DI-160

SERVICE MANUAL

Edition	Date	Remark
1st	Jan 1997	
2nd	Feb 2000	
3rd		
4th		

SHANGHAI TERAOKA ELECTRONIC CO., LTD.

TINGLIN INDUSTRIAL DEVELOPMENT ZONE, JINSHAN DISTRICT, SHANGHAI P. R. CHINA 20150

Tel: +86-21-5723-4888 Fax: +86-21-5723-4090 E-mail: tservice@public3.sta.net.cn

Table of Contents

1. Features :

This model is a Digital-weighing Indicator named as DI-160. Below are the features of this model.

- DC-12V-18V Power Input via AC Adopter
- 7 x Segments & 6 x Digits LCD Panel
- 5 x Operation Keys
- 1 x Weighing Platform
- Desk Top/Wall-Hanging Type
- RS232C 1/F (1 Channel) available for Output to PC ----------Option
- Remote Display 1/F available for Max . 4 Displays----------Option
- Hg (Mercury) SW 1/F for Level Detection ---------- Option

2. Specifications

2.1. General Specifications

- Power Source ---------- DC 12V－18V (Recommendable Adapter Output DC15V 0.3A)
- Operation Temperature ------- 10℃~ 40 ℃ (14℉~ 104℉)
- Operation Humidity ---------- 15 % ~ 85 % RH (Non-Condensing)
- Weighing Device ---------- Load Cell (Output Range 0.6mV/V~ 4.00mV/V)
- Dimensions ---------- 200mm/7.9” (W) × 140mm/5.5” (H) ×50mm/2.0”（D）

2.2. Approved Standards:

This model complies with the following standards:

■ UL ■ CSA ■ CE Mark ■ FCC A ■ CISRR 22B ■ RFI ■ OIML

2.3. Weighing Specifications:

- Internal Resolution－－－－－－－－－－－－－－－－－－1/ 60 ,000
- Display Resolution－－－－－－－－－－－－－－－－－－1/1,000 ~1/7,500
- Single Interval Method

2.4. A to D Converter Specifications:

- Double Integration Method
- 20 times/sec .Sampling (when 1mV/V is set)
- Load Cell Output allowable Ranges 0.6mV/V ~4.0mV/V
- Load Cell Impedance 350Ω

3. Set-up Procedure:

3.1. Initial Set-up Procedure

1. Remove the rear lid removing 4 screws.
2. Remove a shield sheet, which covers over the PCB.
3. Solder load cell wires to specified points of PCB.

Silk on PCB	Signals	CNW-6410
BLK ----------	F.G.	BLACK
*SLD ----------	F.G.	
Green/Yellow		
*GRN ----------	Load cell Output (+)	Green
*YEL ----------	Load cell Output	Yellow
*RED----------	Load cell Applied Voltage (+)	Red
RS- ----------	Sensor (-)	Orange
RS+ ----------	Sensor (+)	Blue
*WHT ---------	Load cell Applied Voltage (-)	White
GND ----------	GND for Mercury SW	
HGSW ----------	Input of Mercury SW	

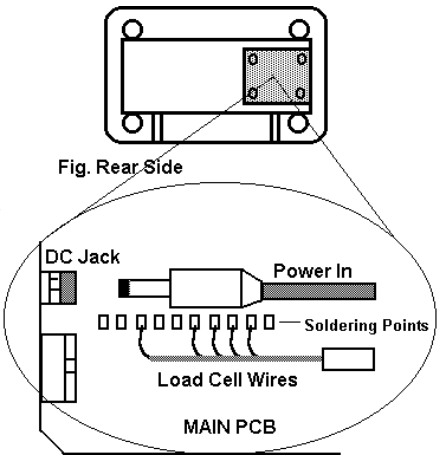


Fig. Locations on Main PCB

NOTES:

When connecting DIGI load cell, wires * marked should be soldered at each soldering point as shown on the right.

4. Insert powers cord from AC adapter into Power Jack on PCB.
5. Pass the load cell wire and power cord through the path in rubber shield block
6. Put the shield sheet and the lid in its position

3.2. Start-up

Next, specification data and weight calibration are required to get the indicator working properly.

