Newsletter - JULY 2011

*ENGLISH VERISON*

MX10 - New Base Station - the Strong Centre

… is now in the final stages of development (PCB layout, panel design etc.). Therefore, we want to report the latest information in this newsletter

We have now given the MX10 priority over the MX32ZL (not as announced in the April Newsletter), as a result of an external contract for some of the development.

The presentation of a digital system is normally done through documenting the available connections and the technical data. In the case of the MX10, no prototypes are available yet, so we have no photographs and are using drawings as shown below.

MX10 – Front Panel:

- Joystick left: All stop, Voltage Off, Total Power Off, Restart , Set Track Voltage, Navigate the Display - Display: Current, Voltage, DCC, RailCom, Bus, USB, LAN, ABA(=AOS=Automated Operations) Display, Decoder Update and Sound Project Load.
- 3 keys for Decoder Update, Sound Project Load and Decoder Test Mode (operating logic like MXULF, see later).
- USB Host, for USB Stick with file to update the MX10 itself, update decoder, or load sound project.
- CAN connections for ZIMO devices (e.g. controllers/cabs and other devices), in parallel with CAN connectors on back panel.

MX10 – Rear Panel:

Photo of Case
(ca. 18 x 20 x 4 cm) →
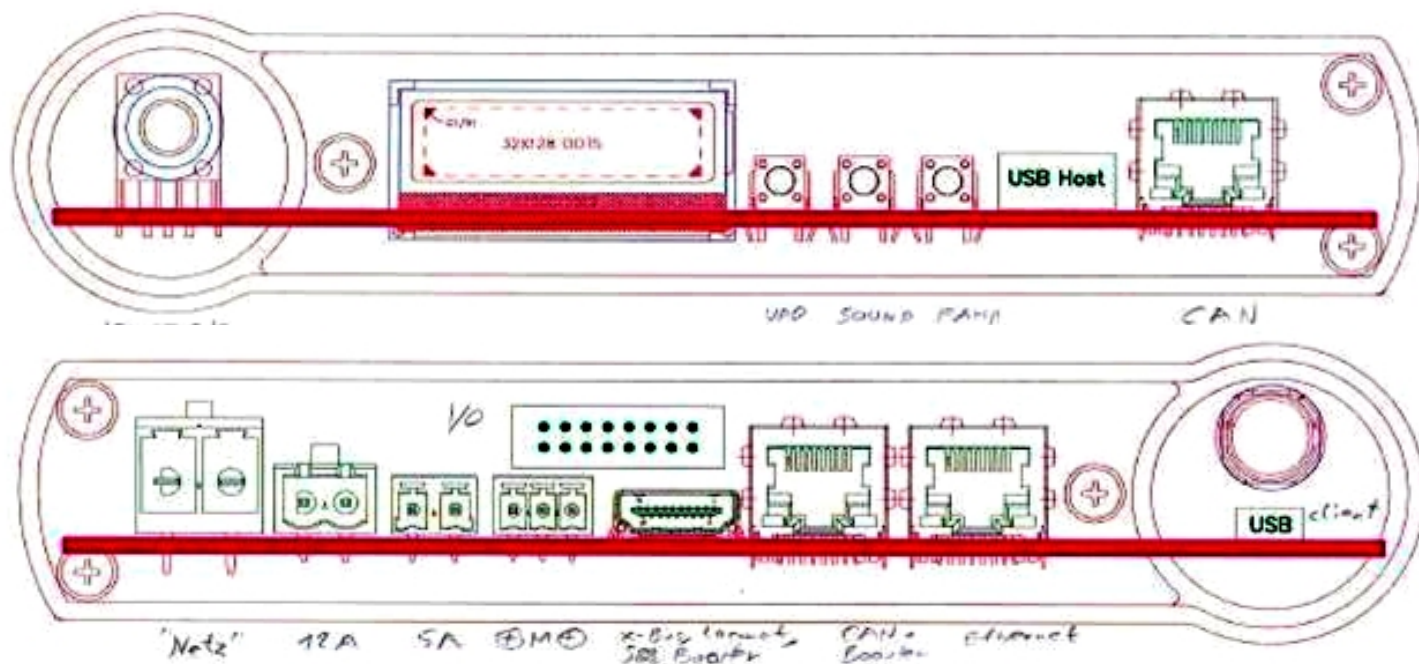
- Large screw terminal for power supply (NOT transformer) from 60 to 300 watts.
- Medium size screw terminals for main line (up to 12 A).
- Small screw terminals for programming track, or second circuit, or accessory circuit, or update track.
- Small screw terminals for DC to rail and Ground.
- About 16 input/output pins for emergency stop buttons, ABA (Automatic Operations) and other special inputs.
- Jacks for external systems: direct connection of Roco Lokmaus, with adapter cables for FRED (loconet) and S88.
- 2 x CAN Bus connectors for ZIMO devices, one with sync. Cables for booster operation.
- Jacks for Ethernet (LAN, or Wireless router), USB Client (for computer), and ZigBee Antenna.

