|  |  |  |
| --- | --- | --- |
| **Title** | LMT Firmware Release Notes | |
| **Distribution** | Development, Product Management, Service, Project Manager | |
| **Author** | Panpan Zhang | Date: 2021/09/22 |
| **Reviewer** |  | |
| **Approver** |  | |
| **Remarks** | | |

**Contents**

[1. Introduction 3](#_Toc83282673)

[2. Documents List 3](#_Toc83282674)

[3. Release History 3](#_Toc83282675)

[ 2021-09-22 Release 00 3](#_Toc83282676)

[ 2019-12-12 Release H 5](#_Toc83282677)

[ 2019-09-02 Release G 6](#_Toc83282678)

[ 2019-06-12 Release F 7](#_Toc83282679)

[ 2018-11-14 Release E 7](#_Toc83282680)

[ 2018-09-30 Release D 7](#_Toc83282681)

[ 2018-04-08 Release C 8](#_Toc83282682)

[ 2017-05-16 Release B 9](#_Toc83282683)

[ 2017-01-16 Release A 10](#_Toc83282684)

[ 2016-11-18 Release NC 11](#_Toc83282685)

[4. Document Revision 12](#_Toc83282686)

# Introduction

This document is intended to describe the LMT firmware release changes in detail.

# Documents List

This part describe the firmware format defination in LMT product.

|  |  |
| --- | --- |
| **Document Number/Name** | **Description** |
| 3KXL000712U0313\_AABBCC\_YYYYMMDD\_CRC\_HASH.bin | LMT CB Bootloader |
| 3KXL000712U0113\_AABBCC\_YYYYMMDD\_CRC\_HASH.bin | LMT CB Application |
| 3KXL000712U0213\_AABBCC\_YYYYMMDD\_CRC.bin | LMT CB Bootloader + Application |
| 3KXL000065U0413\_AABBCC\_YYYYMMDD\_CRC\_HASH.bin | LMT FE Bootloader |
| 3KXL000065U0213\_AABBCC\_YYYYMMDD\_CRC\_HASH.bin | LMT FE Application |
| 3KXL000065U0313\_AABBCC\_YYYYMMDD\_CRC.bin | LMT FE Bootloader + Application |
| 3KXL000065U0513\_AABBCC\_YYYYMMDD\_CRC\_HASH.bin | LMT FPGA Application+Lib |
| 3KXL000065U0113\_AABBCC\_YYYYMMDD\_CRC.stp | LMT FPGA Application |

# Release History

## 2021-09-22 Release 00

### Version Change Notification

|  |  |
| --- | --- |
| **CB board(Smart HMI)** | **Comments** |
| Subpart version | NA |
| Module Version | Update from 02.01.03 to 020300 |
| Design Version: Bootloader | Update from 01.00.00 to 010100 |
| Design Version: Application | Update from 02.01.03 to 020300 |

|  |  |
| --- | --- |
| **CB board(TTG HMI)** | **Comments** |
| Subpart version | NA |
| Module Version | Update from 02.01.03 to 020200 |
| Design Version: Bootloader | NA |
| Design Version: Application | Update from 02.01.03 to 020200 |

|  |  |
| --- | --- |
| **FE board** | **Comments** |
| Subpart version | NA |
| Module Version | Update from 02.01.02 to 020200 |
| Design Version: Bootloader | Update from 02.01.00 to 020101 |
| Design Version: Application | Update from 02.01.02 to 020202 |
| Design Version: FPGA | Update from 01.00.08 to 020100 |

### Released Files:

CB board (support smart HMI):

|  |  |
| --- | --- |
| **File Name** | **Description** |
| 3KXL000712U0113\_020300\_20210720\_D821C92E\_d26e75b.bin | LMT CB Application |
| 3KXL000712U0313\_010100\_20210414\_002B6A32\_8b4c0b9.bin | LMT CB Bootloader |
| 3KXL000712U0213\_020300\_20210720\_DBF96BA3.mot | LMT CB Bootloader + Application |

CB board (support TTG HMI):

|  |  |
| --- | --- |
| **File Name** | **Description** |
| 3KXL000712U0113\_020200\_20210610\_FBA4648A\_9bf4d2d.bin | LMT CB Application |
| 3KXL000712U0313\_010000\_20171204\_76A284DF\_87ca4b1.bin | LMT CB Bootloader |
| 3KXL000712U0213\_020200\_2210610\_00150ADB.mot | LMT CB Bootloader + Application |

