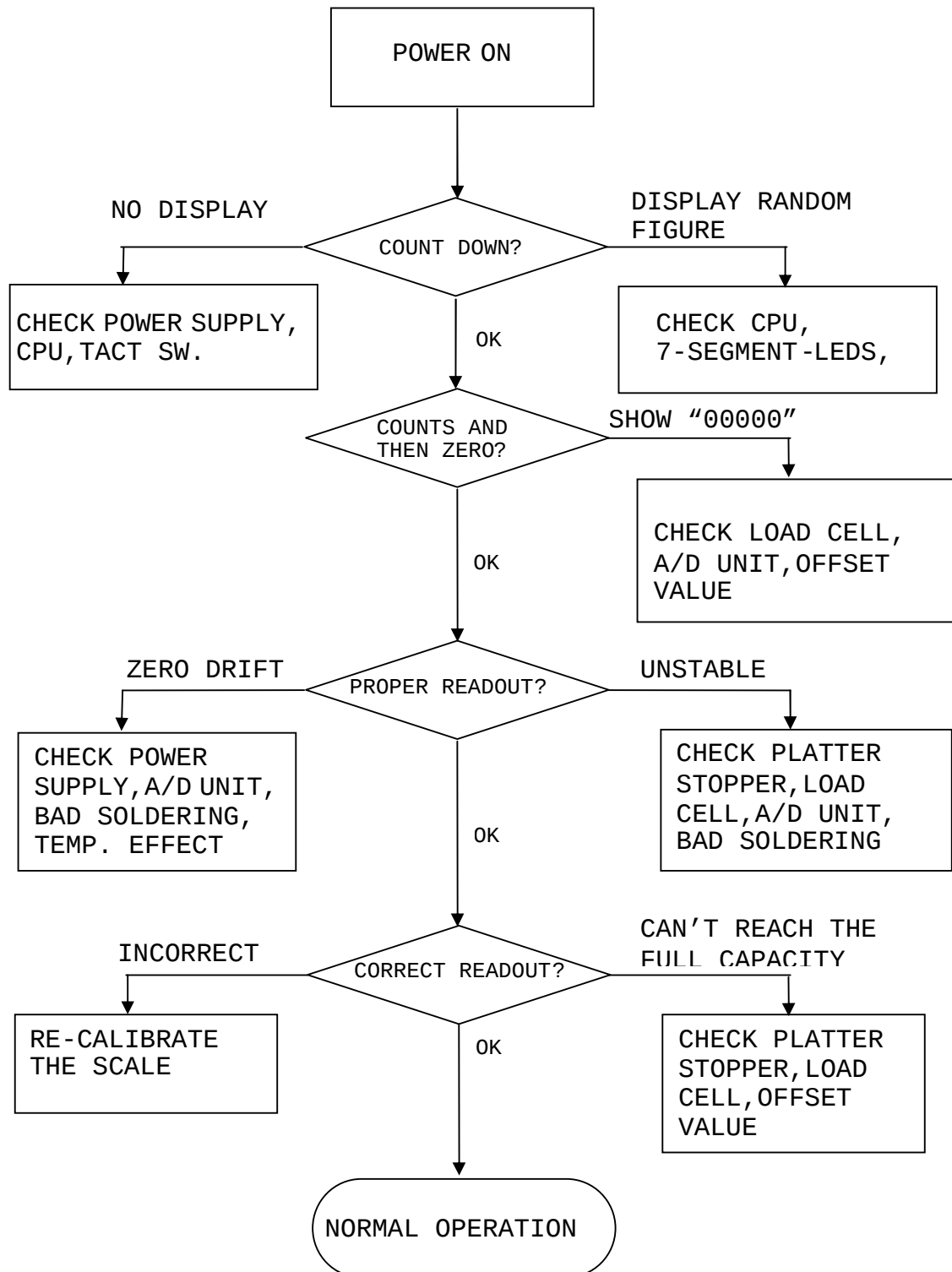






4. TROUBLE SHOOTING

4.1 TROUBLE SHOOTING LOOP



4.2 PARTS AND COMPONENTS TROUBLE SHOOTING

4.2.1 Power Supply Checking

4.2.1.1 Relevant parts:

Main Board (DW-11-X)

Q5 (C1061)

ZD1 (8.2V)

BR1 (W04/1A)

Q1 (A1515)

Q2 (C945)

Q3 (C945)

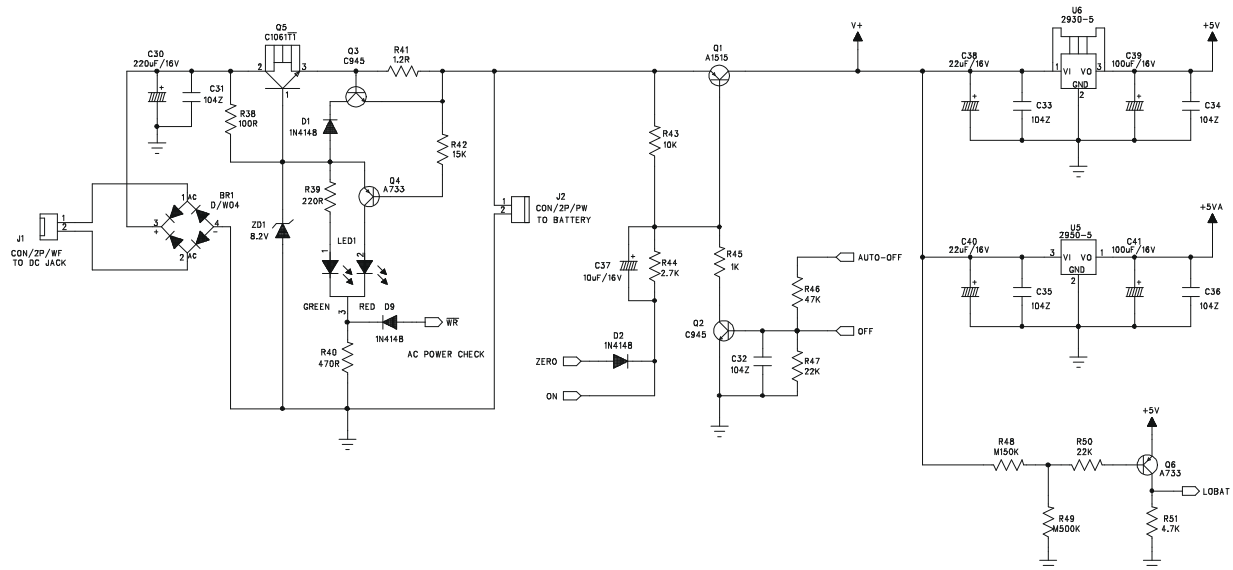
R41 (1.2 ohm, 1/2W)

Q6 (A733)

U5(2950-5)

U6(2930-5)

6V 4Ah BATTERY



Description:

1) AC Adaptor: This AC Adaptor provides power of DC9~12V,500mA

2) Battery: Built-in Rechargeable Battery 6V/4Ah

3) How Battery is charged completely?

The charging voltage is regulated by Q5 (C1061) and ZD1 (8.2V) for about 7 volts.

The charging current will go down automatically when voltage reached. Q3 (C945) and R41 (1.2R, 1/2W) provide Over-Current protection.

- 4) +5V power drives analog circuit system.
U5 (2950-5) is a 5volts Voltage Regulator.
- 5) +5V power drives digital circuit system.
U6 (2930-5) is a 5volts Voltage Regulator.
- 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 draw down Q2, then Q1 cuts off, the scale will be shut down immediately.
- 7) Low Power Detection:
The Q6 (A733) is designed to detect the power level. When battery power is less than 5.5V, the collector pole of Q6 will become low potential level, mean while CPU detects the level changed then CPU will light up LO-BAT indicator on the display.