Planned Technical Data for MX10:

Primary supply by DC power supply unit ……………………………………………………………… 24 V, between 80 and 300 Watt
  (maximum input voltage for special applications with high voltage   ……………………………………………………………… 35 V)
Rail voltage on the main line, adjustable   ……………………………………………………………………………….. 10 – 24 V
  (Special output for higher voltage ………………………………………………………………………………. up to 27 V)
Available current on the main line ……………………………………………………………………………… 12 A
Rail voltage on the secondary output for programming, update track, or second layout …………………………………….. 10 – 24 V
Available current on secondary output ………………………………………………………………………………… 5 A
Supply for CABS and other devices on the CAN Bus …………………………………………………………………… 32 V, 3 A
Memory in the device   ……………………..... Program Memory 512KB (fast) and 5 MB (in RAM),
                                              static RAM 512 KB, dynamic RAM 64 MB, NAND-Flash 2 GB
Built-in battery for maintaining the operating data in static RAM and the real time clock ……………………………………… 100 mAh
Radio properties   ……………………………………………………………………… Zig-Bee 2,4 GHz, 10 mW, 256 kBd, for 64 wireless devices
Dimensions   ……………………………………………………………………………………………………… 170 x 200 x 40 mm
Weight ……… ?

Details ….

Driving voltage and current:

The primary source comes from an external power supply, which transforms and rectifies the mains power outside the MX10, which means that the MX10 is significantly smaller than its predecessors, generates less heat and has less power loss, but still can handle high output power (up to 300 W) within a compact design.

The voltage at the rails is fully stabilized as in all ZIMO command stations and can be set to a wide range (**10 to 24 V**), of course this is fully protected from overload and short circuit, and can deliver a maximum continuous current of **12 A**. The current limit for the overload protection and the reaction time for short-circuits is fully adjustable, and the design of the high-frequency switching regulation is such that there are no energy peaks during a short-circuit. In addition, there is a special differential current detection circuit which shuts down a sudden increase in current and is designed to protect wheels and rails in the smaller scales (N, TT,...) .

Booster Solution:

Due to the high output current of the MX10 (up to 12A), only very large layouts or those layouts which use large scale motors would need a booster. In these cases, the preferred solution is to use an additional MX10, which is synchronized with the "main" MX10.

The use of boosters from other manufacturers is possible, but less advantageous, as the only communication with such devices is using the out-dated NMRA Control Bus, which transmits only timing information and short messages.

CAN Bus and other Bus Systems:

The MX10 (as is standard for ZIMO devices) includes two parallel connected Can Bus connectors (RJ-45, 6 pin), to connect the MX10 to other system devices such as controllers (CABS like the MX and its predecessors), switch (turnout/point) and track section modules (MX8, MX9 and their successors), including RailCom multi-detectors. A jack for connecting system devices from other manufacturer's devices (X-Bus, S88, possibly Loconet for FRED's), provided the implementation of these devices is open.

Optional Wireless Communication

The wireless version for the MX10 is equipped with a „ZigBee" module, "ZigBee" is a modern standard used globally and is already certified for use in the 2.4 GHz band. Compared to Bluetooth (which also uses the 2.4 GHz band), ZigBee offers a much greater range (up to several hundred meters), and provides higher data throughput than the 344 MHz radio technology previously used by ZIMO, with worldwide interoperability. Potential disadvantages, compared with the old 344 MHz radio technology could be the lack of penetration of signals through buildings (no actual practical experience in the field yet), but it is possible that this could be overcome by using repeaters to relay the signal to areas where the signal is blocked.

The ZigBee technology provides the ideal foundation for further expansion of wireless model railway operation, which is mainly interesting for garden and large scale railway modellers.

Interface to Computer:

The USB (client) – Interface is provided for external decoder programming (using PfuSch, Train Programmer, etc.) or for layout control software (using STP, ESWGJ, Train Controller, etc.).

