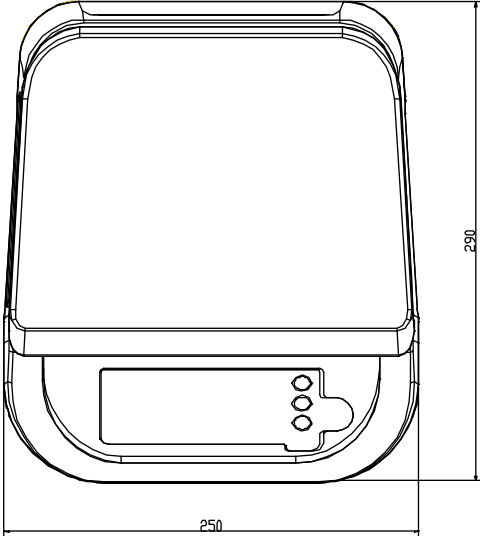
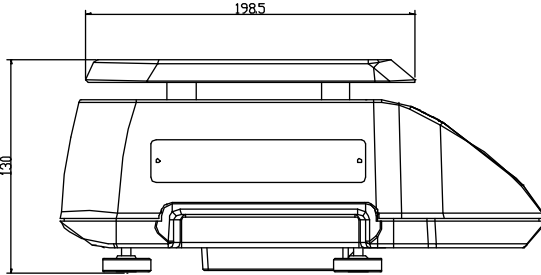
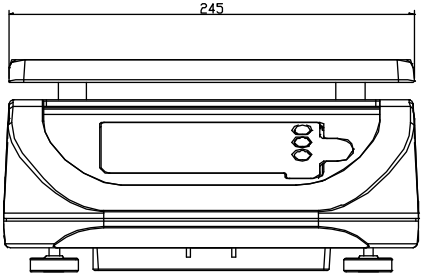


Specifications and Operation Manual for DS-673

Prepared : 1 January 2007
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1. General Layout



2. Purpose

To develop a low cost LED digital weighing scale which caters OIML Standard.

3. Features

- * Low cost LED digital weighing scale.
- * Quick response to weight changes.
- * Capacity : 1.5kg, 3kg, 6kg, 15kg, 30kg, 3lb, 6lb, 15lb, 30lb and 60lb.
- * Resolution : Display Resolution 1/3,000.
Internal Resolution 1/90,000.
- * Fast self-test procedure when power on.
- * Selectable automatic shut off time.
- * Rechargeable Battery (optional) backup for 60 hours of continuous usage (when Dimmer Level is set to '2' or below).
- * Intelligent power control
 - A. When AC power is available, scale will use AC power only whatever rechargeable battery is installed or not. When AC power is shut off, scale will use battery automatically.
 - B. When scale works on rechargeable battery, if the battery is weak, the battery indicator will light up. When the power from battery becomes low such that the scale can not compute accurately, all Displays will shut off except the Battery indicator. The power is then shut off completely after 1 minute.
 - C. Scale detects rechargeable battery voltage and control battery charge process automatically. The battery charge indicator lights up when rechargeable battery is being charged.
- * Calibration by software.
- * Splash proof.
- * LED operator display and optional LED customer display.
- * 3 / 4 keys : REZERO key, TARE key, ON/OFF key. Additional UNIT key for certain version.
- * Plastic body and base.
- * Flat platter.

4. Operating Conditions

- * Power Source : AC 240/230/220V, 117/100V.
: DC 6V 5Ah rechargeable battery (optional).
- * Operating Temperature : -10°C ~ +40°C (OIML).
- * Operating Humidity : 15 ~ 85% RH.
- * Power Consumption : 18W when using AC power.
: 3W when using rechargeable battery.

5. Charging Conditions

(for Rechargeable battery only)

- * Power Source : AC 240/230/220V, 117/100V.
- * Charge Current : 800 mA.
- * Charge Time : 12 - 14 hours.

6. Analog Specification

- * Input sensitivity : 1mV/V.
- * Zero adjust range : $0 \pm 3.3\text{mV}$.
- * Zero balance range : $0 \pm 0.33\text{mV}$.
- * L/C applied voltage : DC 3.3V.
- * Speed of A/D conversion : 10 times/sec.
- * Internal Resolution : 90,000.