1. Press (ON/OFF) key to start up the machine .

➥ Software version # is displayed such as “Ver.0.04” . → All segments like “8, 8, 8, 8, 8, 8” are displayed.

→ The display blanks off. → The display locks up with all “8”s.

Now it is ready to set up the specification data and weight calibration.

* If “Lo-VoL“ is displayed, this indication that the input power voltage is too low to operate the unit.

This is because the input voltage drop detection circuit is equipped to prevent the unit from malfunctioning when the voltage dropped.

To exit this error, please reset the unit by turning off and on.

3.3. SPEC’s Data setting for RS-232C Communication

1. Press (T) key 3 times by holding (REZERO) key --------- “Z” + “TTT”

➥ This key operation leads you to SPEC data mode regarding **RS-232C Communication**.

2. For setting procedures, please refer to the following pages.
3. To exit this mode, press (T) key .

3.4. SPEC' s Data Setting for Weigh & Measure

1. Turn on the SPAN SW. (SW6 on Main Board.)
2. Press (→) key 3 times by holding (REZERO) ------- " Z " + " → → → "
   ➥This key operation leads you to SPEC setting mode regarding W&M.
3. For setting procedures, please refer to the following pages.
4. To exit this mode, (T) key.

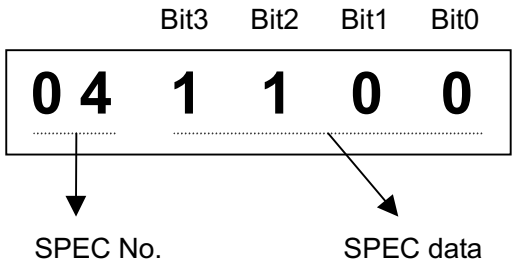
3.5 How to Set /Change SPEC Date

As introduced at the previous section, there are 2 kinds of key-operation when entering SPEC setting mode.

a . (T) (T) (T) holding (REZERO) ------- for SPEC No. 0-No. 3

b . (→) (→) (→) holding (REZERO) -------for SPEC No. 4-No. 15

In case of "b" operation , the following display will appear.



*The two leftmost bits indicate SPEC No. such as "04 "

*The remaining **4** bits indicate SPEC numeric data such as " 1100 ".

*Mark " ▼ " under a figure indicates the current programmable position

When setting or changing SPEC data, key switches function are as follows.

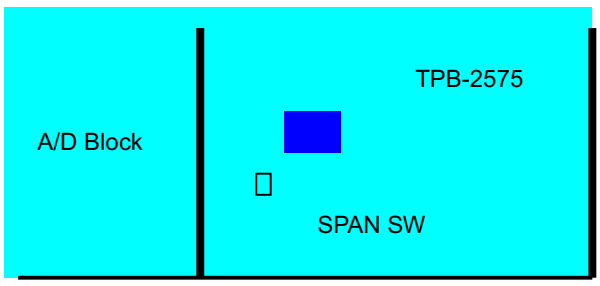
(REZERO)----------SPEC No. skips each time this key is pressed.

(T) ---------- To renew the data and exit this mode.

(→) ---------- To move digit position. ⇨ " ▼ " will move to next digit.

(↓) ---------- To change SPEC data to either "0" or "1".

From the next page, the SPEC data list is attached so that you can set/change the data according to your requirement.



3.6. SPEC Data List

a. (T) (T) (T) + (REZERO)

SPEC No.	Bit3	Bit2	Bit1	Bit0
SPEC 00	**RS-232C Connection** 0: Not Connected 1: Connected	**Baud Rate [bps]** 0 0 0 ---------- 1200 0 0 1 ----------2400 0 1 0 ----------4800 0 1 1 ----------9600 1 0 0 ----------19800 **NOTE:** Other combinations except above are prohibited.		
SPEC 01	**Stop Bit** 0: 1 bit 1: 2 bit	**Data Length** 0: 7 bits 1: 8 bits	**Parity Bit** 0 0 --------- No Parity 0 1 --------- Odd 1 0 --------- Even Note: Setting of “11” is prohibited.	
SPEC 02	**Selection of RS-232 Communication Type** 0 0: Stream output (Continuous Output) 0 1: Output by Pressing “up arrow” key. 1 0: Output by Command from External 1 1: Inhibit		**Stable of Text Data** 0: Inhibit 1: Allow	**Header of Text Data** 0: Without 1: With
SPEC 03	Not in use --------- Set all “ 0 “			**Transmission Condition** 0: Stable Only 1: Both Stable or Unstable