FE board:

|  |  |
| --- | --- |
| **File Name** | **Description** |
| 3KXL000065U0213\_020200\_20210607\_A01843DE\_508dd73.bin | LMT FE Application |
| 3KXL000065U0413\_020101\_20210325\_84490EDC\_9ed7cb3.bin | LMT FE Bootloader |
| 3KXL000065U0313\_020200\_20210607\_F0957A1B.bin | LMT FE Bootloader + Application |
| 3KXL000065U0513\_020100\_20200817\_B1C740F8\_715ee8f.bin | LMT FPGA Application+Lib |
| 3KXL000065U0113\_020100\_20200817\_34B62006.stp | LMT FPGA Application |

### Change Reason:

1. linked to GLBCR2011009
2. add gain adjust feature, cyber security and bugfixs

### Firmware Changes:

1. CB Application:

change the “echo signal lost” from “maintenance” to “failure”; change the default timer to raise “signal lost” from 30 seconds to 1 minute.

o Add gain to adjust signal strength in HMI menu and HART command

o Add fast menu POL to waveform interface to set the signal polarity

o Fix Linearization table bugs in HMI and Factory setup tool

o Fix waveform display abnormal: no threshold line and axis scale

o Add the cyber security feature:

* Add menu service account and HART command that disable/enable service user
* Change user password storage from Hash 32 to SHA 256 algorithm

o Fix the bug that reset calibration carry out wrong action

o Fix issue that some value range shown in HMI are incorrect

o Fix issue that alarm of current out uncertain produce with out of limit or communication error

o Fix bug that hardware revision changes after carrying out NV format

o Fix issue that level range will be changed once entering the calibrate menu

o Fix Chinese language cannot be saved successfully

o Fix issue that PV percentage is not matched with level value when linearization enables

o Fix issue that safety manual and device implementation are mismatches between for current out readback alarm

o Extend level range limit to meet more application scenarios

o Add communication retry times to improve robustness for some special condition

o Make firmware compatibility with previous firmware revision and hardware revision

1. FE Application:

o Fix sensor board fault alarm for HFXO issue

o Add access interface to adjust signal strength and record the gain readback value

o Fix bug that unreasonable parameter for trim value will cause sensor reference value error

o Change 3V and 6V power supply monitor mode from single mode to oversample mode

o Change signal threshold setup from digital potentiometer to FPGA control

o Add periodically diagnosis for gain read back from digital potentiometer

o Optimize 1.2V power supply diagnosis to avoid false alarm

o This change can supports FE hardware revision 02.00.00 and 01.01.00

1. FE Bootloader:

* Fix bug that will block the programming for FPGA thru JTAG port

1. FE FPGA Application

* Add the FPGA logic circuit for support threshold value setting thru MCU
* Add OR gate to block the unexpected TH signal for proper measurement test function
* Add SAVE\_BLK\_EXTD logic signal to extend blanking factor
* Use one 17-bit counter directly instead of one 16 bits counter and one 1-bit counter to assembled as one 17-bit counter.
* Level measurement strategy update: FPGA detects a rising edge of the Zero Crossing signal and the following falling edge of the Threshold signal. MCU will get both of these level detection value and perform a combination algorithm to figure out an effective value for valid level detection
* Fix bug fixe for measurement task watch dog
* Change logic schematics to Verilog language for FPGA measurement module design

## 2019-12-12 Release H

### Version Change Notification

GLBCR1908001. Only updated checksums for FE & FPGA binary releases

### Released Files:

None.

### Firmware Changes:

None.

## 2019-09-02 Release G

### Version Change Notification

GLBCR1908001.

### Released Files:

|  |  |
| --- | --- |
| **File Name** | **Description** |
| 3KXL000712U0113\_2.1.3\_19.08.26.bin | CB Application to on-line update |
| 3KXL000712U0213\_2.1.3\_19.08.26.bin | For PCBA supplier to off-line programming CB |
| 3KXL000065U0213\_2.1.2\_19.08.30.bin | For PCBA supplier to off-line programming CB |
| 3KXL000065U0413\_2.1.0\_19.08.20.bin | FE Bootloader to on-line update |
| 3KXL000065U0313\_2.1.2\_19.08.30.bin | For PCBA supplier to off-line programming FE MCU |
| 3KXL000065U0513\_1\_0\_8\_19.08.20.bin | FE FPGA to on-line update |

### Firmware Changes:

1. CB Application:

* Fix NV failure issues
* Fix CB cannot start with FE existing
* Fix CB not retaining configuration changes after power cycling when sensor configured with temperature
* Fix CB max & min sensor temperature wrongly stored
* Fix calibration not precise issue
* Add the language of Polish
* Make CB compatible with push button HMI
* This change supports CB hardware version 1.0.0.

1. FE Application:

* Fix sensor out of limits
* Enable direct write to objects to write FE
* Solve issue that current outputs abnormally when a sensor out of limit is detected
* This change supports FE hardware version 1.0.0 and 1.1.0.

