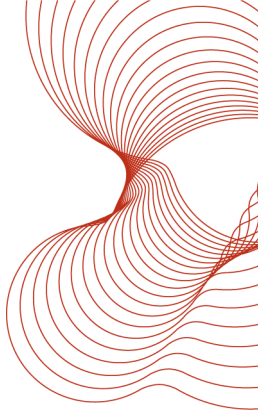


The logo for BRE Global, with 'bre' in red and 'global' in white, set against a dark grey background with a white abstract line pattern.

breglobal

A red abstract line pattern in the top right corner, consisting of multiple overlapping, curved lines that create a sense of depth and movement.

**Software Evaluation of
the GLT Export Ltd,
Fyreye II range of
conventional
multi-sensor detectors
to Clause 4.11 of EN 54-5
& Clause 4.11 of EN 54-7**

Prepared for:
Loss Prevention Certification
Board
BRE Global Ltd
Bucknalls Lane
Herts, WD25 9XX
UK

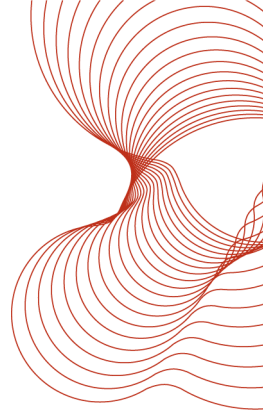
23 April 2013
Test report number:
TE 273419-SW



in association with
ABI and Lloyd's

The logo for BRE Global, with 'bre' in red and 'global' in white, set against a dark grey background with a white abstract line pattern of overlapping circles.

breglobal



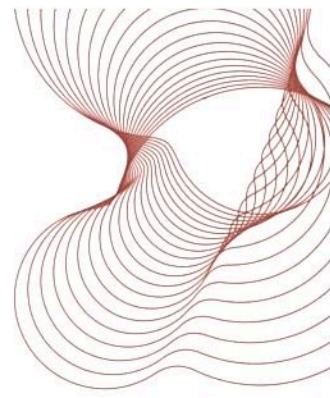
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BRE Global Ltd
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Herts, WD25 9XX
UK

23 April 2013
Test report number:
TE 273419-SW



0578



Prepared on behalf of BRE Global by

Name Geoff Reid

Position Certification Scheme Manager

Signature 

Authorised on behalf of BRE Global by

Name Mehmet Asim

Position Principal Consultant

Date 23 April 2013

Signature 

BRE Global
Bucknalls Lane
Watford
Herts
WD25 9XX
T + 44 (0) 1923 664100
F + 44 (0) 1923 664994
E enquiries@breglobal.com
www.breglobal.com

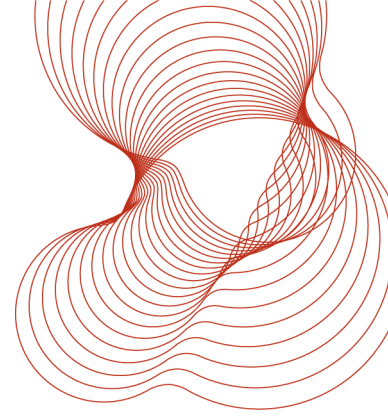
BRE Global is not UKAS accredited to make opinions and interpretation. Any opinions and interpretations included as part of this report are clearly marked as such.



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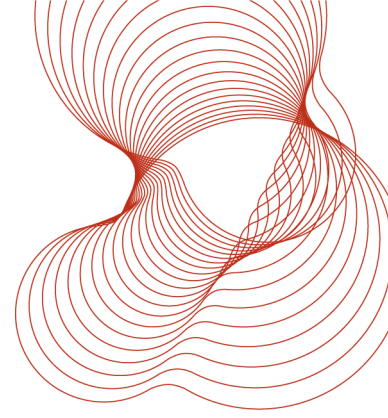
This report may only be distributed in its entirety and in accordance with the terms and conditions of the contract. Test results relate only to the items tested. We have no responsibility for the design, materials, workmanship or performance of the product or items tested. This report does not constitute an approval, certification or endorsement of the product tested.

This report is made on behalf of BRE Global. By receiving the report and action on it, the client accepts that no individual is personally liable in contract, tort or breach of statutory duty (including negligence). No third party has any right to rely on this report.