ZIMO itself offers the free software ZIRC (ZIMO Rail Centre) and ZSP (ZIMO Sound Program), whose main tasks are to manage the software updates for ZIMO products (all devices and decoders), the loading and editing of sound projects for ZIMO sound decoders, as well as the management and programming of the CVs of ZIMO system devices and decoders.

An Ethernet socket is provided for future applications such as connecting a wireless router, for connection of smart phones, pad and netbooks, with the appropriate apps to act as controllers (CABS) connected to the MX10.

USB (host) - Interface:

This interface supports the direct connection of a USB stick, which contains the software updates for the MX10, or decoder software updates, or sound projects for loading into the decoder.

From many years of experience (with the MX31ZL), it has been shown that this method of providing software updates is more reliable and does away with the problems of directly connecting a compute, which often causes issues with the various drivers and operating systems. ZIMO have provided such an interface also on the MX32 and MXULF, despite the relatively high cost.

Track protocol:

DCC and Motorola are supported initially as basic standards. The hardware and software are open for expansion to support other standards if such a need (such as for faster data transmission) becomes necessary.

Of course the standard protocols are fully supported with (for DCC) 10,239 locomotive addresses, 2,048 accessory addresses (each with 4 sub-addresses), 14/28/128 speed steps, 28 functions etc.

RailCom and alternative feedback systems:

The "bi-directional communication" as defined by „RailCom" is built-in to every new ZIMO device and decoder, and is a part of all relevant components, no additional modules are necessary.

The MX10 is equipped with "Precision RailCom Global Detector". "Global" means any function which is not dependent on the current vehicle location ("Local Detectors" are concerned with address recognition within a section of track). "Precision" means that the reception and evaluation of RailCom messages relies not only on the standard threshold, but will also analyse in detail the RailCom message and attempt to decode garbled messages, and thus be more tolerant of electrical interference, which can occur in large layouts.

RailCom message are first used in the command station (MX10), to increase the efficiency of communication with the decoders, (in simple terms: RailCom messages which have already arrived in the decoder don't need to be repeated), messages which are for controllers, devices and the computer are transmitted further. Simple application of RailCom are: read and display CV values in "Operational" mode (from vehicles on the main track), continuous display of the measured speed and current consumption from the decoder, alert messages or message from the accessory decoders showing the position of switches (points/turnouts) etc.

Due to the uncertain situation regarding "RailCom", the MX10 command station has been prepared for using its own feedback system, which will be a development of the "ZIMO Train ID" method (ZIMO Zugnummernerkennung). See later in this Newsletter for further details about RailCom

Auxiliary Inputs:

The MX10 (like the MX1) has 16 logic-level inputs or outputs, which serve to connect simple do-it-yourself (DIY) interlocking systems, or connection of emergency stop buttons, or control ABA events (ABA = Automated Operations).

Display and Service Facilities:

The first plans for the MX10 have very spartan equipment in this regard, which sees the implementation of a front graphic display panel with 128 x 64 pixels, monochromatic, but with multi-coloured backlighting. Furthermore, there is a joystick for various tasks (adjusting the track voltage, the navigation display, etc.) and three buttons that are used primarily in connection with a software update for decoders and sound project loading.

Data management for vehicles and accessories:
This is the second main task for the command station (after ensuring a good power supply to the layout with DCC or another control signal), the information from the various input devices (from controllers intended for vehicles and accessories) is conveyed in an efficient way to the decoders and kept consistent, both in the case with RailCom feedback and without, but always taking into account the disturbances on the data channel, which in many cases on a model railway has many problems with the contact failures between rail and wheel.

The MX10 is equipped with a high-performance micro-controller and generously size memory (RAM and Flash) and with a storage battery, which allows the simultaneous support of 512 vehicles and, in addition, of course, all addressable accessories, ABAs (Automated Operations), etc.

The MX10 as Decoder Update Device:

To support the software updating of devices and decoders, plus the loading of sound projects, is a fundamental task of a modern digital system. Therefore, no additional update device or sound programmer is required, at least for the decoders produced by the system manufacturer, in this case ZIMOs.

The MX10 can be used in two different ways for the decoder update: (1) decoder update from the computer, with the MX10 serving as an interface between the computer and the decoder, and this uses the USB client on the MX10, (2) decoder update from a USB stick, using the USB Host interface (USB port) on the MX10 to load new software or sound projects stored as files on the USB stick.