7. Capacity/Minimum Graduation/Tare range

7.1. Single Interval

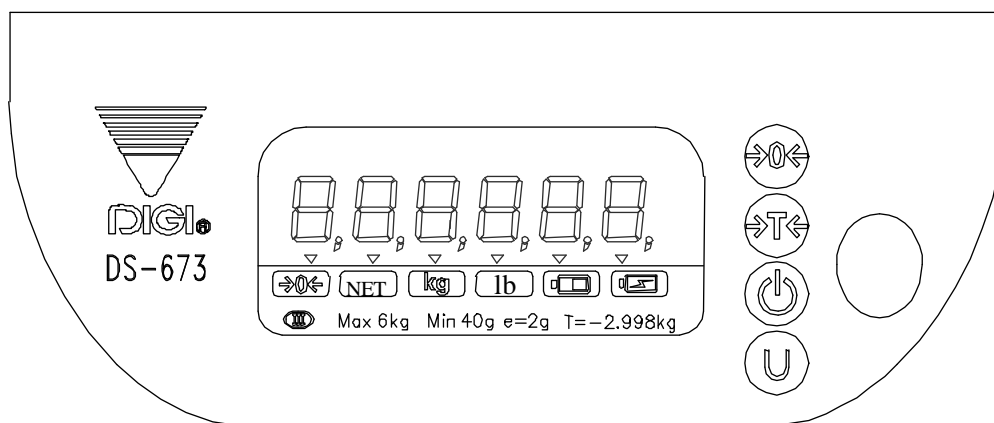
Capacity	Minimum Graduation	Tare Rang
1.5kg	0.5g (1e = 30IR)	0 - 0.7495kg
3kg	1g (1e = 30IR)	0 - 1.499kg
6kg	2g (1e = 30IR)	0 - 2.998kg
15kg	5g (1e = 30IR)	0 - 7.495kg
30kg	10g (1e = 30IR)	0 - 14.99kg
6lb	0.002lb (1e = 30IR)	0 - 2.998lb
15lb	0.005lb (1e = 30IR)	0 - 7.495lb
30lb	0.01lb (1e = 30IR)	0 - 14.99lb
60lb	0.02lb (1e = 30IR)	0 - 29.98lb

7.2. Multi-Interval

Capacity	Minimum Graduation		Tare Rang
1.5kg	(0-0.6kg): 0.2g (1e=12IR)	(0.6-1.5kg): 0.5g (1e=30IR)	0 - 0.5998kg
3kg	(0-1.5kg): 0.5g (1e=15IR)	(1.5-3kg): 1g (1e=30IR)	0 - 1.4995kg
6kg	(0-3kg): 1g (1e=15IR)	(3-6kg): 2g (1e=30IR)	0 - 2.999kg
15kg	(0-6kg): 2g (1e=12IR)	(6-15kg): 5g (1e=30IR)	0 - 5.998kg
30kg	(0-15kg): 5g (1e=15IR)	(15-30kg): 10g (1e=30IR)	0 - 9.995kg
6lb	(0-3lb): 0.001lb (1e=15IR)	(3-6lb): 0.002lb (1e=30IR)	0 - 2.999lb
15lb	(0-6lb): 0.002lb (1e=12IR)	(6-15lb): 0.005lb (1e=30IR)	0 - 5.998lb
30lb	(0-15lb): 0.005lb (1e=15IR)	(15-30lb): 0.01lb (1e=30IR)	0 - 9.995lb
60lb	(0-30lb): 0.01lb (1e=15IR)	(15-30lb): 0.02lb (1e=30IR)	0 - 29.99lb

*NOTE: IR -> Internal Resolution, e -> Division(Minimum Increment).
Internal count(full scale capacity) = 90000IR.

8. Display and Indicators



8.1. Display Specifications

- * Weight Display : 6 digits.
- * Special Display : 6 digits.
- * Decimal point : Selectable by SPEC.

8.2. Indicators

- * $\neq 0$: On when zero point is adjusted and weight is stable.
- * NET : On when tare subtraction is performed.
- * BATTERY : On when Battery is weak and needs to charge (only for rechargeable battery type).
- * CHARGE : On when Battery is charging (only for rechargeable battery type).
- * kg : On when weight display in kg (only for 4 keys version).
- * lb : On when weight display in lb (only for 4 keys version).