4.2.1.2 Input voltage: 5.5V or higher

Check and recharge battery if voltage less than 5.5V.
Check DC-JACK or AC Adaptor if been defective.

4.2.1.3 System voltage (Vcc): 5V +/- 10%

Check that the system voltage is within 5V +/- 10%
a) less than 4.5V, the CPU may not work properly.
b) more than 6V, it may damage some components .

4.2.2 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.

4.2.3 LED Display Checking

4.2.3.1 Check that every LED module is soldered properly onto the main board.

4.2.3.2 Check whether segment of LED module is ruined.

4.2.4 CPU Checking

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

4.2.4.2 Check that the Crystal Oscillator works.

4.2.4.3 Check the RESET is normally low.

4.2.5 A/D Unit Checking

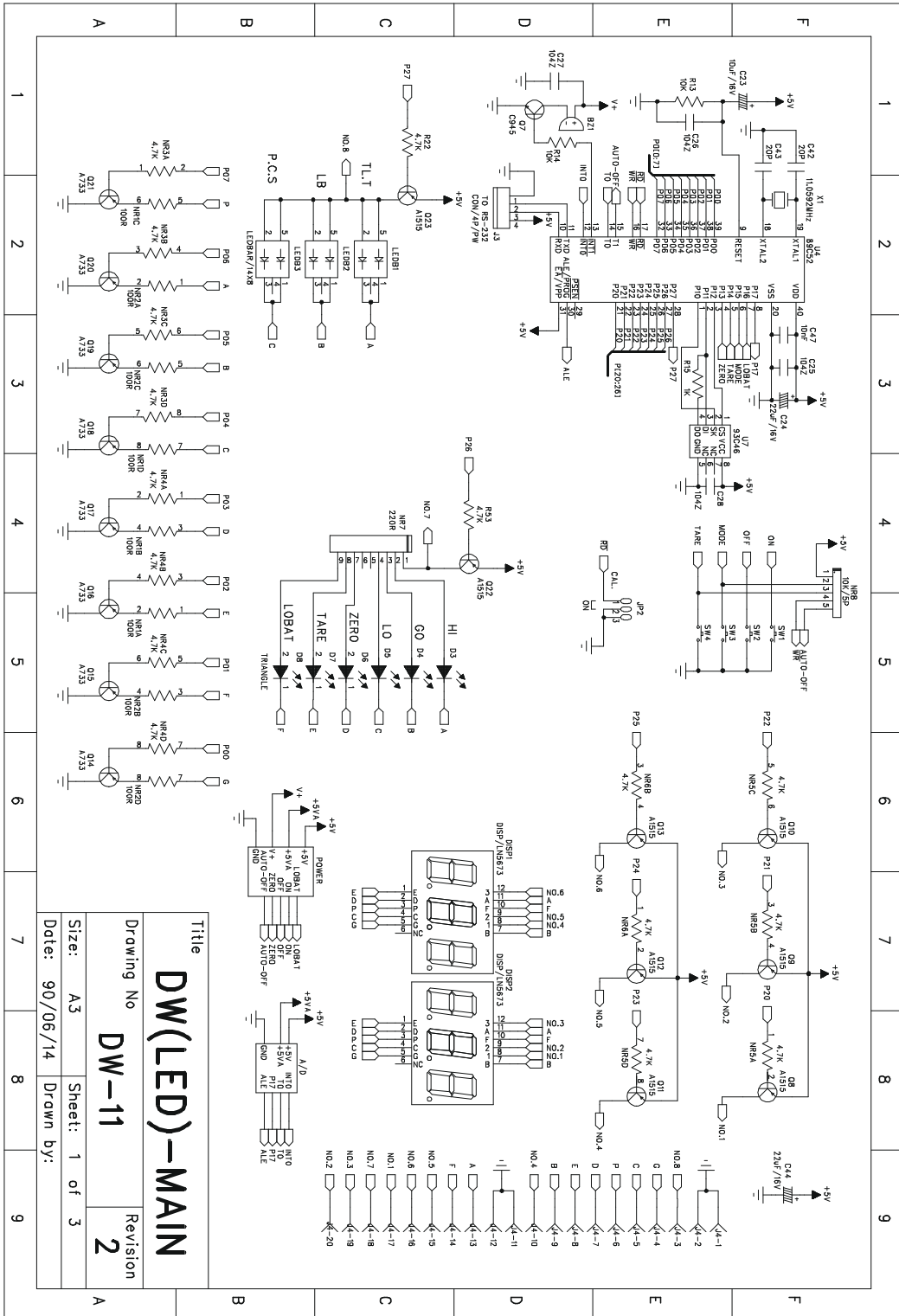
- 4.2.5.1** Check that the +5VA & +5V powers are correctly fed to the A/D unit.
- 4.2.5.2** Check that the signal output of loadcell is normal.
- 4.2.5.3** Check OP. Amplifiers & A/D Converter (AD7715).

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.

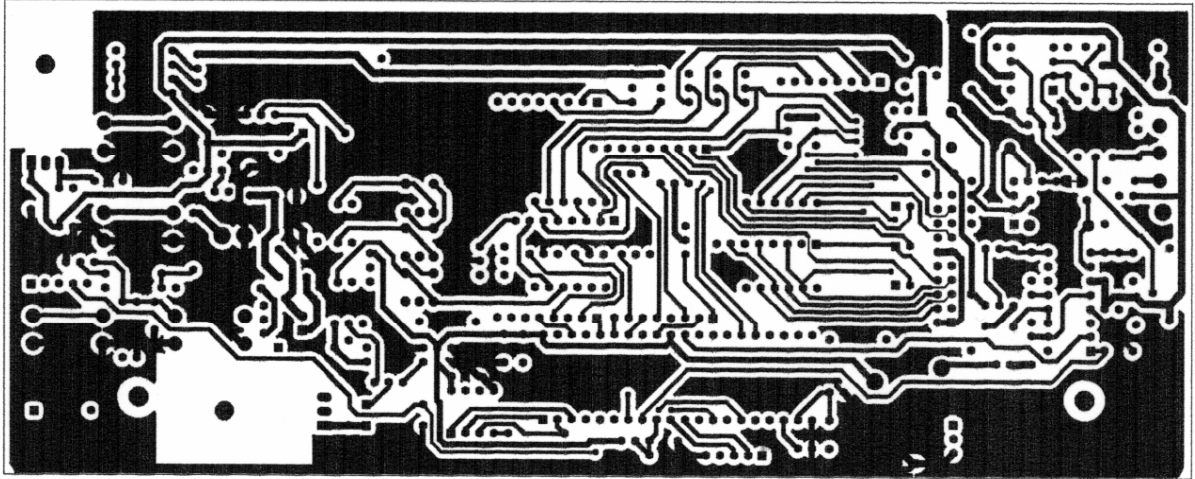
In this way, the readout of weight would be varied because of the output voltage of loadcell and different span value, so re-calibration is required after this replacement.

