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

Commented [JL1]: Shall be updated every time

Commented [JL2]: Shall be approved by **Design owner**

Contents

1. Introduction

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

2. 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

3. 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

ABB	**Firmware Release Notes** **LMT**	**3KXL140000G0140**
Responsibility: **IAMA TC China**	Date: **2021-09-22**	Language: **EN**	Filing system **Alfresco**	Revision: **00**	Page: **5/12**
Issued by: **See Author**		Reviewed: **See reviewer**	Approved: **See approver**		Area of validity: **<Level>**

2) 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

3) FE Bootloader:
  o Fix bug that will block the programming for FPGA thru JTAG port

4) FE FPGA Application
  o Add the FPGA logic circuit for support threshold value setting thru MCU
  o Add OR gate to block the unexpected TH signal for proper measurement test function
  o Add SAVE_BLK_EXTD logic signal to extend blanking factor
  o Use one 17-bit counter directly instead of one 16 bits counter and one 1-bit counter to assembled as one 17-bit counter.
  o 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
  o Fix bug fixe for measurement task watch dog
  o 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

![ABB]	**Firmware Release Notes** **LMT**	**3KXL140000G0140**	
Responsibility: **IAMA TC China**	Date: **2021-09-22**	Language: **EN**	Filing system **Alfresco**	Revision: **00**	Page: **6/12**
Issued by: **See Author**		Reviewed: **See reviewer**	Approved: **See approver**		Area of validity: **<Level>**

	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.

  2) 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.

  3) 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

  4) 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:
  - o 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:
  - o Fix communication error issues
  - o This change supports CB hardware version 1.0.0.

  2) FE Application:
  - o Fix sensor board fault issues
  - o Fix communication error issues
  - o 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

	Firmware Release Notes **LMT**	**3KXL140000G0140**		
Responsibility: **IAMA TC China**	Date: **2021-09-22**	Language: **EN**	Filing system **Alfresco**	Revision: **00**	Page: **8/12**
Issued by: **See Author**		Reviewed: **See reviewer**	Approved: **See approver**	Area of validity: **<Level>**

3KXL000065U0113_1_0_8_180927.stp	For PCBA supplier to off-line programming FE FPGA

- **Firmware Changes:**

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

    2) FE Bootloader:
    - o Add FPGA programming feature
    - o This change supports FE hardware version 1.0.0 and 1.1.0.

    3) FE FPGA:
    - o 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:
    - o Update Signal Polarity Reversal logic when changing mount orientation:
    - o Signal Polarity will be reversed each time mount orientation is changed;
    - o Enable waveform horizontal scrolling to go below zero;
    - o Add support for future hardware version to automatically adjust the vertical scale in the waveform to the correct range;

- o Separate calibration preparation logic from HMI;
- o Change default level limit/ullage limit when changing probe length;
- o Add validation function for sensor calibration;
- o Correct ranges for several data objects;
- o Bug fix related to OS_Unuse() for resource semaphores with communications;
- o Bug fix related to Level/Interface range update;
- o Bug fix related to 2 float unit direction reversal;
- o Bug fix related to calibration result validation on 2 float unit;
- o Bug fix service port cannot communicate with FE board;
- o This change support CB hardware version 1.0.0.

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

3) FE FPGA:
- o Removed Test Points used for development;
- o Removed reverse function of the data during External Bus Interface Test for SIL Certification;
- o Added Probe Length Read-back Test for SIL Certification;
- o Added FPGA internal watchdog of the Measurement Task for SIL Certification;
- o 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:**

4) FE Application+Bootloader:
- o Use 11 MHz oscillator to clock the UART for the bootloader
- o Change 7 MHz oscillator for waveform scaling to 14 MHz oscillator with proper prescaler selected
- o Modify sensor trimming rules to allow 25% minimum span between trim points

- o Sensor reference point is back-calculated to 0 counts based on trim gain/slope calculation
- o Lower trim value can be up to probe length – 5"
- o 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:
  - o Fix software write protect bug
  - o Implement software reset to FE on consecutive missed messages
  - o Fix diagnostic alarm behavior for current read back hi/lo

  2) FE Application+Bootloader:
  - o Fix median filter bug
  - o 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.

4. 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

Commented [JL3]: List the change history of the release notes template.
Please remove this part at the final release notes.