MAXM86161EVSYS Release Notes and Compatibility Matrix

MAXM86161EVSYS Compatibility Matrix

MAX32664C for MAXM86161 .msbl version	MAXM86161 GUI version	NRF52832 version	Description
30.2.3 (KX122) (MAXM86161EVSYS is factory programmed to 30.2.3)	1.0.0 (MAXM86161GUISetupV100)	0.1 (MAXM86161EVSYS is factory programmed to ob12shHost_nrf52_full_v0.1.hex)	Initial Release.
32.9.23 (KX122)	v2.0.0-rc2 (MAXM86161SensorHubGUISetupV200-rc2.exe)	2.2 (os58shHost_nrf52_full_v2.2_20201002.hex)	Latest Release for MAXM86161EVSYS. (The raw data registers tab is accessed via Options, Advanced, Register Access.)

Sensor Hub .msbl Version Numbering Convention

MAX32664+ Optical Sensor	.msbl versions	WLP IC, Accel	Form Factor
MAX32664C+ MAXM86161	MAX32664C_MAXM86161_WHRM_AEC_SCD_WSPO2_C_32.9.23.msbl (MAX32664 Website)	MAX32664GWEC, KX122	Ear
	MAX32664C_MAXM86161_WHRM_AEC_SCD_WSPO2_C_32.9.29.msbl (MAX32664 Website)	MAX32664GWEC, LIS2DS12	
	MAX32664C_MAXM86161_WHRM_AEC_SCD_WSPO2_Z_32.9.23.msbl (MAX86161EVSYS Website or MAX32664 Website)	MAX32664GWEZ, KX122	

MAX32664C for MAXM86161 .msbl Release Notes

Version	Date	Importance	History	Known Issues
32.9.33 (LIS2DS12)	4/12/22	Medium	- Parts of the .msbl firmware compiler optimized for size to fit latest algorithm. - Wearable Algorithm Suite 8.4.0 o HR and SpO2 Performance Enhancements o SpO2 algorithm is updated to reject negative PPG o AEC algorithm is updated to reject negative PPG o Improved sudden SpO2 drop detection. o Improved SpO2 Confidence Level o WHRM Motion Frequency usage is enhanced to increase HRM accuracy - AEF Controller Enhancement o Logic Improvement for SNR calculation when LED current cannot reach calculated target o Re-trigger SNR calculation if optical contact deteriorates - I2C command 0x20 added as a synonym to 0x12 00 - I2C command 0x21 added as a synonym to 0x12 01 - I2C command 0x52 0x07 0x04 added, packed normal samples report - I2C command 0x50 0x07 0x20 added, config mask for packed - samples fifo data	- This version only LIS2DS12 accel (KX122 accel not supported in this version). - SCDSM, SCD not supported. - MFIO interrupt mode not supported. - Algo Hub mode not supported. - 0x10 0x00 0x08, enter bootloader mode is not operational. - 0x11 0x03, read I2C address command is not supported. - ST accel is high resolution mode; low resolution mode was too noisy to be useful. - Initial HR setting configuration is not operational. - Raw data mode is not operational. - For 0x50 0x07 0x17, only 0x00 0x73 is functional for MAXM86161 - 0x51 0x07 0x17 is not implemented for for MAXM86161. Default is 0x00 0x73
32.9.31 (LIS2DS12)	4/5/22	Medium	- .msbl is equivalent to as 32.9.33 except for the version numbers, use 32.9.33. (I2C log files updated in 32.9.33)	- .msbl is equivalent to as 32.9.33 except for the version numbers, use 32.9.33.
32.9.23 (KX122)	3/7/22	Low	- Wearable Algorithm Suite 2.10.0 - Added read algo output FIFO size 0x11 0x06 0x01/2 command. - Added Disable/Enable LDO_EN 0x10 0x12 command. - Added Disable/Enable MAXM86161 GPIO 0x10 0x13 command.	- This version only supports KX122 (LIS2DS12 not supported in this version). KX122 is NRND - MFIO interrupt mode not supported. - Algo Hub mode not supported. - 0x10 0x00 0x08, enter bootloader mode is not operational. - 0x11 0x03, read I2C address command is not supported. - Initial HR setting configuration is not operational.
32.9.29 (LIS2DS12)	1/23/22	High	- Wearable Algorithm Suite 6.5.0 - Fix R values are not output in SpO2 calibration mode. - Fix Extended Algorithm report values: • SpO2 low signal quality flag • SpO2 motion flag • SpO2 low PI flag • SpO2 unreliable R flag • SpO2 state - Fix 0x50 0x07 0x14, write minimum sampling average - Fix 0x50 0x07 0x16, write maximum sampling average - Fix 0x50 0x07 0x13, write minimum integration time - Fix 0x50 0x07 0x15, write maximum integration time	- This version only LIS2DS12 accel (KX122 accel not supported in this version). - SCDSM not supported. - MFIO interrupt mode not supported. - Algo Hub mode not supported. - 0x10 0x00 0x08, enter bootloader mode is not operational. - 0x11 0x03, read I2C address command is not supported. - ST accel is high resolution mode; low resolution mode was too noisy to be useful. - Initial HR setting configuration is not operational. - Raw data mode is not operational. - For 0x50 0x07 0x17, only 0x00 0x73 is functional for MAXM86161 0x51 0x07 0x17 is not implemented for for MAXM86161. Default is 0x00 0x73

