Unleashing the Power of DCC

Digital plus *by Lenz*

LZ100 Command Station Operations Manual Version 3.2

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Version 3.2

XpressNet

Getting started

To get started with DIGITAL plus, you need:

- Command Station LZ100
- Hand Held Controller LH100, LH200 or other certified **X**press**NET** handheld
- Power Station LV101 or LV200
- Locomotive equipped with a DIGITAL plus locomotive decoder, or with another NMRA-DCC compatible locomotive decoder
- Suitable transformer for your power station (see power station manual for details)
- Transformer providing 18VA at 14-16 volts AC for LZ100 (part# TR16 or suitable substitute)

The DIGITAL plus units have removable multi-pin connectors with screw terminals, to make connecting wires easy.

System architecture of DIGITAL plus

Your LZ100 is the central hub in your DIGITAl plus system. DIGITAL plus is a digital multi-train control system for all model railroad scales. It was developed in close cooperation with model railroaders. Figure 1 shows the simple and clear system design of DIGITAL plus.

DIGITAL plus is compatible with NMRA-DCC systems and their locomotive and accessory decoders. It is also compatible with all **X**press**Net** certified handhelds or other system devices. If you have an older NMRA DCC system, you can use this older system as a handheld using the Translation Module LC100.

The capabilities of DIGITAL plus are to a large extent determined by a program running inside the unit, the software. Version 3.0 is our 4th major system release.

The advantage of this approach is that new functions can be adopted simply by changing the software. It is not necessary to purchase new units. This way it is easier to implement suggestions for improvements from model railroaders.
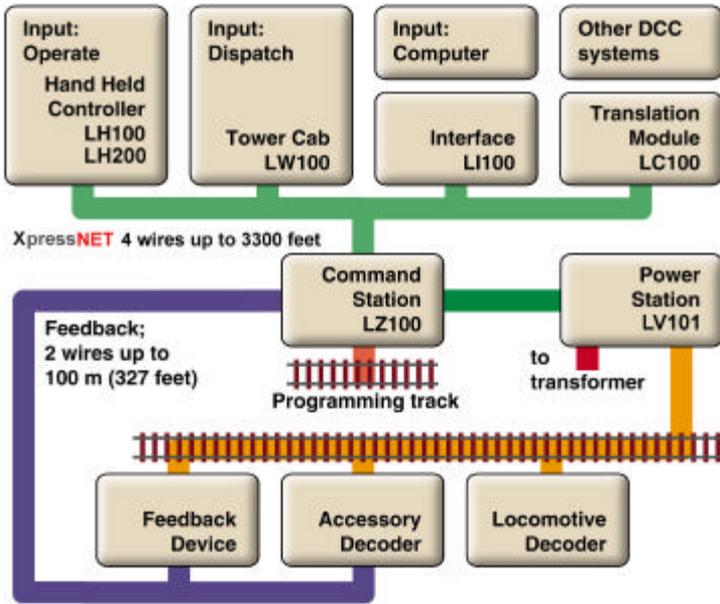
Figure 1: DIGITAL plus System Overview

Command Station LZ100

The core of the system is the LZ100 Command Station. The LZ100 coordinates the input devices (Hand Held Controller LH100, etc.) and is also responsible for data processing. Information is exchanged between Command Station and input devices via a 4-wire cable, called **X**press**Net**. The Command Station generates the control signals for Power Station LV101/LV200, which combines them with the necessary power and sends them to locomotive and accessory decoders.

The Command Station has no boosted output to connect to tracks. Accordingly it only needs a small transformer 14-16V AC (18VA), which could be one you already have from a starter set or supplied as part number TR16.