9. Dimensions

- * Platter size : 245(W) x 198.5(D) mm.
- * Overall size : 250(W) x 290(D) x 130(H) mm.

10. External Connectors

- * AC plug.

11. Main Components

- * Microcomputer : Renesas R5F21254(16bit, 16K ROM) / R5F21255(16 bit, 24K ROM) / R5F21256(16 bit, 32K ROM) / R5F21257(16 bit, 48K ROM).
- * Display device : LED.
- * Loadcell : 1k resistance loadcell.

12. Existing parts to be used

- * LED (DS-650E).
- * J type Loadcell (DS-671).

13. Keysheet and Key Functions

13.1. Keysheet Layout

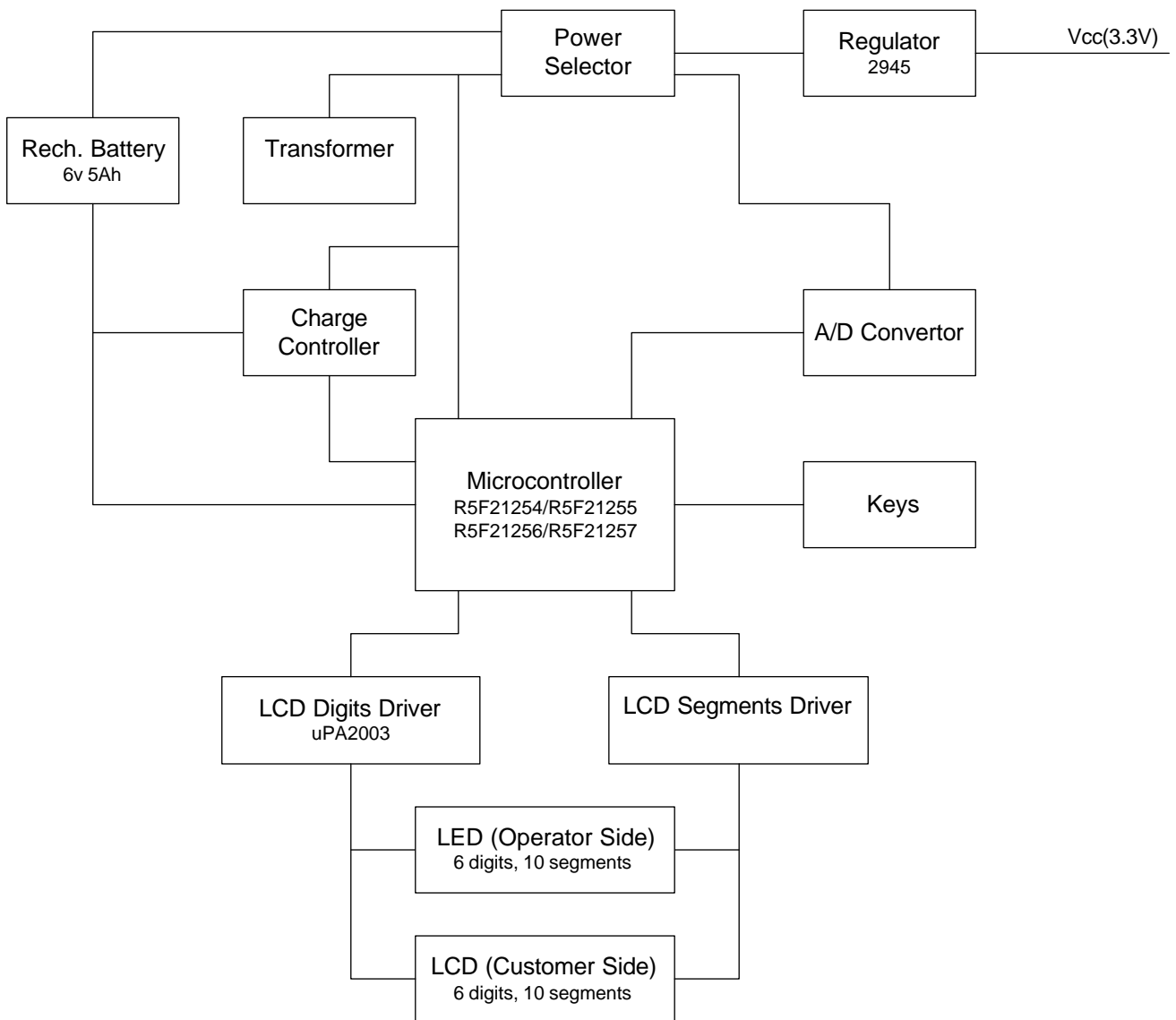
13.2. Key Functions

- * **ON/OFF** : ON/OFF key. To turn display on or off.
- * **RE-ZERO** : RE-ZERO key. To resets weight display to zero.
- * **TARE** : TARE key. To set or clears tare value.
- * **UNIT** : UNIT key. To changes measurement base (only for 4 keys version).

14. Notable differences from current Teraoka scales:

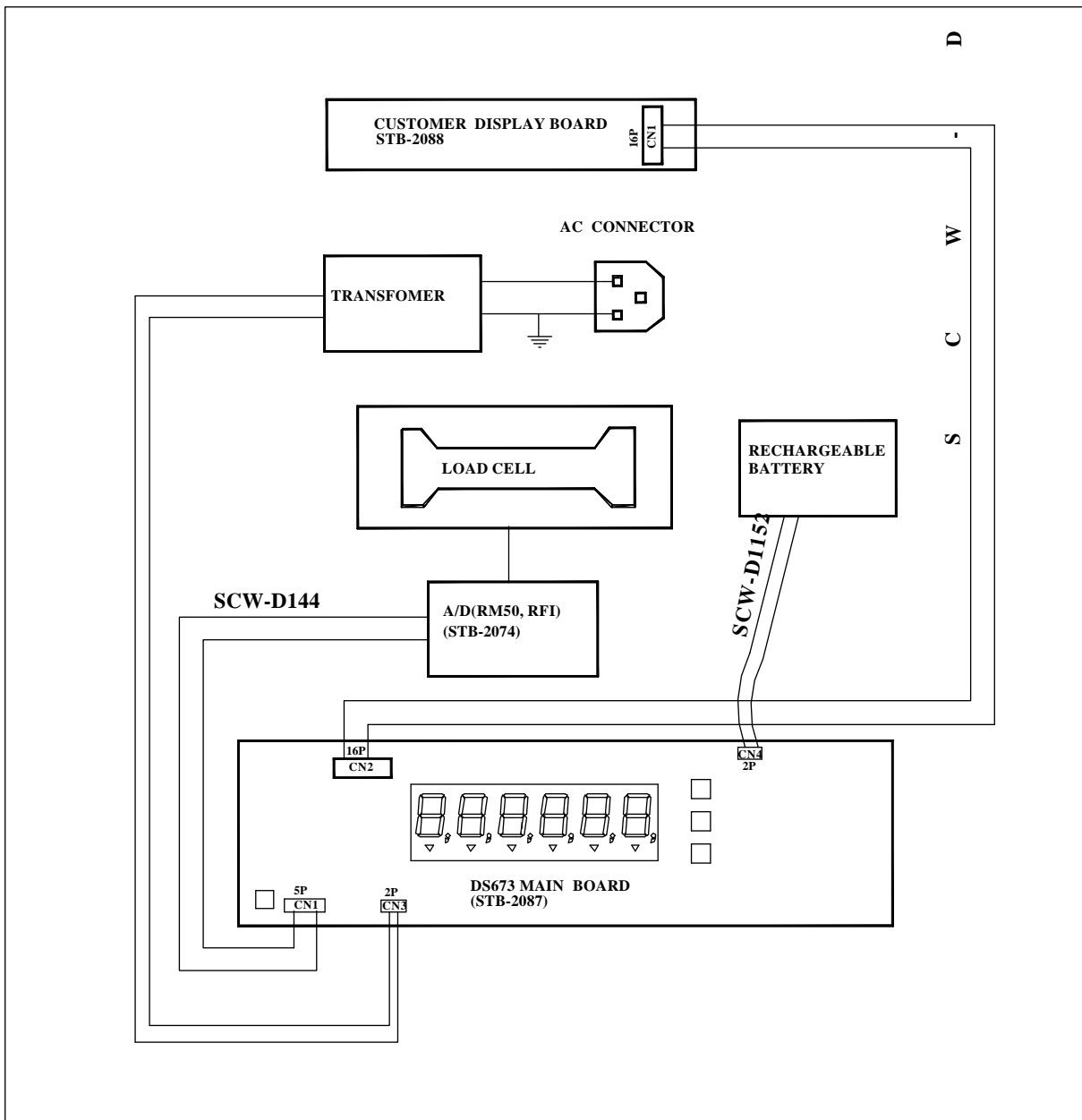
- * LED digital weighing scale.