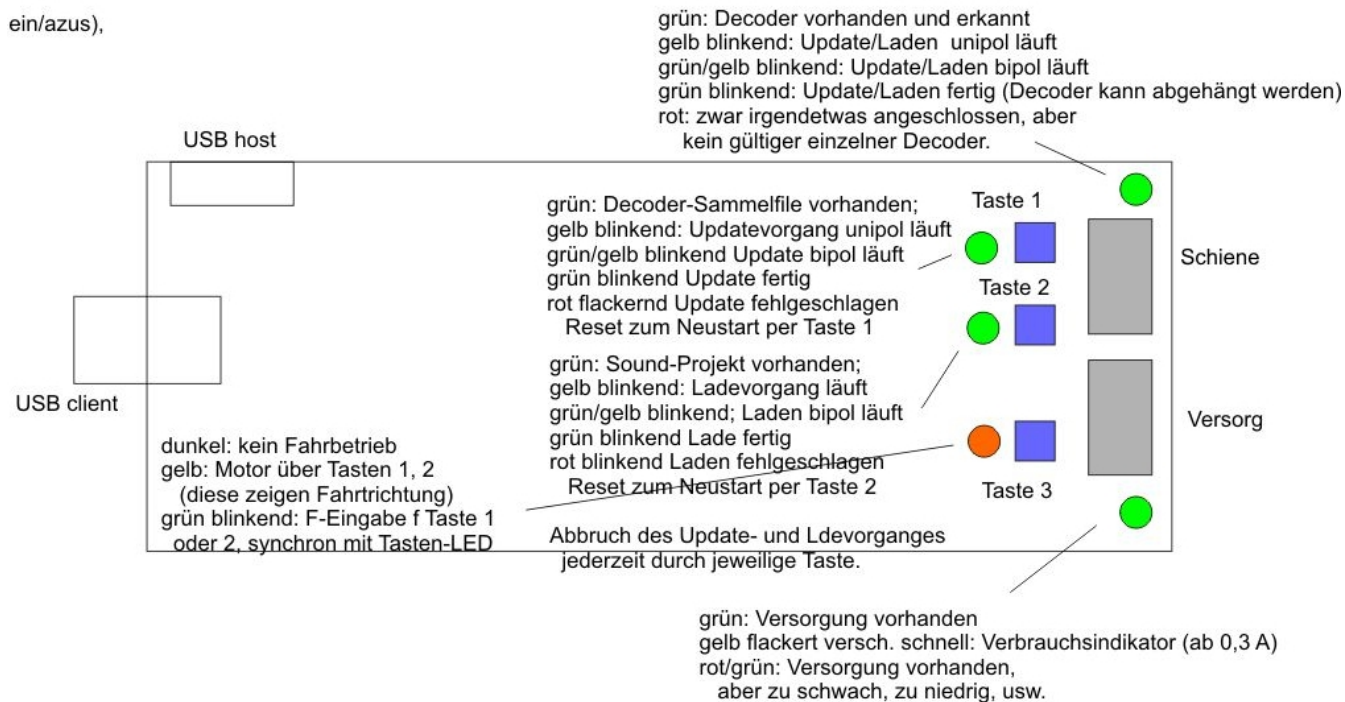***The MX10 as stand-alone – Digital Centre:***

User who do not want to have actual "physical" control of the layout, but prefer computer control with the appropriate software (e.g. ESTWGJ, STP, Train Controller etc.) and display on the screen the layout with controls to drive the vehicles, do not need to have any hand controllers connected. Even in such cases, the MX10 has high output power, well-developed overload handling, RailCom detector, and a lot of other benefits – and with the option to attach walk around controllers always available.

*) RailCom is a Trade Mark of Lenz GmbH

MXULF - the new Decoder Programming Device

… is in a similar status as the MX10, i.e. the circuit board is under development. The MXULF is, in a sense, a miniature command station, which distinguishes it from its predecessor, the MXDECUP, as it has a full DCC output capability, which allows, among other things, simple test driving.

