User's Manual

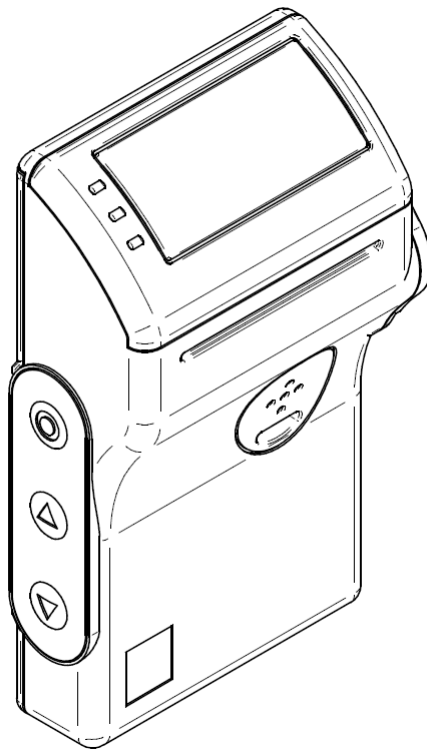**Electronic Personal Dosimeter**
NRF50

Introduction

This User's Manual is a document to explain the operation of the Electronic Personal Dosimeter

NRF50 sample unit briefly. It is organized to provide descriptions of parts, functions and operational

instructions for optimal use. Please make sure that you read this manual carefully before operation. If

there are some requirements or improvements about this sample unit, please contact Fuji Electric

representative.

Also, in the event of unit malfunction, contact Fuji Electric representative immediately.

Handling Precaution

Please read the following handling precautions to ensure that you use the sample unit safely and avoid injury/damages. Please read this User's Manual carefully to understand all the precautions before using the sample unit.

	Measures of Precaution

⚠️Attention	· The Dosimeter is a precision instrument; do not drop it or subject it to impact.
	· Keep the Dosimeter in a plastic bag for protection when use in an environment where chemical fumes, splashes/steam, full of dust and wastes are present.
	· Handle the Dosimeter with clean, dry hands. If becomes tainted, clean it with dry cloth.
	· Do not place the Dosimeter and metal objects in the same pocket. It may cause the Dosimeter breaking.
	· Avoid use where high frequency noise. Pay attention when use near the following devices:
	  1. Mobile phone
	  2. Premises/local wireless phone such as <PHS>
	  3. High power transceiver, or like kind
	  4. Microwave oven
	  5. Radar
	  6. Welding machine
	  7. Any other spark discharging or high intensity radio wave emitting devices
	   Especially keep the Dosimeter at least 5cm away from any mobile/ wireless phones
	· When the battery level is critically low, read the displayed value within 10 minutes.
	· Use AA alkaline battery only. During replacement, align the battery polarities correctly.
	· Prior to disposal of the used battery, protect exposed terminals with insulating tape to prevent shorting that may cause possible heating, rupture, or burning. Otherwise, injury or fire may result.
	· Do not throw the Dosimeter or battery into a fire. Do not disassemble them.
	· Keep distance between the buzzer and ears to avoid the injury. (Buzzer makes the sound over 90dB)
	· Do not use the Dosimeter as a survey meter.
	· If a hard impact operating on the Dosimeter, it is fear of having a crack to the Dosimeter. In this case, it is capable of deteriorations to the capabilities in a waterproof and a resistance of radio wave.

Contents

1.   Overview

The Electronic Personal Dosimeter NRF50 (hereinafter referred to as NRF50) is designed to provide

measurement of personal dose equivalent of external exposure to radiations (hereinafter referred to as

dose).

NRF50 indicates accumulated dose or dose rate. It measured dose (rate) value exceeds preset dose

(rate) threshold (Alarm threshold), NRF50 will be audibly alarmed and flashes LED.

Using the Setting Device and a PC, it is able to write PC-edited values to NRF 50 and read measurement

trend data from the NRF50 via communication with the device.

If worn tight to the body, energy characteristic of the NRF50 enables direct reading of personal dose

equivalent Hp(10). (unit: rem)