15. Block Diagram of Electrical Connection



16. Physical layout of Electrical Connection

1
5
1
D



17. Hardware Description

17.1. Microcomputer

The R5F21254 / R5F21255 / R5F21256 / R5F21257 Microcomputer was chosen for the following reasons:

- * Cheaper.
- * Low voltage low power consumption.
- * On-chip oscillator.
- * On-chip power-on reset circuit and voltage detection circuit.
- * Flash programming and erasure endurance: 1000 times for program ROM and 10000 times data flash.
- * 20 interrupt sources and efficient interrupt processing.
- * 4 versatile timers.
- * 12 channels 10-bit A/D converter.
- * Pin compatibility of similar package with difference ROM sizes.
- * Good support.

17.2. Pin Assignment

Pin	I/O	Assignment	Device	Remark
P00/AN7	I	ACVOLT	AC Power	Detects AC Power
P01/AN6	I	BTVOLT	Battery	Detects Battery Voltage
P02/AN5	O	-	-	NC
P03/AN4	O	-	-	NC
P04/AN3	O	-	-	NC
P05/AN2	O	-	-	NC
P06/AN1	O	-	-	NC
P07/AN0	O	-	-	NC
P10/K10/AN8	I	K_ONOFF	Keyboard	ON/OFF key
P11/K11/AN9	I	K_REZERO	Keyboard	REZERO key
P12/K12/AN10	I	K_TARE	Keyboard	TARE key
P13/K13/AN11	I	K_UNIT	Keyboard	UNIT key
P14/TXD0	O	-	-	NC
P15/RXD0	O	-	-	NC
P16/CLK0	O	-	-	NC
P17/TRAIO/INT1	I	K_SPANSW	SPAN Switch	Detects SPAN SW status
P20/TRDIOA0	O	Csa	LED	LED Segment Driver
P21/TRDIOB0	O	Csb	LED	LED Segment Driver
P22/TRDIOC0	O	Csc	LED	LED Segment Driver
P23/TRDIOD0	O	Csd	LED	LED Segment Driver
P24/TRDIOA1	O	Cse	LED	LED Segment Driver
P25/TRDIOB1	O	Csf	LED	LED Segment Driver
P26/TRDIOC1	O	Csg	LED	LED Segment Driver
P27/TRDIOD1	O	Csdp	LED	LED Segment Driver
P30/TRAO	O	Cscom	LED	LED Segment Driver
P31/TRBO	O	Cscur	LED	LED Segment Driver
P33/SSI	O	BTPW	BATT-PW	Controls battery power
P34/SDA/SCS	O	BTCHG	BATT-CHARGER	Controls battery charger
P35/SCL/SSCK	O	-	-	NC
P37/SSO	O	-	-	NC

Pin	I/O	Assignment	Device	Remark
P42/VREF	I	-	-	A/D Reference Voltage
P43/XCIN	O	ADPOWN	TI1232	Power Down and Reset
P44/XCOUT	O	ADCLK	TI1232	Serial Clock
P45/INT0	I	ADDO	TI1232	Serial Data
P46/XIN	I	-	-	Connect to VCC via resistor
P47/XOUT	I	-	-	Connect to VCC via resistor
P60/TREO	O	Cdigi1	UPA2003	LED Digit Driver
P61	O	Cdigi2	UPA2003	LED Digit Driver
P62	O	Cdigi3	UPA2003	LED Digit Driver
P63	O	Cdigi4	UPA2003	LED Digit Driver
P64	O	Cdigi5	UPA2003	LED Digit Driver
P65/CLK1	O	Cdigi6	UPA2003	LED Digit Driver
P66/INT2/TXD1	O	-	-	NC
P67/INT3/RXD1	O	-	-	NC
VCC/AVCC	I	-	-	Power Supply / Analog Power Supply
VSS/AVSS	I	-	-	Power Supply / Analog Power Supply
MODE	I	-	-	Mode Input
RESET	I	-	-	Reset Input