5. ELECTRICAL CIRCUITRY

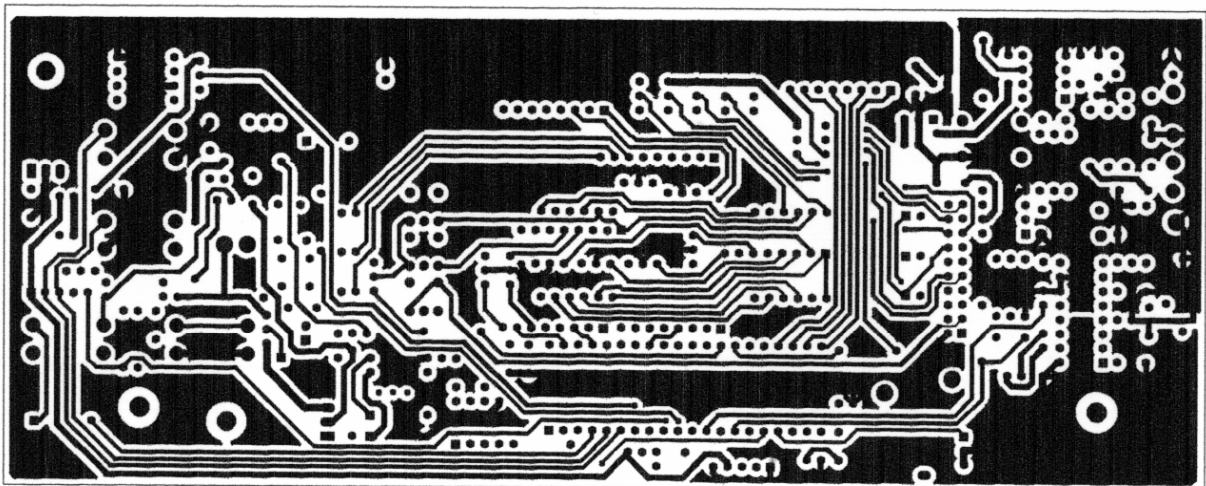
5.1 SCHEMATICS



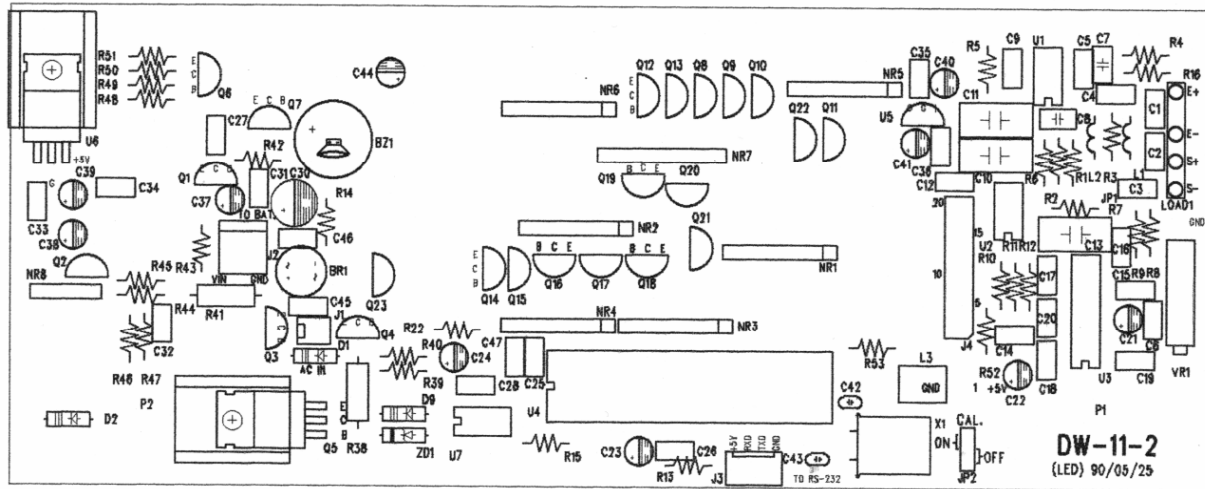
5.2 PCB LAYOUT



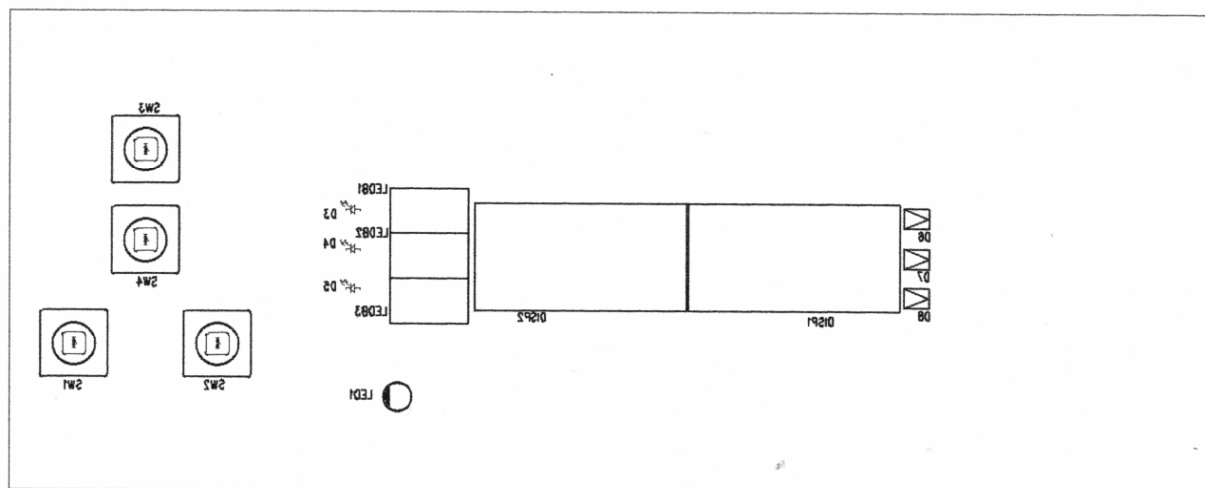
DW-11-2 TOP LAYER



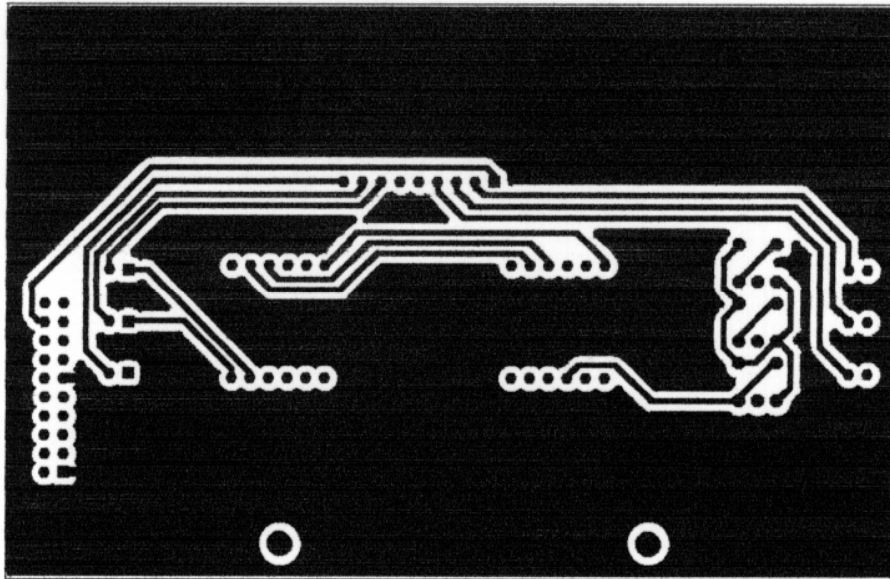
DW-11-2 BOTTOM LAYER



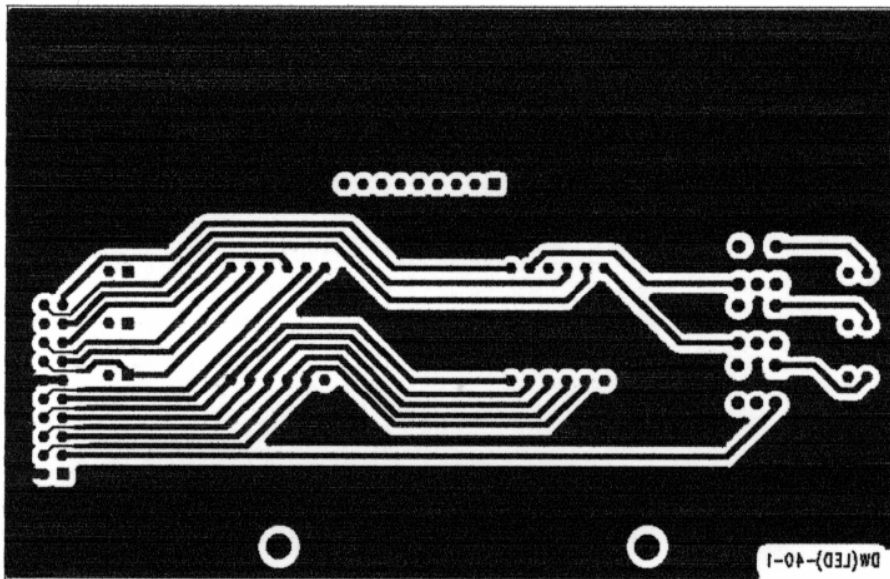
DW-11-2 TOP OVERLAY



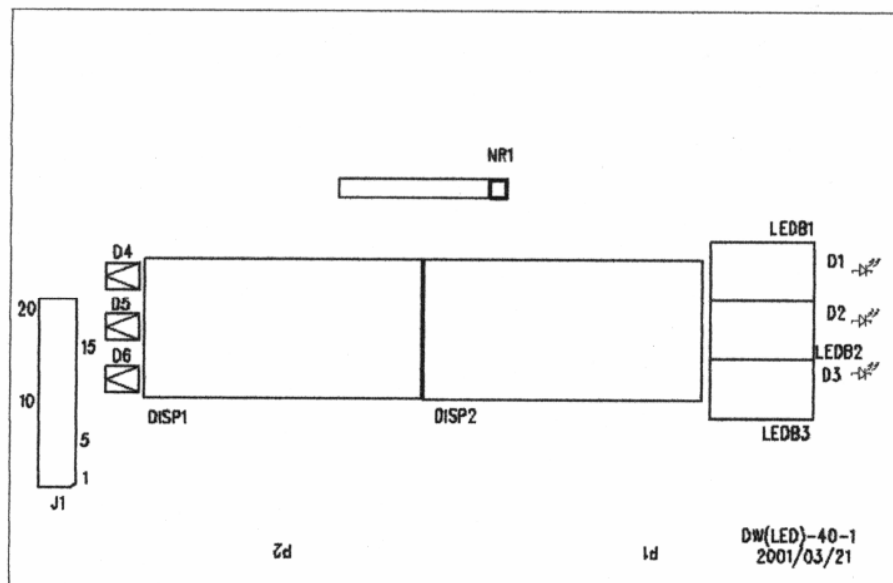
DW-11-2 BOTTOM OVERLAY



DW-40-1 TOP LAYER



DW-40-1 BOTTOM LAYER



DW-40-1 TOP OVERLAY

6. BILL OF MATERIAL

STRUCTURE

Parts No.	Description	Specification	Qty	Remark
E0DW0000011	P.C.B. KIT	DW-11-X MAINBOARD	1	
E0DW0001000	P.C.B. KIT	DW-40-X REAR BOARD	1	OPTION
A0015*****	LOAD CELL UCG TYPE	CAPACITY = 6KG	1	DW-3000
		CAPACITY = 10KG	1	DW-6000
		CAPACITY = 20KG	1	DW-15K
		CAPACITY = 35KG	1	DW-30K
G0001DW0100	UPPER CABINET	DW SERIES (WHITE)	1	
G0001DW0000	UNDER CABINET	DW SERIES (GRAY)	1	
F0003DW0200	ALUMINUM L/C SUPPORT	DW SERIES	2	
F0002DW0000	S/S PLATTER	DW SERIES	1	
G0002DW0000	PLASTIC PLATTER	DW SERIES	1	
G0002DW0001	PLASTIC PLATTER SUPPORT	DW SERIES	1	
A5005000090	BUBBLE LEVEL	D14	1	
G0004DW0001	ADJUSTABLE FEET RUBBER	DW SERIES, ψ 16x3.5t	4	
G0004DW0000	PLASTIC ADJUSTABLE FEET	DW SERIES, M8x ψ 28x28	4	
A1600060400	RECHARGEABLE BATTERY	GP4-6/6V 4Ah	1	
