

INSTRUCTION

MANUAL

FOOT CONTAMINATION MONITOR



TYPE : FCM 738

NUCLEONIX SYSTEMS PRIVATE LIMITED

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File Name : FCM 738
Date : 03-09-2013

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CHAPTER- I

INTRODUCTION

Foot Contamination Monitor FCM 738 manufactured by NUCLEONIX SYSTEMS primarily serves as a personnel monitoring system for checking the alpha contamination of foot of radiation workers / technicians working in Nuclear Power Plants, reactors, Radiochemical plants and other similar installations. This is floor mounted design.

Start of counting is initiated by an IR source detector arrangement.

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

FEATURES :

- q Micro-controller based design.
- q Efficiency > 20% for Am-241.
- q Uses ZnS scintillator coupled to PMT of suitable dia.
- q Provided with a rugged protective grill.
- q 6 digit 7 segment LED display for display of counts & 16x2 LCD display for show-up configuration screens.
- q Visual and audio alarms in the event of alarm condition.
- q Uses interface is through a detachable keypad.
- q Monitor design ensures continuous maintenance free operation in harsh atmospheric conditions in Radiochemical plants.



Fig. : Foot Assembly



Fig. : Display Module

CHAPTER - II

FRONT PANEL & SIDE PANEL CONTROLS & INDICATORS

2.1 FRONT PANEL

2.1.1 LCD DISPLAY

This is a 16 x 2 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 LED's

The below LEDs are lit when corresponding status is set

- a) CLEAN : This is a 10mm RED led which indicates the CLEAN status after acquisition
- b) CONTAMINATION : This is a 10 mm RED LED which indicates CONTAMINATION status after acquisition
- c) READY : This is a 5mm LED which indicates the instrument to be 'READY' for acquisition.
- d) BUSY : This is a 5mm LED which indicates the acquisition is in progress.
- e) INCOMPLETE : This is a 5mm LED which indicates the incomplete operation during acquisition i.e. (Hand removed when acquisition is in progress).
- f) HIGH BG : This is a 5mm LED which indicates high background counts are obtained (i.e) background preset levels are exceeded.

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 is used to switch AC mains ON/OFF to the instrument mains.



2.2.2 5 PIN CIRCULAR CONNECTOR & DETACHABLE KEYPAD

The detachable keypad provided connects to the unit through a 5 pin circular connector. 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)  : These keys 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

2.2.4 ADAPTOR JACK PIN

This connector is used to provide 12V DC supply to the instrument.

2.2.5 RS485 COMM. PIN

This is used for RS485 communication through PC

CHAPTER - III

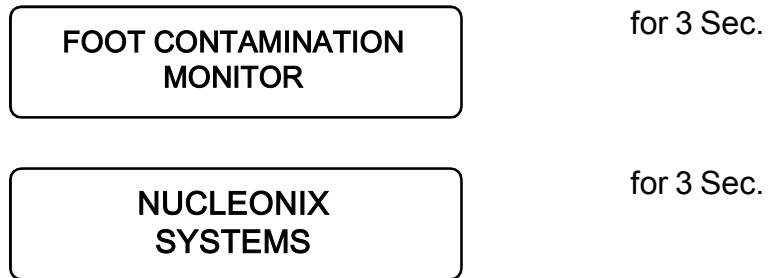
SPECIFICATIONS

Detector	: Zns (Ag) Scintillator of dimensions 140x300mm 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.
Foot Detection	: By an IR sensor
Efficiency	: >20%
Display	: 16x2 dot matrix LCD and 6 digit 7 segment LED display for configuration & display of counts respectively.
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 2x2 matrix detachable keypad has been provided for configuring the instrument.
Indication	: Counting ON, Clean, Contaminated, Incomplete operation, High Background.
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.

CHAPTER - IV

4.1. INSTRUCTIONS ON INTELLIGENT KEYPAD COMMANDS

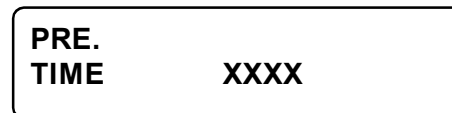
After power ON, the unit displays the following screens.



Now the unit goes into acquisition mode, display shows the following

A. ACQUISITION PRESET TIME MODE

Select below menu option by pressing "▶" key.



User can select the preset time ranging from 1sec to 9999secs. This can be done by using *s* and *t* keys.

s key can be used to increase the value at the cursor position.

t key can be used to shift the cursor position.

4.1.1 PRESET LEVEL FOR COUNTS

Again press "▶" key, display changes to



User can set the preset counts level in the range of 0-9999 counts. This can be done by using *s* and *t* keys.

4.1.2. BG CPM

Again press "▶" key, display changes to

BG CPM	XXXX
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The last updated background CPM value is displayed here

4.1.3 LAST ACQUIRED COUNTS

Press "▶" till the display shows below menu option

LAST ACQ. CNT	XXXX
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Here the last acquired counts data is displayed.

4.1.4 HIGH BACKGROUND CPM

Press "▶" to view the below menu option

HIGH BG CPM	XXXX
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Now using s and t buttons the High Background preset level could be selected in the range of 1-9999 counts

4.1.5. SAVING PROGRAMMED PARAMETERS

All the programmed parameters are to be saved by the user before he can start acquisition without saving the system. The system will use the previous parameters for acquisition. By Pressing 'PROG' key the display changes to

SAVE ?

Press ▲ and ▼ keys to save the selected parameters, now the display changes to,

SAVE? OK

4.2. OPERATING PROCEDURE

1. The Foot Contamination Monitor is a compact and easy to handle unit housed in a light type 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 without PMTs. On unpacking, the user can assemble the PMT & then directly switch ON and use the unit.
4. Now switch ON the Rocker 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

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.

CHAPTER - VII

BLOCK DIAGRAM & DESCRIPTION

Palm contamination monitor is consists of

- (i). High voltage & pulse processing section (ii). Controller, display & power supplies

Instrument comprises of a 12V DC Adaptor which converts the input AC supplies to 12V DC.

Display & Logic circuits :

The AC adaptor used generates +12V from which regulated voltages of +5V are generated by a switching regulator provided on the controller board.

A 8051 family micro-controller based design has been employed for controlling display & logic circuits. Here micro-controller interfaces with 16 x 2 LCD display for displaying textual messages and acquired data, keypad for user interface and facilitating system configuration, optional sensors for initiating acquisition. It drives status LEDs depending upon current acquisition status like ready, High BG, clean, etc., and also generates aural alarms by driving a buzzer in the event of preset alarms.

The TTL pulses coming from the tail to TTL connecter are counted by external event counter during acquisition and at the end of counting depending on acquisition mode and obtained counts, alarm status is updated.

High voltage & pulse processing circuits section:

High loltage module consists of a 555 oscillator with external drive. This typically oscillates in the range of 25kHz to 35 kHz. This typically drives a RF transformer whose o/p is fed to a voltage doubler circuit. The feedback from the o/p is taken by an error amplifier and give to the primary linear regulator IC. This will give higly stable EHT variable in the range of (0-1200V) @ 1mA.

