

INSTRUCTION MANUAL

ALPHA HAND & CLOTHING MONITOR



TYPE : AH733

NUCLEONIX SYSTEMS PRIVATE LIMITED

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UNPACKING

Alpha Hand & Clothing Monitor Type: AH733 has been thoroughly tested and is dispatched in ready to assemble condition. However, on unpacking and prior to operation, it is advisable to check visually and make sure that there is no visible damage caused in transit. Also checkup the items (instrument / sub-systems/ accessories / cables etc.) physically by verifying with the packing list contents for correct types & quantities. Any discrepancy if found, may please be communicated by email to Head, Customer support division.

Typical packed carton & wooden crates contain

- (a) Electronic rack assembly
- (b) Display and hands assembly
- (c) Detectors assembly
- (d) Base assembly

All these items on receiving are to be unpacked carefully & inspected visually.

If any damage to the instrument is observed, do not switch ON the unit and report the matter immediately to:

Head CSD
Customer Support Division
Nucleonix Systems Private Limited
Plot No: 162 A & B, PHASE II,
I.D.A. Cherlapally, Hyderabad - 500 051.

Ph : 91-040-27263701/30918055, FAX : 91-040-27262146, e-mail :info@nucleonix.net

In all correspondence regarding the instrument, please mention the type, serial number of the unit, date of supply etc., of the unit.

CHAPTER - I

INTRODUCTION

Alpha Hand & Clothing Monitor AH733 manufactured by NUCLEONIX SYSTEMS primarily serve as a personnel monitoring system for checking the contamination of hands & clothing of radiation worker / technicians working in Nuclear Power Plants, reactors, Radiochemical plants and other similar installations.

This instrument has been developed using state of art ARM7 based SBC working on embedded Linux platform. GUI & multi-lingual user interface & corresponding voice messages are facilitated by a colour TFT monitor & a stereo sound device.

Guidance to the user during monitoring in the form of colour graphic mimic for left / right hand & status indications during monitoring & at the end of monitoring are a unique feature for Nucleonix systems make.

Advanced fault diagnostic features facilitate the user to diagnose the problem easily. Also provision for faulty channel bypassing feature has been provided. RS485 & Ethernet communication interfaces using MODBUS protocols facilitate remote monitoring, configuration & fault diagnostics.

Each Hand detector assembly shown in figure is modular in construction with two detectors plugged onto a single pre-amp box, facilitating easy maintenance incase of problems.

FEATURES:

- ❑ Developed using state of art ARM7 based SBC working on embedded Linux platform and FPGA technologies.
- ❑ Provided with a 7 ½" colour TFT display for graphical & multi-lingual user interface during measurement mode. Voice & visual languages supported - English, Hindi, Tamil & Marathi.
- ❑ ZnS (Ag) scintillator of dimensions 220x140mm coupled to suitable PMT for each hand channel detector and 50 mm dia scintillator coupled to 2" PMT for clothing probe.
- ❑ Use I/O interface is through a detachable keypad & colour TFT display
- ❑ Built-in RS485 & Ethernet interface using MODBUS protocols allow centralized monitoring and fault diagnostics.
- ❑ Monitor design ensures continuous maintenance free operation in harsh atmospheric conditions in Radiochemical plants.
- ❑ Designed in accordance to IEC61098 performance specification for personnel monitors.
- ❑ Built-in fault diagnostics for fault location or bypassing.

Fig (1) ALPHA HAND & CLOTHING MONITOR

TYPE: AH733



CHAPTER – II

TECHNICAL SPECIFICATIONS

The Alpha Hand and clothing monitor comprises of a set of detectors and an electronic unit.

DETECTORS:

Hand probes:

- Number of monitoring channels : 4 (Right hand upper & lower, Left hand upper & lower).
- Detector type : Scintillator combined with optically coupled Photo-multiplier.
- Scintillator : ZnS (Ag), 10 mg /cm² coated on a clear perspex.
- Photo-multiplier Tube : 3 inch Dia., The scintillator is optically coupled to the photomultiplier tube.
- Detection Efficiency : >25% for plutonium alphas with phantom source.
- Probe Construction : They are fabricated and fitted in the instrument so that they can be detached easily for maintenance.
- Sensitive Area. : 300 sq. cm.
- Opaque window : The scintillator is covered by 0.8 mg/cm² aluminised, pin -hole free, light-resistant, alpha-transparent aluminised mylar film.
- Protection Grill : The whole detector assembly is protected by a suitable thin metallic grill.
- Detector dimensions and performance conforms to IEC 61098 specifications.

Clothing probe:

- Number of monitoring channels: one
- Detector type : Scintillator combined with optically coupled Photo- multiplier.
- Scintillator : ZnS (Ag), 10 mg /cm² coated on a clear perspex.
- Photo-multiplier Tube : 2 inch Dia., The scintillator is optically coupled to the photomultiplier tube.
- Detection Efficiency : Better than 25% for plutonium alphas.

- Probe Construction : Hand-held type; Cylindrical, light weight. Viewing side to be provide with a removable cover. It is placed on a holder with integrated optical sensor assembly on the side of the monitor. On lifting the detector, the monitoring will start.
- Sensitive Area. : 20 sq. cm
- Opaque window : The scintillator is covered by 0.8 mg/cm² aluminised, pin-hole free, light-resistant, alpha-transparent aluminised mylar film.
- Protection Grill : The whole detector assembly is protected by a suitable thin metallic grill.
- Detector dimensions and performance conforms to IEC 61098 specifications.

ELECTRONIC UNIT :

The electronic unit consists of the following

- a. Signal processing and display unit.
- b. Mother board
- c. Switched mode LV supplies unit
- d. 5 channel pre-amplifier unit
- e. High voltage power supplies unit

Signal processing and display unit : The signal processing & display unit comprising of an ARM7 based SBC & 7 ½” LCD is the data acquisition & control device. It carries out the following functions of

- User interface during configuration & measurement through the 7 ½” TFT display, 4x4 matrix keypad and optical sensors.
- Counting of pulses from 5 individual detectors.
- Storage of last 100 acquired data and last 100 contamination data.
- Configuration of various parameters like PM time, BG time, BG dwell time, Low BG set point, High BG set point, Alarm set point, Baud rate, Device ID, IP address, Voice & visual guidance languages, fault diagnostic configuration, detector efficiency, detector status etc.
- Interfacing with status & alarm indicating bar LEDs during measurement cycle.
- Generation of voice guidance messages through stereo O/P sound device during measurement cycle.

- Initiates / terminates measurement cycle by sensing optical sensors status.
- Communicates to remote PC through RS485 / Ethernet ports using MODBUS protocol.
- **Counting Range :**
 0 to 9999 counts
 0 to 9999 CPS
 0 to 9999 Bq
 0 to 99999 CPM
 On overflow the display will indicate 'OVR'
- **Timing range :**
 Pre-settable from 1 to 99 seconds in 1 sec steps for COUNTS, Bq, CPS or CPM modes for Hand and Foot monitoring. Time constant for checking the Clothing monitoring is 5 seconds with display being refreshed every second

Mother board : Signal from the pre-amplifier unit optical sensors, RS485 port control & reference signals for HV module are routed to the signal processing unit through this board. The LV supplies to all the sub-systems are routed through this board.

Switch mode power supplies unit : An AC-DC converter generates the necessary DC voltages of +12, +24 & +5V necessary to the power the electronic sub-systems. It is also provided with a line filter & other EMC suppression components.

5 channel pre-amplifier unit : This unit comprises of 5 individual pre-amplifier modules used for connecting the -ve tail pulses to TTL coming from each of the GM detectors. HV bias to the GM tubes is fed through the pre-amplifier unit.

HUMAN MACHINE INTERFACE:

Indications & controls:

Mains switch : The mains switch is provided inside the cabinet of the monitor.

Mains indication : Red LED to indicate mains power ON is provided on the display panel.

Optical sensor : The monitor is provided with optical sensor inside the detector cavities for initializing the counting.

Test switch : A push button switch is provided on the side panel for carrying out test acquisition.

Visual alarm : Each channel visual mimic indication on LED indicators and additionally color mimics for each channel are provided on the colour LCD display.

Audio Alarm : Loud audio tone.

Audio Instructions : Audio instructions are generated for clear, contaminated, instrument fault, monitoring in progress and incomplete operation.