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1 Introduction

The object of this evaluation was to assess the software design and documentation of the GLT Export Ltd, trading as Zeta Alarm Systems, Fyreye II range of conventional detectors listed below, for compliance against the requirements of EN 54-5¹ Clause 4.11 and EN 54-7² Clause 4.11, in accordance with LPCB test schedules E122379/1.2³

Item	Model	Class/Sensitivity	Description
1	MKII-OH		Conventional optical smoke and heat detector
2	MKII-HF	A2S	Conventional A2S heat detector
3	MKII-HR	A2R	Conventional A2R heat detector
4	MKII-OP		Conventional optical smoke detector

1.1 Origin of request

The evaluation was undertaken for the Loss Prevention Certification Board (LPCB).

Project No: E122379

Test schedule: E122379/1.2³

1.2 Glossary

Section 8 contains a list of terms and abbreviations used in this report

1.3 Client

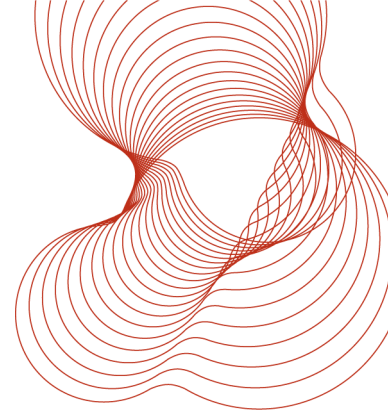
LPCB, BRE Global Ltd, Bucknalls Lane, Garston, Watford, WD25 9XX, U.K.

1.4 Applicant

GLT Export Ltd, trading as Zeta Alarm Systems, Detection House, 72-78 Morfa Road, Swansea, SA1 2EN.

1.5 Manufacturer

Wizmart Technology Inc, Building B, 88 Chang-Yang Road, Jiang Bei Investment Pioneering Park, Ningbo, Zhe-Jiang, China.



2 Documentation Submitted

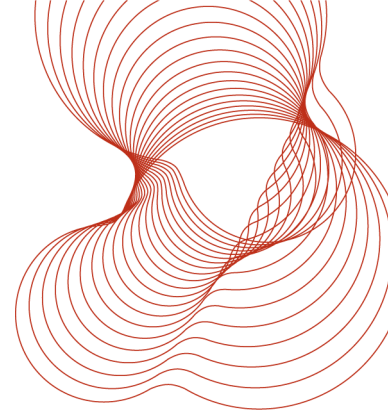
2.1 First submission

Ref. №	Document File Reference	Description / Title	Issue	Date (dd/mm/yr)
[1]	MKII-XX LPCB V10.pdf	MKII-XX Series Optical Smoke and Fixed/ROR Heat detector Documents for LPCB Application	1.0	25/04/2012
[2]	PIC16F684.pdf	Microchip PIC16F684 Data sheet DS41202F	F	03/2007
[3]	MKII-XX V11 LPCB reqired .c	MKII-xx Series Source code	V1.1	-
[4]	MKII_head V11 LPCB reqired.h	MKII-xx Source code header file	-	26/11/2009
Note: All documents were submitted on CD or in electronic format.				

2.2 Second submission

A second submission of the source code was submitted by email on 14 September 2012, to raise a fault when the limit of compensation for dirt contamination (a.k.a. drift compensation) in the photoelectric chamber was reached.

Ref. №	Document File Reference	Description / Title	Issue	Date (dd/mm/yr)
[1]	MKII-XX LPCB V10.pdf	MKII-XX Series Optical Smoke and Fixed/ROR Heat detector Documents for LPCB Application	1.0	25/04/2012
[2]	PIC16F684.pdf	Microchip PIC16F684 Data sheet DS41202F	F	03/2007
[3]	MKII-XX V12 LPCB reqired .c	MKII-xx Series Source code	V1.2	-
[4]	MKII_head V12 LPCB reqired.h	MKII-xx Source code header file	-	26/11/2009
[5]	Response to slowly Developing fires V13.doc	Response to slowly Developing fires	1.3	
Note: All documents were submitted on CD or in electronic format.				