C1GW0000000	PANEL PC	GW SERIES, 135.5x45.5x0.8	2	
C1DW0030000	OVERLAY	DW SERIES	1	
C1DW0030999	REAR PANEL	DW SERIES	1	
C1DW0040999	REAR PANEL	DW SERIES REAR DISPLAY	1	OPTION
G0005NBS101	PLASTIC PLATTER CAP	NBS SERIES, M-16	1	
G0009DW0000	BATTERY CAP	DW SERIES, ABS(TRANSPARENT)	1	
G0030DW0000	PLASTIC COVER PLATE	DW SERIES, 20x19x3 ABS	2	
G0030DW0001	RUBBER TUBE	DW SERIES	1	
G0030DW0003	RUBBER BUSHING	ψ 12x12Lx ψ 3	1	FOR L/C
G0030DW0004	SILICON SEALING WIRE	ψ 3.2x420	2	
G0030DW0004	SILICON SEALING WIRE	ψ 3.2x540	1	
Z0010000616	PLASTIC SCREW	M6x1x16	1	
A0906003430	D.C. JACK	DC-343(BLACK)	1	
A1202020151	WIRE ARRAY	2PIN 15cm, SINGLE HOUSING	1	
A1208020251	BATTERY WIRE	2PIN 25cm	1	
G0030DW0002	RUBBER PLUG	DW SERIES, ψ 27x11	1	FOR DC JACK
A60*****	ADAPTOR	***V/9V 500mA	1	
Z1DW0000***	NAME STICKER	DW SERIES	1	

DW-11-X MAINBOARD

E0DW0000011	P.C.B.	DW-11-X	1	
A0202093461	I.C.	93C46	1	U7
A0201089521	I.C.	89C52	1	U4
A0203077151	I.C.	AD7715AN-5	1	U3
A0206000071	I.C.	OP-07CP	2	U1,2
A0103000001	7 SEGMENTS LED DISPLAY	14.22mm HEIGHT, 3 DIGITS	2	DISP1,2
A0207029300	VOLTAGE REGULATOR I.C.	LM2930-5	1	U6
A0207029500	VOLTAGE REGULATOR I.C.	AS2950ACN	1	U5
A0300000040	I.C. SOCKET	40 PIN	1	U4
A0401009450	TRANSISTOR	2SC945	3	Q2,3,7

