I N S T R U C T I O N

M A N U A L

PALM CONTAMINATION MONITOR (HJfZH)

TYPE : PCM 738H

NUCLEONIX SYSTEMS PRIVATE LIMITED

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File Name : PCM 738A

Contents

CHAPTER- I

INTRODUCTION

Palm Contamination Monitor PCM 738B manufactured by NUCLEONIX SYSTEMS primarily serves as a personnel monitoring system for checking the Beta / Gamma contamination of Palm of radiation workers / technicians working in Nuclear Power Plants, reactors, Radiochemical plants and other similar installations. This is wall mounted design.

Start of counting is initiated by an IR source detector arrangement on detection of palm. It can also be used as a frisker for checking clothing etc after disconnecting IR sensor connector

Guidance to the user during monitoring is in the form of textual messages during monitoring & at the end of monitoring.

FEATURES :

* Micro-controller based design.
* Efficiency > 40% for Sr90.
* Uses plastic scintillator coupled to 2Pi PMT of suitable dia.
* Provided with a rugged protective grill.
* 20X4 LCD display for showing up configuration screens.
* Visual and audio alarms in the event of alarm condition.
* User interface is through a detachable keypad.
* Monitor design ensures continuous maintenance free operation in harsh atmospheric conditions in Radiochemical plants.

Fig. : Arrangement of Palm Contamination Monitor

CHAPTER - II

FRONT PANEL & SIDE PANEL CONTROLS & INDICATORS

2.1 FRONT PANEL

2.1.1 LCD DISPLAY

This is a 20 X 4 LCD dotmatrix display which shows preset counts, elapsed time and other status information during acquisition and it also shows various parameters during configuration

2.1.2 STATUS MESSAGES

All status messages are shown 20X4 LCD display during monitoring configuration
The below LEDs are lit when corresponding status is set

A. 10x10mm RED LED is provided for indication of contamination status after acquisistion.

2.1.3 BUZZER

Audio output is generated by this buzzer in the event alarms are exceeded.

2.2 SIDE PANEL

2.2.1 MAINS ON SWITCH

A toggle switch provided on side panel of display unit & is used to switch DC supply ON/ OFF to the instrument.

2.2.2 DETACHABLE KEYPAD

The detachable keypad provided connects to the unit. This keypad facilitates user to select suitable program option and configure the instrument

2.2.3 KEYS

A 2x2 matrix detachable keypad has been provided for configuring the instrument.

Keypad details :

a) Fn : Fn key facilitates the user to select the menu options for configuration like preset time, preset counts, etc.

b) ▲/▼ : These keys facilitates user to edit the selected menu options Keypad commands have been explained in detail in chapter IV

c) ▲/▼ : start /stop button facilitates the user to aquire in clothing mode by bypassing the optical sensor.

2.2.4 ADAPTOR JACK PIN

This connector is used to provide charging voltage to the instrument.

2.2.5 USB COMM. PIN

This is used for USB communication through PC

CHAPTER - III
SPECIFICATIONS

Detector	:	Plastic Scintillator of dimensions 140x220mm covered with Aluminized mylar film and coupled to suitable PMT serves as the Alpha detector. It is also provided with a rugged SS grill for protection to the detection assembly.
Palm Detection	:	By an IR sensor
Efficiency	:	Overall efficiency is better than 40% for Sr90
Display	:	20 X 4 dot matrix LCD display for configuration & display of counts respectively.
Aquisition Modes	:	Palm / Clothing Modes
Preset time	:	1 - 99 sec.
Measuring Range	:	0 - 9999 counts / 0-9999 CPS / 0-99999 CPM
Preset counts range	:	1 - 9999 counts
User Interface	:	A 2 X 2 matrix detachable keypad has been provided for configuring the instrument.
LED Indication	:	Contamination.
Audio	:	Warning audio signals for contaminated and incomplete operation.
Data storage & transfer	:	Data storage facility for last 1000 readings is provided. Each reading is stored along with time stamp. This data can be transferred through the USB port to PC using data communication software.
Power Supply	:	7.4V Li-ion batteries pack along with AC Charger

