This document describes firmware changes for:
"Lynx Ion 350"
"Lynx Ion + Shunt350"
"Lynx Ion + Shunt 600"

When upgrading device check if the correct .bin file is used!
The .bin file for the "Lynx Ion + shunt" can be used for the 350 and 600.

Never downgrade a device to previous versions.

See document 'updating new firmware to the Lynx Ion' for update instructions.

Change log:
v02.05 - 24-01-2018
Changes:
- *Added Distributed Voltage and Current Control (DVCC) to "Lynx Ion 350".*

v02.04 - 18-01-2018
Changes:
- *Added Distributed Voltage and Current Control (DVCC).*
- *Added warning for charging over temperature*
- *Added warning for discharging over temperature*
- *Updated Vreg VE_REG_LINK_CHARGE_CURRENT_PERCENTAGE from 0 or 100% to controlled %.*
- *Updated Vreg VE_REG_LINK_CHARGE_CURRENT_LIMIT to controlled amps.*
- *Fixed invalid highest and lowest cell voltage/temperature.*
- *Fixed initialization bug for (old) "Lynx Ion 350" to detect "Lynx Shunt", when not present.*
- *Updated shutdown time from 2 to 8 seconds to support DVCC.*
- *more code improvements, not affecting functionality.*

Change log:
v02.03 - 12-05-2017
Changes:
- *Fixed "allow to charge" and "allow to discharge" bug in "Lynx Ion" device.*
- *Removed slave warning notification to CCGX*
- *Fixed start up bug with more than two old batteries.*
- *Added "Lynx Ion" clear history option.*
- *Added Vreg's to "Lynx Ion plus Shunt":*
  - VE_REG_HIST_BATTERY_CELL_VOLTAGE_MIN_MAX
  - VE_REG_BMS_LAST_ERRORS
  - VE_REG_DC_CHANNEL1_VOLTAGE
  - VE_REG_DC_CHANNEL1_CURRENT
  - VE_REG_BATTERY_MIN_MAX_CELL_VOLTAGE
  - VE_REG_BATTERY_MIN_MAX_CELL_TEMPERATURE
  - VE_REG_SOC
  - VE_REG_HIST_MIN_TEMPERATURE
  - VE_REG_HIST_MAX_TEMPERATURE
  - VE_REG_LINK_CHARGE_CURRENT_LIMIT
  - VE_REG_CAH
  - VE_REG_TTG
  - VE_REG_BMS_FLAGS
  - VE_REG_BMS_ERROR
  - VE_REG_BATTERY_CAPACITY
  - VE_REG_BATTERY_CONFIGURATION
  - VE_REG_RELAY_CONTROL
- *Added slave warning notifications:*
  - Led flash 4 times(without beep), no balance power received at battery;
  - Led flash 5 times(without beep), defect inside battery.
- *more code improvements, not affecting functionality.*

v02.02 - 1-05-2017
Not released.

v02.01 - 13-02-2017
note: "Lynx Ion 350" requires "lynx_ion.app.v2_01.bin" file update by USB to support Color Control GX vup update in the future.
Changes:
- *Fixed boot up battery detection bug.*
- *possible to set the ISO ECU Instance field of the ACL to 7.*

- *more code improvements, not affecting functionality.*

v02.00 - 18-01-2017
note: pgn name *BATTERY_BANK is also named BATTERY_STATUS.*
Changes:

- *The Data instance from PGN: 127508 BATTERY_BANK or PGN: 127506 DC_DETAILED can be changed by steps of 32 -> 0, 32, 64, 96, 128.. If data instance from BATTERY_BANK is changed, also data instance of DC_DETAILED will change, vice versa. Data instance from BATTERY_BANK_MIN, BATTERY_BANK_MAX and BATTERY_BANK10 - BATTERY_BANK25 are increased with the data instance from BATTERY_BANK.*

Data instance from PGN's			
BATTERY_BANK DC_DETAILED	*BATTERY_BANK_MIN*	*BATTERY_BANK_MAX*	*BATTERY_BANK10 - BATTERY_BANK25*
0	*1*	*2*	*10 - 25*
32	*33*	*34*	*42 - 57*
64	*65*	*66*	*74 - 89*
...	*...*	*...*	*...*
224	*225*	*226*	*234 - 249*

Data instance is stored, if during boot data instance is invalid, it will be restored to 0.