A0401015150	TRANSISTOR	A1515	9	Q1,8-13, 22-23
A0401007330	TRANSISTOR	A733	10	Q4,6, 14-21
A0401010610	TRANSISTOR	C1061C OR D880	1	Q5
A0501004148	DIODE	1N4148	3	D1,2,9
A0501004002	DIODE	1N4002	1	D7
A0502000001	BRIDGE RECTIFIER	W06 (1A)	1	BR1
A0503020082	ZENER DIODE	1/2W 8V2(9A3)	1	ZD1
A0625050000	L.E.D.	ROUND,5mm,(RED, GREEN)	1	LED1
A0605050000	L.E.D.	ROUND,5mm,(GREEN)	1	D4
A0603050000	L.E.D.	ROUND,5mm,(ORANGE)	2	D3,5
A0602030000	L.E.D.	ROUND,3mm,(RED)	3	D6,7,8
A0633100000	LIGHT BAR	CML-1003	3	LEDB1,2,3 (OPTION)
A0701227017	CAPACITOR (EC)	220uF/16V (SS TYPE)	1	C30
A0701107017	CAPACITOR (EC)	100uF/16V	2	C39,41
A0701226017	CAPACITOR (EC)	22uF/16V (SS TYPE)	4	C24,38,40, 44
A0701106017	CAPACITOR (EC)	10uF/16V (SS TYPE)	2	C23,37
A0702106016	CAPACITOR (TC)	10uF/16V	2	C21,22
A0730104050	CAPACITOR (MLC)	104Z	22	C1-6,9,12, 15-18,25-28 ,31-36
A0710224101	POLYESTER FILM CAPACITOR(MEF)	0.22uF/100V(224)	1	C13
A0713474063	POLYESTER FILM CAPACITOR(MEF)	0.47uF/63V(474)	2	C10,11
A0720103101	POLYESTER FILM CAPACITOR(PEI)	0.01uF/100V(103J)	2	C7,8
A0740020050	CERAMIC CAPACITOR (CC)	20pF	2	C42,43
A0740101050	CERAMIC CAPACITOR (CC)	100PF/50V(101)	3	C14,C19,20
A0740103050	CERAMIC CAPACITOR (CC)	0.01uF/50V(103)	1	C47
A0740104050	CERAMIC CAPACITOR (CC)	0.1uF/50V(104)	2	C45-46
A0801001203	TRIMMER	3006P-001-203(20K)	1	VR1
A0802010305	RESISTOR NETWORK	10KΩ 5 PIN	1	NR8
A0802022109	RESISTOR NETWORK	220Ω 9 PIN	1	NR7
A0802110108	RESISTOR NETWORK	100Ω 8 PIN B-TYPE	2	NR1,2
A0802110108	RESISTOR NETWORK	100Ω 8 PIN B-TYPE	2	NR1,2 (OPTION)
A0802127208	RESISTOR NETWORK	4.7KΩ 8 PIN B-TYPE	4	NR3-6
A0803042501	METAL FILM RESISTOR(10PPM)	2.5KΩ 1/4W	1	R12
A0803041002	METAL FILM RESISTOR(10PPM)	10KΩ 1/4W	3	R8,9,11
A0804041003	METAL FILM RESISTOR	100KΩ 1/4W	3	R3,5,6
A0804041503	METAL FILM RESISTOR	150KΩ 1/4W	1	R48
A0804042502	METAL FILM RESISTOR	25KΩ 1/4W	1	R7
A0804045003	METAL FILM RESISTOR	500KΩ 1/4W	1	R49
A0804046002	METAL FILM RESISTOR	60KΩ 1/4W	1	R4
A0804040300	METAL FILM RESISTOR	30Ω 1/4W	1	R16
A0805020120	CARBON FILM RESISTOR	1.2Ω 1/2W	1	R41

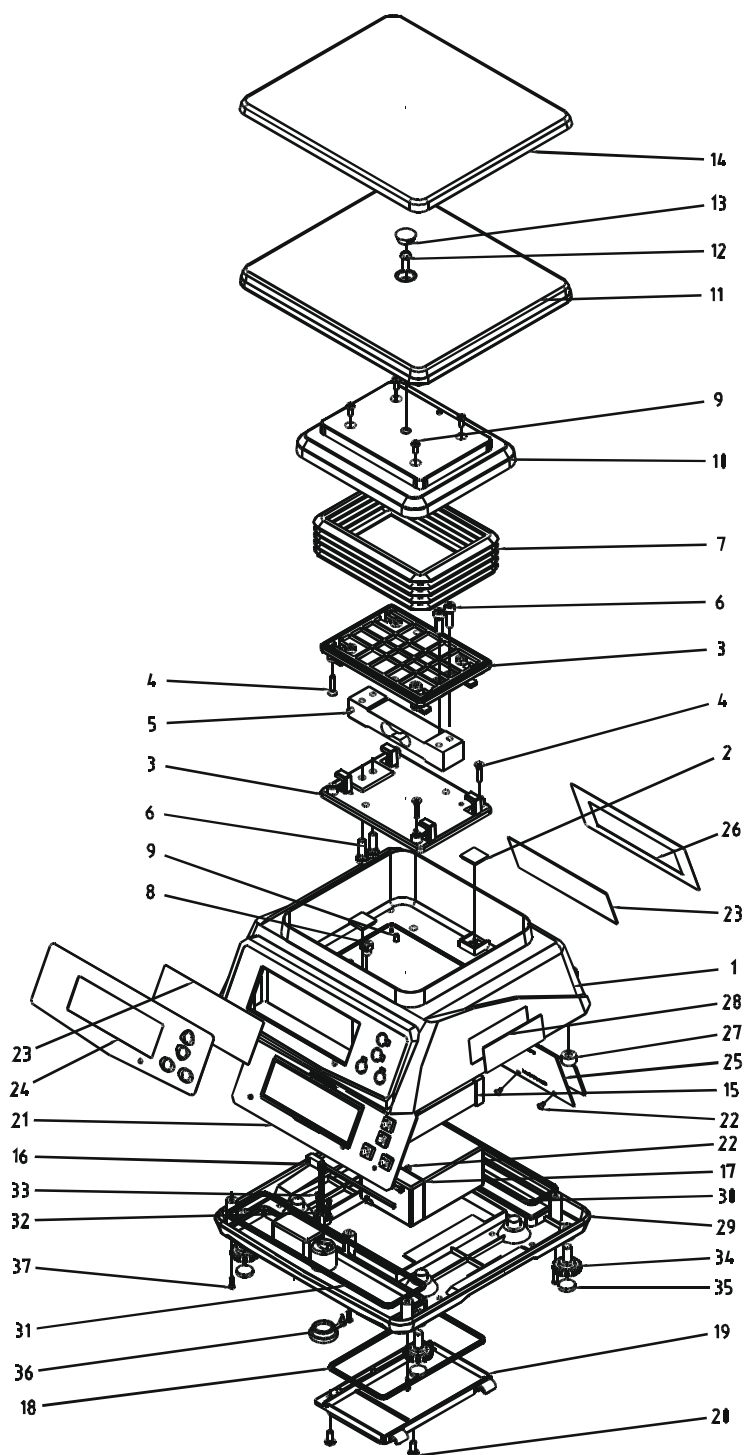
A0805021101	CARBON FILM RESISTOR	100Ω	1/2W	1	R38
A0805041101	CARBON FILM RESISTOR	100Ω	1/4W	1	R10
A0805041102	CARBON FILM RESISTOR	1KΩ	1/4W	2	R15, 45
A0805041103	CARBON FILM RESISTOR	10KΩ	1/4W	4	R13, 14, 43, 52
A0805041153	CARBON FILM RESISTOR	15KΩ	1/4W	1	R42
A0805041221	CARBON FILM RESISTOR	220Ω	1/4W	1	R39
A0805041223	CARBON FILM RESISTOR	22KΩ	1/4W	2	R47, 50
A0805041272	CARBON FILM RESISTOR	2.7KΩ	1/4W	2	R44, 51
A0805041471	CARBON FILM RESISTOR	470Ω	1/4W	1	R40
A0805041472	CARBON FILM RESISTOR	4.7KΩ	1/4W	2	R22, 53
A0805041473	CARBON FILM RESISTOR	47KΩ	1/4W	1	R46
A0901010020	CONNECTOR	2PIN WAFER		1	J1
A0901010040	CONNECTOR	4PIN WAFER		1	J3(RS-232)
A0902010020	CONNECTOR	2PIN, PITCH=3.9mm		1	J2
A0907010030	CONNECTOR(PIN PLUG)	1 * 3 PIN 180°		1	JP2
A0907020200	CONNECTOR(PIN PLUG)	2 * 10 PIN		1	J4(OPTION)
A0910110020	CONNECTOR	2 PIN ,MINIJUMP		1	JP2
A1005030512	FERRITE BEAD	3.5*6*0.8		2	L1, 2
A1100311059	CRYSTAL	11.0592MHZ		1	X1
A1306000003	TACT SW	KPT-1104B		4	SW1-4
A15000000004	BUZZER	0B0-15210		1	BZ1
A10070000001	FERRITE CORE	TR-16x9x28		1	FOR L/C
A1005030610	FERRITE BEADS	ψ 6x10, 2.5T		1	L3
A10070000008	FERRITE CORE	TR-14.2x7.2x15mm(L8)		1	DC INPUT