CHAPTER - IV

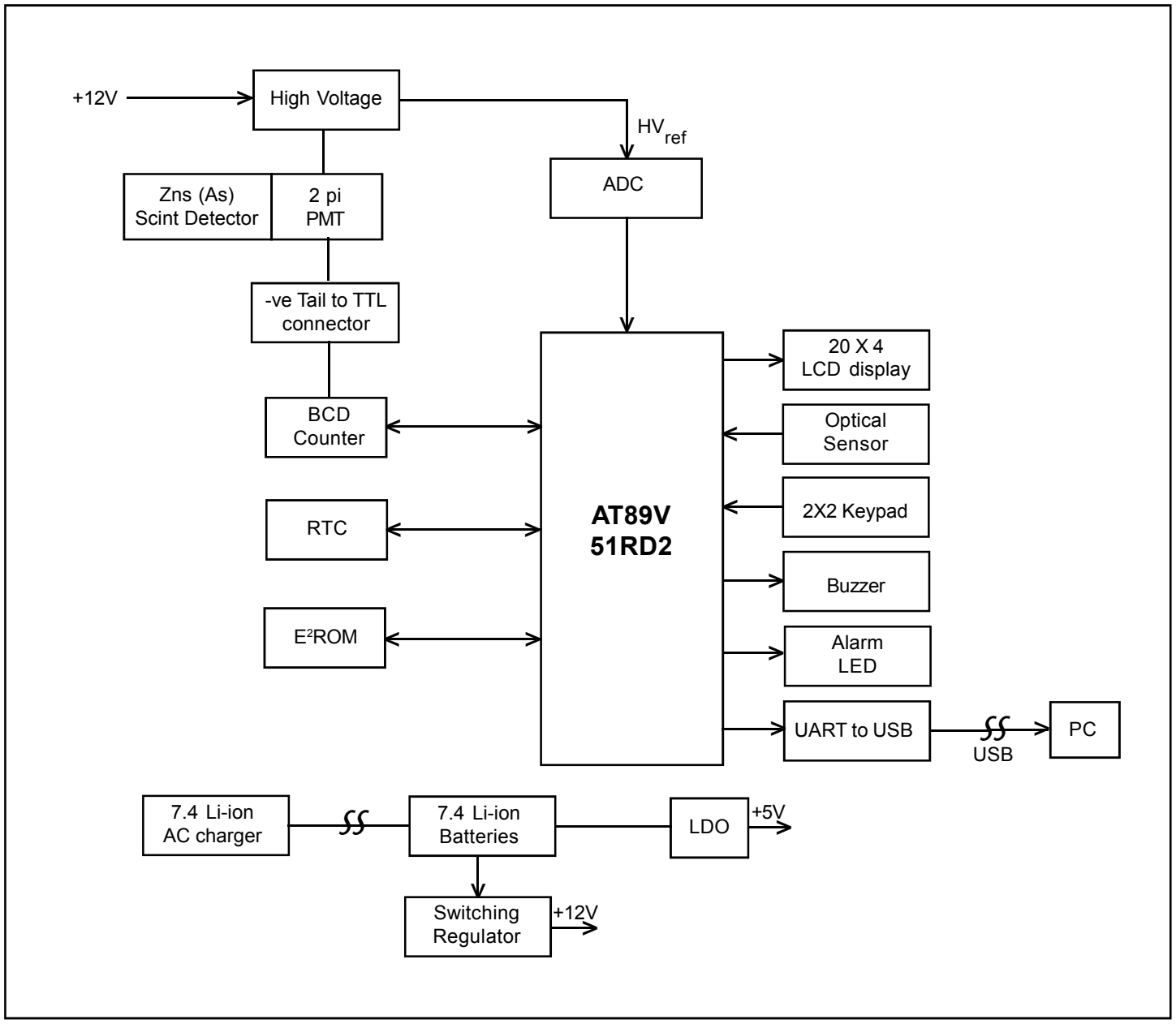
BLOCK DIAGRAM & DESCRIPTION

Palm Contamination Monitor Type PCM738B is designed for operation as a wall mounted palm monitor and as a hand-held frisker nce removed from the wall mount holder.

This is Li-ion battery operated device which is normally connected to AC mains for charging through charger for frisking in hand-held mode, disconnect banana plug connected to the unit for battery mode operation.