Installing the Command Station

Command Station LZ100 is connected to the AC output of the transformer with 2 wires at terminals **U** and **V** (see Figure 2). For long-term operation you need a separate transformer such as the TR16.
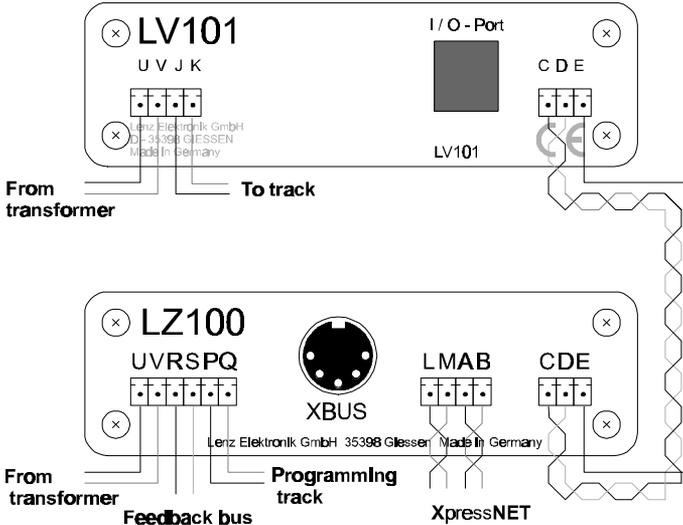

Figure 2: Complete Connections of Command Station and Power Station

Connect the programming track to terminals **P** and **Q**. This track must be completely isolated from the rest of the layout.

Terminals **C** and **D** transmit the data signal needed by the Power Station. These terminals are connected with the corresponding terminals on the Power Station with a twisted pair wire (see Figure 2). You can easily make a twisted pair wire from two normal single wires that you twist together.

The terminal **E** connection between the LZ100 and the LV101 is optional. If terminal **E** on the Command Station is connected to terminal E on the Power Station, the Power Station is able to provide feedback about overloads. The Command Station will then turn off all other Power Stations and send the corresponding information to Hand Held Controllers and other input devices. You can also use a pushbutton to connect terminal **E** to connection **M**. This allows the push button to be used as a layout emergency stop.

"Emergency stop button"
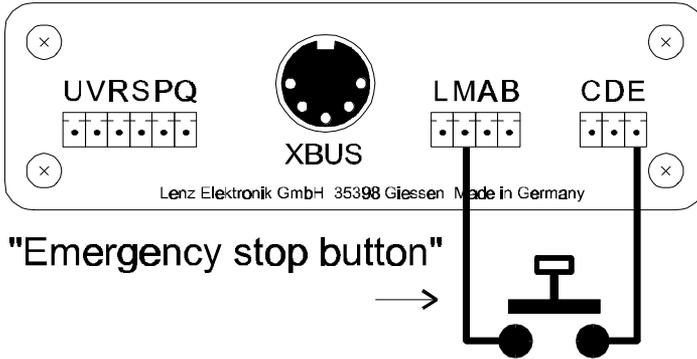
The **feedback bus** is connected at terminals **R** and **S**. Via this wire, which also must be a twisted pair, the Command Station asks for the state of for example turnouts or track occupancy detectors. For this purpose, feedback units are connected to this (Accessory Decoder with Feedback LS100 or Feedback Encoder LR101). For more details on connecting these units, please refer to the respective manuals.

If the Command Station is correctly installed and wired, and the supply power of the transformer switched on, the LED on the front of the Command Station lights up. If the LED flashes after the power up, then there is a wiring problem on the **X**press**Net**.

The LZ100 **X**press**Net**

The connecting wires from Command Station LZ100 to the input units, (for instance Hand Held Controller LH100, LH200, or the Interface), are referred to as the **X**press**Net**. Via this computer network, the Command Station and connected devices exchange information.

Xpress**Net** is an open protocol and uses the industry standard RS-485 for communication. Any certified **X**press**Net** device can be used with your LZ100

A maximum of 30 devices are allowed on **X**press**Net**. Each of the connected units has its own address, so that data exchange is problem-free. Directions for how to change the address of Hand Held Controller LH100 or another input device on **X**press**Net** are found in the corresponding manuals.

The **X**press**Net** can be connected to the Command Station via either a 5-pin DIN connector or terminals **L**, **M**, **A** and **B**. You can connect the first Hand Held Controller directly to the 5-pin DIN connector on Command Station LZ100.

If you want to connect additional Hand Held Controller LH100/LH200 (or other input devices) to your LZ100 Command Station, then you use terminals **L**, **M**, **A** and **B**. Via the wires at terminals **A** and **B**, the units exchange data with the Command Station. Via the wires at terminals **L** (plus) and **M** (minus) the units are supplied with power.