Multi-lingual messages can be played back in either Hindi / Tamil / Marathi based on the selection.

Operational Guidance : Operational guidance messages are displayed Before monitoring, On Clear, On Contamination and On Incomplete operations can be generated in either Hindi / Tamil / Marathi apart from the primary language English.

Incomplete operation : Yellow LED indicator along with Multi-lingual textual indication accompanied by audio alert are generated when counting is interrupted.

Clear Indication : Green LED indicator and LCD mimic indicator will be ON when all the channels are clear.

Counting in progress Indication : Busy LED indicator will be ON and Time left is displayed when counting is in progress.

Visual display : 7.5" colour LCD display.

Given below is a partial list of the functions being carried out by the visual display.

- Display normal status messages.
- Visual display of monitoring in progress (including count down of time in seconds)
- Display of individual channel readings
- Alarm annunciation
- Background checking and display
- Instructions for use.
- Self explanatory, language independent symbols / user instructions.

Computer interface :

The monitor has a RS485 serial & Ethernet 10/100 Mbps port for interfacing with a remote IBM PC-compatible computer. The features supported by Ethernet port are given below.

- The PC and the monitor operate in a host-slave configuration and the software protocol will be MODBUS/RTU or MODBUS / TCP
- The firmware of the monitor will be able to send the instrument data like Instrument ID, Instrument type, Maximum counting range, Timer range, alarm settings, alarm status, current reading etc. to the Host PC on demand.
- The firmware will be able to receive commands from Host PC and carry out the setting of different parameters like Instrument ID, Instrument type, Maximum counting range, Timer range, alarm settings, instrument address etc.
- The PC as the host gives commands and send queries. The monitor will carry out various functions in response to the queries.

Power supplies :

The monitor has a High voltage power supply unit for the detectors and a low voltage power supply unit which supplies the DC power supplies required for the Electronic unit. It will have a very good line voltage and load regulation for all the supplies. It will be fitted with Mains line filters to avoid line interferences.

The High voltage output will be adjustable by a trimpot and EHT should be displayed on the display on demand. The EHT will be adjustable from 300 V to 1500 V DC.

Instrument fault indication :

Fault diagnostics are carried out periodically and any failures are reported on the display like LV, HV and detector failures.

Fault indications will be cleared automatically if normal status is resumed.

Housing:

- Most of the modules of the Electronic unit and detectors will be integrated into a column shaped cabinet with castor wheels.
- The hand probes will fitted so that both the hands can be inserted and the optical sensors inside the cavities are activated when hands are placed to start monitoring.
- The cabinet will be rat-proof, rugged & elegant.

Self diagnostics :

The monitor will have built-in self diagnostics. On being powered it will perform tests to ensure that all components and sub systems are functioning properly. It will check for the Power supply, High Voltage Supply, Detector, Counting and measuring circuits, Alarm Systems, Display Systems and communication port.

The firmware will be designed for high reliability and availability.

Test points will provided for checking the EHT voltage and for connecting external input pulse signals.

Input Power :

230VAC +/-10%, 50Hz, single phase supply. Power ON/OFF indication will be provided with an indicator LED. Line filter and spike suppressor are provided.

Environment :

The instrument will be able to withstand temperature upto 50°C and relative humidity upto 90% in radiation areas.

Environmental EMI / RFI performance compliance :

This instrument is designed to comply to IEC 61098 for its radiation performance, environmental & EMI / RFI compliance. For EMI / RFI compliance, test specifications specified by IEC61000 standards are applicable.

CHAPTER - III

VISUAL DISPLAY, CONTROLS AND INTERCONNECTIONS

DISPLAY UNIT :

The display unit mounted on the top of the unit is used to display alphanumeric data/messages and visual indication by means of status LEDs.

It comprises of 7 ½" Colour TFT display to display messages / program parameters, etc.

CONTAMINATED (RED) & CLEAN (GREEN) BAR LEDs are used to indicate contamination and clean conditions respectively.

Additionally hand & clothing contamination is shown by corresponding visual LED indications.

AMBER/YELLOW BAR LED glows during BUSY, HIGH BG & INCOMPLETE conditions.

CONTROLS :

Outside / Accessible Controls and Connectors :

- a. **Detachable Keypad:** This detachable keypad is used by health physicist to configure the instrument settings initially. It comprises of 16 push button switches arrange in 4x4 matrix configuration. Once programmed, the keypad can be detached and kept safely. This keypad is connected to the monitor through a 9 pin D connector on the side panel.
- b. **Optical Switches:** There are 3 optical switches one for each hand and clothing probe. The status of these switches is used to prompt messages to the user to indicate the acquisition when all hand & foot sensors are activated and terminate incase of removal of hands or feet, to initiate clothing acquisition, when clothing probe is lifted from its holder and terminate acquisition once replaced.
- c. **9 pin D Connector:** A 9 pin D connector has been provided for RS485 communication with PC using MODBUS-RTU protocol.
- d. **MHV Connector:** This connector on the side panel is used to connect clothing probe to the monitor.
- e. **3 pin MS Connector:** This connector on the rear panel is used to provide AC mains to the monitor.
- f. **Test Switch :** This is a momentary push button switch provided on the side panel used for doing test acquisition.
- g. **Ethernet Socket:** A rear panel mounted RJ45 connector socket is provided for Ethernet communication with PC using MODBUS-TCP protocol. This connects directly to the SBC

INSIDE CONTROLS AND CONNECTORS:

Controls:

- Power ON switch & Indication Lamp:** A toggle switch has been provided on the mains transformer enclosure to power the unit. When the switch is put ON, mains AC is made available to the unit and neon lamp adjacent to the unit is also turned ON.
- Fuse:** A 750mA fuse is provided on the mains transformer enclosure for short circuit protection.
- HV On /Off toggle switch

Connectors on Mother Board PCB :

<u>MOTHER BOARD CONNECTOR DETAILS</u>			
Sl.No	Connector Name	To	Description
1	J1	SBC F25 D-connector	TTL & optical signals
2	J2	SBC M25 D-connector	Communication data lines, LV Fraction voltage
3	J4 (use for AH733)	Preamplifier Box	5 TTL signals & supplies
4	J5	SMPS	24V, 5V, GND & 12V supplies
5	J6	Speaker	J6_2 – GND J6_4 – 9V
6	J7	SBC supply	J7_2 – 5V J7_3 – GND
7	CN1	Backlight inverter	CN1_1 – 12V CN1_2 – GND
8	J9	HV module	J9_1 – Shutdown control J9_2 – 24V J9_3 – 12V J9_4 – GND J9_5– HV fraction
9	J10	Test switch	
10	J12	9 pin D-connector on side panel	J12_1 – RS485 data + J12_2 – RS485 data – J12_3– RS485 GND
11	LHOS, RHOS & CLOS	Left hand optical sensor, Right hand optical sensor, Clothing optical sensor	LHOS-1, RHOS-1, CLOS-1 – Signal LHOS-2, RHOS-2, CLOS-2 – GND LHOS-3, RHOS-3, CLOS-3 – 5V
12	LH LED, RH LED	Optical LEDs	LHOS-1, RHOS-1 - +5V LHOS-2, RHOS-2 - GND

CHAPTER – IV

BLOCK DIAGRAM DESCRIPTION

The Alpha Hand & clothing monitor manufactured by Nucleonix Systems Pvt. Ltd. is capable of monitoring Alpha radiation detected by the individual detector assemblies for Hands & Clothing of personnel working in nuclear power plant. It generates audio / visual alarm messages once the counts exceed preset alarm level set by the user.

The instrument is powered & driven by a application residing on embedded Linux based single board computer. The single board computer comprises of ARM7 based EP9315 processor working @ 200 Mhz. Apart from this board there is an additional board on which FPGA circuit is contained which works as a 16 channel, 32 bit counter. External I/O for serial communication, optical sensing, keypad, I²C devices, analog signals, etc., is carried out using connectors provided for the purpose.

It also interfaces to 7.5" colour TFT display, sound box, Ethernet port through relevant connectors. The SBC & FPGA board require 5V DC @ 1A from the power supplies. TFT display require +12V additionally for its CFL backlight.

Optical sensors in source detector configuration have been used for Hand channels. For clothing probe reflective type sensor has been used.

For configuration & operation of instruments, 4x4 matrix keypad has been provided. After password authorization software configuration can be edited.