3 Description of Software

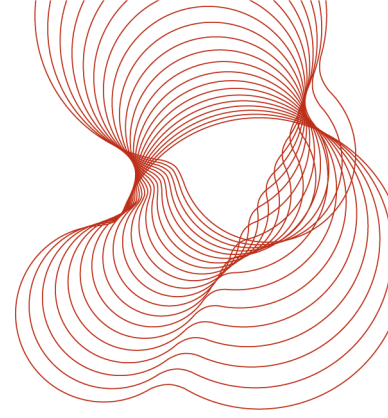
Processor		Program(s)		
Function	Type	Name	Version N ^o	Language
Main CPU of detectors	Microchip PIC16F684	MKII-XX	V1.1 † * (FE22)	C

The same source code is used to generate the program for each detector type in the range (MK11-xx ranges of detectors). Manufacturer's data and pre-set constants are set to implement the various detector types. Detector type ("Typeram") is programmed into the EEPROM of the MCU.

Each of the detectors in the test samples of each model type had a label showing: "Batch (number): xxxxxx."

* The software version was embedded in the FLASH program memory as an ID word ("FE22") programmed into the MCU, as detailed on page 39 of document [1].

† During the course of the evaluation the software was updated to version 1.2. The new ID word was not advised.



4 Test Result

4.1 Test Schedule

The Test schedule E122379/1.2³ required these multi-sensor smoke and heat detectors' performance to be assessed to Clause 4.11 of EN 54-5¹ and EN 54-7², the requirements for software. There are no differences between the software requirements in the two standards. Therefore the software was assessed in accordance with Clause 4.11 of EN 54-7², the specification for smoke detectors, and was deemed to achieve the same results for Clause 4.11 of EN 54-5¹ the specification for heat detectors.

The software evaluation was performed in accordance with the test programme detailed below. This lists the relevant standard(s) and test clauses, together with a summary of the results:-

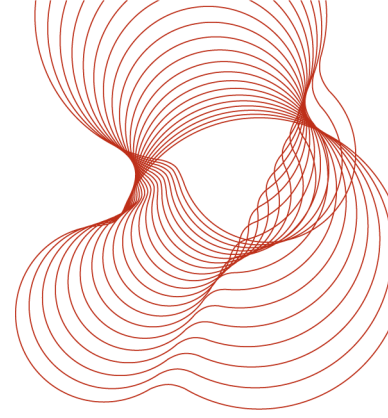
EN 54-7 ²	
Clause – Title/Test	Pass/Fail
Clause 4.11.2 – Software Documentation	Pass
Clause 4.11.3 – Software Design	Pass
Clause 4.11.4 – Storage of Programs & Data	Pass

The software documents also complied with:

EN 54-5 ¹	
Clause – Title/Test	Pass/Fail
Clause 4.11.2 – Software Documentation	Pass
Clause 4.11.3 – Software Design	Pass
Clause 4.11.4 – Storage of Programs & Data	Pass

4.2 Date of Evaluation

The evaluation was performed between the 25 July 2012 and 18 September 2012.



5 Observations and results

5.1 Software documentation

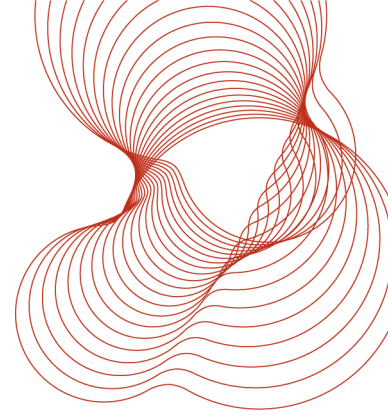
5.1.1 Test procedure

The requirements were assessed in accordance with Clause 4.11.2 of EN 54-7

5.1.2 Overview of the Software Design

The documentation was reviewed to ascertain the elements of Clause 4.11.2.1 as required by EN 54-7 standard and are detailed in the table below:

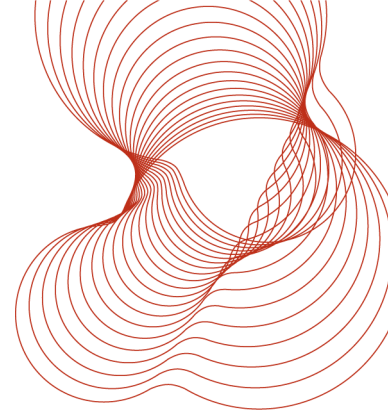
Program: MKII-xx V11		
Clause 4.11.2.1 of EN 54-7 ² - A functional description of the main program flow including:-		
Element of 4.11.2.1	Data Ref.	Details
1) Brief description of modules, with tasks performed.	[1], [3] & [4]	The program consists of a single C code listing [3] and header file [4], the modular routines and functions of which were described on page 34 of document [1].
2) The module interactions and data flow.	[1]	The modules interactions and data flow were described and illustrated by flowcharts on page 31 & 32 of document [1]
3) Overall hierarchy of the program	[1]	The overall hierarchy of the program was described / illustrated by and by the text and flowcharts on pages 30-34 of document [1].
4) Software / hardware interactions	[1]	The software and hardware interactions could be deduced from document [1]; using the circuit diagrams on pages 5,6 & 7 and the explanation on pages 35-38 of document [1].
5) The way in which the modules are called including interrupt processing	[1]	The way in which the modules are called including interrupt processing was illustrated by the explanations and flowcharts on pages 30-33 of document [1].
b) Memory allocation / Memory maps	[1]	The memory allocation was described on pages 40-43 of document [1].
c) A designation to identify software & version	[1] & [3]	The name of the software program for the range of detectors was identified by the header and filename of the source code [3] "MKII-xx_v11". Page 39 of document [1] indicated how the firmware version of samples could be identified by an ID programmed into the MCU.



5.1.3 Detailed Design Documentation and Source Code Listings

Samples of the source code listing were reviewed to ascertain the elements of Clause 4.11.2.2 as required by EN 54-7² standard and are detailed in the table below:

Program: MKII-xx V11		
Element of 4.11.2.2	Data Ref.	Comments
a) An overview of the system	[1]	An overview of the whole system including all hardware & software could be deduced from documents [1].
b1) Description & Name of the source code modules	[1], [3] & [4]	There was only one 'C' source code file/module [3] and one header file [4] which was described in design document [1]. The listing contained modular files and functions which were described on pages 30 -34 of document [1]. The names of the modules and functions in the listing correlated with those described in the design document.
Date / version reference	[1] & [3]	The source code had a version in its filename and in the header comments of the source code [3]. The firmware or compiled code is identified with an ID programmed into the MCU as described on page 39 of document [1].
b2) Description of task	[1] & [3]	The tasks were described in document [1] and also by the function headers of the source code [3].
b3) Interfaces, data transfer, data range, data validity	[1], [3] & [4]	The data structures and variables were declared in the source code [3] & [4] together with their values and ranges. They were also detailed in document [1]. The checking for valid data was included in the source code.
c) Source code listing	[3] & [4]	The code listings [3] & [4] included the variables, constants and labels used, and contained adequate comments to determine the function of the code and the data flow.



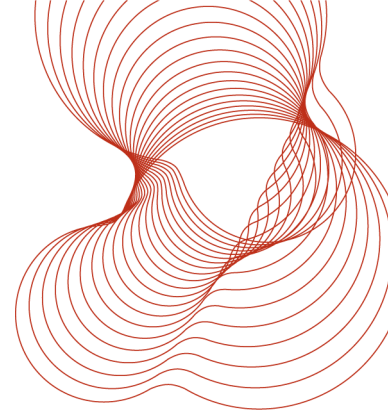
5.1.4 Software tools

The manufacturer indicated on page 44 of document [1] that the following versions of tools were used to develop the software and are shown in the table below:

Software tools		
Type of tool	Name	Version
Integrated Development Environment	Microchip MPLAB IDE	8.10
Compiler & Debugger	MPLAB ICD 2 by Golden-Chip Corporation	-

5.1.5 Assessment

The requirements of Clause 4.11.2 of EN 54-7² were met.



5.2 Software design

5.2.1 Test procedure

The requirements were assessed in accordance with Clause 4.11.3 of EN 54-7

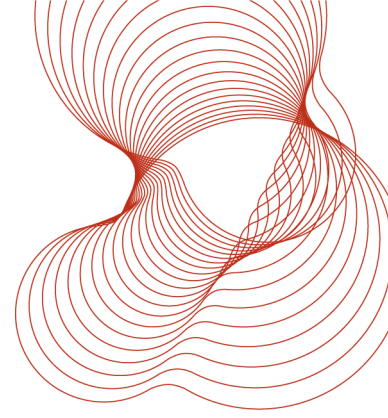
5.2.2 Modularity, Invalid data protection and deadlock

The documentation was reviewed to ascertain the elements of Clause 4.11.3 as required by EN 54-7 standard and are detailed in the table below.