32.9.28 (LIS2DS12)	10/11/21	High	- Wearable Algorithm Suite 6.5.0 - MAX32664, deep sleep between FIFO reads fixed - LIS2DS12 shutdown when algo disabled fixed. - Algo Output FIFO size is 20 bytes for normal and 52 bytes for extended. - Sensor hub only supports STM LIS2DS12 (no KX122) - Firmware compiled with -O0 optimization - 0x50 0x07 0x17 0x00 0x73 fixed; No other 0x50 0x07 0x17 0xXX 0xXX commands are accepted. - Added read algo output FIFO size 0x11 0x06 0x01/2 command. - Added Disable/Enable LDO_EN 0x10 0x12 command. - Added Disable/Enable MAXM86161 GPIO 0x10 0x13 command.	- Only supports LIS2DS12 (KX122 not supported). - SCDSM not supported. - MFIO interrupt mode not supported. - Algo Hub mode not supported. - 0x10 0x00 0x08, enter bootloader mode is not operational. - 0x11 0x03, read I2C address command is not supported. - ST accel is high resolution mode; low resolution mode was too noisy to be useful. - Initial HR setting configuration is not operational. - Raw data mode is not operational. - For 0x50 0x07 0x17, only 0x00 0x73 is functional for MAXM86161 - 0x51 0x07 0x17 is not implemented for for MAXM86161. Default is 0x00 0x73
32.13.12 (LIS2DS12) (engineering release)	3/8/21	High	- Wearable Algorithm Suite 5.0 - Four bytes added to the Algo Ouput FIFO - 1Hz IBI reporting mode - Sensor hub only supports STM LIS2DS12 (no KX122) - ST accel to high resolution mode - Algo Hub mode - Firmware compiled with -O2 optimization - Sensor hub only supports STM LIS2DS12 (no KX122)	- ST accel is high resolution mode; low resolution mode was too noisy to be useful. - SCDSM not supported for ST LIS2DS12 accelerometer part - Initial HR setting configuration is not operational. - 0x10 0x00 0x08, enter bootloader mode is not functional. - 0x11 0x03, read I2C address command is not supported.
32.9.22 (KX122)	10/5/20	High	- Wearable Algorithm Suite 2.10.0 • Improved SpO2 performance with the following ○ Signal assessment block ○ Estimation duration ○ Accuracy with subjects who are at the lower end of PI ○ Fast converging Spo2 ○ Enhanced MLP model - Command added to change LED firing (0x50 0x07 0x19) - Definition of command (0x50 0x07 0x17/0x18) are changed. They specify Slot # rather than LED #. THIS MAY CAUSE BACKWARD COMPATIBILITY IF NON-DEFAULT LED/PD CONFIGURATIONS ARE USED	
32.12.0 (not supported, use 32.9.22) (KX122)	7/22/20	High	- Wearable Algorithm Suite 2.10.0 - Improved SpO2 performance with the following ○ Signal assessment block ○ Estimation duration ○ Accuracy with subjects who are at the lower end of PI ○ Fast converging Spo2 ○ Enhanced MLP model - Command added to change LED firing (0x50 0x07 0x19) - Definition of command (0x50 0x07 0x17/0x18) are changed. They specify Slot # rather than LED #.	Command 0x11 0x05 is not available in this version
32.9.21 (KX122)	9/30/20	Low	- Added command to query the number of bytes used for the PPG output FIFO samples report (0x11 0x05).	