Palm monitor comprises of the following sub-assemlies
a) Main detector display unit
b) AC charger for 7.4V Li-ion battery
c) Wall mounting arrangement for palm monitor

The block diagram of the palm monitor is illustrated below



As the block diagram indicates, Li-ion batteries / AC charger provides the DC voltage to the electronic unit.

The regulated voltageof +12V are generated by switching regulator and regulated voltages of +5V is generated by LDO MAX883.

Positive high voltage used for powered by +12V supplies. The high voltage for the PMT is set at +750 to 800V DC. The Alpha detector ZnS(As) when exposed to alpha particles light scintillations.

This signal is detected and a -ve tail pulse is produced by the PMT. This signal is amplified by the hybrid -ve Tail to TTL circuit. The TTL pulse thus produced is fed to display board for counting and further analysis.

The display board essentially compreses of 20X4 LCD, micro-controller and other peripherals like BCD counter, RTC, E^2PROM, UART to USB connector, keypad etc.

The counts recieved from the Tail to TTL connector are fed to the 6 digit BCD conter. The counts are readout by the micro-controller periodically for counts / count-rate calculations and display on 20X4 LCD display also reads / sets micro-controller RTC device and displays on LCD current time and date. The instrument settings area configured through 2X2 front panel keypad and stored in the E^2PROM.

Acquisition for palm is initiated on optical sensor transition and goes on uninterrupted until there is transition in optical sensor status.

At the end of acquisition, result is diplayed on LCD and depending on alarm status, audio alarms are generated for contamination event.

Acquisition data is stored in the E^2PROM and it can be transferred to PC through USB port.

CHAPTER - V
OPERATING INSTRUCTIONS

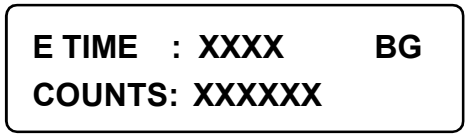
Instructions on operation of intrument

Palm Monitor Type PCM 738AB manufactured by Nucleonix is a multi-function contamination monitoring device. in wall mounted configuration, it works as a Beta / Gamma Palm Monitor. When the palm monitor is detached from its wall mount frame, it can be used as a frisker.

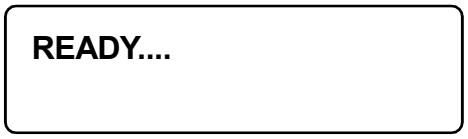
4.1 Use of the instrument as Palm Monitor:

* Mount the instrument in its wall mount frame
* Connect the banana plug to the palm monitor
* Now instrument is ready for use as Palm Monitor

After power ON, the instrument updates background counts as shown below.



Once acquisition is completed below screen appears



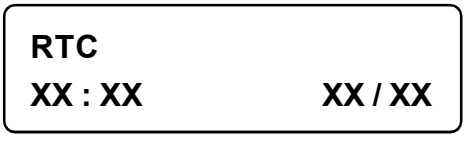
4.1.1 Configuration before use:

Now press Fn key, password screen appears. Now enter 9090 using ▲ &▼ keys.

Use ▲ key to increment digit and ▼ key to scroll left.

4.1.2 **Settings of RTC**

Now press Fn key till below screen appears



Use ▲key to increment digit and ▼key to scroll left & set the desired time / date.

4.1.3 Background(BG) Update Time:

Based on the background (BG) update time, background will be refreshed .

To set press Fn key till below screen appears

BG UPDATE
TIME MIN : XX

Now using ▲ &▼ keys, select the desired update time.

4.1.4 High Background (BG) CPM:

Based on the value set, high background message will be shown during background acquisition. In case background exceeds high background, acquisition will be halted completely until restart

To set press Fn key till below screen appears

HIGH BG
CPM XXXX

Now using ▲ &▼ keys, select the desired update time.

4.1.5 Background (BG) SUBTRACT:

Background(BG) subtraction of the instrument can be kept ON/OFF as needed.

To set, press Fn key till below screen appears

BG SUBTRACT
XXXX

Now using ▲ &▼ keys, select the subtraction mode as necessary.