b. (→) (→) (→) + (REZERO) **NOTE: SPAN SW** should be **ON.**

SPEC No.	Bit3	Bit2	Bit1	Bit0
SPEC 04	**Loadcell Output Sensitivity (mV /V)** 0 0 0 0: ---- 3.80 ~ 4.00 0 0 0 1: ---- 3.60 ~ 3.80 0 0 1 0: ---- 3.35 ~ 3.60 0 0 1 1: ---- 3.15 ~ 3.35 0 1 0 0: ---- 2.90 ~ 3.15 0 1 0 1: ---- 2.65 ~ 2.90 0 1 1 0: ---- 2.40 ~ 2.65 0 1 1 1: ---- 2.15 ~ 2.40 1 0 0 0: ---- 1.95 ~ 2.15 1 0 0 1: ---- 1.75 ~ 1.95 1 0 1 0: ---- 1.45 ~ 1.70 1 0 1 1: ---- 1.20 ~ 1.45 1 1 0 0: ---- 0.97 ~ 1.20 1 1 0 1: ---- 0.80 ~ 0.97 1 1 1 0: ---- 0.70 ~ 0.80 1 1 1 1: ---- 0.60 ~ 0.70			
SPEC 05	**Shape of Decimal Point** 0: Period 1: Comma	Not in use	**Position of Decimal Opint** 0 0-------No Decimal (00000) 1 0 ------2nd Decimal (000. 00) 0 1 ------1st Decimal (0000. 0) 1 1 ------3rd Decimal (00. 000)	
SPEC 06	**Zero Tracking during Tare Reduction** 0 : Inhibit 1 : Allow	**Digital Tare Reduction** 0: Inhibit 1: Allow	**Tare Accumulation** 0 : Inhibit 1 : Allow	**Tare Reduction Range** 0 : 50% 1: 100% of Capacity.

SPEC No.	Bit3	Bit2	Bit1	Bit0
SPEC 07	**Zero-resetting during Tare Reduction** 0: Inhibit 1: Allow	**Minus Weight Display** 0: -9e 1: No limit	**Zero-resetting Range when Power On** 0: ±10% 1: ±100%	**Zero-resetting Range** 0: ±2% 1: ±100%
SPEC 08	**Internal Count Display when SPAN SW is OFF.** 0: Inhibit 1: Allow	**Gravity Adjustment (Only for Japanese market)** 0: Inhibit	**SPAN SW** *3 This should be always set to "0"	**Weight Data Hold-on Function when power is shut off** *4 0: Inhibit 1: Effective
SPEC 09-10	Set "0000 ". (**Japanese Market Use only**).			
SPEC 11	**One-touch Tare Reduction** *5 0: Inhibit 1: Allow	**Mercury SW Output Condition** *6 0: Active 1: Active High	**Mercury SW Connection** *7 0: Not Connected 1: Connected	**Animal Mod** *8 0: Inhibit 1: Effective
SPEC 12	Not in use. Set all 0.			**Weight Stability Condition in Animal Mode** 0: Tight 1: Loose
SPEC 13-15	Set "0 0 0 0"			

Notes :

* 1 RS-232C Connection---------- Net weight and Tare weight data are transmitted via RS-232 port.

* 2 DigitalTare Reduction-------Tare weight that you digital-input by arrow keys can be reduce .

* 3 SPAN SW ---------- SPAN switch is located on silk No. SW6 of Main PCB-2575.

*4 Weight Data Hold-On Function------For example , when 100 kg of oil drum is weighed, a power cut suddenly happens. If this function is effective, it can read previous weigh data (100kg) before power cut due to the fact that the previous zero point as was held as it was. However as the zero point data is held only when zero- resetting in , correct weight data can not read without zero-resetting in one try.

* 5 One-touch Tare Reduction---This function by pressing tare key when an item on platform. The range of tare reduction is selectable either 50% or 100% capacity by other SPEC data.

* 6 Mercury SW --- When Mercury switch is out of the level, if a high level output appears at the SW output, it is "Active-High" and if a low level output appears, it is "Active-low".