18. Maintenance Mode

18.1. Software Version and Span Switch State check

1 - ZERO 2 - NET

OPERATION	DISPLAY	1	2	REMARKS
[RE-ZERO]	0.0 0 0	▼		Weighing mode.
[RE-ZERO] + [ON/OFF] [ON/OFF] [ON/OFF]	8 8 8 8 8 8			Enter [ON/OFF] [ON/OFF] [ON/OFF] while depressing [RE-ZERO]. Display software version for 2s.
	V r x . x x			Display current Span Switch state: (S-ON or S-OFF)
	S - O N			
	0.0 0 0	▼		Exit after 3s.

18.2. SPAN Adjustment

1 - ZERO 2 - NET

OPERATION	DISPLAY	1	2	REMARKS
[RE-ZERO]	0.0 0 0	▼		Weighing mode.
[RE-ZERO] + [ON/OFF] [ON/OFF] [TARE]	8 8 8 8 8 8			Enter [ON/OFF] [ON/OFF] [TARE] while depressing [RE-ZERO].
Ensure no weight on platter, [RE-ZERO]	- - - - -			Calibrating zero point.
:				
:				
Put full capacity weight on platter(e.g. 6kg), [RE-ZERO]	C A L S P			Calibrating Span.
After calibration	- - - - -			Goes back to Weighing mode.
	6.0 0 0			

18.3. Escape from Maintenance mode

1 - ZERO 2 - NET

OPERATION	DISPLAY	1	2	REMARKS
[RE-ZERO]	0.0 0 0	▼		Weighing mode.
[RE-ZERO] + [ON/OFF] [ON/OFF] [TARE]	8 8 8 8 8 8			Enter [ON/OFF] [ON/OFF] [TARE] while depressing [RE-ZERO].
[TARE]	0.0 0 0	▼		Escape to Weighing mode.
[RE-ZERO]	8 8 8 8 8 8			Enter [ON/OFF] [ON/OFF] [TARE] while depressing [RE-ZERO].
[RE-ZERO] + [ON/OFF] [ON/OFF] [TARE]	C A L 0 0			Calibrating zero point.
Ensure no weight on platter, [RE-ZERO]	- - - - -			
:				
:				
[TARE]	C A L S P			
	0.0 0 0	▼		Escape to Weighing mode.

18.4. Specification Setting

NOTE: It can work only when SPAN SWITCH is on (Enable).

1 - ZERO 2 - NET

OPERATION	DISPLAY	1	2	REMARKS
	0.0 0 0	▼		Weighing mode.
[RE-ZERO]	8 8 8 8 8 8			Enter [TARE] [ON/OFF] [ON/OFF] while depressing
[RE-ZERO] + [TARE] [ON/OFF] [ON/OFF]	S P C 0 0			[RE-ZERO]. Display SPEC number
	0 0 0			and setting value alternately.
[ON/OFF]	0 0 1			[ON/OFF] key to increase SPEC setting value.
[RE-ZERO]	S P C 0 1			[RE-ZERO] key to save data and increase SPEC count.
	0 0 0			
[TARE]		▼		[TARE] key to store SPECS & escape to Weighing mode.

18.5. Internal Count & A/D Count Display

1 - ZERO 2 - NET

OPERATION	DISPLAY	1	2	REMARKS
	0.0 0 0	▼		Weighing mode.
[RE-ZERO]	8 8 8 8 8 8			Enter [TARE] [TARE] [ON/OFF] while depressing
[RE-ZERO] + [TARE] [TARE] [ON/OFF]	, , , , ,0,			[RE-ZERO]. Display Internal Count.
[ON/OFF]	5.2.4.2.8.8.			Display A/D Count. [ON/OFF] as alternative key.
[TARE]		▼		Escape to Weighing mode.