2.   Contents

2.1   Sample unit package

(1) NRF50   1

(2) Accessory

・Battery (AA alkaline battery)   2

2.2   Model

NRF50

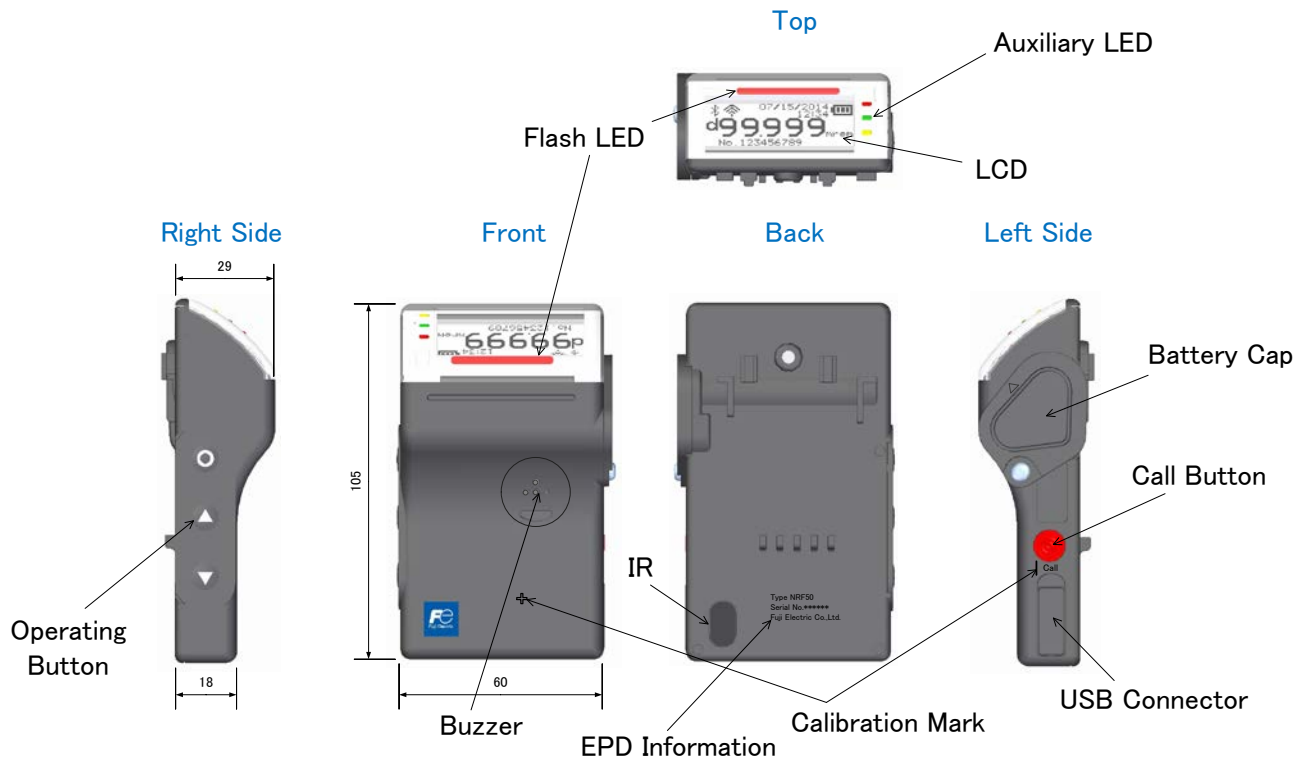# 3. Precaution

⚠️Attention

3.1 Operational conditions

Item	Conditions
Temperature range	-10 °C to +50 °C
Relative humidity	95 % or less (No condensation)
Storage temperature	-25 °C to +50 °C

3.2 Other requirements

(1) See User's Manual of "Setting Device" for information on parameter writing and data reading via the device and a PC.

(2) Try turn OFF & ON the NRF50 if you encounter technical problems. See the "Troubleshooting Table" if not recovered.

(3) Accumulated dose cannot be reset if the power-on-reset setting of NRF50 is "OFF". In this case, please reset the accumulated dose through the Setting Device.
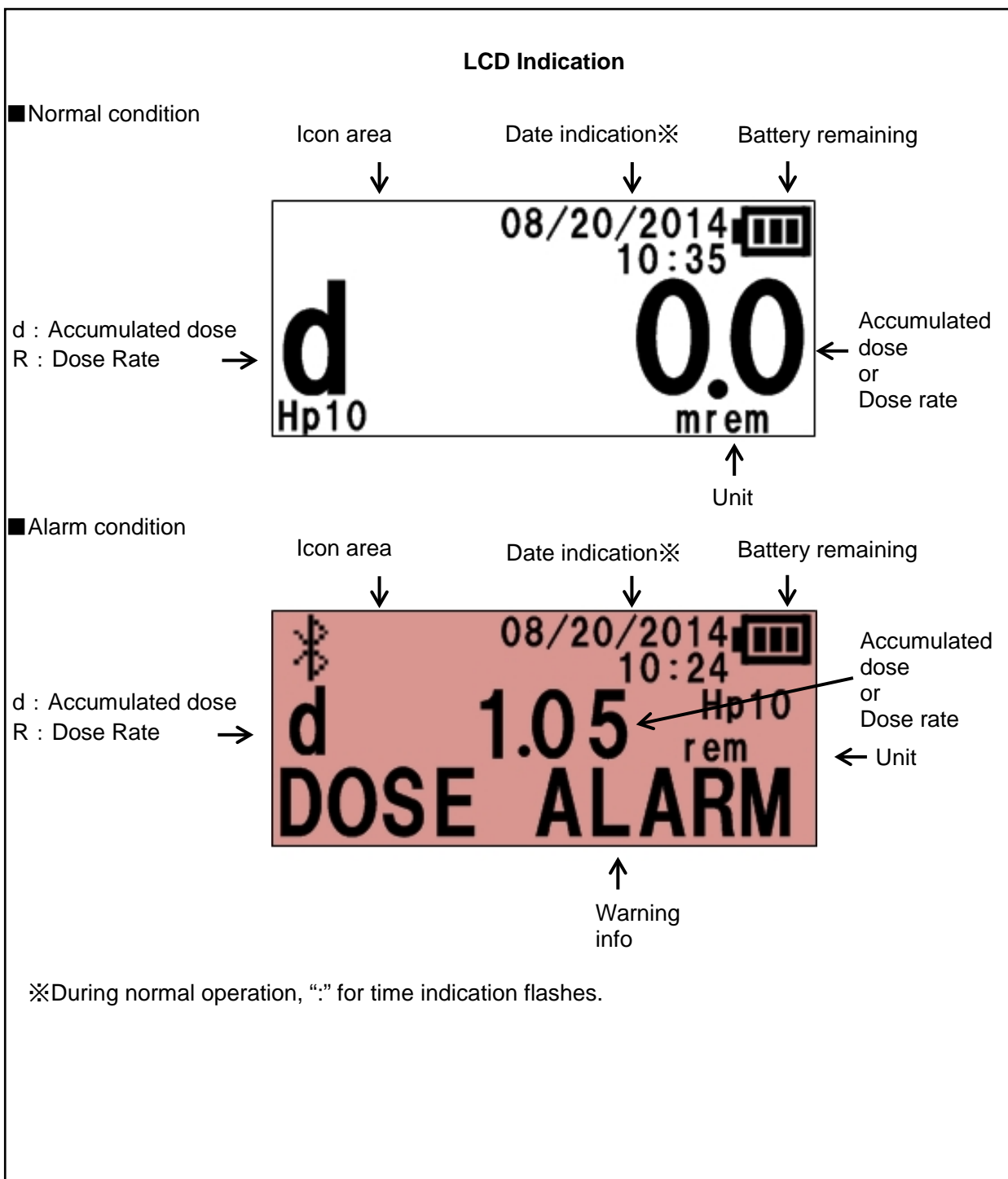
4.   Description of Parts and Functions

4.1   Part names

Top

Auxiliary LED

Flash LED

LCD

Right Side   Front   Back   Left Side

29

105

18

60

Operating
Button

Buzzer

EPD Information

IR

Calibration Mark

Battery Cap

Call Button

USB Connector

Type NRF50
Serial No.******
Fuji Electric Co.,Ltd.

Functions

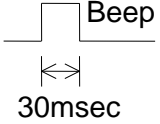|		
1. Buzzer	:	Sounds when starting, alarm and monitoring sound is generated.
2. Flash LED	:	Red LED on top of LCD flashes during alarm generation.
3. Auxiliary LED	:	Green LED flashes along to monitoring sound. Red LED flashes along to alarm. Yellow LED flashes along to preliminary alarm.
4. LCD	:	Liquid Crystal Display Indicator.
5. Battery Cap	:	Cap of battery compartment. Tighten with screw.
6. Operating Button	:	Switch indication screen. Also, alarm threshold can be changed by this button.
7. Calibration Mark	:	Shows location of calibration point. (Sensor position)
8. USB Connector	:	For power supply or communication by connecting USB cable.
9. IR	:	For communication with infrared communication device.
10. Call Button	:	Emergency alarm button. Press for more than 3 seconds to generate warning sound and indication.
11. EPD Information	:	For indicating model and serial number of the NRF50.