4.1.6 Preset Level Selection:

Preset level for triggering alarms can be set by selecting below option

To set press Fn key till below screen appears

PRE LEV
CNT XXXX

Now using ▲ &▼ keys, select the preset alarm set point.

4.1.7 Preset Time Selection:

Preset time for counting for palm can be selected using the menu option

PRE TIME
(SECS) XXXX

Now using ▲ &▼ keys, select the preset time in seconds.

4.1.8 Acquisition Unit Selection for Clothing Mode:

Palm monitor can be usedas a frisker by removing the palm monitor form its holder (disconnect power, cables to the unit). Now select below menu option

CL CNT
MODE

Now using ▲ &▼ keys, select clothing acquisition mode as preset time or CPS or CPM mode.

4.1.9 To Save Settings:

To save settings configured/modified, select below menu option

SAVE ?

Now press ▲ or ▼ keys to store the settings changed in E^2PROM.

4.1.10 Acquisition Mode:

To acquire for palm, place the palm so that IR sensor on the wall mounted frame is obstructed. This triggers the acquisition to start for a duration of preset time.

Screen as shown below appears during acquisition.

ETIME : XXXX
COUNTS : XXXXXX

Upon completion of acqusition, one of the below screen appears

YOU ARE CLEAN.....

If alarm set point is not exceeded. This is accompanied by a long single tone

or

CONTAMINATION.....

If alarm set point is exceeded. This is accompanied by two tone audio alert & flashing RED LED indication.

4.2 Use of the instrument as Hand-Held Frisker / Contamination Monitor:

Remove palm monitor from its wall mounting frame after disconnecting its connector. Now to use instrument as frisker, refer to configuration, to start acquisition press START / STOP button.

YOU ARE CLEAN.....
CPS/CPM XXXXX

Above screen will appear if CPS/CPM modes are selected.

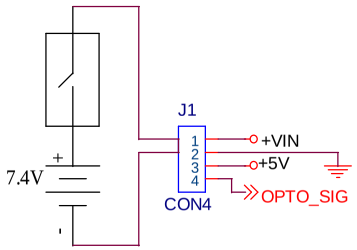
Acquisition will be continuousuntil STRT/STOP button is pressed.

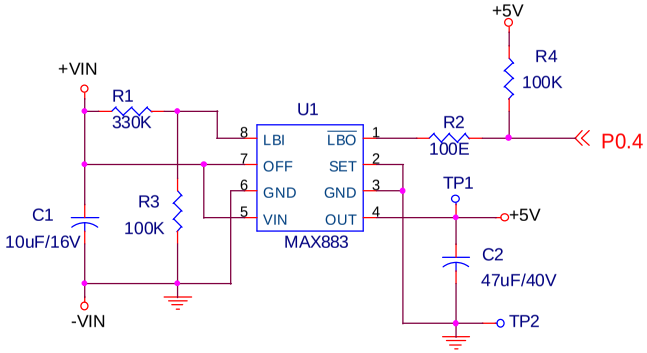
4.3. General Instructions

1. The Palm Contamination Monitor is a compact and easy to handle unit housed in a light tight assembly and provided with a wall mounting arrangement.
2. Before switching ON please read the operating instructions as in Chapter IV Section 4.1 completely.
3. The unit is packed and dispatched to site in reading to use condition.
4. Now switch ON the Toggle switch to operate the unit.
5. After Power-up the monitor will acquire for the background CPM and come to ready mode after 60 secs
6. User can monitor himself by placing his palm on the grill area. Instrument will count for preset time and at the end of counting shows the alarm status.
7. In case of contamination user has to decontaminate himself and recheck.