18.6. Operational Specification List

NOTE: It can work only when the SPAN Switch is on (Enable)

SPEC NO.	BIT 2	BIT 1	BIT 0
00	Decimal point position 000 - None 001 - 2nd digit (0.0) 010 - 3rd digit (0.00) 011 - 4th digit (0.000) 100 - 5th digit (0.0000) 101 ~ 111 - Not used		
01	Minimum display 00 - 1 01 - 2 10 - 5 11 - 10		Net / Gross Multi-interval 0 - Gross 1 - Net
02	Selection of resolution 00 - 1/2000 01 - 1/3000 10 - 1/6000 11 - 1/7500		Weight single interval or multi-interval 0 - Single interval 1 - Multi-interval
03	Decimal point figure for numeral 0 - Period (.) 1 - Comma (,)	Negative weight display mask 0 - Minus gross > 9e 1 - Minus gross Weight	IR mode protected by SPAN SW 0 - NO 1 - YES
04	Start range 00 - $\pm 10\%$ F.S. 01 - $\pm 5\%$ F.S.	Re-zero range 10 - $\pm 3\%$ F.S. 11 - $\pm 2\%$ F.S.	
05	Manual tare cancellation 0 - Allow 1 - Inhibit	Tare subtraction 0 - Allow 1 - Inhibit	Tare accumulation 0 - Allow 1 - Inhibit
06	Auto tare clear when rezero 0 - Allow 1 - Inhibit	Weight reset when tare 0 - Allow 1 - Inhibit	Tare auto clear (Gross 21e & Net 5e) 0 - Allow 1 - Inhibit
07	Zero tracking when Tare 0 - Inhibit 1 - Allow	Re-zero function 0 - Allow 1 - Inhibit	Not Used
08	Unit key 000 - No 001 - For kg and lb conversion 010 - For kg, decimal lb and kati conversion (for HK) 011 ~ 111 - Not used		

19. Operations In Weighing Mode

19.1. ON/OFF

1 - ZERO 2 - NET

OPERATION	DISPLAY	1	2	REMARKS
[ON/OFF]	8.8.8.8.8.8.			Display for 1 seconds. Blank for 1 seconds.
	8.8.8.8.8.8.			Display for 1 seconds. Blank for 1 seconds.
Ready to operate	0.0 0 0	▼		Weighing mode.
[ON/OFF]				Display off.

19.2. Reset and Weighing Check

All weighing operations will be performed based on the procedure shown below. Operator should check this operation before any transactions.

1 - ZERO 2 - NET

OPERATION	DISPLAY	1	2	REMARKS
Stand-by-status	0.0 0	▼		
[REZERO]	8 8 8 8			Reset the zero point.
	0.0 0	▼		
Place an item on the platter. (e.g. 1.00kg)	1.0 0 0			
Remove the item from platter	0.0 0 0	▼		

19.3. Tare Subtraction

1 - ZERO 2 - NET

OPERATION	DISPLAY	1	2	REMARKS
Stand-by-status	0.0 0 0	▼		
Put tare (e.g. 30 g) on platter	0.0 3 0			
[TARE]	0.0 0 0			Subtract the tare weight.
Remove the tare weight	- 0.0 3 0	▼		
[TARE]	0.0 0 0	▼		Clear the tare weight.

19.4. Automatic Shut-Off Timer Setting

1 - ZERO 2 - NET

OPERATION	DISPLAY	1	2	REMARKS
Display off				
Depress [ON/OFF]				
Keep pressing for 3s	3			
Release [ON/OFF]	8.8.8.8.8.8.			Set Automatic shut-off timer to 3 minutes.
Ready to operate [ON/OFF]	0.0 0 0 ▼			Weighing mode. Display off.
Depress [ON/OFF]				
Keep pressing for 3s	3			
Keep pressing for 6s	1 0			
Release [ON/OFF]	8.8.8.8.8.8.			Set Automatic shut-off timer to 10 minutes.
Ready to operate [ON/OFF]	0.0 0 0 ▼			Weighing mode. Display off.
Depress [ON/OFF]				
Keep pressing for 3s	3			
Keep pressing for 6s	1 0			
Keep pressing for 9s	9 9 9			
Release [ON/OFF]	8.8.8.8.8.8.			Set NO Automatic shut-off.
Ready to operate	0.0 0 0 ▼			Weighing mode.