OM-41-X REAR BOARD

E0DW0001000	P.C.B	DW-40-X	1	
A01030000001	7 SEGMENTS LED DISPLAY	14.22mm HEIGHT, 3 DIGITS	2	DISP1, 2
A0605050000	L.E.D.	ROUND, 5mm, (GREEN)	1	D4
A0603050000	L.E.D.	ROUND, 5mm, (ORANGE)	2	D3, 5
A0602030000	L.E.D.	ROUND, 3mm, (RED)	3	D6, 7, 8
A0633100000	LIGHT BAR	CML-1003	3	LEDB1, 2, 3 (OPTION)
A0802022109	RESISTOR NETWORK	220Ω 9 PIN	1	NR7
A0907021200	CONNECTOR(PIN PLUG)	2 * 10 PIN 90°	1	J4
A1203200400	FLAT CABLE	20PIN, 40cm	1	

=====

7 . APPENDIX
PARTS EXPLOSION:



TEM	PART NAME	DESCRIPTION	QTY
1	UPPER CABINET	DW SERIES (WHITE)	1

2	PLASTIC COVER PLATE	DW SERIES, 20x19x3 ABS	2
3	ALUMINUM L/C SUPPORT	DW SERIES	2
4	S/S SCREW(NYLOK)	M4 x 0.7 x 20	4
5	LOAD CELL	UCG TYPE OR EQUIVALENT	1
6	S/S HEX. SCREW	M6 x 1 x 20	4
7	RUBBER TUBE	DW SERIES	1
8	RUBBER BUSHING	DW SERIES, ψ 12x12Lx ψ 3	1
9	S/S SCREW	M4 x 0.7 x 10	8
10	PLASTIC PLATTER SUPPORT	DW SERIES	1
11	PLASTIC PLATTER	DW SERIES	1
12	PLASTIC SCREW	M6 x 1 x16, M06016D, PA66	1
13	PLASTIC PLATTER CAP	NBS SERIES, M-16	1
14	S/S PLATTER	DW SERIES, 251 x 216 x 0.8t	1
15	FLAT CABLE	20PIN, 40cm	1
16	BATTERY WIRE	2PIN, 25cm	1
17	RECHARGEABLE BATTERY	GP4-6/6V 4Ah	1
18	SILICON SEALING WIRE	ψ 3.2x420	1
19	BATTERY CAP	DW SERIES, ABS(TRANSPARENT)	1
20	S/S HEX. SCREW	M5 x 0.8 x 12	2
21	P.C.B.	DW-11-X	1
22	SCREW	M3 x 10, TAPER	4/2
23	PANEL PC	GW SERIES, 135.5x45.5x0.8	2
24	OVERLAY	DW SERIES	1
25	P.C.B.(REAR DISPLAY)	DW-40-X	1
26	REAR PANEL	DW SERIES	1
27	BUBBLE LEVEL	D14	1
28	NAME STICKER	DW SERIES	1
29	UNDER CABINET	DW SERIES	1
30	SILICON SEALING WIRE	ψ 3.2x420	1
31	SILICON SEALING WIRE	ψ 3.2x540	1
32	D.C. JACK	DC-343(BLACK)	1
33	SCREW	M2 x 6, TAPER	2
34	PLASTIC ADJUSTABLE FEET	DW SERIES, M8x ψ 28x28	4
35	ADJUSTABLE FEET RUBBER	DW SERIES, ψ 16x3.5t	4
36	RUBBER PLUG	DW SERIES, ψ 27x11	1
37	S/S SCREW	M3 x 12, TAPER	6

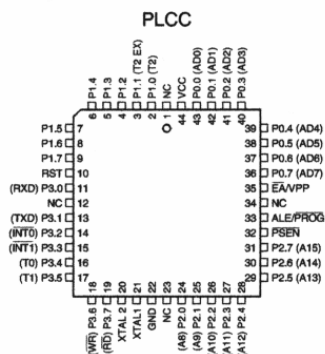
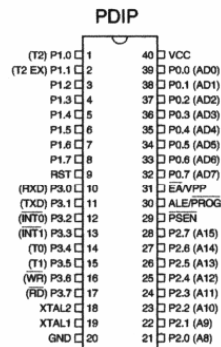
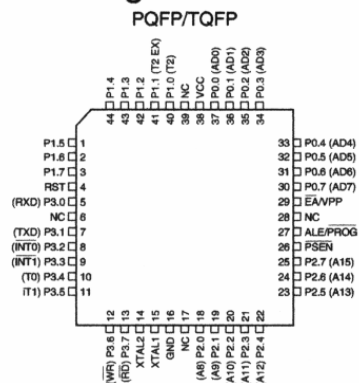
Features

- Compatible with MCS-51™ Products
- 8K Bytes 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 8K bytes 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.