4.2 Display function

LCD Indication

■Normal condition

Icon area Date indication※ Battery remaining

↓   ↓   ↓

08/20/2014 ▐▌▌▌
10:35

d : Accumulated dose
R : Dose Rate →

d
Hp10   **0.0**
mrem

Accumulated
dose
or
Dose rate

↑
Unit

■Alarm condition

Icon area Date indication※ Battery remaining

↓   ↓   ↓

08/20/2014 ▐▌▌▌
10:24

d : Accumulated dose
R : Dose Rate →

d   **1.05**   Hp10
rem
DOSE ALARM

Accumulated
dose
or
Dose rate

← Unit

↑
Warning
info

※During normal operation, ":" for time indication flashes.

4.3   Buzzer function

4.3.1 Audible signal

Audible signals sound under the following circumstances:

Signal beep	Starts when	Beep pattern
Turn ON/OFF	NRF50 is turned on	⎍ Beep ↔ 30msec
	NRF50 is turned off	No sound
Contact to setting device	Communication starts.	No sound
Data transmission	Successful completion of data transmission	No sound
	Setting values of NRF50 are changed using a setting device.	No sound
	Data transmission failed	No sound

4.3.2 Audible alarms

Alarm activations and beep patterns are as follows:

① Dose value alarm

Alarm type	LCD indication	Buzzer	Vibration	LED
Alarm for accumulated dose	08/20/2014 10:24 Hp10 d 1.05 rem DOSE ALARM	Sounds 3 times per 1 second	Vibrates 1 time per 1 second	Flashes 1 time per 1 second Alarm： Flash LED + Auxiliary LED (RED) Preliminary alarm： Auxiliary LED (YELLOW)
Preliminary alarm for accumulated dose	08/20/2014 10:24 Hp10 d 0.52 rem DOSE WARN			
Alarm for dose rate	08/20/2014 10:24 Hp10 R 1.05 rem/h RATE ALARM	Sounds 2 times per 1 second (Long beep)		
Preliminary alarm for dose rate	08/20/2014 10:24 Hp10 R 0.52 rem/h RATE WARN			

Operating time

② Operation time alarm

Alarm type	LCD indication	Buzzer	Vibration	LED
Time alarm	08/20/2014 10:24 Hp10 R 0.1 mrem/h TIME 8:00	Sounds 1 time per 1 second (Short sound)	Vibrates 1 time per 10 seconds	Flashes 1 time per 10 seconds Flash LED + Auxiliary LED (RED)

Operating time

③ Low battery voltage

Alarm type	LCD indication	Buzzer	Vibration	LED
Low battery voltage	08/20/2014 10:24 Hp10 R 0.140 rem/h LOW BAT 8h	Sounds 3 times per 10 minutes (Short sound)	No vibration	Flashes 1 time per 10 minutes Auxiliary LED (RED)
Operating time				

④ Indication of abnormality

Alarm type	LCD indication	Buzzer	Vibration	LED
Detector optical error	08/20/2014 10:24 Hp10 R _ _ _ _ _ rem/h OPTI ERROR	Sounds 4 times per 1 second	Vibrates 1 time per 1 second	Flashes 1 time per 1 second Flash LED + Auxiliary LED (RED)
Memory error	08/20/2014 10:24 Hp10 R 0.300 rem/h MEM ERROR			
Memory error (When measurement stops)	08/20/2014 10:24 Hp10 R _ _ _ _ _ rem/h MEM ERROR			
RTC error	08/20/2014 10:24 Hp10 R 0.101 rem/h RTC ERROR			
RTC error (When measurement stops)	08/20/2014 10:24 Hp10 R _ _ _ _ _ rem/h RTC ERROR			
Emergency alarm	08/20/2014 10:24 Hp10 R 12.1 mrem/h EMERGENCY			
Operating time				

4.3.3 Monitoring Sound

Buzzer sounds 1 time, if accumulated dose reaches a preset value of dose interval for monitoring sound. Monitoring sound interval can be chosen from 6 types such as "OFF", "10mrem", "1mrem", "0.1mrem", "8 counts" and "4 counts". Please see User's Manual of "Setting Device" for details.

5.   Parts Replacement

5.1   Battery replacement

Follow these steps to replace the batteries:

(1) Press and hold "◎" button to turn NRF50 off.

(2) Open the cap of battery compartment using screwdriver.

(3) Replace the batteries.

Insert new ones properly in the compartment with care to check the directions "+" and "-".

(Both batteries are positioned in the same direction)

(4) Close the cap and tighten with screwdriver.
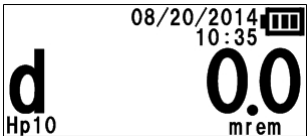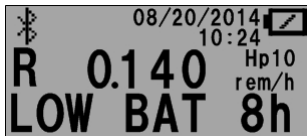
⚠ Attention	① When replacing batteries, make sure to turn off NRF50. ② During replacement, align the battery polarity correctly. ③ Use only AA Alkaline battery.

6.   Operational Instruction

6.1   When starting to use

(1) Press and hold "◎" button for more than 3 seconds to start the NRF50. Confirm the power is ON (one

beep) and LCD.