The sketch diagram below and the following information describes the MXULF (ULF = Update software, Load sound project, driving, = Fahren in German) . (This diagram remains in German, for technical reasons, but most of the functions are explained in the text)


```
ein/azus),

USB host                                       grün: Decoder vorhanden und erkannt
                                               gelb blinkend: Update/Laden  unipol läuft
                                               grün/gelb blinkend: Update/Laden bipol läuft
                                               grün blinkend: Update/Laden fertig (Decoder kann abgehängt werden)
                                               rot: zwar irgendetwas angeschlossen, aber
                                                    kein gültiger einzelner Decoder.

            grün: Decoder-Sammelfile vorhanden;        Taste 1
            gelb blinkend: Updatevorgang unipol läuft
            grün/gelb blinkend Update bipol läuft                    Schiene
            grün blinkend Update fertig
            rot flackernd Update fehlgeschlagen          Taste 2
              Reset zum Neustart per Taste 1

            grün: Sound-Projekt vorhanden;
            gelb blinkend: Ladevorgang läuft
            grün/gelb blinkend; Laden bipol läuft                    Versorg
            grün blinkend Lade fertig
USB client  rot blinkend Laden fehlgeschlagen
              Reset zum Neustart per Taste 2          Taste 3

dunkel: kein Fahrbetrieb
gelb: Motor über Tasten 1, 2          Abbruch des Update- und Ldevorganges
    (diese zeigen Fahrtrichtung)      jederzeit durch jeweilige Taste.
grün blinkend: F-Eingabe f Taste 1
    oder 2, synchron mit Tasten-LED

                                      grün: Versorgung vorhanden
                                      gelb flackert versch. schnell: Verbrauchsindikator (ab 0,3 A)
                                      rot/grün: Versorgung vorhanden,
                                           aber zu schwach, zu niedrig, usw.
```

Decoder Software Update and Sound Project Loading with MXULF from USB Stick:

First a power supply must be connected (MXULF is flexible and accepts 10V power supply or can be connected to the rails), and whether this is sufficient is shown on an LED. Then the decoder is connected, for example with the locomotive with the decoder or with the loco on programming track. Another LED shows that the (ZIMO) decoder has been detected

Then the USB stick is inserted, the corresponding LED indicates whether a decoder update file collection or sound project has been found. With the appropriate button (1 or 2), the update process or sound project loading is started.

The LEDs indicate success or failure of the selected action.

(probably this function will not be available initially in the MXULF, but will be added later via software update using the USB stick)

The 3rd button is used to switch on the driving mode and the LED next to this button will indicate this. With the buttons 1 and 2, you can gradually go up and down the speed steps (and run and a constant speed). By pushing the 3rd key, it is possible to switch functions on and off.

The same 3 keys will be found on the MX10 command station and they operate in a similar way as the MXULF, to update software and load sound projects. The MX10 also has a display which means a selection between multiple update files and/or sound projects is possible.

MX32 - New Software Version for the Controller

Since 15th June, the new downloadable software version contains mainly "Operations" mode CV programming on the main (POM). If the command station has RailCom capability, then the CVs can be read back, but currently that is only possible with the MX31ZL and soon with the MX10.

Also in this software version, and in the coming July update, will add the capability to control the MX8 and MX9, as well as the expansion of the object database.


Also more convenient solutions are being sought for the implementation of software updates

MX695 – the New Large Scale Decoder

The first test batch (around 500) of the new large scale sound decoder has been delivered, and feedback has resulted in some modifications before going into production (in August 2011):

- the current consumption during programming on the main (POM) needs to be smaller, because some other vendors systems switch the programming track off due to the large consumption of the MX695, although this can be overcome by connecting a 10 ohm resistor.

- the synchronous rectifier will be optimized.

- the interface for the external volume control needs to be changed.

- The circuit for an alternative feedback system will be installed (see RailCom and …. later)!