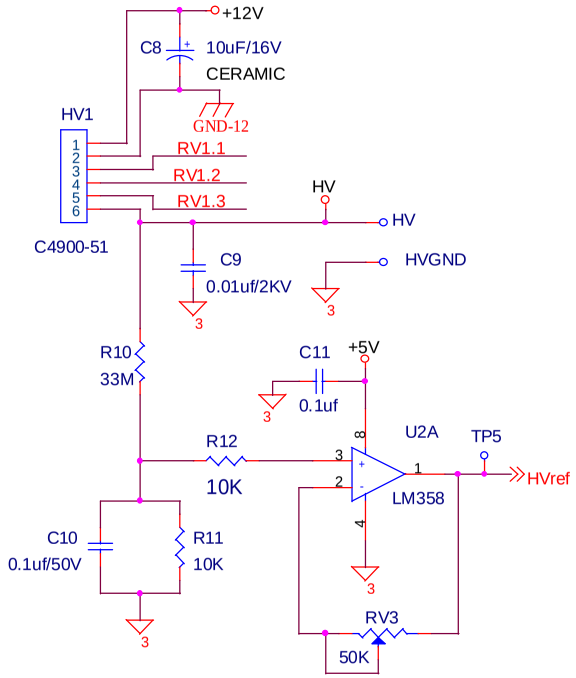
CHAPTER - VI
CIRCUIT DIAGRAMS

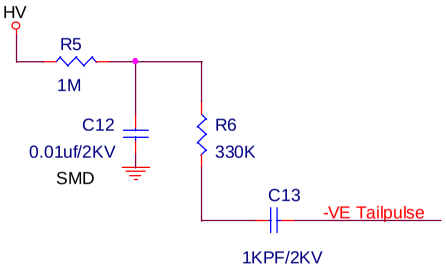
LI-ION BATTERY
TOGGLE SWITCH

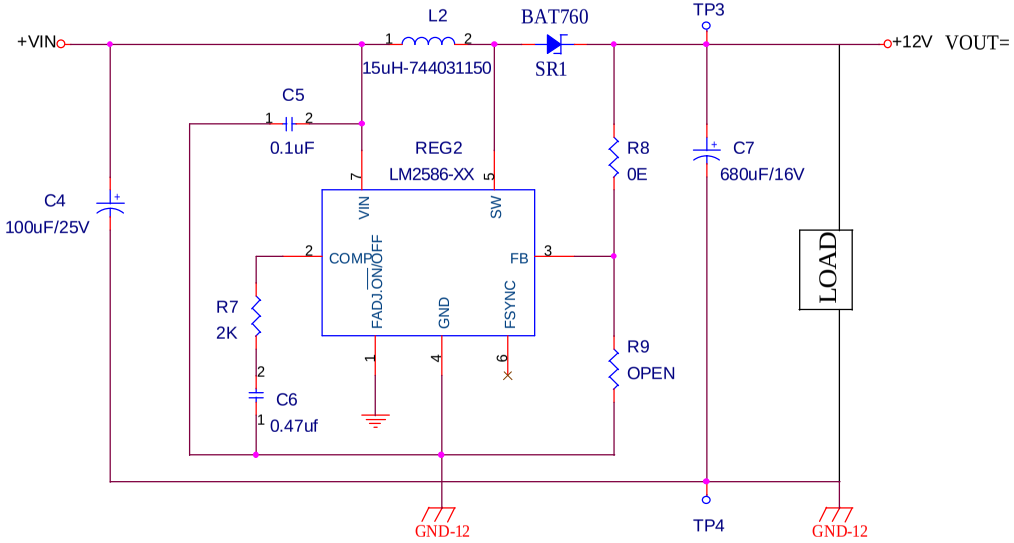




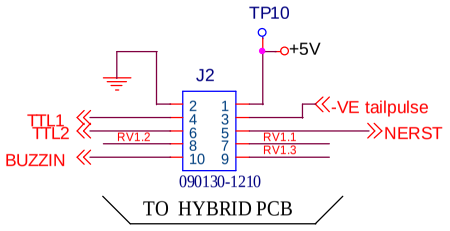
STANDARD CIRCUIT FOR ADJUSTABLE VERSION



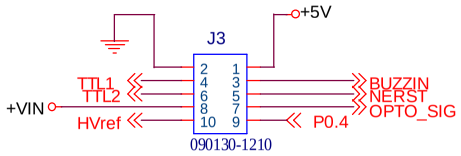




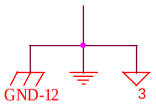
+12V REGULATOR



TO HYBRID PCB



TO MICRO CONTROLLER



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Size: A3	Document Number	Rev: 0
Date: Saturday, February 27, 2016	Sheet 1 of 1	