* 7 Mercury SW connection --- This switch is equipped on scale side and is used to know the level of scale signal.

* 8 Animal Mode--- This mode is provided for weighing animal by changing weight stability condition.

3.7. Weight Calibration (SPAN Adjustment)

Before attempting to calibrate the weighing platform connected to DI-160, ensure the following:

A: Posting of Decimal Point according to the capacity weight --------- SPEC 05 Bit 1-0

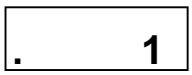
B: Load cell Output Sensitivity ---------- SPEC 04 Bit 3-0

C: Minimum Display Figure required ---------- 1 or 2 or 5

Next is the adjusting procedure.

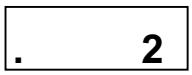
0. Set SPAN SW to ON. (SW6 on Board.)

1. Press (→) (T) (T) by holding (REZERO).

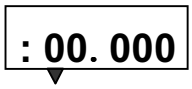


2. Press (↑) key to set minimum display figure.

➥ Display will read 1→ 2 →5 alternately each time the arrow key is pressed.

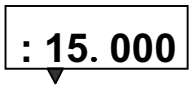


3. Press (REZERO) key.



4. Set capacity weight by using arrow keys.

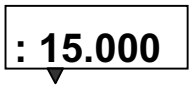
4 –1. Enter the capacity weight at the bit above " ▼ " by press (↑).



4 – 2. Move the " ▼ " mark to next bit according to capacity by (→).

Ex) In case of 15.000g of capacity weight, set it as shown on the right.

5. Press REZERO key, then enter the weight which is used to calibrate by taking the same steps as above #4 with arrow keys.



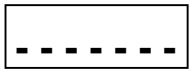
Ex) In case of using 15.000 kg of weight.

NOTE: When using less 30 % of capacity weight, weight error may be created Incidentally.

6. Press (REZERO) key.

➥ When finishing minimum display, calibration, the display will change →

7. Press (REZERO) key to calibrate a zero point .



8. Place the weight onto the platform.

9. Press (REZERO) key to calibrate SPAN counts . → Internal counts read.

10. Press (T) key to escape from Calibration Mode .

11. Set SPAN SW to OFF.

12. Check to see if the displayed weight is correct when placing 1 / 3, 2 / 3, and full capacity weight.

4. Machine Operation

4.1. Key Functions

(ON / OFF) ------To turn on or off the display.

(REZERO) ------To re-zero the scale.

(T) -------To set tare weight.

(→) -------To set digital tare weight value, /To shift digital that " ▼ " shown.

(↑) -------To set digital tare weight value, /To change numeric data for set-up mode.

4 .2. Sign-Lamps

▼Zero lamp ------▼sign will light up when current zero point is within 1/4d of true zero and true zero.

▼TARE lamp -------▼sign will light up when tare weight is set.

▼STABLE lamp ------▼sign will light up when weight/scale is in stable condition.

4 .3. ZERO Resetting

1. Place some weight on to the platform. (E.g. 100g)
2. Press (REZERO) key.

   ➥ Zero resetting will be executed.
3. If the weight is within the available range of zero resetting, the display will return to 0.

   If it is out of the range, the display will lock up with all 8.

4. 4. One-touch Tare Weight Reduction

1. Place tare on the platform. (e.g. 100g)
2. Press (T) key.
3. If the tare weight is within the available rang of tare reduction, the display will return to 0 and tare lamp "▼" will light up .

   If it is out of the range, the weight will remain in the display.
4. Weigh an item placing it on the platform. (E.g.. 1000g)
5. Remove the item from the platform.
6. Press (T) key to reset the tare weight.

4.5. Digital Tare Weight Reduction

1. Press → key to shift a digit to where tare weight to be set.

   ➥ Digit to set the tare will light on and off.

2. Press ↑ key to input the weight. Each time this key is pressed, the figure will advance 1 only.

3. Repeat step # 1 and # 2 until desired tare weight is set at each digit.

4. Press **T** key .

5. If the weight is within the available rang of tare reduction, the weight will read together with minus " – " sign and

   TARE lamp ▼ will light up .

   If it is out of the range, the display will return to 0.