The TFT monitor used is a 7.5" TFT monitor. Backlighting inverter requires +12V for generating necessary voltages for the CCFL of the display. The data interface between LCD & SBC is through a 33 pin FCC cable.

The SBC is provided with isolated RS485 port & Ethernet port with compliance to MODBUS protocols.

The audio message signals generated during acquisition & alarm annunciation are fed to a stereo O/P sound box.

The detector signals from all the connected detectors after conversion to TTL are fed to FPGA board mated to SBC board. The obtained data in the form of 16 bit counts data is readout by SBC during acquisition mode from the corresponding channels.

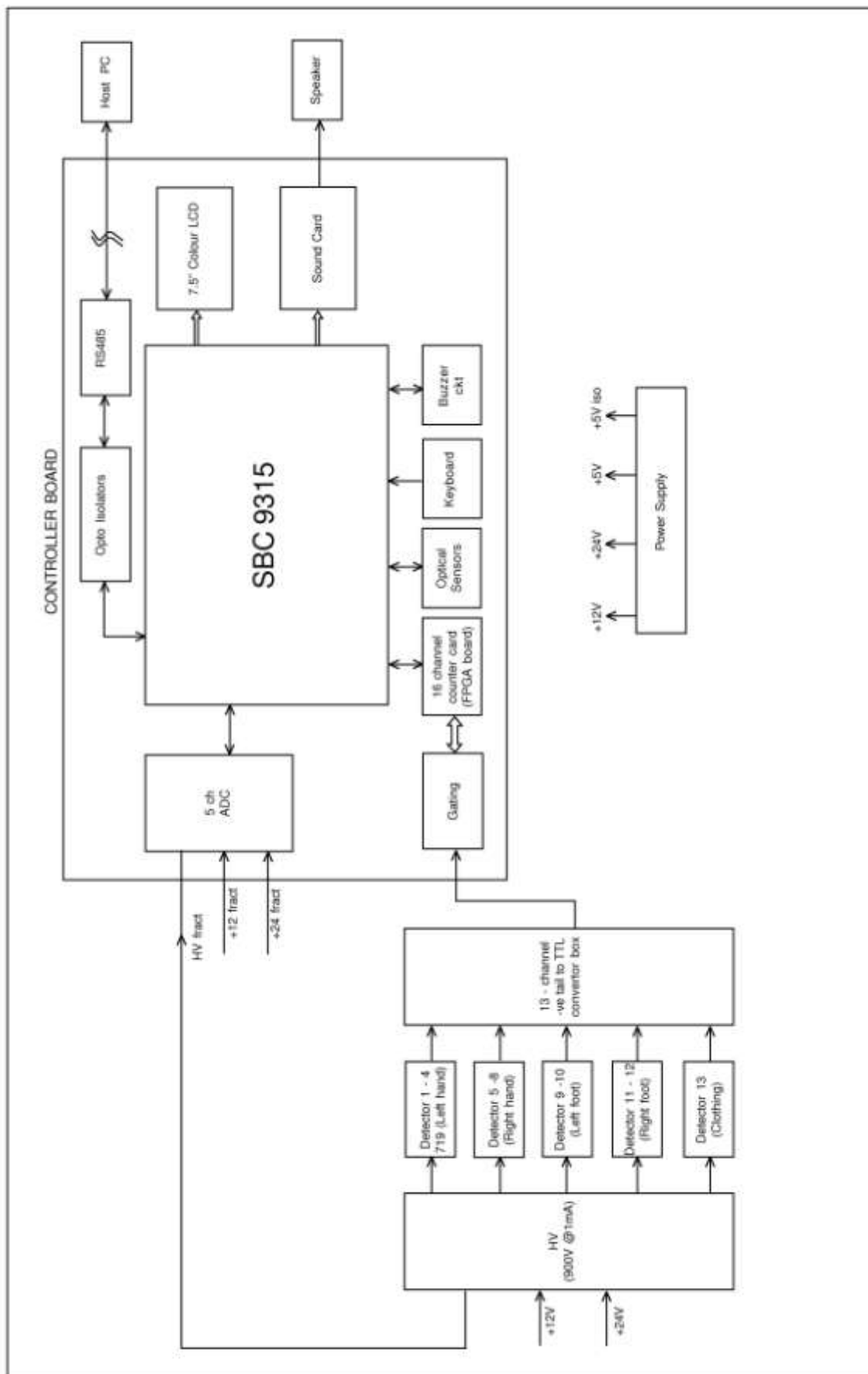
The SBC comprises of 5 channel 10 bit ADC on board. This is used to monitor reference LV & HV signals from the electronics for fault diagnostic purposes.

The high voltage module based on LM723 linear regulator generates highly regulated voltages in the range of 0-1200V @ 1mA. It uses +12V & 24V for powering the electronics. The high voltage generated is used to bias the 13 individual detectors used in the system.

The ZnS (Ag) based scintillation assemblies generate –ve tail pulse O/P on detection of alpha radiation. All the detector O/P's are fed to a 5 channel pre-amplifier box which converts –ve tail pulses to TTL for each of the connected channels.

The Alpha Hand & Clothing Monitor is a mains operated equipment which can work on 110 / 220V AC, 50 / 60 Hz. This uses SMPS based design to generate DC output voltages of +5V, +12V & +24V. The power supplies are protected from surge, transients & conducted interference by use of surge suppression, line filters & EMI suppression toroid.

Fig. Block diagram of Alpha Hand & Clothing Monitor



CHAPTER -V

OPERATING INSTRUCTIONS

I **SETTING UP OF THE INSTRUMENT**

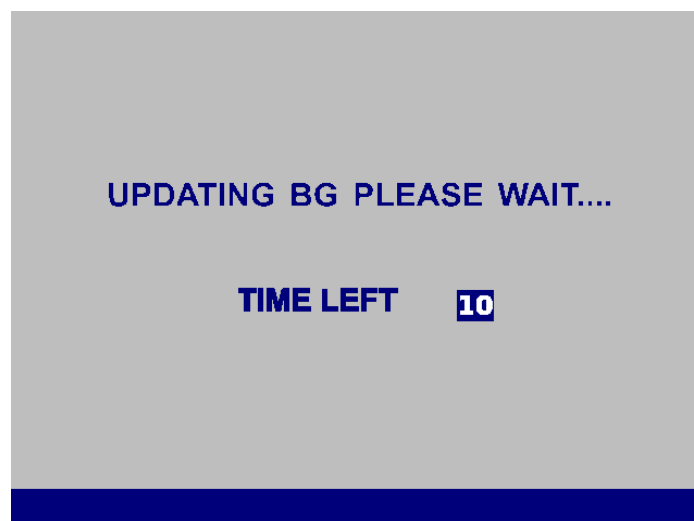
Once the instrument is installed and made functionally ready for use, its settings need to be configured. Please go through the below sequence for configuring the instrument.

A **POWER ON SELF TEST:**

After power ON the following screen shot appears. This would show up for about 45 secs – 1 minute during the boot up.



Subsequently the Hand Foot monitor application is invoked and the below screen appears if all the hardware is working properly.



Incase of any hardware fault, one of the below screens will appear

HV SENSE FAILURE

**HV is shut down.
Please reset the instrument.**

Incase HV sensed is greater than 1200V, then this message will appear. Rectify & restart the system.

HARDWARE TEST REPORT

HVfract1 FAIL (600 V)

HVfract2

LV_5V OK

LV_12V (1663 V)

Low BG Status ...

High BG Status ...

Incase HV is sensed to be less than 800V, then typical message as shown will appear.

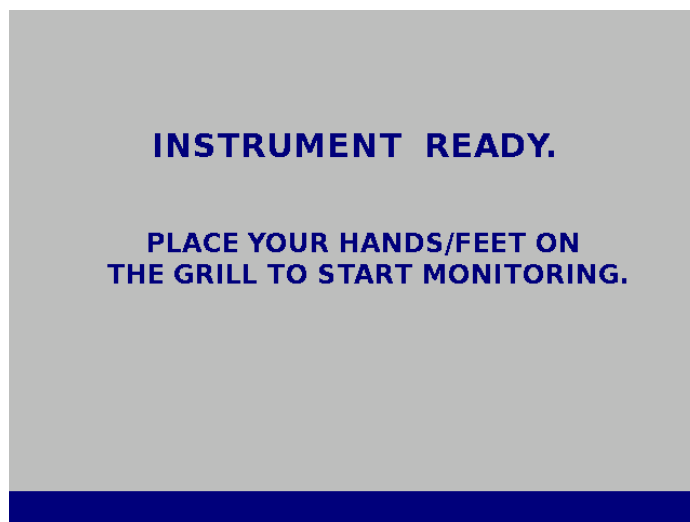
The fault screens will persist until recovery or until user intervention.