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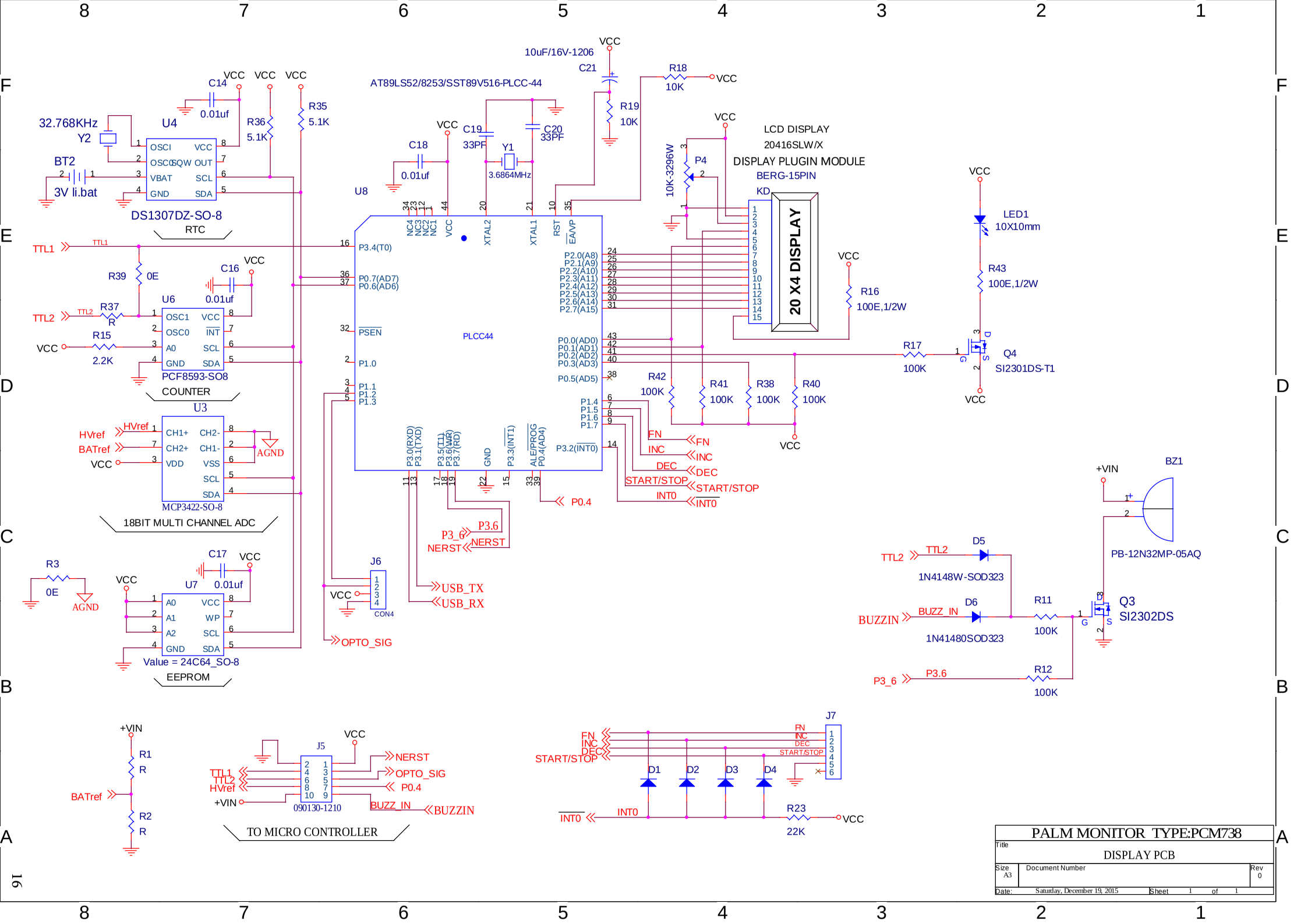
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C21
R18
10K
R19
10K
VCC
C14
0.01uf
R35
5.1K
R36
5.1K
32.768KHz
Y2
BT2
3V li.bat
U4
DS1307DZ-SO-8
RTC
C18
0.01uf
C19
33PF
C20
33PF
Y1
3.6864MHz
LCD DISPLAY
20416SLW/X
DISPLAY PLUGIN MODULE
BERG-15PIN
KD
10K-3296W
P4
20 X4 DISPLAY
LED1
10X10mm
R43
100E,1/2W
R16
100E,1/2W
R17
100K
Q4
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TTL1
R39
0E
C16
0.01uf
TTL2
R37
R
R15
2.2K
U6
PCF8593-SO8
COUNTER
R42
100K
R41
100K
R38
100K
R40
100K
FN
INC
DEC
START/STOP
INT0
P0.4
HVref
BATref
U3
MCP3422-SO8
18BIT MULTI CHANNEL ADC
AGND
R3
0E
C17
0.01uf
U7
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EEPROM
J6
CON4
P3.6
NERST
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USB_RX
OPTO_SIG
+VIN
BZ1
PB-12N32MP-05AQ
D5
1N4148W-SOD323
D6
1N41480SOD323
BUZZIN
BUZZ_IN
R11
100K
R12
100K
Q3
SI2302DS
R1
R
R2
R
BATref
J5
090130-1210
TO MICRO CONTROLLER
J7
D1
D2
D3
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Size A3
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Rev 0
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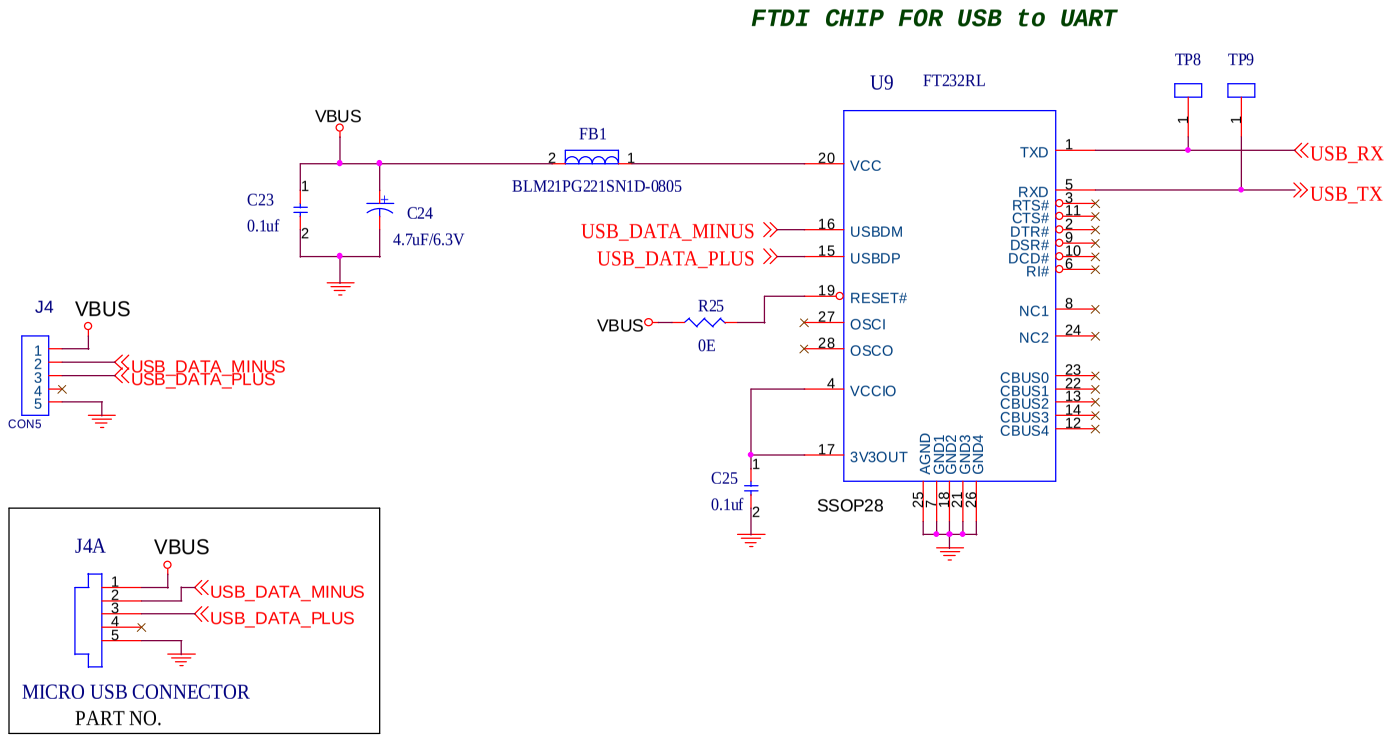
Sheet 1 of 1