Otherwise the design for the MX695 remains unchanged with all the properties shown on the following plan (which is for the larger types – MX695KV, MX695LV). For technical reasons, this diagram has not been translated.
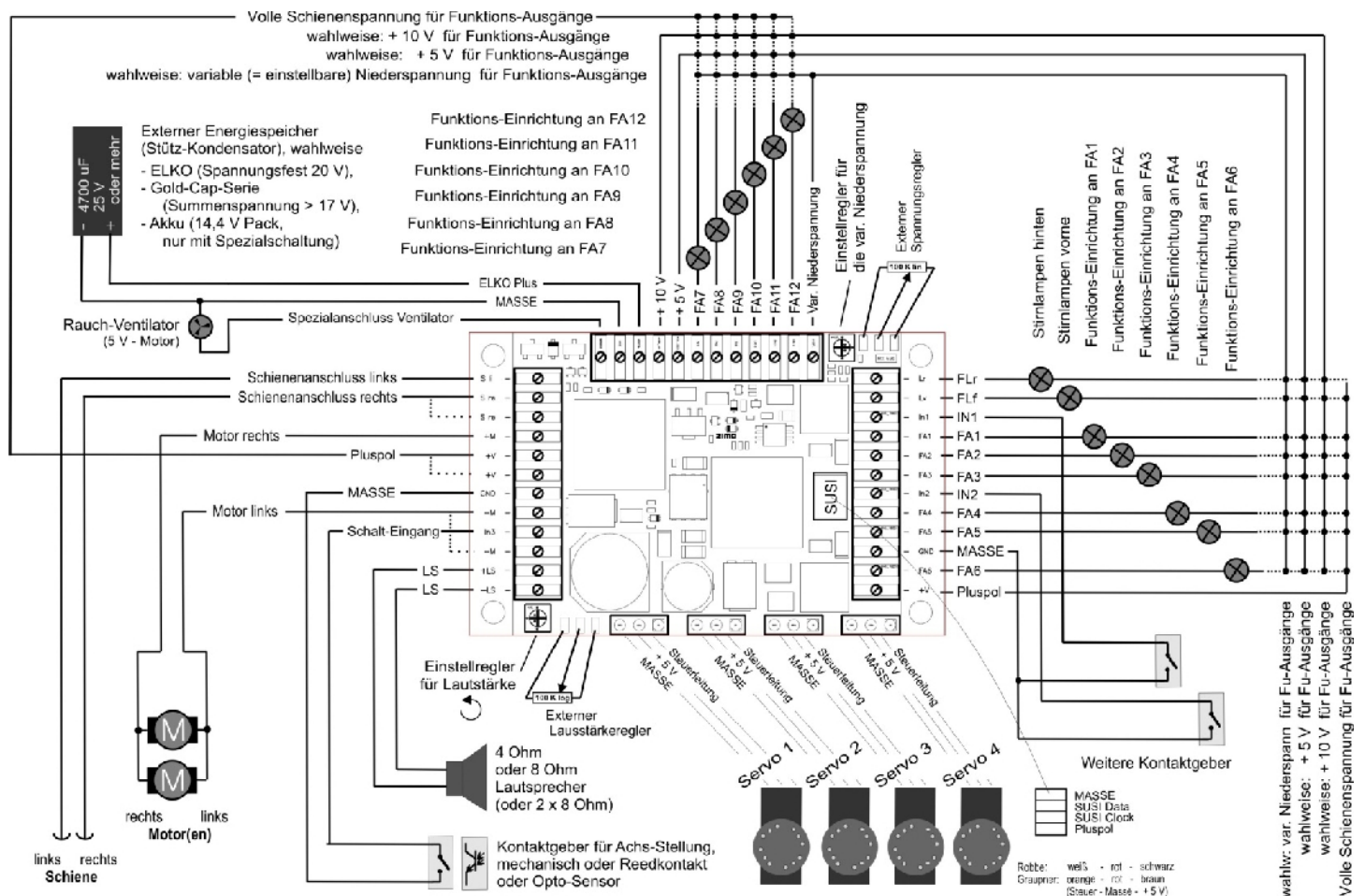
The most important characteristics of the new ZIMO large scale decoders are:

High motor current (6 A) without low heat loss and no bulky heat sink:

The modern technique of "synchronous rectification" brings a level of performance that makes the question "What is the maximum current for the motor?" almost obsolete. Also the function outputs are designed for high currents, a total of 2 A which may be drawn from one output alone.

Up to 15 Function Outputs *(depending on version), special Ventilator output:*

Thus even complex lighting systems can be built and several other devices controlled. This naturally includes the highly developed "Function Mapping" (which still includes the NMRA standard), and (just recently) this has expanded again (not only for the MX695, but for all ZIMO decoders).

In addition 4 servo outputs with standard plugs (including a 5V supply on the MX695KV and LV):

Brand new in the MX695KV, MX695LV (and MX696V) are the 3-pin power connectors for direct connection of servos and these also contain the 5V power supply. The servo-control connections also are available with the "low cost" MX695KS and LS versions.

3 low-voltage supplies for functions (5V fixed, 1.2V variable in MX695Vv and LV, 10V fixed all versions):

In large scale locomotives, low voltage loads are often used (for lamps, LEDs, smoke generators, fans), the low voltage outputs of the MX695KV and LV provide a comfortable and low-risk connection; for the variable low voltage output, there is a control screw on the board (PCB). Of course, there are additional controls available via the CVs for dimming and dipping.

Audio power up to 10 Watt (on 4 Ohm or 2 x 8 Ohm), 32 MBit, 6 Sound Channels:

Something which was only possible in the previous decoders with enhancement boards, is now standard from ZIMO (therefore no extra charge) - 10 Watts audio power. The number of sound channels (6 instead of 4) again improves sound quality and the sampling rate of 22 kHz was already the highest so far.