1. FE Bootloader:

* Fix the bug that FE bootloader cannot show the correct version of FPGA after upgrading
* Remove timeout feature in FE bootloader to avoid firmware damaged

1. FE FPGA Application

* Change the flashing library for FE FPGA to make it not coupling with FE bootloader

(Precaution: using bootloader to upgrade FPGA to version 1.0.8 requires 3KXL000065U0513\_1\_0\_8\_19.08.20.bin if FE bootloader version is 3KXL000065U0413\_2.1.0\_19.08.20.bin, while it requires 3KXL000065U0513\_1\_0\_8\_180927.bin if FE bootloader version is 3KXL000065U0413\_2.0.0\_18.09.29.bin)

## 2019-06-12 Release F

### Version Change Notification

Required from US Warminster Factory.

### Released Files:

|  |  |
| --- | --- |
| **File Name** | **Description** |
| 3KXL000712U0113\_2.1.2\_19.06.12.bin | CB Application to on-line update |

### Firmware Changes:

1. CB Application:

* Fix the issue that NV data storing does not work if the device is configured as level plus temperature

## 2018-11-14 Release E

### Version Change Notification

GLBCR1809008.

### Released Files:

|  |  |
| --- | --- |
| **File Name** | **Description** |
| 3KXL000712U0113\_2.1.1\_18.11.14.bin | CB Application to on-line update |
| 3KXL000712U0213\_2.1.1\_18.11.14.bin | For PCBA supplier to off-line programming CB |
| 3KXL000065U0213\_2.1.1\_18.11.13.bin | FE Application to on-line update |
| 3KXL000065U0313\_2.1.1\_18.11.13.bin | For PCBA supplier to off-line programming FE MCU |

### Firmware Changes:

1. CB Application:

* Fix communication error issues
* This change supports CB hardware version 1.0.0.

1. FE Application:

* Fix sensor board fault issues
* Fix communication error issues
* This change supports FE hardware version 1.0.0 and 1.1.0.

## 2018-09-30 Release D

### Version Change Notification

GLBCR1803008.

### Released Files:

|  |  |
| --- | --- |
| **File Name** | **Description** |
| 3KXL000065U0213\_2.1.1\_18.09.30.bin | FE Application to on-line update |
| 3KXL000065U0313\_2.1.1\_18.09.30.bin | For PCBA supplier to off-line programming FE MCU |
| 3KXL000065U0413\_2.0.0\_18.09.29.bin | FE Bootloader to on-line update |
| 3KXL000065U0513\_1\_0\_8\_180927.bin | FE FPGA to on-line update |
| 3KXL000065U0113\_1\_0\_8\_180927.stp | For PCBA supplier to off-line programming FE FPGA |

### Firmware Changes:

1. FE Application:

* Fix sensor board fault issues
* Add internal data objects to track Sensor Board Fault causes
* Modify the threshold value which restricts the input of lower trim value
* Optimize power consumption when measuring current through ADC
* This change supports FE hardware version 1.0.0 and 1.1.0.

1. FE Bootloader:

* Add FPGA programming feature
* This change supports FE hardware version 1.0.0 and 1.1.0.

1. FE FPGA:

* Bug fix related to unexceptional level detection signal when the level measurement test implements.

## 2018-04-08 Release C

### Version Change Notification

GLBCR1803003.

### Released Files:

|  |  |
| --- | --- |
| **File Name** | **Description** |
| 3KXL000712U0113\_2.1.0\_18.03.14.bin | CB Application to on-line update |
| 3KXL000712U0213\_2.1.0\_18.04.08.mot | For PCBA supplier to off-line programming CB |
| 3KXL000712U0313\_1.0.0\_17.12.04.bin | CB Bootloader to on-line update |
| 3KXL000065U0213\_2.1.0\_18.03.26.bin | FE Application to on-line update |
| 3KXL000065U0313\_2.1.0\_18.03.26.bin | For PCBA supplier to off-line programming FE MCU |
| 3KXL000065U0413\_1.0.0\_17.12.04.bin | FE Bootloader to on-line update |
| 3KXL000065U0113\_v\_1\_0\_7\_180201.stp | For PCBA supplier to off-line programming FE FPGA |

### Firmware Changes:

1. CB Application+Bootloader:

* Update Signal Polarity Reversal logic when changing mount orientation:
* Signal Polarity will be reversed each time mount orientation is changed;
* Enable waveform horizontal scrolling to go below zero;
* Add support for future hardware version to automatically adjust the vertical scale in the waveform to the correct range;
* Separate calibration preparation logic from HMI;
* Change default level limit/ullage limit when changing probe length;
* Add validation function for sensor calibration;
* Correct ranges for several data objects;
* Bug fix related to OS\_Unuse() for resource semaphores with communications;
* Bug fix related to Level/Interface range update;
* Bug fix related to 2 float unit direction reversal;
* Bug fix related to calibration result validation on 2 float unit;
* Bug fix service port cannot communicate with FE board;
* This change support CB hardware version 1.0.0.