32.9.2 (KX122)	1/28/2020	High	- Wearable Algorithm Suite 2.2.0
			  ○ Peak detector module for IBI detection enhanced to reduce false detection rate
			  ○ MLP integration to improve HR accuracy
			  ○ Motion frequency tracking for HR measurement and skin contact detection are improved
			- Default SpO2 calibration coefficients updated to better suite MRD103 platform: a = 0; b = -26.224999; c = 112.317421;
			- Fixed bug of lagging PPG samples after long term run
			- Algorithm configuration command to set initial value of sensor sample rate/average and time integration
			- Fixed bug of sampled HR mode
			- Authentication feature and commands
			- Improved authentication commands
			- Automatically detects number of PDs supported	

32.7.0 (KX122)	11/8/2019	High	- Wearable Algorithm Suite 1.9.3
			  ○ Motion frequency tracking for HR measurement improved
			  ○ Max Sampling frequency default is 100Hz with avg=4
			- Internal FIFO increased to support host poll time of once per up to 8min in 1sec algorithm report mode (Power Saving Mode) and with sensor hub accel.
			- Reported number of samples in output FIFO (Family byte=0x12, index=0x00) changed from 1 to two byte, LSB first
			- Sensor Hub status [7:0] bit 6 is used to flag for Host accel underflow if samples are not feed fast enough to sensor hub
			- Sensor Hub accelerometer sampling freq changed from 100Hz to 200Hz to support 100Hz raw streaming.
			- HR RR and RR confidence are reported only when calculated (typically once per several samples) and zero the rest of the time.
			- Initials sampling frequency of sensor set to 100Hz with avg=4.
				Sampled mode HR (mode 3) does not produce correct result.

32.1.2 (KX122)	9/12/2019	High	- LOW Power Feature added and MFIO functionality changed to support low power mode:
			MFIO is always input and used to wake up MAX32664 and keep it active during normal application (not bootloader).
			HOST application should be update to:
			  ○ Pull MFIO LOW at least *250usec* PRIOR to start of any I2C command transaction to force a wake up.
			  ○ Keep MFIO LOW until the end of I2C transaction to ensure MAX32664 will not go to sleep.
			  ○ Set MFIO to HIGH after I2C transaction is complete.
			  ○ Periodically read MAX79356 FIFO according to desired report period (200msec for 40msec report, or 1sec for 1sec report).
			- Additional command to change report period from once per sample (40msec) to once per multiple sample (e.g. 1 per 25 sample for 1sec reporting) in sensor hub "CommChannel" family.
			- Detects chip rev A1 or A2 and switches to low power Sleep or Deep Sleep respectively.
			- Fixed bug of repeated/skipped accel samples
			- Extended report (mode 2) of algorithm output
			- KX122 accel polling rate is 100Hz
			- Fixed bug of limiting range of green LED current to half of maximum.
			- Maintain SpO2 state after reaching TIMEOUT or SUCCESS
			- If sampling of host accel is slightly slow/faster than 25Hz, accelerometer samples inside sensor hub will be repeated/decimated to provide synchronization with sensor samples.
			- Motion Threshold representation is changed from 0.1g to mili-g in the interface
			- PD configuration for WHRM and SPO2 changed to include both PD and LED (index 0x17 and 0x18), Default: LED1/PD1 for WHRM, LED2/3 for ir/red and PD1 for SPO2
				Accelerometer samples occasionally may be repeated or skipped.