6. Weigh an item. (E.g.. 1000g)

7. Remove the item.

8. Press T key to reset the tare weight.

4. 6. Error Display

ERROR	Probable Cause	Remedy
8 8 8 8 8 8 Lock-up **8 8 8 8 8 8** Lighting	Zero-point is out of range. Span SW is still ON.	Need to re-calibrate the scale. Turn SPAN SW off.
Lo-VOL	Power voltage drop.	Turn the power off and on. Check for power voltage.
IF-ERR	Time-out error in data transmission.	Press any key to restore.
0 0 0 0 Lighting on & off	Mercury SW is not level.	Level the Hg SW.

4.7. Quick Maintenance Operation Table

Key Operation	Functions	Display
LCD Segments Check ……All segments light up. Press any key to exit.	REZERO + → T →	8, 8, 8, 8, 8, 8 ▼ ▼ ▼ ▼ ▼ ▼
SPAN SW ON /OFF Check ……To check for SPAN SW Setting on / off. Press any key to exit.	REZERO + T → →	**S-On** Or **S-OFF**

Key Operation	Functions	Display
Internal Count Display (*) ----To display A / D row data ----Press ↑ key. To display internal Count, Press ↑. key. Press any key to exit.	REZERO + → → T	o
SPAN Adjustment (*) ……To calibrate scale/platform.	REZERO + T T →	*Refer to 3.2.
SPEC Setting for RS232C ……To set SPEC # 00- #03 Press T key to exit .	REZERO + T T T	*Refer to 3.3.
SPEC Setting for # 04- # 15 (*) ……To set SPEC data Press T key to exit.	REZERO + → → →	*Refer to 3.4.

NOTE: Key operation with mark * is required to set SPAN SW to ON .

5. RS-232C Data Output

5.1. General

This function is provided as standard for sending weight data (net & Tare Weight) to peripheral units like PC, Thus enabling to use for data transaction and analysis.

5.2. Transmission SPEC

- Baud Rate ---------- Any of 1200, 2400, 4800, 9600, 19200, bps. (SPEC 00 Bit 2- 0)
- Start Bit ---------- 1 bit
- Stop Bit ---------- 1 bit or 2 bit (SPEC 01 Bit 3)
- Data Bit ---------- 7 Bit or 8 Bit (SPEC 01 Bit 2)
- Parity Bit ---------- Any of EVEN , ODD , None (SPEC 01 Bit 1-0)

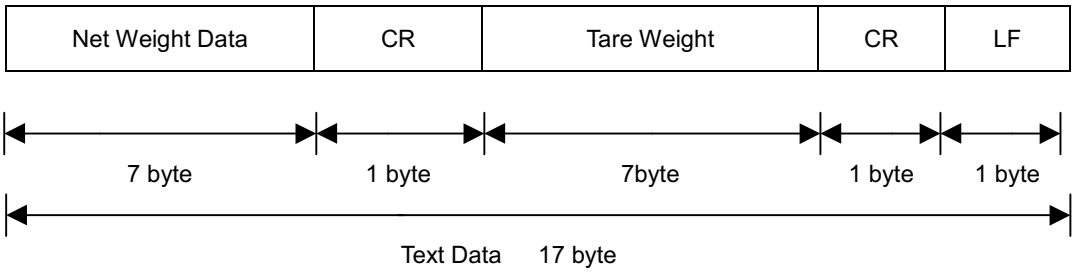
5.3. Text command (ASCII Code)

CR	(0DH)	----------	End of Data
LF	(0AH)	----------	End of Text
0 – 9	(30H – 39H)	--------	Numeric Data
-	(2DH)	----------	Minus
.	(2EH)	----------	Decimal Point

5.4. Connector and Signals (at CN – 2)

Connector:	8 – pins Modular		
Pin Configuration:	Pin # 3	----------	GND
	Pin # 6	----------	TXD (Sending Data)
	Pin # 8	----------	RXD (Receiving Data)

5.5. Text Format



Example)

In case of Net Weight = - 1. 230kg Tara Weight = 0.450kg

a) By Text Format:

.	0	1	.	2	3	0	CR	0	0	0	.	4	5	0	CR	LF

b) By ASCII Code :

2DH	30H	31H	2EH	32H	33H	30H	CR

30H	30H	30H	2EH	34H	35H	30H	CR	LF

NOTE:

- Net weight and tare weight excluding a sign is transmitted shifting to the right.
- When it is minus data (2DH) or plus data (30H) , net and tare weight data are transmitted setting 2DH or 30H into the left-most 1 byte of each 7 bytes data.
- In case of over-weight, the data will be transmitted as follows.

  a. With Header:

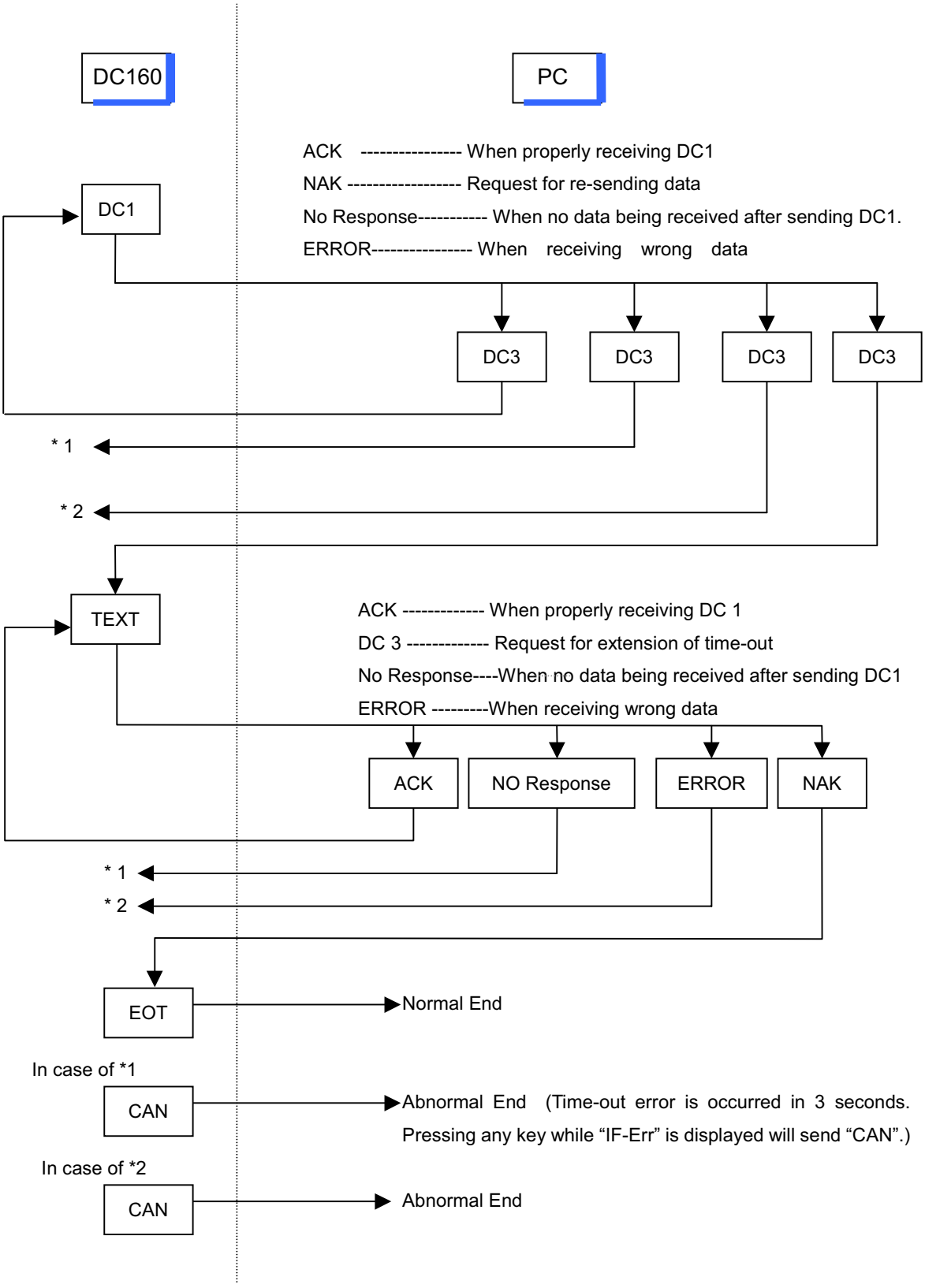
  0 ○ V 0 0 0 0 0 CR 4 ? ? ? ? ? ? ? CR LF

  b. Without Header

  ○ V 0 0 0 0 0 CR 4 ? ? ? ? ? ? ? CR LF

- Decimal point is transmitted as [,] … Comma “ 2CH “ , [.] … Period “ 2EH “ .