1. FE Application+Bootloader:

* Remove useless test signal output;
* Update SRP calculation method;
* Remove legacy module test code from sensor interface sub-system;
* Bug fix related to FPGA Measurement test;
* Bug fix related to FPGA Write Probe Length test.
* This change support FE hardware version 1.0.0 and 1.1.0.

1. FE FPGA:

* Removed Test Points used for development;
* Removed reverse function of the data during External Bus Interface Test for SIL Certification;
* Added Probe Length Read-back Test for SIL Certification;
* Added FPGA internal watchdog of the Measurement Task for SIL Certification;
* General cleanup and minor design simplification.

## 2017-05-16 Release B

### Version Change Notification

ECN1298.

### Released Files:

|  |  |
| --- | --- |
| **File Name** | **Description** |
| 3KXL000065U0413\_0.0.6\_17.05.16.bin | FE Bootloader to on-line update |
| 3KXL000065U0213\_1.0.2\_17.05.16.bin | FE Application to on-line update |
| 3KXL000065U0313\_1.0.2\_17.05.16.bin | For PCBA supplier to off-line programming FE MCU |

### Firmware Changes:

1. FE Application+Bootloader:

* Use 11 MHz oscillator to clock the UART for the bootloader
* Change 7 MHz oscillator for waveform scaling to 14 MHz oscillator with proper prescaler selected
* Modify sensor trimming rules to allow 25% minimum span between trim points
* Sensor reference point is back-calculated to 0 counts based on trim gain/slope calculation
* Lower trim value can be up to probe length – 5”
* Combined image release

## 2017-01-16 Release A

### Version Change Notification

ECN1272.

### Released Files:

|  |  |
| --- | --- |
| **File Name** | **Description** |
| 3KXL000712U0113\_1.0.1\_17.01.12.bin | CB Application to on-line update |
| 3KXL000712U0213\_1.0.1\_17.01.12.mot | For PCBA supplier to off-line programming CB |
| 3KXL000065U0213\_1.0.1\_17.01.11.bin | FE Application to on-line update |
| 3KXL000065U0313\_1.0.1\_17.01.11.bin | For PCBA supplier to off-line programming FE MCU |

### Firmware Changes:

1. CB Application+Bootloader:

* Fix software write protect bug
* Implement software reset to FE on consecutive missed messages
* Fix diagnostic alarm behavior for current read back hi/lo

1. FE Application+Bootloader:

* Fix median filter bug
* Fix sensor stuck diagnostic

## 2016-11-18 Release NC

### Version Change Notification

ECN1252.

### Released Files:

|  |  |
| --- | --- |
| **File Name** | **Description** |
| 3KXL000712U0113\_1.0.0\_16.11.18.bin | CB Application to on-line update |
| 3KXL000712U0213\_1.0.0\_16.11.18.mot | For PCBA supplier to off-line programming CB |
| 3KXL000712U0313\_0.9.5\_13.03.25.bin | CB Application to on-line update |
| 3KXL000065U0113\_0.3.2\_13.08.27.stp | For PCBA supplier to off-line programming FE FPGA |
| 3KXL000065U0213\_1.0.0\_16.11.17.bin | FE Application to on-line update |
| 3KXL000065U0313\_1.0.0\_16.11.17.bin | For PCBA supplier to off-line programming FE MCU |
| 3KXL000065U0413\_0.0.5\_14.05.19.bin | FE Bootloader to on-line update |
| 3KXL000711U0113\_0.5.1\_16.06.10.a43 | HMI Application |

### Firmware Changes:

Initial release.

# Document Revision

|  |  |  |
| --- | --- | --- |
| **Version** | **Description** | **Date** |
| NC | Initial version | 11/18/16 |
| A | Updated release history for CB & FE updates  Updated checksums for FE binaries  Moved Release notes from Release History for document to its own section | 01/16/17 |
| B | Updated release history for FE firmware  Updated checksums for FE binary releases | 05/16/17 |
| C | Updated release history for CB & FE firmware  Updated checksums for CB & FE binary releases | 04/08/18 |
| D | Updated release history for FE & FPGA firmware  Updated checksums for FE & FPGA firmware | 09/30/18 |
| E | Updated release history for CB & FE firmware  Updated release history for CB & FE binary releases | 11/14/18 |
| F | Updated release history for CB firmware | 06/12/19 |
| G | Updated release history for CB & FE firmware  Updated release history for CB & FE binary releases | 09/02/19 |
| H | Updated release history for FPGA in v1.0.8  Updated checksums for FE & FPGA binary releases | 12/12/19 |
| 00 | Change to the new release note template  Updated release history for CB, FE and FPGA firmware  Updated checksums for CB,FE & FPGA binary releases | 09/22/21 |