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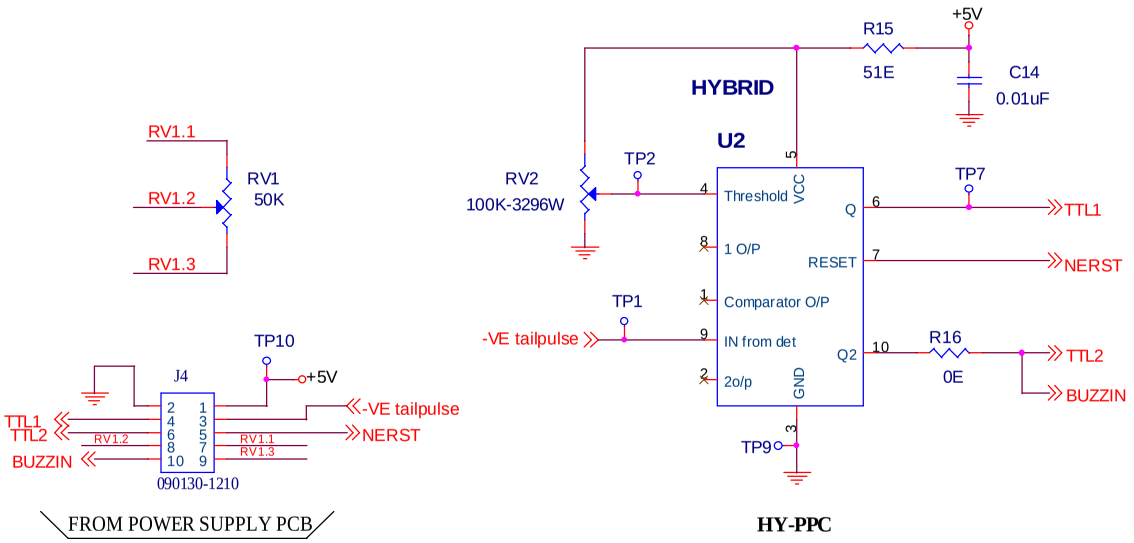