Once hardware is found OK, then background updation cycle is initiated for the background count time as shown below.

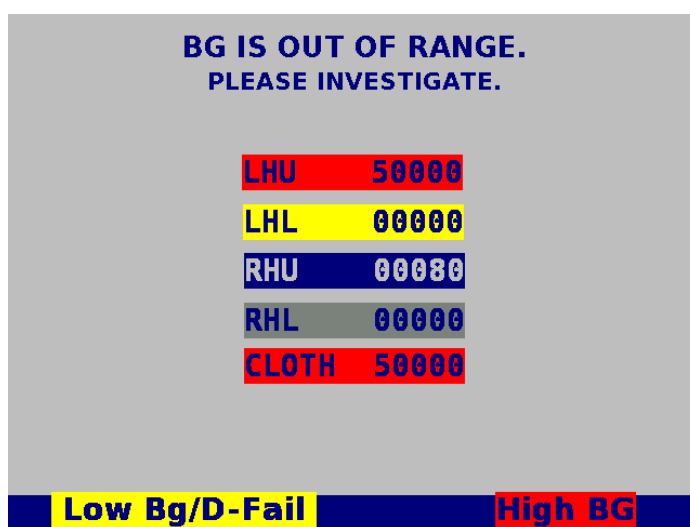
UPDATING BG PLEASE WAIT....

TIME LEFT 10

At the end of background monitoring, in case the obtained values are found to be within range then below screen is shown depending upon optical sensor status.

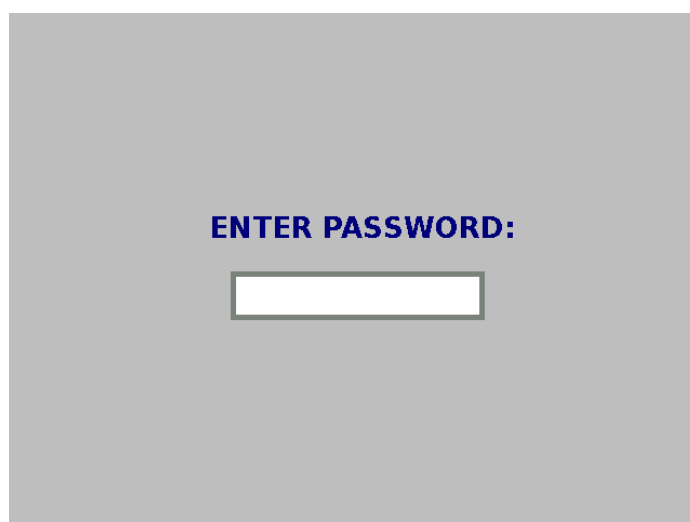


In case background counts are out of range (< low background or > high background) then typical screen as shown below appears.

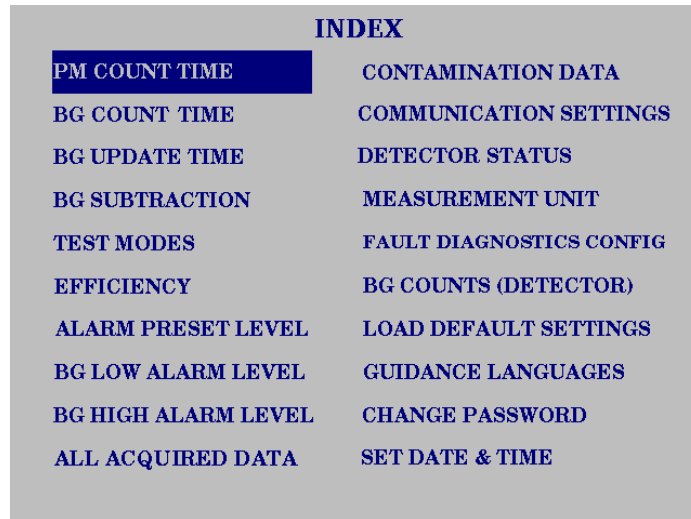


B. CONFIGURING THE INSTRUMENT

Instrument is by default in acquisition mode after boot up to enter configuration mode, press ESC button from the 4x4 matrix keypad. The following screen appears



Now enter the 4 digit access password. Factory default master password is 9090. Upon authorization the following screen appears.



Detailed parameter configuration is detailed below after selection from index screen.

B.1 PERSONNEL MONITORING COUNT TIME

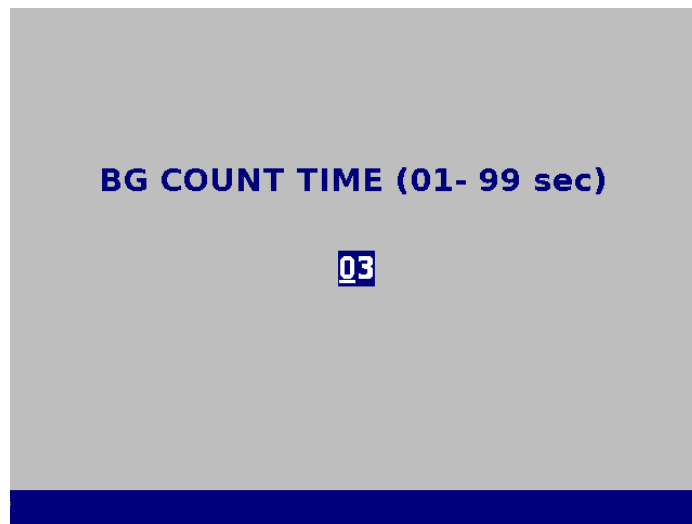
The personnel monitoring time can be set through this menu shown below in the range of 1 – 99 sec



Using digit keys 0 – 9, value can be entered. To save changes press enter key. To return to index menu press ESC key

B.2 BG COUNT TIME

The BG count time can be set through this menu in the range of 1 – 99 sec. However the results are normalized to PM time and stored.



Using digit keys 0 – 9, value can be set. To save changes press enter key. To return to index menu, press ESC key.

B.3 BG UPDATE TIME

The BG contribution to the detector output is periodically computed automatically. BG update time defines the period in minutes between each update interval this set in the range of 2 -99 min.



Using digit keys 0 – 9, value can be set. To save changes, press enter key. TO return to index menu, press ESC key.

B.4 AUTOMATIC BG SUBTRACTION

The BG contribution to the detectors would vary with time and usage because of build up of contamination. To minimize false alarms and to achieve good MDA automatic BG subtraction helps. This setting can either be kept enabled or disable.



User ▲ key, the current setting can be toggled as enabled or disabled. To save changes, press enter key and ESC to return to index screen.

B.5 EFFICIENCY OF DETECTOR

The efficiency of detector once computed manually may be entered here to view acquisition result in Bq. Efficiency be entered in the range of 0.01 – 99.99% through the keypad from the following menu.

EFFICIENCY OF DETECTOR (%)

Detector	Efficiency
LH – UPPER	05.00
LH – LOWER	05.00
RH – UPPER	05.00
RH – LOWER	05.00
CLOTHING	05.00

Using digit keys 0 -9 & CLR efficiency values for a detector could be entered. Using TAB key, detector selection can be done. Press enter key to save settings & ESC key to return to index screen.

B.6 BG ALARM SETTING

BG low & BG high alarm settings can be set through below menus.

BG LOW ALARM LEVEL	
Detector	BG - LOW Counts
LH – UPPER	<u>0000</u>
LH – LOWER	0000
RH – UPPER	0000
RH – LOWER	0000
CLOTHING	0000

BG HIGH ALARM LEVEL	
Detector	BG - HIGH Counts
LH – UPPER	<u>0100</u>
LH – LOWER	0100
RH – UPPER	0100
RH – LOWER	0100
CLOTHING	0100

Using digit keys 0 – 9 & CLR key, the alarm settings can be set in the range of 0 – 9999 for each detector. Using TAB key, detector selection can be done. Press enter key to save settings & ESC key to return to index screen.