In case NRF50 is left without battery for more than 1 day

Normal condition

DATE SETUP & TIME SETUP
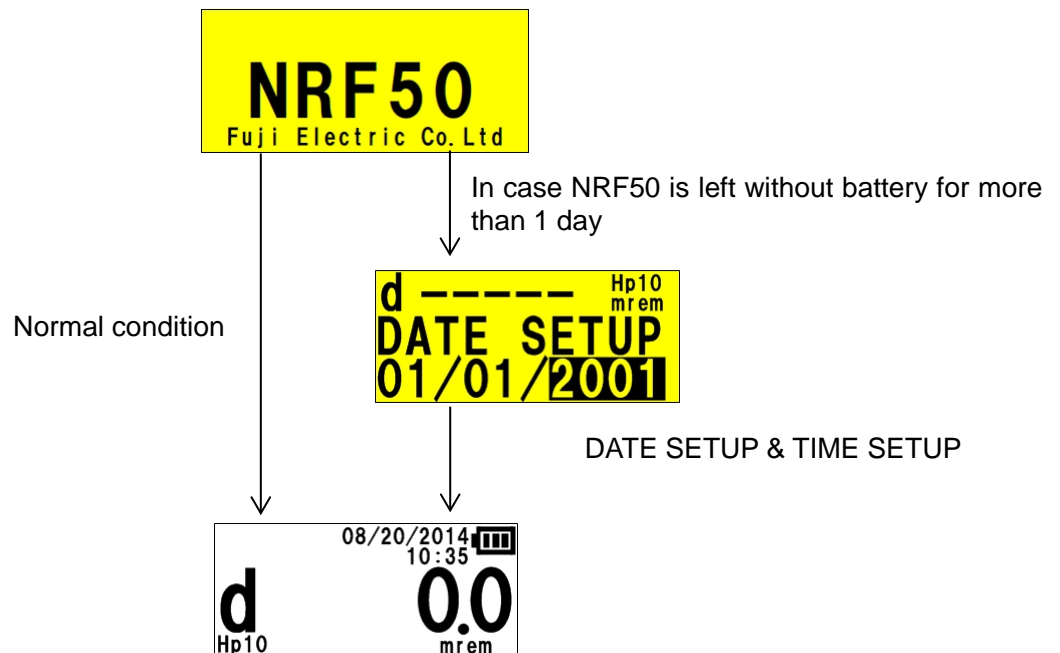
Check items	Confirmation method	
Audible signal (1 beep)	Generates when turning on the power.	
Indicated dose value	0.0 mrem or 0.0 mrem/h (Accumulated dose may not be 0.0 mrem if the power-on-reset setting of NRF50 is "OFF".)	
LCD	〔Normal display〕 When accumulated dose is 0.0mrem	〔Abnormal display〕 When generating alarm for low battery

(2) White backlight turns on by selecting any of "◎", "△" or "▽" button.

Display of accumulated dose (rem) and dose rate (rem/h) can be switched by pushing

the button of "△" or "▽". "◎" button can also switch the display to other screens.

Please see section 6.2 in details for screen change methods by "◎" button.

(3) Put NRF50 in the chest pocket as shown below.

① When putting in an outside pocket
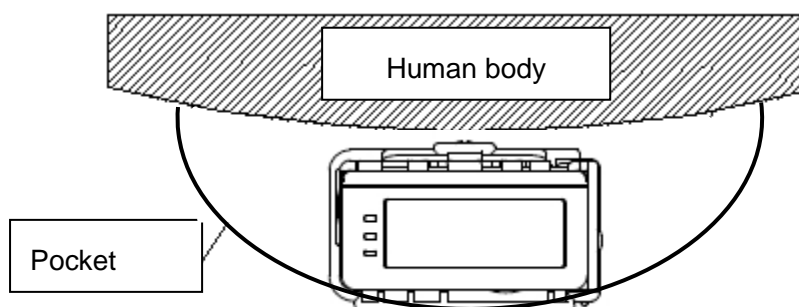
② When putting in an
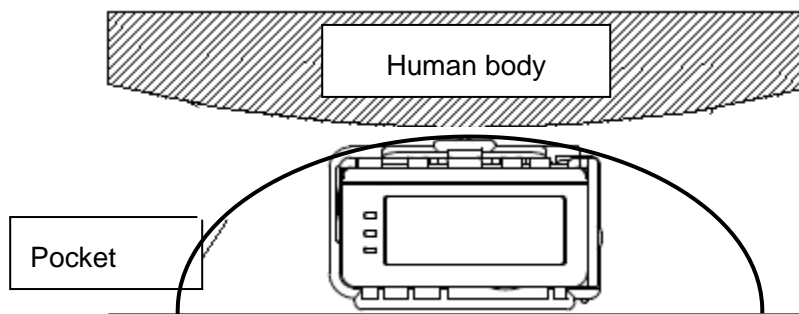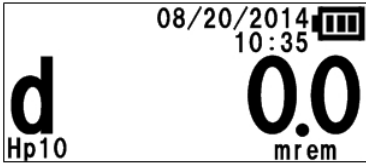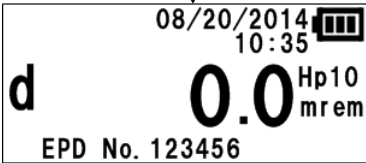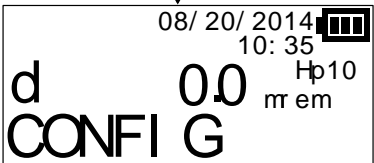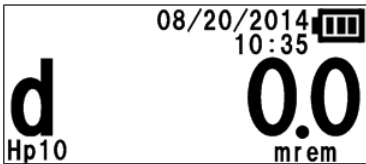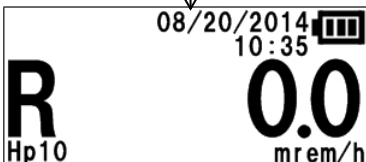
※Direction of NRF50:
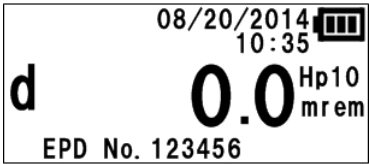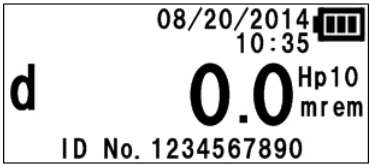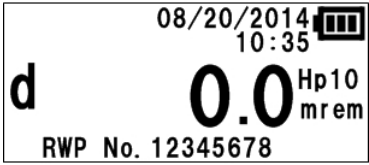
As EPD is viewed from wearer, operation button and auxiliary LED must be positioned so that they are in

the right side, and buzzer faces outward.
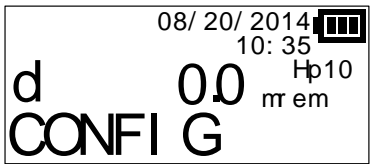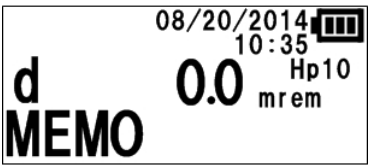
6.2 During use (Normal operation)

LCD display during operation of button
※LCD display will be changed when pressing the designated button with backlight flashed.