5.7. Transmission Procedures:



6. Disassembling

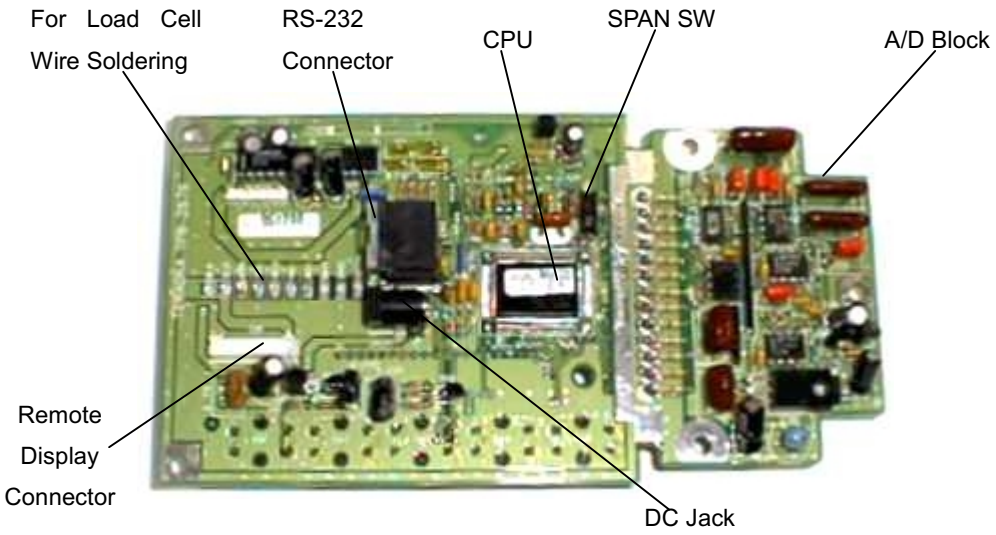
6.1. Disassembling of Indicator Block

1. Remove 5 screws from the rear side of the housing cover.

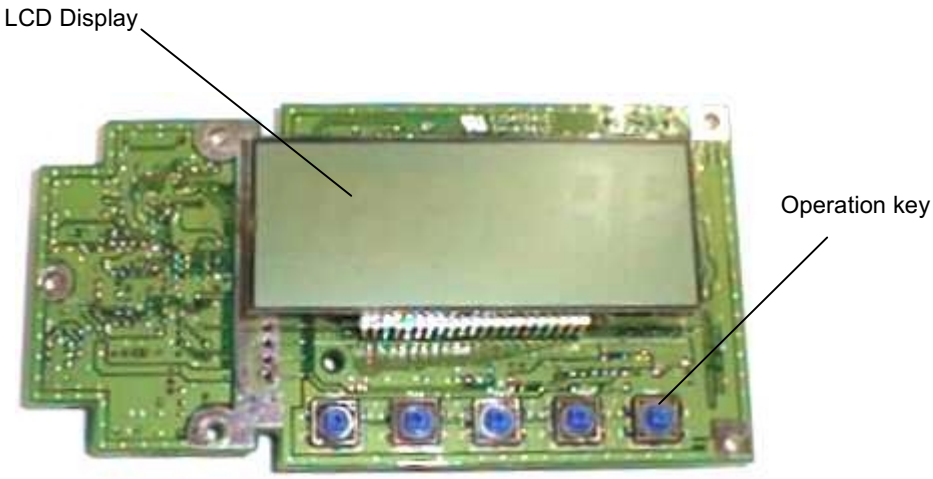
2. To remove the main PCB TPB-2574, remove 2 screws from A /D Board housing case.

3. Remove 4 screws at the corners and 1 screws inside of the PCB.
   Then you can remove the whole PCB from the housing.

7. Electrical Distribution



[Components Side]



[LCD & SW Side]

7.1. Block Diagrams & Circuit Diagrams

From the following pages,