B.7 DETECTOR STATUS

Detectors can be selectively enable / disable to facilitate faulty detector bypassing during acquisition using this menu.

DETECTOR STATUS

Detector	Status
LH – UPPER	ENABLE
LH – LOWER	ENABLE
RH – UPPER	ENABLE
RH – LOWER	ENABLE
CLOTHING	ENABLE

Using ▲ key, toggle the status of corresponding detector and using TAB key select the detector to be configured. Press enter key to save settings & ESC key to return to index screen.

B.8 MEASUREMENT UNIT

Measurement unit for PM mode can be set as either counts / cps / cpm / Bq. For clothing, measurement unit can be set as cps / cpm / Bq from the following menu.

MEASUREMENT UNIT

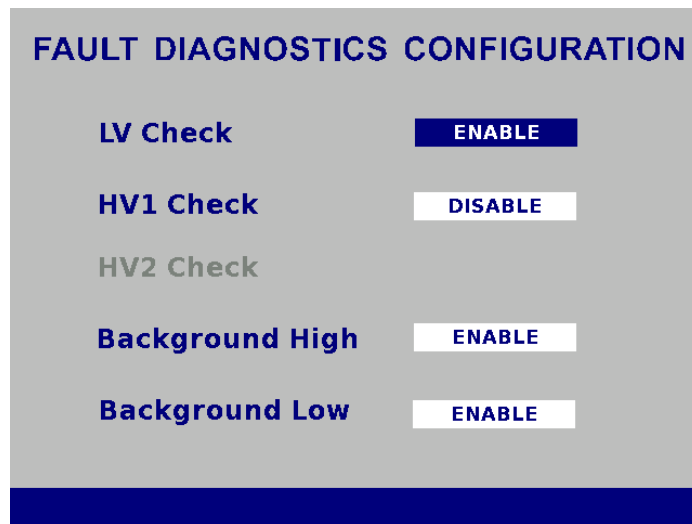
COUNT	(FOR HANDS, FEET)
CPM	(FOR CLOTH)

Using TAB key select HF mode or CL mode for setting unit. Now using ▲ key, select among the available measurement units.

Press enter key to save changes and ESC to return to index screen.

B.9 FAULT DIAGNOSTICS CONFIGURATION

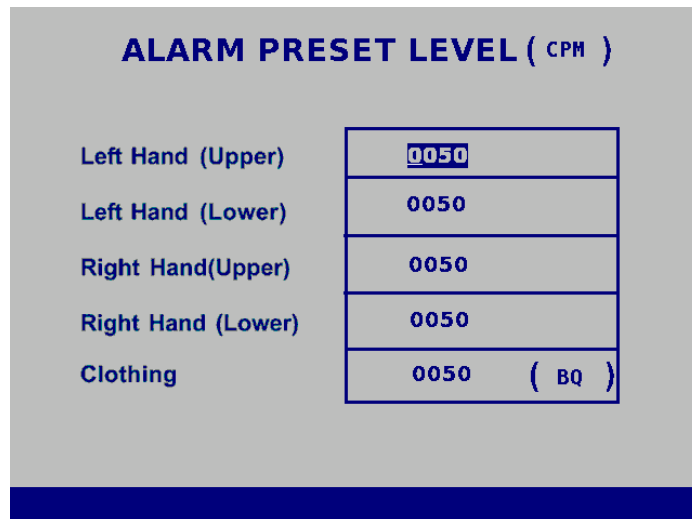
Depending upon current hardware status and BG counts from the detectors, the individual fault diagnostic checks could be enabled or disabled from the following menu.



Using TAB key, select the parameter whose setting needs to be changed. Now using ▲ key, toggle the check status. Press enter key to save changes and ESC to return to index screen.

B.10 ALARM PRESET LEVEL

Alarm preset level for individual channels can be set through this menu in the selected measurement unit.



Using digit keys 0 – 9, CLR key set the value for the corresponding channel. Using TAB key, select the channel for modification. Press enter key to save changes and ESC key to return to index screen.

B.11 LOAD DEFAULT SETTINGS

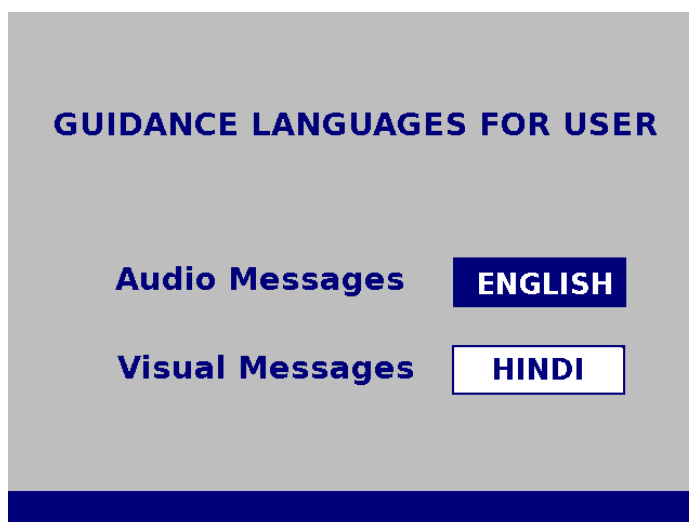
Through the below menu, default settings for all the configuration parameters can be set.

LOAD DEFAULT SETTINGS	
Cycle Timings	For All Channels
PM Count Time = 10 sec BG Count Time = 30 sec BG Update Time = 30 min	Alarm Preset Level=50 counts Low BG Alarm Level=0 counts High BG Alarm Level=100 counts
Fault Diagnostic Config	Detector Efficiency = 5% Detector Status = Enabled
LV Check = Enabled HV Check = Enabled Low BG Check = Enabled High BG Check = Enabled	Communication Settings
Measurement Unit	Baud Rate = 19200 Device Address = 0 IP Address = 192.168.1.0 Identifier = 0
For Hands, Feet = counts For Cloth = CPM	
User Guidance Language	<i>Please press ENTER to load default settings.</i>
Voice = English Visual = Hindi	<i>Press ESC to escape.</i>

Press ENTER to load default settings & ESC key to return to index screen.

B. 12 GUIDANCE LANGUAGES FOR USER

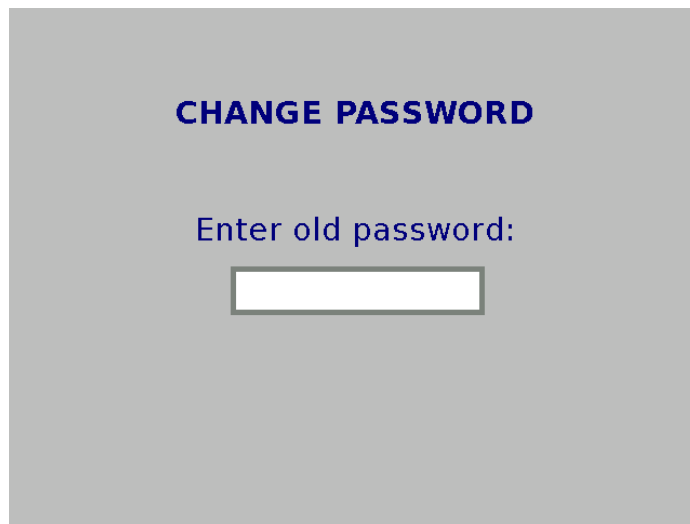
Voice & visual guidance languages are available to user in multi-lingual form in the instrument. Suitable languages can be selected separately for voice & visual indication using below menu option.



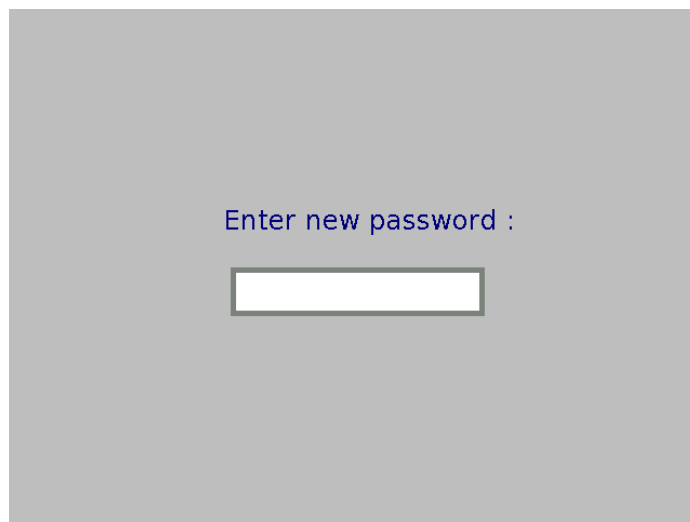
Using TAB key select parameter which needs to be modified. Using ▲ key, toggle the setting as ENGLISH / HINDI / TAMIL / MARATHI. To save setting, press ENTER & ESC to return to index screen.