SEPERATE PCB INSIDE HANDLE	
Title	PALM MONITOR TYPE:PCM738
Size A3	Document Number HYBRID PCB Rev 0
Date: Monday, August 10, 2015	Sheet 1 of 1

CHAPTER - VII
MAINTENANCE AND WARRANTY CLAUSE

(A) GENERAL :

As per the warranty clause of the company we provide one year warranty during which period we provide free service at our works. Hence in case of any mal-function in our instruments you are requested to send the unit back to our works by RPP/COURIER/SPEED POST PARCEL/GAT/XPS/door delivery. We shall arrange immediate rectification/ replacement within two weeks from the date of receipt of the equipment at our place. Please note that the equipment will be serviced at our works only.

The equipment is to be sent to :

The Servicing Department
NUCLEONIX SYSTEMS PRIVATE LIMITED
Plot No : 162 A & B, PHASE II,
I.D.A.Cherlapally,
Hyderabad - 500 051

It is to be noted that the detector probe is not covered by the warranty.

Note : In respect of all types of portable radiation monitors, it may be necessary to checkup and recalibrate the equipment once a year at our works.

(B) UP KEEPING :

It is likely that the front S.S mesh can get contaminated by alpha, in course of usage so, to remove the alpha contamination struck on the mesh, one can remove the mesh by unscrewing two bottom screws with a plate that is holding the mesh.
Then clean the mesh by soap water/liquid soap & clean water dry it up & refix it for usage.

(C) HOW TO CHANGE ALUMINIZED MYLAR :

If aluminized mylar gets ruptured or develops pin holes, one has to refix the mylar.
Place aluminized mylar (spare sheet) slightly of over size on the front face (after removing the defective one). Cut the mylar atleast 15mm excessive on all side & fix it on to back with a black tape. Ensure that it is fixed lightly.