Program: MKII-xx V11		
Element	Data Ref.	Details
Modularity	[3] & [4]	There was evidence of modularity structure in the source code. The functions were used in a modular fashion.
Invalid data protection	[3] & [4]	<p>Sample checks were made to ascertain that the design of interfaces for manually and automatically generated data included error trapping or other means to prevent invalid data causing errors in program execution.</p> <p>These conventional detectors have no interfaces susceptible to the entry of invalid data apart from readings taken by the ADC and these are range checked.</p> <p>Some constants are calibrated and checked on initial activation and test.</p>
Deadlock prevention	Page 38 of document [1] and documents [3] & [4]	<p>The software included means of avoiding deadlock in program flow: -</p> <p>The detectors made use of an on-chip watchdog to limit the effects of deadlock as explained on Page 38 of document [1]. Evidence of the watchdog functions were observed in documents [3] & [4].</p>

5.2.3 Assessment

The requirements of Clause 4.11.3 of EN 54-7 were met.



5.3 Storage of programs and data

5.3.1 Test procedure

The requirements were assessed in accordance with Clause 4.11.4 of EN 54-7.

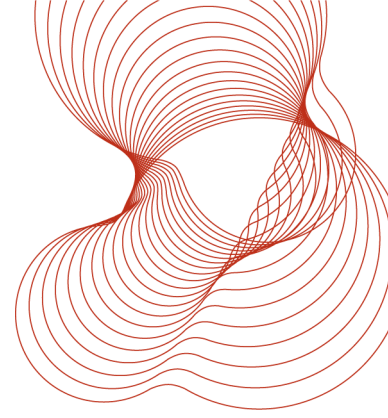
5.3.2 Data protection

The documentation was examined to ascertain the type of memory used for program and data storage. The circuit diagram pages 5, 6, 7 and page 41 of document [1] indicated there was no external memory and the entire program and data resided in the MCU. The datasheet [2] detailed the type of memory contained in the MCU:

Device Type	MCU Internal Memory		
	Data memory - SRAM	Data memory - EEPROM	Program memory- FLASH
Microchip PIC16F684 Main MCU @ U3	128 Bytes	256 Bytes	2048 x 14

Also noted were any write protection systems to safeguard these areas of memory. The results are recorded in the following table:

Memory Structure for program: MKII-xx V11			
Type of Data	Data Ref.	Type of Memory	Details
Program storage	Pages 40-43 of [1]	FLASH	The program was stored in FLASH memory of the MCU.
Running Data	Pages 40-43 of [1]	RAM	Running data is stored in RAM.
Manufacturer's pre-set data	Pages 40-43 of [1]	FLASH & EEPROM	Manufacturer's pre-set data such as factory default parameters were stored in the on-chip Flash or EEPROM. Calibration data is stored in the EEPROM. Special instructions are required to write to the EEPROM.
Site-specific data	Pages 40-43 of [1]	EEPROM	Site specific data such as the current smoke chamber clean air value and threshold were stored in the EEPROM. Special instructions are required to write to the EEPROM.



5.3.3 Memory retention

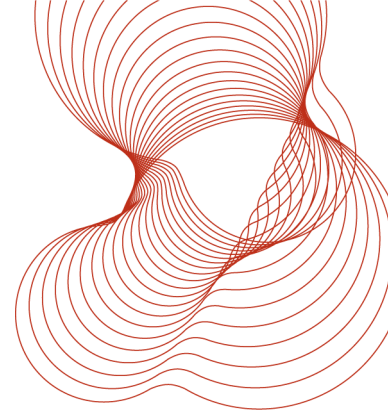
As previously established, program data was held in a non-volatile on-chip FLASH memory and the site specific data was stored in the on-chip data EEPROM.

The MCU datasheet [2] indicated that the FLASH and EEPROM memory had a data retention specification of at least 40 years. Likewise the data sheet indicated that the FLASH write endurance and the EEPROM write endurance was 100,000 and 1,000,000 cycles respectively.

Thus the site specific data is held in non volatile memory and will retain data in excess of two weeks as required by Clause 4.11.4 of EN 54-7².

5.3.4 Assessment

The requirements of Clause 4.11.4 of EN 54-7² were met.