B.13 CHANGE PASSWORD

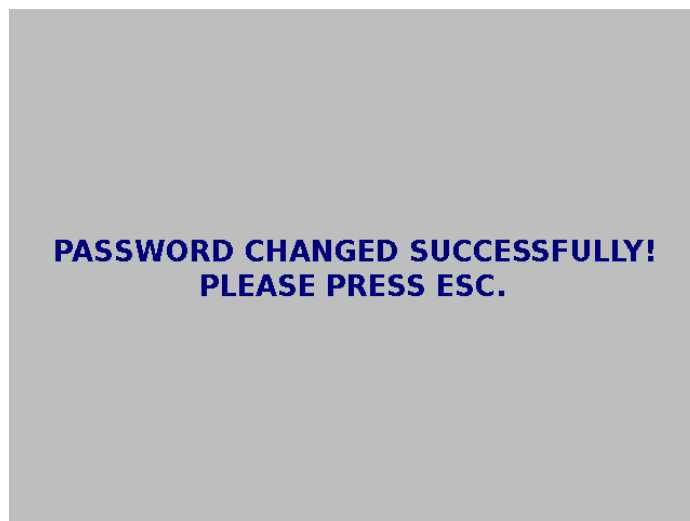
Existing user access password can be modified using this menu option. The new password can be set in the range of 0000 – 9999. To change password, select below menu.



Now enter old password using keys 0 – 9 now the application prompts user to enter new password through below menu.



Now enter new password using keys 0 -9 in the range of 0000 – 9999
On successful change, the below screen appears



B.14 SET TIME & DATE

Time & date is tracked by on board RTC with battery backup. This can be viewed & set using the below menu option

DD	MM	YY
02	07	10
HH	MM	SS
18	47	13

Now using keys 0 – 9 & TAB, set the time and date to desired values. Now press enter key to save changes & ESC key to return to index screen.

C. TEST MODES & ACQUISITION DATA

C.1 TEST MODE

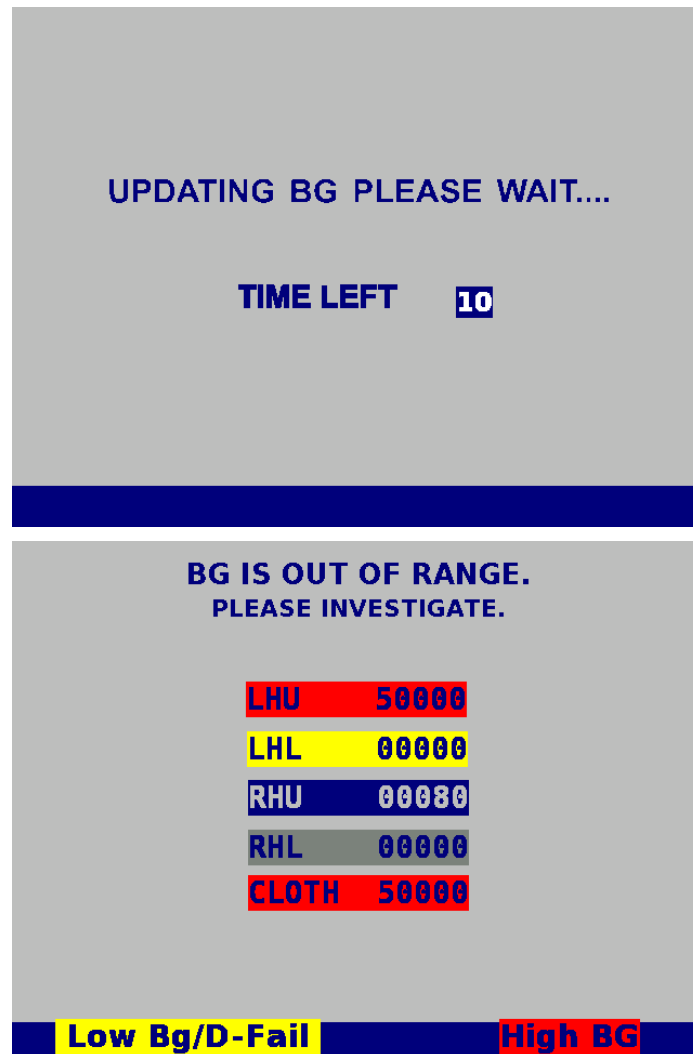
C.1.1 BG TEST

Using this menu option, test run for BG mode will be initiated select below menu option

BG-TEST	(Background)
PM-TEST	(Personal Monitoring)
HW-TEST	(Complete Hardware Test)

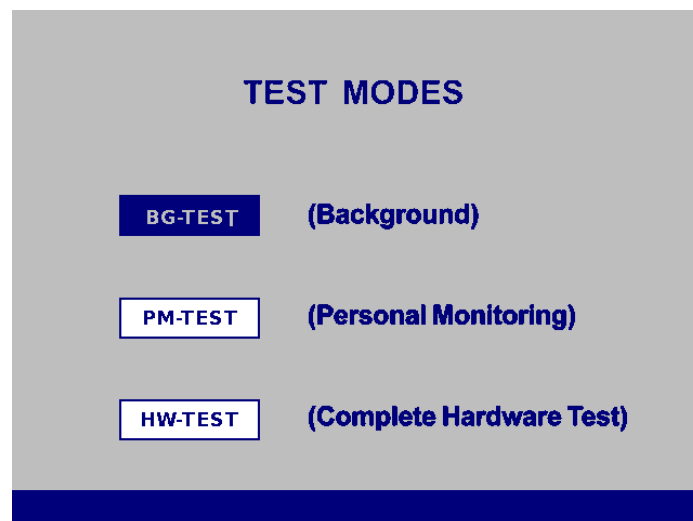
Now select BG-TEST mode by pressing TAB key. To start BG-TEST, press ENTER key. This will initiate BG acquisition cycle & at the end of counting the result will be displayed.

Sequence of screen shots are shown below



C.1.2 PM TEST

Using this menu, test run for PM mode will be initiated. Optical sensor status will be ignored. Select below menu option.





Now select PM-TEST mode using TAB key. To start P-TEST, press ENTER key. This will initiate PM acquisition cycle & at the end of counting the result screen will be displayed.