No.	Display	Remarks
1	【Basic display】 ⇒To No.2 08/20/2014 🔋 10:35 **d** **0.0** Hp10 mrem 【Number indicating display】 Short press of "◎" ⇒To No.3 08/20/2014 🔋 10:35 **d** **0.0** Hp10 mrem EPD No. 123456 【Setting display】 Short press of "◎" ⇒To No.4 08/ 20/ 2014 🔋 10: 35 **d** **0.0** Hp10 mrem **CONFI G** Short pressing of "◎"	Power turns off by long press of "◎" button. (Basic display or number indicating display) Indication is changed by short press of "△" or "▽" button in each display.
2	【Basic display】 Switching 08/20/2014 🔋 10:35 **d** **0.0** Hp10 mrem Indication of accumulated dose Short press of "△" or "▽" 08/20/2014 🔋 10:35 **R** **0.0** Hp10 mrem/h Indication of dose rate	Power turns off by long press of "◎" button.
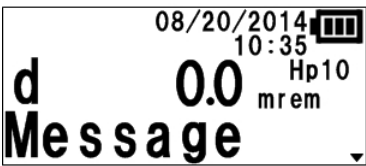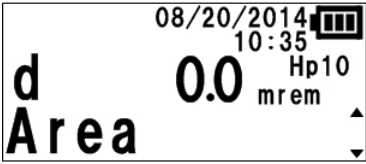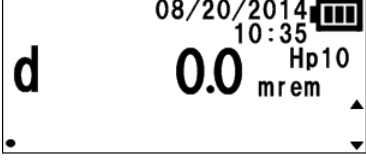
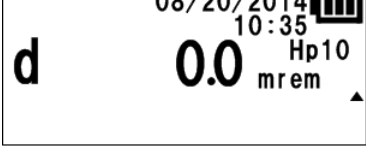| No.	Display	Remarks
3	【Number indicating display】 Switching Short press of "▽" 08/20/2014 ▉▉▉ 10:35 d 0.0 Hp10 mrem EPD No. 123456 — EPD number indication Short press of "▽" Short press of "△" 08/20/2014 ▉▉▉ 10:35 d 0.0 Hp10 mrem ID No. 1234567890 — ID number indication Short press of "▽" Short press of "△" 08/20/2014 ▉▉▉ 10:35 d 0.0 Hp10 mrem RWP No. 12345678 — RWP number indication Short press of "△"	Power turns off by long press of "◎" button.

No.	Display	Remarks
4	【Setting Display】 Switching Short press of "▽" 08/ 20/ 2014 10: 35 Hp10 d 0.0 mrem CONFI G Configuration Long press of "◎" to change display for setting items Short press of "▽" Short press of "△" ⇒ To No.5 08/20/2014 10:35 Hp10 d 0.0 mrem MEMO Memo Long press of "◎" to change a memo indicating display Short press of "△" ⇒ To No.6	Long press of "◎" to change each display.

No.	Display		Remarks
5	【Setting items display】 Switching Short press of "▽" d　　0.0 Hp10 mrem NAME JOHN MAYER　　Name setting Short press of "▽"　　Short press of "△" d　　0.0 Hp10 mrem DOSE ALARM 00. 1000 rem　　Accumulated dose alarm setting Short press of "▽"　　Short press of "△" d　　0.0 Hp10 mrem DOSE WARN 00. 0500 rem　　Accumulated dose preliminary alarm setting Short press of "▽"　　Short press of "△" d　　0.0 Hp10 mrem RATE ALARM 00. 0100 rem/h　　Dose rate alarm setting Short press of "▽"　　Short press of "△" d　　0.0 Hp10 mrem RATE WARN 00. 0050 rem/h　　Dose rate preliminary alarm setting Short press of "△" to the next page		Short press of "◎" to change set values. (Yellow backlight turns on) Long press of "◎" to confirm the change. Name can be entered with 10 characters from A to Z. Alarm value can be set with numbers of 0 to 9.

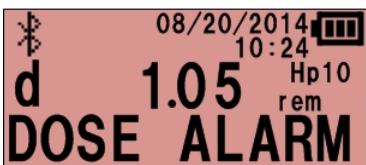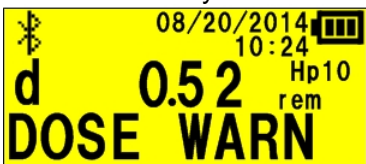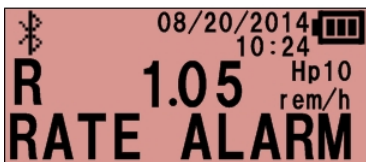| No.	Display	Remarks
5	【Setting items display】 Switching (continued) from the previous page Short press of "▽" d 0.0 Hp10 mrem TIME ALARM 08:00 Operating time alarm setting Short press of "▽" Short press of "△" d 0.0 Hp10 mrem BEEP LEVEL 10mrem Monitoring sound setting Short press of "▽" Short press of "△" d 0.0 Hp10 mrem DATE SETUP 08/ 20/ 2014 Date setting Short press of "▽" Short press of "△" d 0.0 Hp10 mrem TIME SETUP 10: 35: 00 Time setting Short press of "▽" Short press of "△" d 0.0 Hp10 mrem MODE STANDALONE Mode setting (Only confirmation) Short press of "△" to the next page	Change a set value for each items by short press of "◎". (Yellow backlight turns on) Confirm the change by long press of "◎". Alarm setting, date and time setting can be set with numbers 0 to 9. Monitoring sound can be set in "10mrem", "1mrem", "0.1mrem", "8PLS" (8 counts), "4PLS" (4 counts) and "OFF".
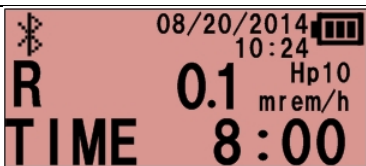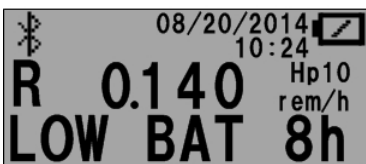
No.	Display	Remarks
5	【Setting items display】 Switching (continued) from the previous page Short press of "∇" Short press of "△" d　　0.0 Hp10 mrem VERSION 01. 00R00 Version (Only confirmation) Short press of "∇" Short press of "△" d　　0.0 Hp10 mrem SETUP END Setting completed ⇒ To No.4 Short press of "△"	TN5A2293　24/37 Return to setting display by short press of "◎".
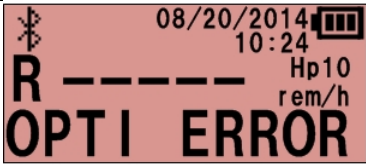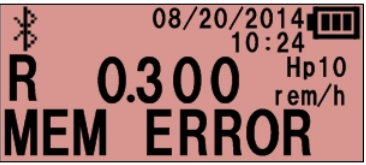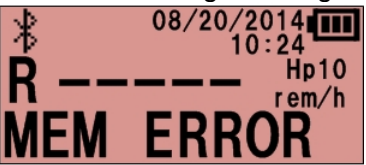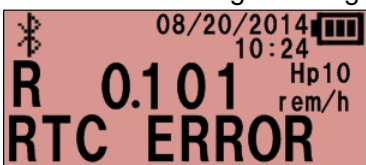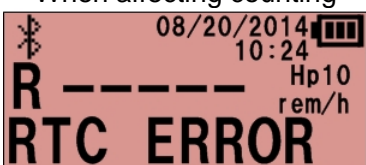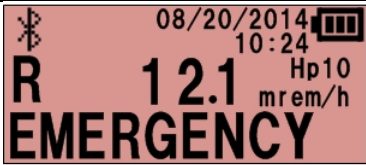
No.	Display	Remarks
6	【Memorandum】 08/20/2014 10:35 Hp10 d 0.0 mrem Message Memo display (1 to 10 characters) Short press of "▽" ↓ ↑ Short press of "△" 08/20/2014 10:35 Hp10 d 0.0 mrem Area Memo display (11 to 20 characters) Short press of "▽" ↓ ↑ Short press of "△" 08/20/2014 10:35 Hp10 d 0.0 mrem Memo display (21 to 30 characters) Short press of "▽" ↓ ↑ Short press of "△" 08/20/2014 10:35 Hp10 d 0.0 mrem Memo display (31 to 32 characters)	Return to setting display by long press of "◎".