- *Device Instance can be changed and is stored.*
- *Device Function Instance can be changed and is stored.*
- *Device Class Instance can be changed and is stored.*
- *Added temperature high and low to PGN BATTERY_BANK_MAX and BATTERY_BANK_MIN.*
- *Updated history handling/storage for higher accuracy. Downgrade to previous versions will result in corrupt history values.*
- *Fixed Single Shot error handling during ACL procedure.*
- *Updated velib*
- *Updated hardware shutdown procedure.*
- *Added VUP boot loader, if running system is updated by vup it will reboot automatically without use of the start button.*
- *Added device serial number to main btl > V1.6, if not present MCU unique ID is used.*
- *Optimized balancing by adding balance mask storage.*
- *Updated battery type settings, changed under temperature charge warning (disable allow to charge) from -5°C to 0°C. Changed under temperature charge alarm from -10°C to -5°C.*
- *Changed current check for under temperature alarm, from 10A charging/discharging to:*
  *- charging: 5% of system capacity -> 2x180Ah batteries in parallel -> 2 * 180Ah * 5% = 18A.*
  *- discharging: 10% of system capacity -> 2x180Ah batteries in parallel -> 2 * 180Ah * 10% = 36A.*
- *Updated Time To Go approximation*
- *Added programmable contact function: under voltage level*
- *Diagnostics tool available, connected by USB cable. Can be used to change settings and log system information. (only windows supported)*
- *many more code improvements, not affecting functionality*

v01.30 - 1-08-2016
Changes:

- *Added broadcast Soc Synchronization to settings, if disabled device is working like always. When enabled, if connected batteries fully charged, device will send broadcast SOC synchronization (VE_REG_SYNCHRONIZE) and other Lynx Ion's that have this setting enabled. They will receive and handle this broadcast SOC synchronization. This way, more systems in parallel will always be synchronized. If separated Lynx Ion system is also connected to VE-CAN bus, just keep this setting disabled and it will not listen to this broadcast message, it will only listen do VE_REG_SYNCHRONIZE directed to it.*
- *Added device Instance for VE-Bus to settings, no special builds are required anymore.*
- *Critical bug fixed in IO handling.*
- *Disabled VE_REG_ZERO_CURRENT.*
- *Added cell voltage min and max to VE_REG_CLEAR_HISTORY.*

v01.29 - 19-07-2016
Changes:

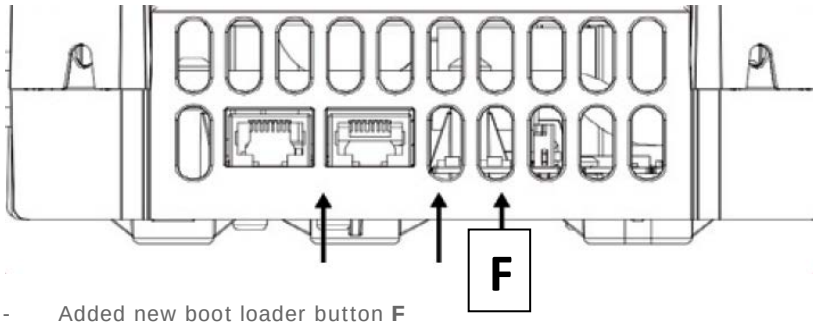
- *j1939Device.name.high.fields.ecuInst = 0; 01.29*
- *j1939Device.name.high.fields.ecuInst = 1; A1.29*
- *j1939Device.name.high.fields.ecuInst = 2; B1.29*
- *j1939Device.name.high.fields.ecuInst = 3; C1.29*
- *j1939Device.name.high.fields.ecuInst = 4; D1.29*
- *Hardware control bug during shutdown fixed.*
- *Added hardware control fault counter to MG-CAN register 0x4040*
- *Improved history saving to 25 variables.*