Pin Configurations



8-bit Microcontroller with 8K Bytes Flash

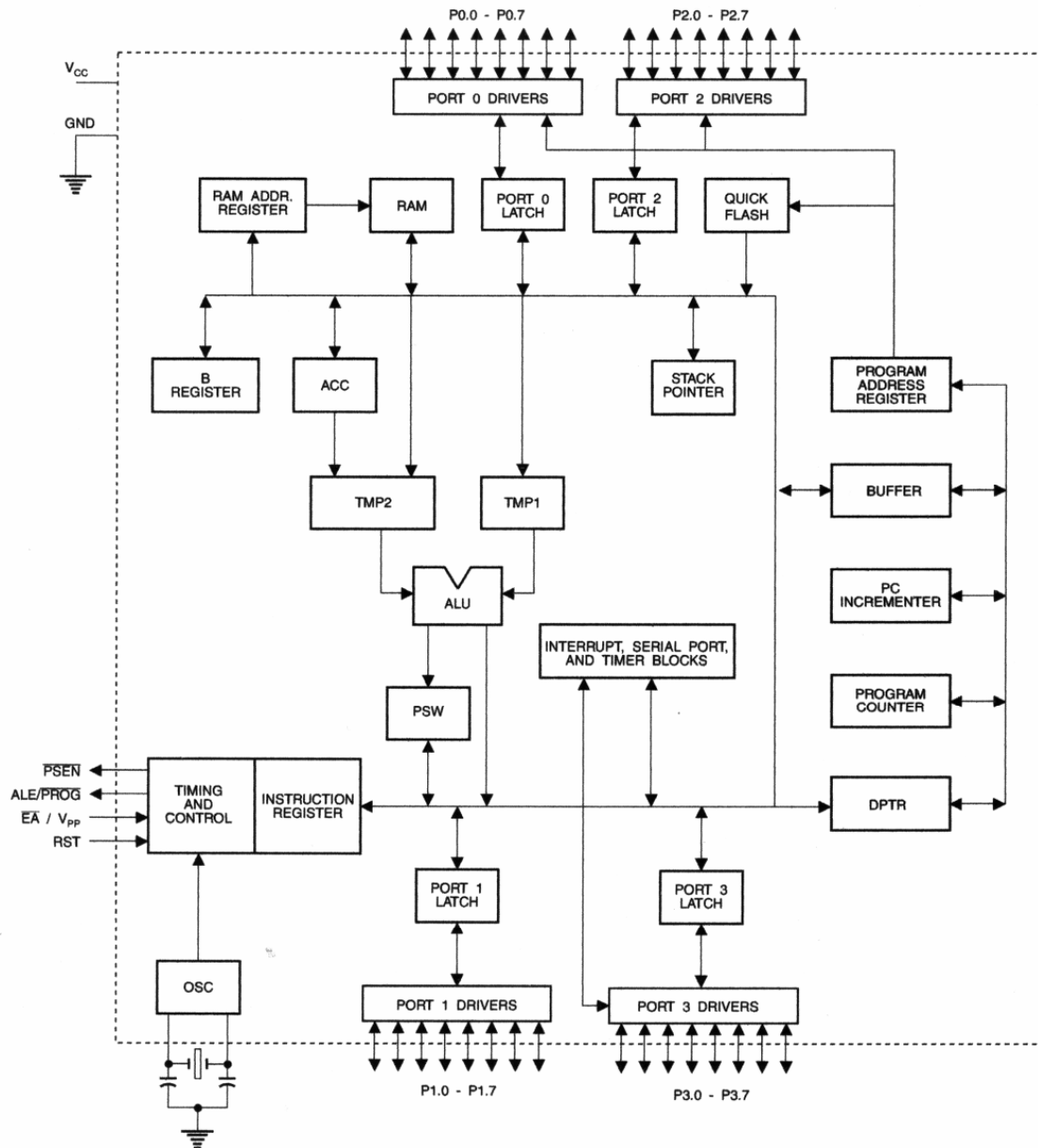
AT89C52

Rev. 0313H-02/00





Block Diagram





3 V/5 V, 450 μ A 16-Bit, Sigma-Delta ADC

AD7715*

FEATURES

Charge-Balancing ADC

16 Bits No Missing Codes

0.0015% Nonlinearity

Programmable Gain Front End

Gains of 1, 2, 32 and 128

Differential Input Capability

Three-Wire Serial Interface

SPI™, QSPI™, MICROWIRE™ and DSP Compatible

Ability to Buffer the Analog Input

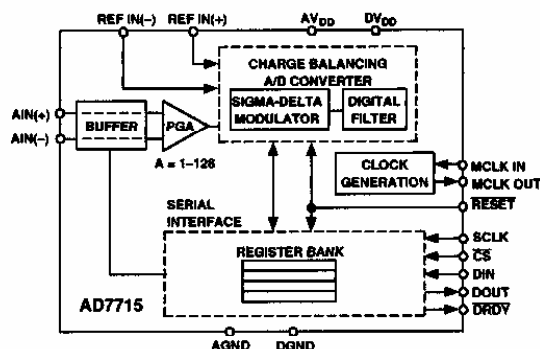
3 V (AD7715-3) or 5 V (AD7715-5) Operation

Low Supply Current: 450 μ A max @ 3 V Supplies

Low-Pass Filter with Programmable Output Update

16-Lead SOIC/DIP/TSSOP

FUNCTIONAL BLOCK DIAGRAM



GENERAL DESCRIPTION

The AD7715 is a complete analog front end for low frequency measurement applications. The part can accept low level input signals directly from a transducer and outputs a serial digital word. It employs a sigma-delta conversion technique to realize up to 16 bits of no missing codes performance. The input signal is applied to a proprietary programmable gain front end based around an analog modulator. The modulator output is processed by an on-chip digital filter. The first notch of this digital filter can be programmed via the on-chip control register allowing adjustment of the filter cutoff and output update rate.

The AD7715 features a differential analog input as well as a differential reference input. It operates from a single supply (+3 V or +5 V). It can handle unipolar input signal ranges of 0 mV to +20 mV, 0 mV to +80 mV, 0 V to +1.25 V and 0 V to +2.5 V. It can also handle bipolar input signal ranges of ± 20 mV, ± 80 mV, ± 1.25 V and ± 2.5 V. These bipolar ranges are referenced to the negative input of the differential analog input. The AD7715 thus performs all signal conditioning and conversion for a single-channel system.

The AD7715 is ideal for use in smart, microcontroller or DSP based systems. It features a serial interface that can be configured for three-wire operation. Gain settings, signal polarity and update rate selection can be configured in software using the input serial port. The part contains self-calibration and system calibration options to eliminate gain and offset errors on the part itself or in the system.

CMOS construction ensures very low power dissipation, and the power-down mode reduces the standby power consumption to 50 μ W typ. The part is available in a 16-lead, 0.3 inch-wide, plastic dual-in-line package (DIP) as well as a 16-lead 0.3 inch-wide small outline (SOIC) package and a 16-lead TSSOP package.

PRODUCT HIGHLIGHTS

1. The AD7715 consumes less than 450 μ A in total supply current at 3 V supplies and 1 MHz master clock, making it ideal for use in low-power systems. Standby current is less than 10 μ A.
2. The programmable gain input allows the AD7715 to accept input signals directly from a strain gage or transducer removing a considerable amount of signal conditioning.
3. The AD7715 is ideal for microcontroller or DSP processor applications with a three-wire serial interface reducing the number of interconnect lines and reducing the number of opto-couplers required in isolated systems. The part contains on-chip registers which allow software control over output update rate, input gain, signal polarity and calibration modes.
4. The part features excellent static performance specifications with 16-bits no missing codes, $\pm 0.0015\%$ accuracy and low rms noise (<550 nV). Endpoint errors and the effects of temperature drift are eliminated by on-chip calibration options, which remove zero-scale and full-scale errors.

SPI and QSPI are trademarks of Motorola, Inc.

MICROWIRE is a trademark of National Semiconductor Corporation.

*Protected by U.S. Patent No: 5,134,401.

See page 30 for data sheet index.

REV. B

Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices.

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781/329-4700 World Wide Web Site: <http://www.analog.com>
Fax: 781/326-8703 © Analog Devices, Inc., 1998

AD7715-3—SPECIFICATIONS ($AV_{DD} = +3\text{ V}$, $DV_{DD} = +3\text{ V}$, REF IN (+) = +1.25 V; REF IN (–) = AGND; $f_{CLK\ IN} = 2.4576\text{ MHz}$ unless otherwise noted. All specifications T_{MIN} to T_{MAX} unless otherwise noted.) AD7715