6.3 During use (When alarm is generated)

LCD display when generating alarm
※See Chapter 4 for operation of buzzer, vibration and LED during alarm generation.
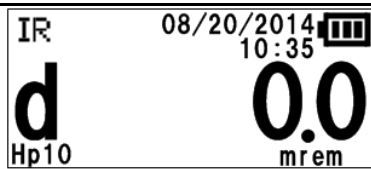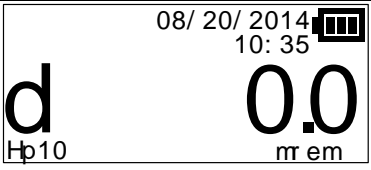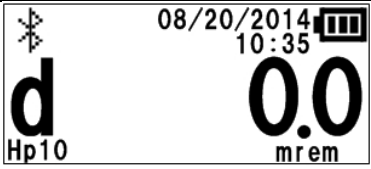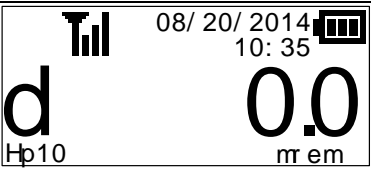
No	Item	Display	Remarks
1	Accumulated dose alarm	Alarm 08/20/2014 10:24 d 1.05 Hp10 rem DOSE ALARM Preliminary Alarm 08/20/2014 10:24 d 0.52 Hp10 rem DOSE WARN	Preliminary alarm is generated, when exceeding warning set value. Alarm is generated, when exceeding alarm set value.
2	Dose rate alarm	Alarm 08/20/2014 10:24 R 1.05 Hp10 rem/h RATE ALARM Preliminary alarm 08/20/2014 10:24 R 0.52 Hp10 rem/h RATE WARN	Preliminary alarm is generated, when exceeding warning set value. Alarm is generated, when exceeding alarm set value. See chapter 4 for alarm operation. Alarm is canceled, when dose rate reaches 90% of preset value or less.
3	Operation time alarm	08/20/2014 10:24 R 0.1 Hp10 mrem/h TIME 8:00	When exceeding alarm set time, time alarm is generated.
4	Low battery voltage	08/20/2014 10:24 R 0.140 Hp10 rem/h LOW BAT 8h	Low battery voltage alarm is generated, when battery voltage reaches less than 1.1V. Remaining operational hours is displayed with numbers 1 to 9 h, then power OFF after 1 hour.

No	Item	Display	Remarks
5	Detector optical error	08/20/2014 10:24 Hp10 rem/h R – – – – – OPTI ERROR	When detector cannot work properly for internal optical pulse check by internal LED, detector optical error alarm is generated.
6	Memory error	When not affecting counting 08/20/2014 10:24 Hp10 rem/h R 0.300 MEM ERROR When affecting counting 08/20/2014 10:24 Hp10 rem/h R – – – – – MEM ERROR	When memory failure occurs during data backup, memory error alarm is generated. When not affecting counting, operation continues, and when affecting counting, operation stops holding the dose (rate) display.
7	RTC error	When not affecting counting 08/20/2014 10:24 Hp10 rem/h R 0.101 RTC ERROR When affecting counting 08/20/2014 10:24 Hp10 rem/h R – – – – – RTC ERROR	RTC error alarm is generated, Real Time Clock (RTC) IC error occurs. When not affecting counting, operation continues, and when affecting counting, operation stops holding the dose (rate) display.
8	Emergency alarm	08/20/2014 10:24 Hp10 mrem/h R 12.1 EMERGENCY	Emergency alarm is generated, when pressing "call" button for more than 3 seconds.

6.4   During use (When communicating)

LCD display during communication

No	Item	Display	Remarks
1	Infrared communication	IR 08/20/2014 10:35 d Hp10 0.0 mrem	"IR" is displayed on the upper left of screen during infrared communication.
2	USB communication	08/ 20/ 2014 10: 35 d Hp10 0.0 mrem	Icon does not appear during USB communication.
3	Bluetooth communication	08/20/2014 10:35 d Hp10 0.0 mrem	"Bluetooth mark" is displayed on the upper left of screen during Bluetooth communication.
4	900MHz wireless telemetry	08/ 20/ 2014 10: 35 d Hp10 0.0 mrem	"Telemetry mark" is displayed on the upper left of screen during communication with 900MHz wireless telemetry.

6.5   After use

Turn OFF by long press of "◎" on basic display or number indicating display.

7.   Care and Maintenance

Check the NRF50 as specified below to ensure quality performance.

7.1   Daily check and maintenance items

No	Check items	Procedures	Check point
1	Appearance	Check the NRF50 visually. When to check ; Before use and after battery replacement Check purpose ; Check if there is no abnormality with the case and battery cap.	No signs of crack, damages or breakage on the case. No signs of gap between case and battery cap.
2	Indication error/ calibration	To confirm the indication error within 10% to the reference dose equivalent using Cs-137. When to check: 1 year or less Check purpose: To optimize the dose management.	If indication error is over 10%, please Contact Fuji Electric representative for calibration of NRF50.

7.2   Consumable supplies

Please Contact Fuji Electric representative for the following consumables.