- *Added protection to maximum number of batteries connected.*
- *Fixed bug in charging and discharging flag.*
- *Added balance test function.*
- *Fixed bug in charge synchronization.*

v01.28 - 30-03-2016
Changes:
- *j1939Device.name.high.fields.ecuInst = 0; 01.28*
- *j1939Device.name.high.fields.ecuInst = 1; A1.28*
- *j1939Device.name.high.fields.ecuInst = 2; B1.28*
- *j1939Device.name.high.fields.ecuInst = 3; C1.28*
- *Updated history storage.*
- *Added unique number J1939_ACL_L_IDENTITY_NUMBER*
- *Fixed bug in ADC check.*
- *updated cell voltage check*
- *updated temperature check*
- "Lynx Ion 350" *changed HW version to HW1.4 for balancing control.*

vA1.27 - 29-03-2016
Changes:
"Lynx Ion 350" Changed hardware version from 1.3 to 1.4 for patched balance pre-charge.

v1.27 - 4-10-2015
Changes:
-



- Added new boot loader button **F**
  If incorrect software is programmed, this button can be used to startup the boot loader again. Button can also be used to go to boot loader directly. If the device is in sleep mode and then the button is pressed for 2 seconds, device will start up in boot loader mode. This way the device is not required first to start up in normal mode.
  NOTE: when device has been in boot loader mode, new software has been loaded or not, first press the Start button for 3 seconds to get it out of boot loader mode.
- Fixed bug in device settings.
- Fixed bug in history value storage.
- Updated device hardware version handling on VE-Can
- Updated charger detection, when charger detected device can also be started directly with the start button.

v1.26 - 21-9-2015
Changes:
- Added test Mode to OD.
- Fixed ADC measure error.
- Updated RTC driver.
- Updated balance hardware disable.
- Improved Hardware IO handling.

v1.25 - 29-6-2015
Changes:
- Fixed data in calibration registers.

v1.24 - 22-6-2015
Changes:
- Improved balance algorithm.
- New USB diagnostic implementation.
- Fixed KWhOut en KWhInCANbus values

- Improved system boot-up for 26 batteries.
- Fixed ADC measurement bug on channel 0
- updated ADC filter.
- added more settings in devreg.
- Software compatible with external DCDC converter from 96V to 48V

v1.23 - 25-8-2014
Changes:
- Synchronized with Lynx Ion + shunt.
- Added delay time at alarm levels for voltage and temperature.
- Improved general system stability
- Small bug fixing

v1.22 June 7th 2014
Changes:
- Changed device name to Lynx Ion + Shunt
- Added KWhIn and KWhout history values
- Improved general system stability
- Improved VE.Canstability (Updated velib to svn rev. 2137.)
- Added VREGS COMMANDS: Set SOC. Synchronize. Clear history.Zero current
- Fixed bug in automatic charge detect

v1.21 April 8th 2014
Changes:
- Battery SOC is no longer lost during a shutdown (both manual shutdown, and automatic shutdowns due to under voltage or other error conditions)
- Added automatic recovery from a low voltage shutdown:
  After the Lynx Ion has shut down (opened the main contactor) due to under voltage, it will continuously monitor voltage on its output. When it sees a voltage 2V higher than battery bank voltage, it will close the relay. It then checks the battery current: if the batteries are charged, it keeps the contactor closed. In case the batteries are being discharged, because the available charge power is not sufficient, it opens the main contactor again. After 5 unsuccessful retries it will stop retrying.
- Added historic data: error-shutdown counter, and highest and lowest cell voltage ever recorded.
- Added charger-control via VE.Can: the Lynx Ion will use VE.Can to control connected chargers. It is therefore no longer necessary to wire the Allow-to-charge terminals to the charger or a contactor. Note that this only works on chargers that support VE.Can BMS-Control. At the moment this is only the MPPT Solar charger controller 150/70, with firmware version v2.01 or higher.
- Improved VE.Can stability
- Improved general system stability