6 Conclusion

The GLT Export Ltd, trading as Zeta Alarm Systems, Fyreye II range of conventional detectors listed below were found, on the second submission, to comply with the software design and documentation requirements of Clause 4.11 of EN 54-7² and Clause 4.11 of EN 54-5¹ in accordance with LPCB test schedule E122379/1.2³.

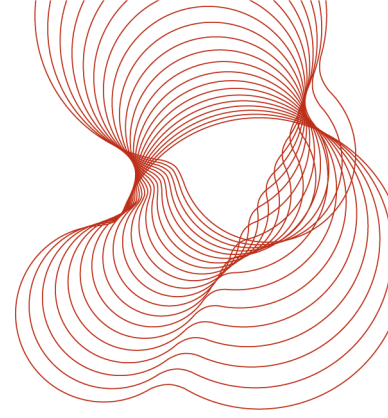
Item	Model	Class/Sensitivity	Description
1	MKII-OH		Conventional optical smoke and heat detector
2	MKII-HF	A2S	Conventional A2S heat detector
3	MKII-HR	A2R	Conventional A2R heat detector
4	MKII-OP		Conventional optical smoke detector

The software was assessed at the following issues:

Source Code: MKII-xx	Version 1.1
Each test sample detector had a label indicating the batch from which the software version could be identified:	"Batch: xxxxxx"

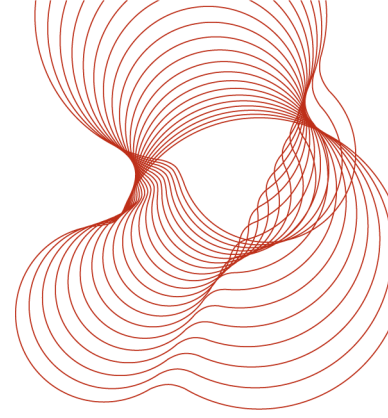
The software was approved at the following final issues:

Source Code: MKII-xx	Version 1.2
Each test sample detector had a label indicating the batch from which the software version could be identified:	"Batch: xxxxxx"



7 References

1. EN 54-5:2000 +A1:2002 (E). Fire detection and fire alarm systems Part 5: Heat Detectors - Point detectors. European Committee for Standardisation, Management Centre, Rue de Stassart 36, B-1050 Brussels.
2. EN 54-7:2000 +A1:2002 +A2:2006 (E). Fire detection and fire alarm systems Part 5: Smoke Detectors - Point detectors using scattered light, transmitted light or ionization. European Committee for Standardisation, Management Centre, Rue de Stassart 36, B-1050 Brussels
3. E122379/1.2 - LPCB Test Schedule for detectors based on EN 54-5, EN 54-7 and CEA4021. GLT Export Ltd, Fyreye II range of detectors (a.k.a. Wizmart MKII). Loss Prevention Certification Board, BRE Global, Bucknalls Lane, Garston, Watford, WD25 9XX.



8 Glossary and abbreviations

Terms & Abbreviations	Definition or description
a.k.a.	Also known as
AV	Audio Visual (e.g. sounder with light beacon)
CIE	Control & Indicating Equipment
CMOS	Complimentary Metal Oxide Semiconductor
CRC	Cyclic Redundancy Check (a kind of checksum for data using 'exclusive or' logic)
EEPROM	Electrically Erasable Programmable Read Only Memory
EFSG	European Fire and Security Group
EMC	Electro-magnetic Compatibility
EPROM	Electrically Programmable Read Only Memory
FACP	Fire Alarm Control Panel
FLASH	A type of EEPROM memory in which pages or segments of memory can be erased
IC	Integrated Circuit
ID	Identity or Identification
I/O	Input / Output
IR	Infra-red
LED	Light emitting diode
LPCB	Loss Prevention Certification Board
MCU	Micro-Controller Unit
PCB	Printed Circuit Board
PIC	Programmable Interface Controller – a type of microprocessor or MCU
QTP	Quick Turnaround Production – Microchip's pre-programmed device service
RAM	Random Access Memory
ROM	Read Only Memory (Mask ROM – programmed during manufacture of the IC)
SCI	Short Circuit Isolator
SRAM	Static Random Access Memory (does not need to be periodically refreshed)
UKAS	United Kingdom Accreditation Service
WDT	Watchdog Timer

=====REPORT ENDS=====