①   Battery cap with O-ring   : Order from 1 unit

② USB connector cap   : Order from 1 unit

8.   Specification

8.1   General Specification

Model   : NRF50
Category   : Grade 1
Detector   : Silicon semi-conductor
Radiation type   : γ(X) rays (30 keV to 7.0 MeV)
Dose display range: 0.1 mrem to 1000 rem, 0.1 mrem/h to 1000 rem/h
Effective measurement range: 2.0 mrem to 1000 rem, 0.05 mrem/h to 1000 rem/h (accumulated dose)
                             10.0 mrem/h to 1000 rem/h (dose rate)
Rated range   : Gmha (category for IEC61526)
                   60 keV to 6 MeV, 10.0 mrem to 1000 rem, 0.05 mrem/h to 1000 rem/h
Indication error : Within ±10 % (Cs-137, 2.0 mrem to 1000 rem)
                   Within ±30 % (Cs-137, 10.0 mrem/h to 100.0 mrem/h)
                   Within ±20 % (Cs-137, 100.0 mrem/h to 1000 rem/h)
Energy response : Relative response 0.71 to 1.67 (60 keV to 6 MeV,   0° to 60°)
Temperature characteristic: -13 % to +18 % (20 °C, -10°C to +40°C)

Temperature test result
Left for 4 hours in each temperatures. Evaluated by amount of change in the last 30 minutes.

Reference (20°C)		-10°C			50°C		
variation	(mrem)	variation	(mrem)	result	variation	(mrem)	result
	1.004		1.032	2.79%		0.932	-7.17%

Dimensions   : approx. 105 mm(H) × 60 mm(W) × 29/18 mm(D) (excluding protrusion)
Weight   : approx. 170 g (2 Batteries), approx. 100 g (Battery excluded)
Battery   : AA alkaline battery (x 2)
Continuous operating time: more than 1000 hours (under normal temperature, no alarms, new battery)
Reference standards: IEC61526 Ed3.0(2010), ANSI N42.20(2003)

8.2   Storage data

①   List of storage data (Updated value is stored in EEPROM every 1 minute)
・EPD number
・Current time
・Current accumulated dose
・Current dose rate
・Operating time
・Alarm setting values (Accumulated dose, Dose rate : 2 for each)
・Time alarm setting value
・Calibration factor
・Error flag
・Condition flag
・Other setting values

② Trend data storage
Following data is stored at preset interval of trend. (max. 4000)
・Measurement date
・Accumulated dose
・Maximum dose rate

9. Appendix

9.1 Trouble shooting table

Error Indication	Possible Cause	Suggested Solution
「OPTI ERROR」	(1)Sensor unit malfunction (2)CPU malfunction	(1),(2) Contact Fuji Electric representative.
「MEM ERROR」	(1)EEPROM malfunction (2)CPU malfunction	(1),(2) Contact Fuji Electric representative.
「RTC ERROR」	(1)RTC malfunction (2)CPU malfunction	(1),(2) Contact Fuji Electric representative.

When returning the item to Fuji Electric representative, please provide with precise details of problems.

Note：This table is applied only to the malfunctions that occurs during use.

Symptom	Possible Cause	Suggested Solution
No indications on LCD	(1) Defective battery connection (2) Mode switch malfunction (3) LCD malfunction (4) CPU malfunction	(1) Check battery polarity and there is no exogenous material. (2)～(4) Contact Fuji Electric representative.
Characters on LCD are garbled.	(1) LCD malfunction (2) CPU malfunction	(1),(2) Contact Fuji Electric representative.
Backlight does not light when pressing a mode switch.	(1) Mode switch malfunction (2) LCD malfunction (3) CPU malfunction	(1)～(3) Contact Fuji Electric representative.
Dose error ・Dose accumulation does not work ・Displayed dose is high ・Displayed dose is low	(1) LCD malfunction (2) Sensor unit malfunction (3) CPU malfunction (4) Calibration constant trouble	(1)～(3) Contact Fuji Electric representative. (4) Check calibration factor. Contact Fuji Electric representative for calibration method.
Buzzer does not sound	(If display is correct) (1) Attached Exogenous material (2) Set frequency failure (3) Buzzer lead wire is broken (4) CPU malfunction	(1)Check if there is no dust. If it is not improved after removing a dust, Contact Fuji Electric representative. (2)～(4) Contact Fuji Electric representative.
Vibration does not work	(1) Vibration malfunction (2) CPU malfunction	(1),(2) Contact Fuji Electric representative.

Symptom	Possible Cause	Suggested Solution
LED does not light	(1) LED unit malfunction (2) CPU malfunction	(1),(2) Contact Fuji Electric representative.
Operational hour is short Battery voltage alarm is always displayed	(1) End of the battery's life (2) Increase the current consumption (3) CPU malfunction (4) Failure of voltage decline detection value	(1) Replace with a new battery. See "5.1". (2) Check the proper contacts in the battery compartment and there is no exogenous material in the battery case. If trouble continues, Contact Fuji Electric representative. (3),(4) Contact Fuji Electric representative.
IR communication is unable.	(1) Communication distance is too far (2) Communication port is dirty. (3) CPU malfunction (4) Malfunction of setting software (PC)	(1) Set the distance between Communication port of NRF50 and the Setting device within 5cm. Also confirm that these windows are face to face. (2) Clean the communication part with soft cloth. Check if there is no exogenous material. If trouble continues, contact Fuji Electric representative. (3) Contact Fuji Electric representative. (4) Refer to the instruction manual of setting software to check if setting is proper.
USB communication does not work	(1) Cable malfunction (2) Connector malfunction (3) CPU malfunction	(1)Check conduction to confirm there is no problem with the cable. (2),(3) Contact Fuji Electric representative.
Bluetooth communication does not work	(1) Module malfunction (2) CPU malfunction (3) Abnormal pairing setting	(1),(2) Contact Fuji Electric representative. (3) Refer to software instruction manual to check if setting is proper.
Telemetry communication does not work	(1) Module malfunction (2) CPU malfunction	(1),(2) Contact Fuji Electric representative.
Crack, breakage, damage on the case	(1) Breakage due to drops, etc.	(1) Contact Fuji Electric representative.

9.2   Disposal

Please follow the local raw and regulation for disposal of the product.

9.3　Calibration

This section describes the calibration procedures for NRF50.

Expose NRF50 to the gamma-ray sources such as ^{137}Cs and ^{60}Co.

A dose should be measured by placing the source at a certain distance (calibration distance) from reference point of NRF50 so that true value of the dose is traceable to the National Standard.

(1) Determination of a reference dose rate value (R_0)

-　　Determine a reference dose rate value (R_0) by the following method:

 a. Calculate R_0 from the reference source activity and the distance between the reference source and reference point of NRF50 (calibration distance).

 b. Or the dose value at the reference point (R_0) may be simply well-known by field calibration/characterization.