You can extend your **X**press**Net** using LA150 or LA152 adaptor boards or solder the 4 wires to the DIN-sockets yourself.

Using 5 pin Din Plugs

The most reliable long-term instillation is to use 5 pin Din plugs. These can be obtained from most electronic parts stores or through your Lenz dealer in groups of five as part XP-5.

The assignment of the five-pin DIN-socket is shown in the following figure:

Connection Board LA150 21150   **Pin Assignments from solder side**
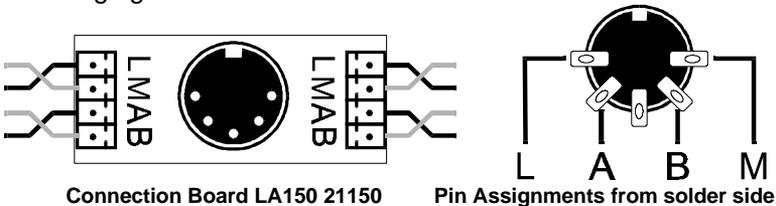
Make sure that you do not mix up the cables of the terminals L and M. This could result in a short in the connected input devices.

If you are upgrading from a Set-02 you may replace the coil cord on the LH200 you used as the command station with a coil cord that has a 5-pin din connector. The DIGITAL plus part number for the cord is LY006

Using Modular Plugs

You may use Module plugs instead of DIN plugs for wiring your **X**press**Net** or any combination of Din and Module plugs.
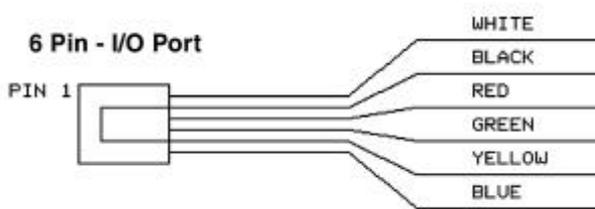
Pin #	Port A	Port B	Description
Pin 1	White	N/C	Not used
Pin 2	Black	Black	Ground "**M**"
Pin 3	Red	Red	- RS-485 "**B**"
Pin 4	Green	Green	+ RS-485 "**A**"
Pin 5	Yellow	Yellow	+12 volts "**L**"
Pin 6	Blue	N/C	Not Used

If you use module plugs you can use either 4 or 6 wire plugs.

Note: If you are upgrading from Set-02 you must remove the module plug connection to your LV101 or LV200 and instead connect your LH200 to the LZ100's **X**press**Net**.
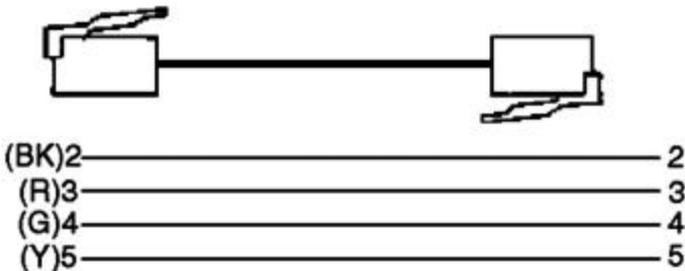
Using the LA152
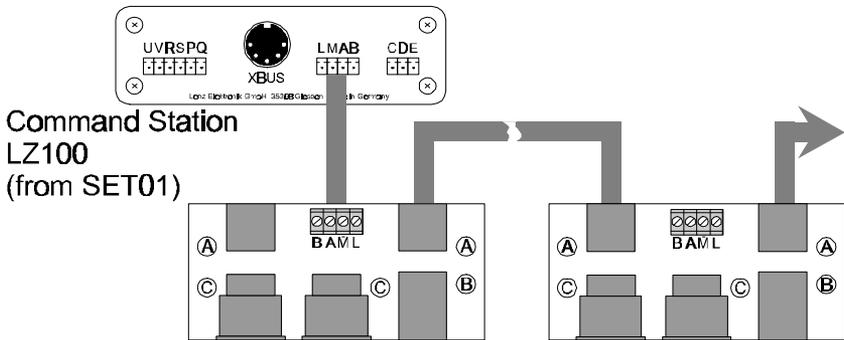
To use the LA152 with an LZ100 simply connect the LMAB outputs on the rear of the LZ100 to the corresponding LMAB connection on the rear of the LA152. Additional LA152 adapters can then be connected using either four wire RJ14 or 6 wire RJ12 cables.