*NOTE : The setting data registered in the memory keeps effectiveness unless new data is established.

19.5. Display Dimmer Setting

1 - ZERO 2 - NET

OPERATION	DISPLAY	1	2	REMARKS
Stand-by-status	0.0 0 0 ▼			
[RE-ZERO]	8 8 8 8 8 8			Enter [TARE] [TARE] [TARE] while depressing
[RE-ZERO] + [TARE] [TARE] [TARE]	≡ 1 ≡			[RE-ZERO]. Display current dimmer level.
[RE-ZERO]	≡ 2 ≡			
[RE-ZERO]	≡ 3 ≡			[RE-ZERO] key to increase dimmer level.
[ON/OFF]	≡ 2 ≡ ▼			[ON/OFF] key to decrease dimmer level.
[TARE]	0.0 0 0 ▼			[TARE] key to store setting & escape to Weighing mode.

19.6. kg and lb Conversion

(For 4 keys version only. Available when SPEC08 = 001)

1 - ZERO 2 - NET 3 - kg 4 - lb

OPERATION	DISPLAY	1	2	3	4	REMARKS
Stand-by-status	0.0 0 0 ▼			▼		
Put product on platter	0.5 0 0			▼		Weight in kg.
Remove product from platter	0.0 0 0 ▼			▼		
[UNIT] <i>*note</i>	P O U N D			▼		Change to lb, display for 2 seconds.
	0.0 0 0 ▼			▼		
Put product on platter	1.1 0 0			▼		Weight in lb.
[UNIT] <i>*note</i>	M E T R I C			▼		Change to kg, display for 2 seconds.
	0.5 0 0			▼		
Remove product	0.0 0 0 ▼			▼		

*NOTE: The operation can not be executed when Tare Subtraction is performed.

19.7. kg, decimal lb and kati Conversion

(For 4 keys version only. Available when SPEC08 = 010)

1 - ZERO 2 - NET 3 - lb 4 - kati

OPERATION	WEIGHT	1	2	3	4	REMARKS
Stand-by-status	0.0 0 0	▼				
Put product on platter	0.5 0 0					Weight in kg.
Remove product from platter	0.0 0 0	▼				
[UNIT] *note	P O U N D			▼		Change to decimal lb, display for 2 seconds.
	0. 0. 0			▼		
Put product on platter	1. 1. 6 0			▼		Weight in decimal lb.
Remove product	0.0 0 0	▼		▼		
[UNIT] *note	K A T I				▼	Change to kati, display for 2 seconds.
	0. 0. 0	▼		▼		
Put product on platter	0. 1 3. 2 0				▼	Weight in kati.
[UNIT] *note	M E T R I C					Change to kg, display for 2 seconds.
	0.5 0 0					Weight in kg.
Remove product	0.0 0 0	▼				

*NOTE: The operation can not be executed when Tare Subtraction is performed.

19.8. Set Default Weight Unit

(For 4 keys version only. Available when SPEC08 = 001 or SPEC08 = 010)

1 - ZERO 2 - NET

OPERATION	DISPLAY	1	2	REMARKS
Stand-by-status	0.0 0 0	▼		
[RE-ZERO]	8 8 8 8 8 8			Enter [UNIT] [UNIT] [UNIT] while depressing
[RE-ZERO] + [UNIT] [UNIT] [UNIT]	M E T R I C			[RE-ZERO]. Display default weight unit setting.
[ON/OFF]	P O U N D			[ON/OFF] key to select weight unit.
[TARE]	0.0 0 0	▼		[TARE] key to store setting & escape to Weighing mode.

20. Error Message List

The following error message will appear when an incorrect operation is performed.

Message	Remarks	Appropriate Operation
8 8 8 8 8 8	When scale is not steady when power on.	Place scale on firm, flat base.
O F	When weight exceeds capacity+9d, or something is on the platter when power on.	Remove the item on the platter.
U F	When negative weight exceeds display limit.	REZERO or ON/OFF again.
E r r o r	When error occurs in maintenance mode.	Repeat operation.
E R R 01	When A/D error.	Contact dealer.
E R R 02	When data flash erase error.	Contact dealer.
E R R 03	When data flash program error.	Contact dealer.