v1.19-15-5-2013
Changes:
- Bilge pump output is now configured to give status led output functionality by default. It can be configured to function as the original bilge pump output with a software tool. Tool is available on request.
- Fixed contactor voltage bug: on short high currents, the Lynx Ion could go in alarm and open the main contactor.

v1.18–2-4-2013
Changes:
- Support for REV2 hardware. The differences between REV1 and REV2 hardware are
  - Reduction in power consumption in standby mode. See manual for the reduction. Firmware also supports REV1 hardware.
  - REV2 hardware is easier to update, see How to upload new firmware document for details.
- Changed LED behavior in standby mode, the LED is now always off, instead of blinking rapidly
- Changed LED and BEEP behavior when an error occurs. See manual for more information.
- System goes to standby after 10 minutes in error mode.
- Added key functionalities:
  - When in error or running mode the system can be set into standby by holding the START key pressed.
  - When in error mode and the START key is shortly pressed it will restart the system.
- When an extra battery is connected to the BMS CAN-Bus of a running system an error will occur.

- System saves the last 4 errors occurred. Requires Ion Control firmware version 1.07 or higher.

v1.15–22-1-2013
Changes:

- Fixed temperature shutdown mechanism. The new rules are:

  Stop charging and discharging at +60C (charge and discharge contact off)
  Charge and discharge alarm at +65 (main contactor open)

  Stop charging at -5C (charge contact off)
  Stop discharging at -20C (discharge contact off)

  Charging alarm at -10C and current > 10A (main contactor open)
  Discharging alarm at -25C and current < -10A (main contactor open)

  Previous versions opened the big contactor already at 0C for under-temperature protection.

Known issues:

- It will not start when connected to other VE.Can products. After connecting it to the batteries, the LED will be constant green, instead of blinking rapidly, and it will not respond when you the start-button is pressed. Workaround is to disconnect it from the rest of the VE.Can network, then restart it by pressing the reset button on the bottom (the left one), and after proper power up reconnect the rest of the VE.Can network.

v1.14–9-10-2012
Changes:

- Added and enabled balancing
- Fixed lynx shunt life-timer bug
- Added reset functionality to the front button (it now works as a system on/off pushbutton)
- Fixed bug in min and max cell voltages

v1.13–3-8-2012 – this version has serious bugs, do not use it
Changes:

- Improved handling of invalidated data. Fixes bug where SOC and TTG where shown incorrectly in an unsynchronized situation.

Known issues:

- It resets now and then, opening the main relay and causing a black-out (lynx shunt life-timer bug)
- Min and max cell voltage are incorrect

v1.12 – 31-7-2012
Changes:

- Fixed invalidate values if shunt goes offline.
- Added the sending of all history values from shunt.
- Fixed discharge issue (after discharged first charge it with 5Ah before enabling discharger again)
- Fixed error set in initializing state of BMS.
- Fixed "delay" in beeping on error set.
- Changed sending of battery status / detailed status only when BMS is running.
- Added sending battery status(instance 1: minimal cell voltage)
- Added sending battery status(instance 2: maximum cell voltage)
- Added sending cell voltages of every battery
- Fixed start-up sequence for use with more than 2 batteries connected to the bus.
- Added support for sending n2k message per battery. Only the first 16 batteries.
- Added support for connecting 48 batteries to the BMS-bus.

v1.11 - 14-6-2012
Changes:

- Added lynx shunt set low soc to 10%
- Changed peukertcoeff. to 1.00.

v1.10 – 10-6-2012

Changes:

- Fixed bug in synchronizing shunt when charged

v1.00 – 6-6-2012
Initial version