(2) Dose value (R_1) measurement

-　Place the source such as ^{137}Cs and ^{60}Co at the calibration distance from reference point of NRF50.

-　Take the dose reading (R_1) after irradiation which gives enough value of dose.
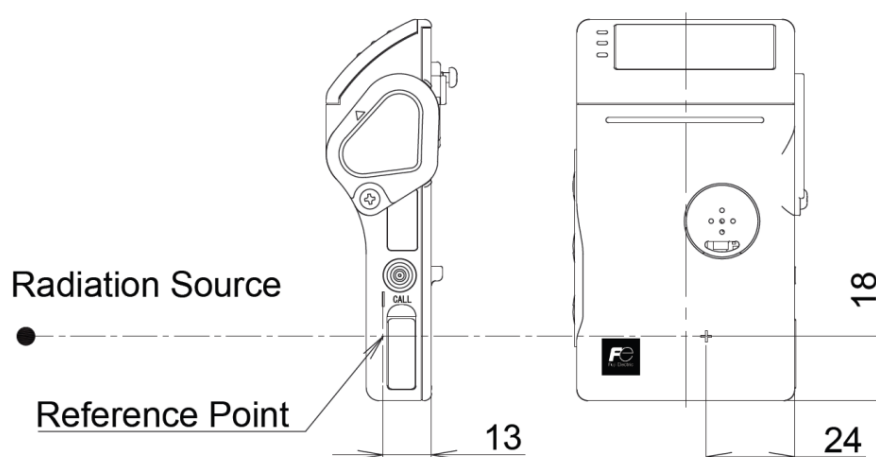
Example of Geometrical Conditions

(3) Calculation of the calibration factor

- Compare the reference dose (R_0) and the dose reading (R_1). If there is an unacceptable difference between R_0 and R_1, change the calibration factor.

In general, the calibration factor (C_1) is calculated by the following formula:

$$C_1 = C_0 \times R_0/R_1$$

C_0: Original Calibration Factor

(4) Setup of the calibration factor

- To change the calibration factor, perform the following procedures:

a. After the irradiation, run configuration software.

b. Click on "Calibration", enter the calculated calibration factor (C_1) to the new value of gamma-ray calibration factor.

c. Press the "Write" button.

d. Confirm the current value is set to the new value.

9.4 Block diagram

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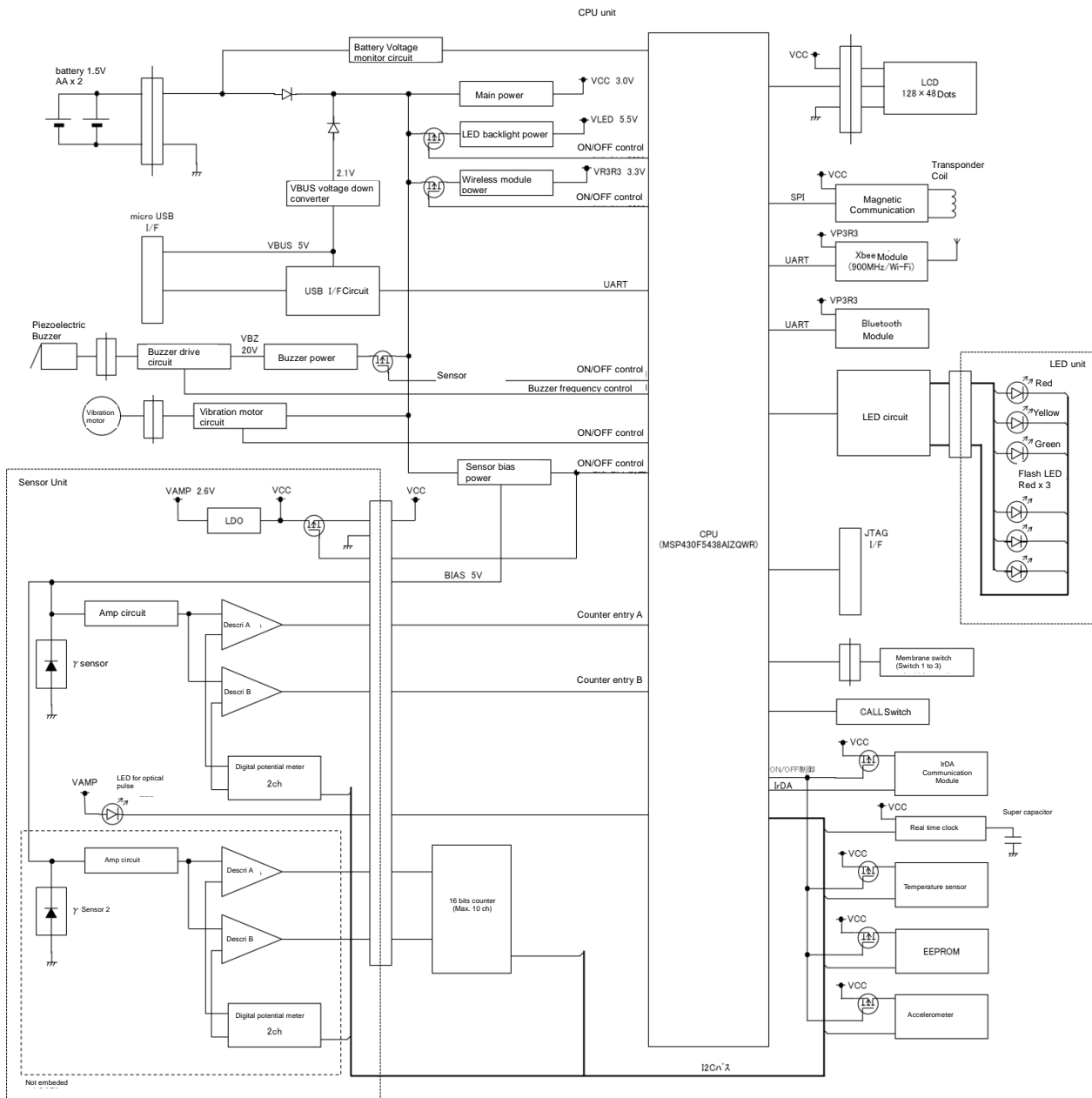
<table>
<tr><td colspan="2" align="center">★   Your Comment   ★</td></tr>
</table>

Dear customers,

   Any comments/ requests/ suggestions regarding our instruction manual? Please feel free to contact us by filling out this form and give to our sales representative.

Document No	TN5A2293		Date		year month day
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				Dept	
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