			- Wearable Algorithm Suite 1.7, simultaneous HR and SPO2, - Initialize sampling freq. and integration time of sensor to max. (400Hz avg4 and to 117usec), controlled by AEC - I2C Slave address configurable with a command - Shutdown command added - SCD based power saving support added, set accel to motion detection wake mode - Command added to check chip rev and sleep being enabled - Bug fix in stopping streaming after few samples - Spo2 r value is reported as integer represented as 1000*r instead of 10*r.	
30.2.3 (KX122)	6/04/2019	High	- Initial release for MAX32664C/MAX86161 sensor hub - MAX86161 DAC calibration - WHRM controls sensor sampling rate/average and time integration (TINT) - Single API command to enable algorithm and required sensors - Sensor Hub v.1.9.8 - Sensor Hub accel polling, sampling frequency is 200Hz and low power mode - Algorithm versions - Wearable Algorithm Union v.1.4.0 - WHRM_AEC_SCD:	- SpO2 100Hz sample rate mode is disabled

nRF52 Firmware Release Notes

Version	Date	Importance	History	Known Issues
2.2	10/2/20	Medium	- Toggle MFIO on each application mode I2C transaction to save power and to follow Quick Start Guide. - Query the number of bytes used for the PPG output FIFO samples report (0x11 0x05). - Add API to set the PPG data length based on QSG documentation to be compatible for older SH FW that do not have the API for the size of the PPG output FIFO samples report. - Poll the status bit after a SH command is written in case the delay is too short and the SH is busy. (QSG documentation was updated to use 2ms standard delays and 680ms after writing a flash page via the bootloader, but the v2.1 host FW was using 2us and 340ms (C key) without issue (it seems that the Z key FW requires ~380ms)) - Start the initial SH poll timer in pedSensorsStartStop() rather than in mfioIntHandler(). - Check for SH FW v33.Y.Z before initialization to use red/IR PD1 for SpO2 (SH FW v33.Y.Z default is PD2) Use SH FW defaults for red/IR LED slots for MAXM86161 testing (these were incorrectly swapped based on SH FW v33.Y.Z swapping these, but SH FW v32.Y.Z does not swap them).	
2.1 (not released)	3/14/20	Medium	Add 2nd WHRM (green) channel	
2.0 (not released)	3/2/20	Medium	- Add read/write register group	
1.0	2/6/20	High	- Host FW for MAX32664C-MAXM86146 SH v33.6.0 and equivalent for MAX32664C-MAXM86161 SH. - Add read/write register group - Separate debug APIs from the sensor APIs	
0.0 (not released)	8/7/19	Low	- Host FW for MAX32664C-MAXM86161 SH v30.2.3 and equivalent for MAX32664C-MAXM86146 SH v33.6.0.	

PC GUI for MAXM86161 Sensor Hub Evaluation System

Version	Date	Importance	History	Known Issues
2.0	10/2/20	Medium	- Added draft version of .msbl updater. Do not use – Use the stand-alone updater as described in the Installation Guide. - Setting tab that was in 1.0 for raw data is removed, Use the Registers tab to manipulate raw data configuration. - Registers tab is accessed via Options, Advanced, Register Access.	- Do not use the GUI .msbl updater: Use the stand-alone updater as described in the Installation Guide.
1.0	7/12/19	High	- Host FW for MAX32664C-MAXM86146 SH v33.6.0 and equivalent for MAX32664C-MAXM86161 SH. - Add read/write register group - Separate debug APIs from the sensor APIs	
0.0 (not released)	8/7/19	Low	- Host FW for MAX32664C-MAXM86161 SH v30.2.3 and equivalent for MAX32664C-MAXM86146 SH v33.6.0.	