Arrangements for external power storage:

The direct connection of capacitors for energy storage is now commonplace for many ZIMO decoders (only the miniature types are excluded); the MX695 (and MX696) can also be connected to the large gold-caps with simple additional circuitry and 14.4V battery pack.

MX695 **Family**	**Large Scale Sound Decoder, 10 Watt Audio on 4 Ohm (or 2 x 8 Ohm),** for 0, G, 1, 2, … with **Energy Storage Connections** (also for Gold-Caps), up to **three low voltage outputs**.
MX695KV	**Full Version** with **36 screw connections**: 15 function outputs, 4 servo outputs (3-pin plug), 3 low voltage (5 V, 10 V, 1.2 variable), 2 on-board regulators (for audio and low voltage), SUSI Connection.
MX695KS	**Reduced** Version with 28 connections, 8 function outputs, one low voltage (10 V).
MX695LV	**Full Version** with **three 12-pin connectors** (as a low-cost alternative to screw connections).
MX695LS	**Reduced** Version with two 12-pin connectors, 8 function outputs, fits directly into ESU compatible loco boards.
MX695KN	Large scale decoder *without sound;* 20 screw connections, 8 function outputs, low voltage 10 V

MX695LV

All: **50 x 40 x 12 mm**
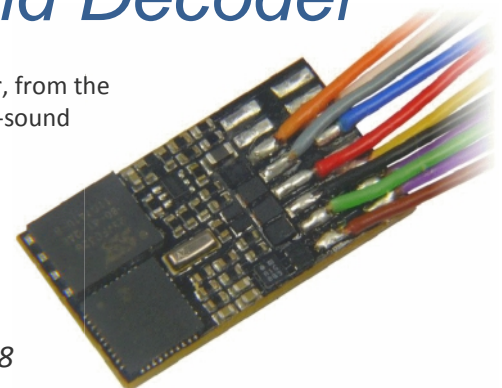
MX695KV

MX695KS

MX695LS
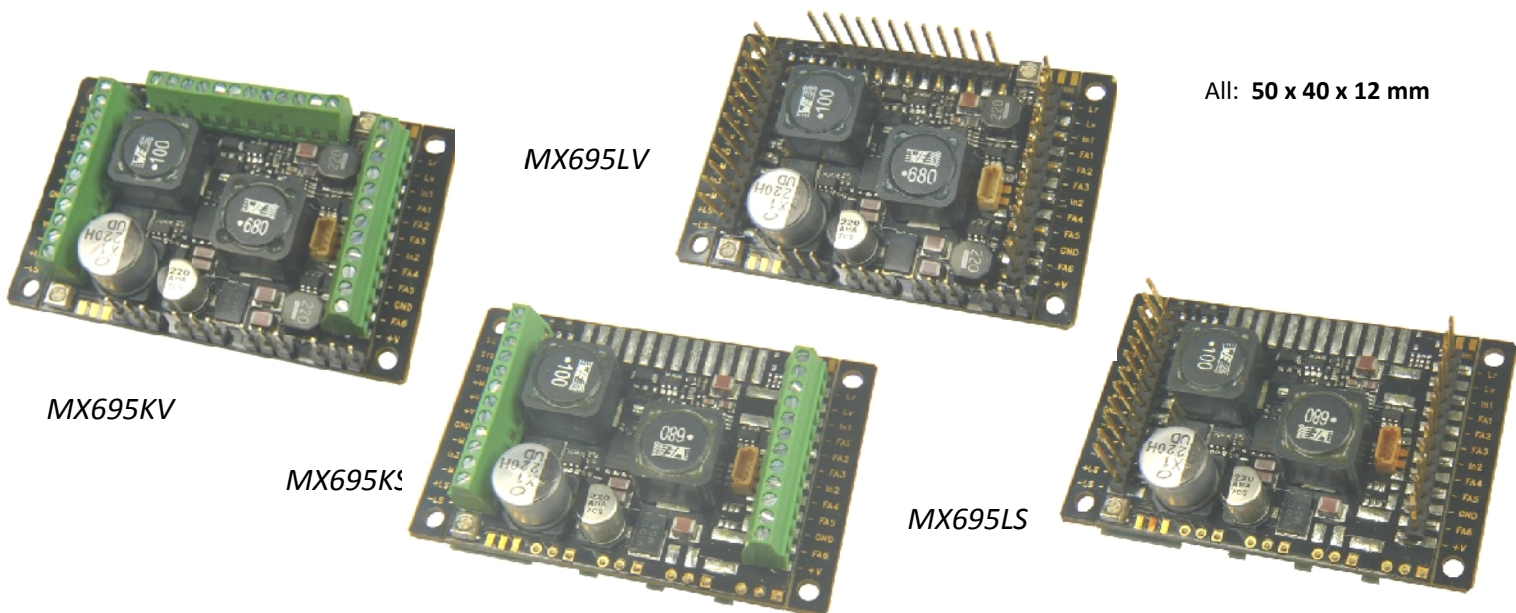
MX648 – new Miniature Sound Decoder
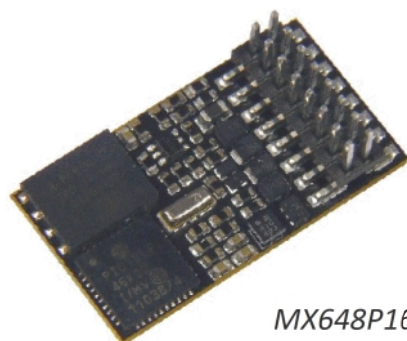
With 20 **x 11 x 4 mm**, this new sound decoder, from the top, looks the same size as the miniature non-sound decoder, only slightly thicker.