Sequence of screen shots are shown below


ACQUISITION ON

TIME LEFT	10	Sec
समय बाकी		सेकंद

LEFT HAND	बाँया हाथ	COUNT
	UPPER	00100
	LOWER	00100

RIGHT HAND	दाँया हाथ	COUNT
	UPPER	00000
	LOWER	00000

ACQUISITION COMPLETE



CLEAN


YOU ARE CLEAN

आप शुद्ध है

LEFT HAND	बाँया हाथ	COUNT
	UPPER	00500
	LOWER	00500

RIGHT HAND	दाँया हाथ	COUNT
	UPPER	00500
	LOWER	00500

ACQUISITION COMPLETE




CONTAMINATED


YOU ARE CONTAMINATED

LEFT HAND

आप संदूषित है

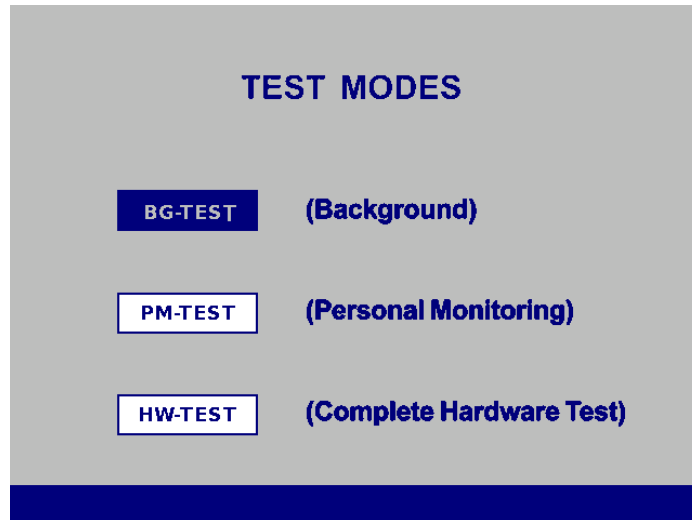
बाँया हाथ

LEFT HAND	बाँया हाथ	COUNT
	UPPER	04600
	LOWER	04600

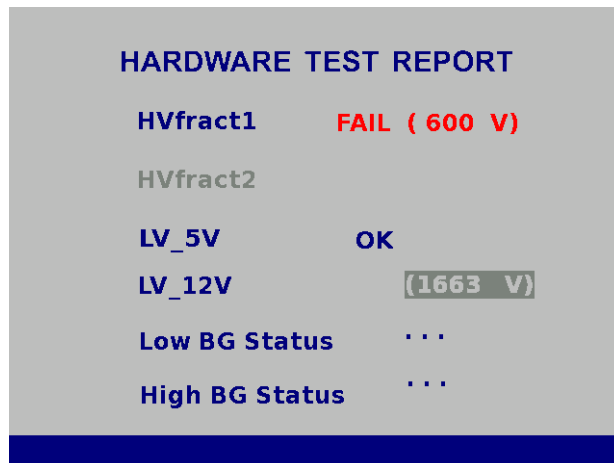
RIGHT HAND	दाँया हाथ	COUNT
	UPPER	00000
	LOWER	00000

C.1.3 HARDWARE – TEST

Using this menu, hardware status can be checked manually and result shown. Select below menu option



Now select hardware-test mode using TAB key. To select hardware-test, press ENTER key. This will initiate hardware test cycle & at the end of check result is displayed in the below screen.

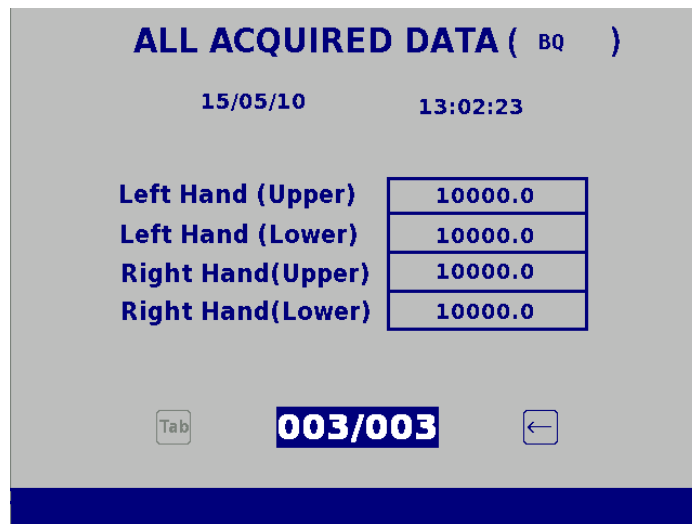


C.2 ACQUIRED DATA REVIEW

Review of last 100 acquired and last 100 contamination data history is possible through the below menu options. Also last BG data per channel & per detector could be reviewed through below menu options.

C2.1 ALL ACQUIRED DATA

Instrument records & tracks last 100 acquired data along with measurement unit & time stamp. Select below menu option from the index screen.

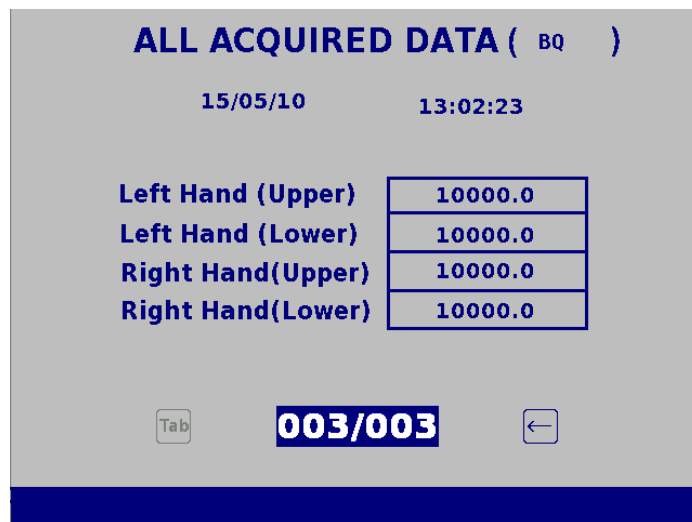


Use TAB or ← to scroll through the stored readings. To return to index screen press ESC key.

C.2.2 CONTAMINATION DATA

Instrument records & tracks last 100 contamination data along with measurement unit & time stamp.

Select below menu option from the index screen.



Use TAB or ← to scroll through the stored readings. To return to index screen press ESC key.

C.2.4 LAST BG COUNTS PER DETECTOR

The High BG data is shown in RED & Low BG/ D-fail data is shown in yellow for the corresponding detectors.

LAST BG COUNTS PER DETECTOR
(Normalized to personnel monitoring time)

Detector	BG Counts
LH – UPPER	00000
LH – LOWER	00000
RH – UPPER	00000
RH – LOWER	00000
CLOTHING	00000

Low Bg/D-Fail
High BG

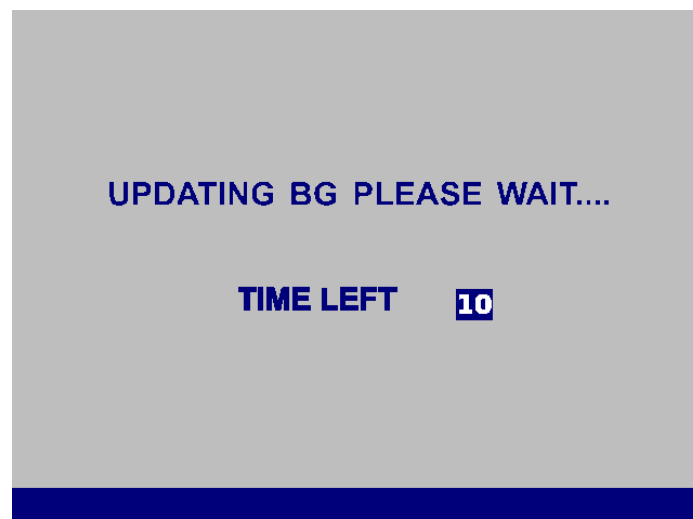
D. ACQUISITION MODE

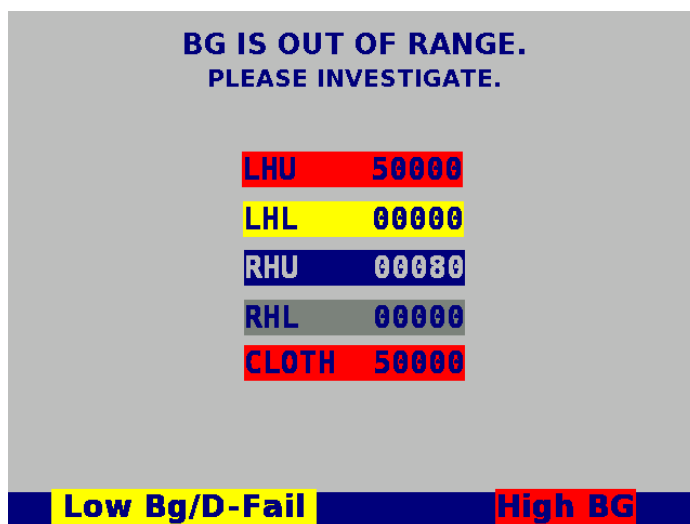
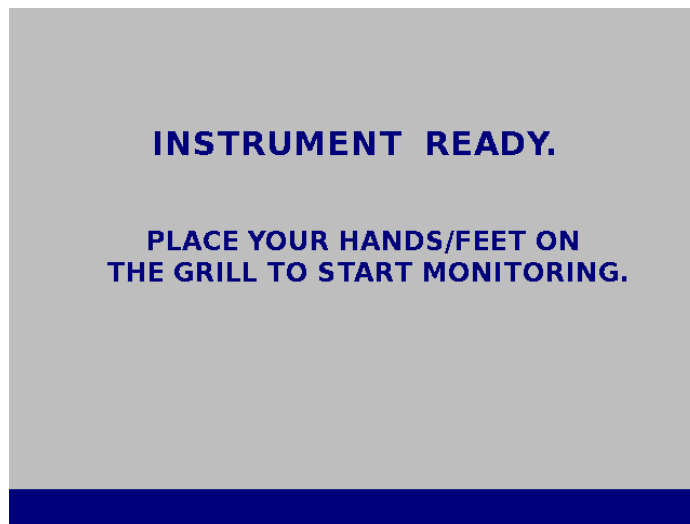
Acquisition mode can be categorized into the following

- i. BG monitoring mode
- ii. HF monitoring mode
- iii. CL monitoring mode

D.1 BG MONITORING MODE

This instrument is designed to monitor background radiation for set BG count duration automatically after every BG update time. The BG data so obtained is normalized to PM count time and stored. This data will be subtracted during acquisition for personnel (HF & CL modes) if BG subtraction is enabled.