Parameter	A Version ¹	Units	Conditions/Comments
STATIC PERFORMANCE			
No Missing Codes	16	Bits min	Guaranteed by Design. Filter Notch $\leq 60\text{ Hz}$
Output Noise	See Tables IX to XII		Depends on Filter Cutoffs and Selected Gain
Integral Nonlinearity	± 0.0015	% of FSR max	Filter Notch $\leq 60\text{ Hz}$
Unipolar Offset Error	See Note 2		
Unipolar Offset Drift ³	0.2	$\mu\text{V}/^\circ\text{C}$ typ	
Bipolar Zero Error	See Note 2		
Bipolar Zero Drift ³	0.2	$\mu\text{V}/^\circ\text{C}$ typ	
Positive Full-Scale Error ⁴	See Note 2		
Full-Scale Drift ^{3,5}	0.2	$\mu\text{V}/^\circ\text{C}$ typ	
Gain Error ⁶	See Note 2		
Gain Drift ^{3,7}	0.2	ppm of FSR/ $^\circ\text{C}$ typ	
Bipolar Negative Full-Scale Error ²	± 0.003	% of FSR max	Typically $\pm 0.0004\%$
Bipolar Negative Full-Scale Drift ³	1	$\mu\text{V}/^\circ\text{C}$ typ	For Gains of 1 and 2
	0.6	$\mu\text{V}/^\circ\text{C}$ typ	For Gains of 32 and 128
ANALOG INPUTS/REFERENCE INPUTS			
Input Common-Mode Rejection (CMR)	90	dB min	Specifications for AIN and REF IN Unless Noted at DC. Typically 102 dB
Normal-Mode 50 Hz Rejection ⁸	98	dB min	For Filter Notches of 25 Hz, 50 Hz, $\pm 0.02 \times f_{NOTCH}$
Normal-Mode 60 Hz Rejection ⁸	98	dB min	For Filter Notches of 20 Hz, 60 Hz, $\pm 0.02 \times f_{NOTCH}$
Common-Mode 50 Hz Rejection ⁸	150	dB min	For Filter Notches of 25 Hz, 50 Hz, $\pm 0.02 \times f_{NOTCH}$
Common-Mode 60 Hz Rejection ⁸	150	dB min	For Filter Notches of 20 Hz, 60 Hz, $\pm 0.02 \times f_{NOTCH}$
Common-Mode Voltage Range ⁹	AGND to AV_{DD}	V min to V max	AIN for BUF Bit of Setup Register = 0 and REF IN
Absolute AIN/REF IN Voltage ⁸	AGND – 30 mV	V min	AIN for BUF Bit of Setup Register = 0 and REF IN
	$AV_{DD} + 30\text{ mV}$	V max	
Absolute/Common-Mode AIN Voltage ⁹	AGND + 50 mV	V min	BUF Bit of Setup Register = 1
	$AV_{DD} - 1.5\text{ V}$	V max	
AIN DC Input Current ⁸	1	nA max	
AIN Sampling Capacitance ⁸	10	pF max	
AIN Differential Voltage Range ¹⁰	0 to $+V_{REF}/GAIN^{11}$	nom	Unipolar Input Range (B/U Bit of Setup Register = 1)
	$\pm V_{REF}/GAIN$	nom	Bipolar Input Range (B/U Bit of Setup Register = 0)
AIN Input Sampling Rate, f_s	$GAIN \times f_{CLK\ IN}/64$		For Gains of 1 and 2
	$f_{CLK\ IN}/8$		For Gains of 32 and 128
REF IN(+) – REF IN(–) Voltage	+1.25	V nom	$\pm 1\%$ for Specified Performance. Functional with Lower V_{REF}
REF IN Input Sampling Rate, f_s	$f_{CLK\ IN}/64$		
LOGIC INPUTS			
Input Current	± 10	μA max	
All Inputs Except MCLK IN			
V_{INL} , Input Low Voltage	0.8	V max	
V_{INH} , Input High Voltage	2.0	V min	
MCLK IN Only			
V_{INL} , Input Low Voltage	0.4	V max	
V_{INH} , Input High Voltage	2.5	V min	
LOGIC OUTPUTS (Including MCLK OUT)			
V_{OL} , Output Low Voltage	0.4	V max	$I_{SINK} = 100\text{ }\mu\text{A}$ Except for MCLK OUT ¹²
V_{OH} , Output High Voltage	$DV_{DD} - 0.6$	V min	$I_{SOURCE} = 100\text{ }\mu\text{A}$ Except for MCLK OUT ¹²
Floating State Leakage Current	± 10	μA max	
Floating State Output Capacitance ¹³	9	pF typ	
Data Output Coding	Binary		Unipolar Mode
	Offset Binary		Bipolar Mode

Top View Dimensions:
 Pin pitch: 2.54 x 1.3 = 3.3
 Pin 5 location: 3.50 from left edge, 8.00 from right edge.
 Pin 1 location: 12.70 from left edge, 37.80 from right edge.
 Pin 10 location: 12.70 from left edge, 14.20 from right edge.
 Pin 15 location: 12.70 from left edge, 19.00 from right edge.
 Pin 20 location: 14.20 from left edge, 15.24 from right edge.
 Pin 25 location: 19.00 from left edge, 15.24 from right edge.
 Pin 30 location: 15.24 from left edge, 15.24 from right edge.
 Pin 35 location: 15.24 from left edge, 15.24 from right edge.
 Pin 40 location: 15.24 from left edge, 15.24 from right edge.
 Pin 45 location: 15.24 from left edge, 15.24 from right edge.
 Pin 50 location: 15.24 from left edge, 15.24 from right edge.
 Pin 55 location: 15.24 from left edge, 15.24 from right edge.

Side View Dimensions:
 Pin pitch: 2.54 x 5 = 12.7
 Pin 1 location: 8.00 from left edge, 15.24 from right edge.
 Pin 10 location: 12.70 from left edge, 14.20 from right edge.
 Pin 15 location: 12.70 from left edge, 19.00 from right edge.
 Pin 20 location: 14.20 from left edge, 15.24 from right edge.
 Pin 25 location: 19.00 from left edge, 15.24 from right edge.
 Pin 30 location: 15.24 from left edge, 15.24 from right edge.
 Pin 35 location: 15.24 from left edge, 15.24 from right edge.
 Pin 40 location: 15.24 from left edge, 15.24 from right edge.
 Pin 45 location: 15.24 from left edge, 15.24 from right edge.
 Pin 50 location: 15.24 from left edge, 15.24 from right edge.
 Pin 55 location: 15.24 from left edge, 15.24 from right edge.

Pinout Information:
 Pin 1: 1.45
 Pin 2: 1.45
 Pin 3: 1.45
 Pin 4: 1.45
 Pin 5: 1.45
 Pin 6: 1.45
 Pin 7: 1.45
 Pin 8: 1.45
 Pin 9: 1.45
 Pin 10: 1.45
 Pin 11: 1.45
 Pin 12: 1.45
 Pin 13: 1.45
 Pin 14: 1.45
 Pin 15: 1.45
 Pin 16: 1.45
 Pin 17: 1.45
 Pin 18: 1.45
 Pin 19: 1.45
 Pin 20: 1.45
 Pin 21: 1.45
 Pin 22: 1.45
 Pin 23: 1.45
 Pin 24: 1.45
 Pin 25: 1.45
 Pin 26: 1.45
 Pin 27: 1.45
 Pin 28: 1.45
 Pin 29: 1.45
 Pin 30: 1.45
 Pin 31: 1.45
 Pin 32: 1.45
 Pin 33: 1.45
 Pin 34: 1.45
 Pin 35: 1.45
 Pin 36: 1.45
 Pin 37: 1.45
 Pin 38: 1.45
 Pin 39: 1.45
 Pin 40: 1.45
 Pin 41: 1.45
 Pin 42: 1.45
 Pin 43: 1.45
 Pin 44: 1.45
 Pin 45: 1.45
 Pin 46: 1.45
 Pin 47: 1.45
 Pin 48: 1.45
 Pin 49: 1.45
 Pin 50: 1.45
 Pin 51: 1.45
 Pin 52: 1.45
 Pin 53: 1.45
 Pin 54: 1.45
 Pin 55: 1.45