Nevertheless, this is a full ZIMO sound decoder with 6 function outputs, 32 Mbit sound memory, 1 Watt audio power, RailCom and software update-able.

MX648P16

MX648

MX681, MX685 - new Function Decoder

Unfortunately, there has been a long gap in the supply chain, with the old function decoder having expired and, due to lack of time; the new version of the software could not be finished. In the future, there will be 2 function decoders, one based on the MX630 and a smaller one based on the MX621 design.
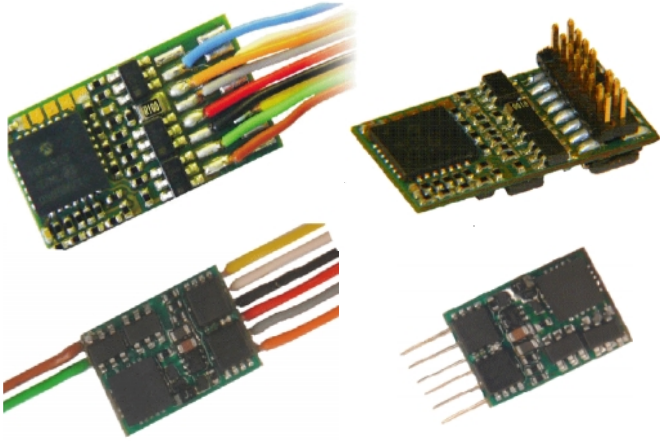
MX685, MX685P16 *(based on MX630)*

20 x 11 x 3.5 mm, 6 function outputs,
1.0 A in total, SUSI interface.

MX681, MX681N *(based on MX621)*

12 x 8.5 x 2.25 mm, 4 function outputs,
0.8 A in total.

Accessory Decoder, *was "Solenoid Decoder"*

The proven MX82 decoder type will continue to be produced! It was planned to replace the MX82 family with a new one (especially with a 5V supply, so that servos could be connected directly), but lack of time has forced a postponement.

Opinion on the "RailCom - Affair"

(Please note that this is an unofficial translation and, in the case of any dispute, the German version is the official version)

According to the ZIMO lawyers, the public statement from Lenz terminating the contract was not effective on procedural and substantive grounds; therefore ZIMO has raised a legal objection against this. Meanwhile, ZIMO continues to supply RailCom capable decoders.

In the meantime, ZIMO started to work again on their own feedback system, which has been in use since 1998 in ZIMO's own DCC system, and was known as the ZIMO Train Id Recognition System ("Zugnummernerkennung"). This technical solution was set aside and not developed further for 7 years, while ZIMO worked on a common solution with other manufacturers within the RailCom working group. But, in the current technology, a functionally advanced "Train Id" system (not just train numbers and route setting) has great potential.

There are some properties of the ZIMO system which represent advantages over the RailCom method, for example the behaviour when using carriage lighting (old style with bulb rather than LEDs). Therefore, it is quite possible that ZIMO uses this experience and offers combined solutions.

It now seems that those who warned us for a long time about the RailCom licensing may well be right., that there were potential problems with RailCom being under patent protection and this approach is not suitable for use as a standard in DCC, as the associated licensing policies could be abused to establish dominance of the market, even in the case where no royalties are demanded, just by the suppression of innovative ideas from the other companies under the public pretext of striving for compatibility.

RailCom" is a Trade Mark of LenzElektronik GmbH.