While BG updation is in progress, intervention by activating optical sensors will terminate BG monitoring.

D.2 HF MONITORING DATA

The instrument acquires for hands / foot for the PM time set on placement of both the hands / foot. The counts data obtained for each of the channels is refreshed every second on the display in the selected measurement unit after BG subtraction (if enabled).



Sequence of screen shots during acquisition are shown below.

INSTRUMENT READY....

LEFT	HAND
कृपया बाँया हाथ रखिये	
	

ACQUISITION ON

TIME LEFT		Sec
समय बाकी	10	सेकंद

LEFT HAND	बाँया हाथ	COUNT	RIGHT HAND	दाँया हाथ	COUNT
	UPPER	00100		UPPER	00000
	LOWER	00100		LOWER	00000

At the end of monitoring depending upon the alarm status, suitable result message as shown below on LCD and voice message is played back in the selected languages.

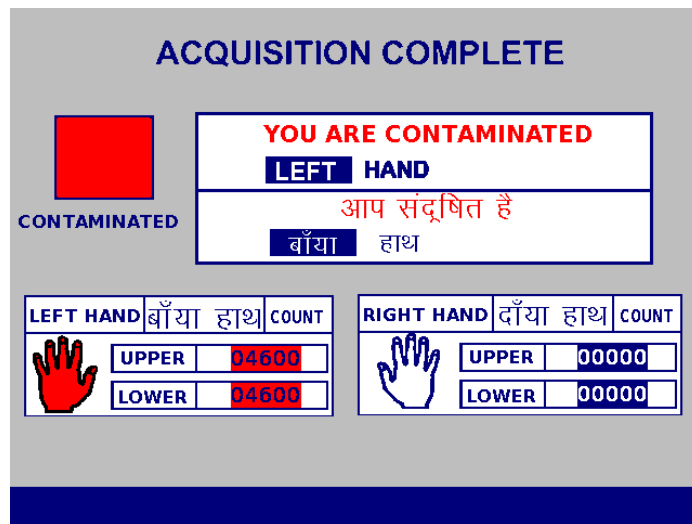
ACQUISITION COMPLETE



CLEAN

YOU ARE CLEAN
आप शुद्ध है

LEFT HAND	बाँया हाथ	COUNT	RIGHT HAND	दाँया हाथ	COUNT
	UPPER	00500		UPPER	00500
	LOWER	00500		LOWER	00500



While personnel monitoring is in progress in case one of the hands / foot are removed the acquisition is terminated and a voice / visual guidance message is played back.



D.3 CL MONITORING MODE

The instrument enters clothing monitoring mode once the closing probe is lifted off from its holder. It is a continuously monitoring for countrate / activity seen by its sensitive surface.



Acquisition continues until clothing probe is replaced into its holder.



Incase high countrate is encountered causing alarm condition voice / visual message status alarm event is played back in the selected languages.

CHAPTER – VI

AVAILING OF EQUIPMENT MAINTENANCE/ CALIBRATION SERVICES AND WARRANTY CLAUSE

6.1 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 malfunction in our instruments, you are requested to send the unit back to our works by RPP/COURIER/SPEED POST PARCEL/GATI/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 051Ph: 040-27263701/329145448/32918055

E-mail: info@nucleonix.com www.nucleonix.com

For all the Radiation monitoring equipment, detectors built-in or external probes will not have one-year warranty, but only inspection warranty at the time of supply is provided. Since detectors will / may have fragile glass construction, we do not provide warranty. In case of failure of these components, Nucleonix will supply detector replacement at cost-cost price.

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.

6.2 HOW TO AVAIL SERVICES FOR EQUIPMENT REPAIRS (DURING & AFTER WARRANTY)

6.2.1 DURING WARRANTY

The following procedure is to be followed by the customers with in India for availing services / repairing facility during warranty period.

- Customer must register service request / compliant with customer support department, Nucleonix.
- For all equipments, costing less than 3.0 lakhs or equipments weighting not more than 20Kg, one year warranty & free service is offered, when the equipments are sent to our works only.
- Equipment is to be properly packed with adequate cushion to prevent any damages in transit. Nucleonix Systems is not responsible for damages or loss during transportation.
- Packing / Freight charge is to be borne by customer when he sends the equipment to our works. However when we return after servicing packing will be Nucleonix responsibility & Freight charges will be to your account.
- please indicate in your correspondence equipment model & serial number.
- All the equipments are to be sent to our works only on door delivery basis.
- For Door Delivery Transportation contact XPS/GATI cargo in your city / town or a reliable courier service to pick the consignment from your place. For their nearest local address & phone no's look into their websites. Transit insurance if the customer feels is necessary it is to be covered.
- Nucleonix Systems will not receive the equipments sent by other modes of transportation, such as Rail/Road.
- After servicing equipments will be send back by same mode of transport such a XPS/GATI/COURIER/RPP.
- All types of Radiation detectors, glass ware, PMTs etc., which are fragile are not covered in warranty.
- You can also send the equipment personally to our works for repairs either during or after warranty, after fixing up with our service dept (Customer Support Division). If possible we may repair on same day or your person can stay for a day & get it repaired.

6.2.2 AFTER WARRANTY SERVICES

- On expiry of 1 year warranty, if you like to send the equipment (low cost less than 3.0 lakhs & smaller in size & weight less than 20 Kg) of repairs to our works, you may please follow the following procedure.
- Submit, Service request form given here, mentioning that you agree to pay service charges which includes: Basic service charges per unit / module are RS: 2000 + cost of components if it exceeds Rs:200 + packing charges (Rs:200) + Return Freight charges Rs:300 or actuals which ever is higher.
- Followed by this you can send the equipment straight away if it is within 5 years old. If the equipment is beyond 5 years old, then you can send it for repairs, only after you receive confirmation from Customer Support Division, that it is repairable & is not an obsolete model.
- For all equipments costing above Rs: 3.0 lakhs which are to be attended in the field only, you can obtain a quotation with relevant details by submitting service request form & avail the services accordingly.
- For all field servicing jobs, since we need to depute engineers, it is likely, to take time & also it will cost more which includes Engineer's TA & DA etc., apart from basic service charges + cot of spares etc. Please note that basic service charges will be different for different products depending upon sophistication.
- For all jobs to be serviced in the field, customer is requested to provide adequate details on the nature of problems, to enable our engineer to come prepared with adequate spares.

6.3 HOW TO AVAIL CALIBRATION SERVICES

- It is best advised that each of the Radiation monitors including Area monitors are calibrated once in a year. When you want to send your Radiation monitor / Area monitor / Contamination monitor for calibration to our works, you may submit "**Calibration Services request form**" & send the equipment for calibration, by following the steps given below:
- Send your equipment along with your work order, if it is 5 years old or less.
- Also send work order & clearly indicate that you will agree to pay calibration charges & also equipment repair charges additionally if the unit is faulty & requires repairs before one can take it up for calibration.
- You are requested to ensure good packing to avoid any transportation damages.

- Use only the specified following mode of transportation system for dispatching on door delivery basis. XPS/GATI cargo/Courier/RPP/Speed Post parcel etc., Send the equipment on freight paid basis. (Equipments sent by other methods such as Rail/Road etc., will not be collected).
- Immediately on receipt of the equipment, we will send an acknowledgement & also a proforma bill by email/post.
- Based on the proforma bill, once we receive the payment, equipment will be dispatched back b similar mode of transportation as mentioned above.3