Using Multiple LA152s

You can install any combination of LA152 and or DIN sockets around your layout that you like.

When interconnecting LA152s you can use either RJ11 4 wire cable or RJ12 6 wire cable to connect Port A of one LA152 to Port A of another LA152.

| Note:	Care must be taken to use reverse style modular phone cables (see above figure) to interconnect LA152s

XpressNet Wiring

The **X**press**Net** wiring must be installed so that the line starts at the Command Station and ends somewhere on your layout. (Daisy chained from Command Station via intermediate input locations to the last input location.) Between the start and end you may insert connecting panels or 5-pin DIN connectors anywhere. You must not route the wire as a closed loop. Under all circumstances you must ensure that either phone cables are used or the wires that are connected to terminals **A** and **B** are twisted.
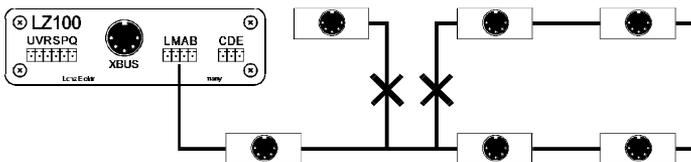
When wiring the X-BUS, wires must not be allowed to loop

The ends of the **X**press**Net** Network lines A and B should be connected to the resistor, which is enclosed with the LZ100. The resistor has a value of 120 Ohm.
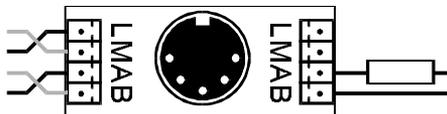
Terminating the XpressNET with a resistor

Which cable is to be used for the XpressNET?
The minimum gauge of the wire in the **X**press**Net** should be 24 gauge. In practice so-called "bell wire" has proved efficient. This can be acquired cheaply. It is sufficiently twisted and available in various colors. If you are using LA152 adaptors then common 6 wire phone cables can be used.

How long may an XpressNET network be?
For reasons of physics the maximum length of the **X**press**Net** depends on the kind and size of the wires used for the **X**press**Net**. With normal telephone wire the length should not exceed 300 ft. If you install a twin-core, twisted cable for the signal lines of the **X**press**Net** you can increase the length to up to 3000 ft. without problems.

Configuring the LZ100

There are several settings that can be configured on the LZ100. These settings can be activated from any **X**press**Net** handheld.

System Reset

If you experience problems with your LZ100 or wish to reset it to factory default setting you may perform the following operation

1) Set your handheld to operate locomotive 00 (the analog locomotive) and bring that locomotive to a stop
2) Press the F4 key 25 times in succession. You may notice that after the 20th time that a brief power interruption occurs on the layout.
3) Remove power from the LZ100. When you next power up the system all memory will be returned to factory default settings.

Note all memory including knowledge of consists will be removed from the LZ100 memory when you perform a reset operation.

Auto mode/Manual Mode

The LZ10 has two modes of operation. In manual mode (the default) the LZ100 activates all the functions that were on when the LZ100 was last shut down. In automatic operation the speed and direction of all locomotives are also returned to what they were when the LZ100 was last powered down.

To reconfigure the LZ100 for automatic operation perform the following operation

1) Set your handheld to operate locomotive 00 (the analog locomotive) and bring that locomotive to a stop
2) Press the F1 key approximately 5 times till the LED on the front of the LZ100 turns off and than continue pressing the F1 key till the LZ100 LED turns on again.

To return the LZ100 to manual operation perform the following operation

1) Set your handheld to operate locomotive 00 (the analog locomotive) and bring that locomotive to a stop
2) Press the F2 key approximately 5 times till the LED on the front of the LZ100 turns off and than continue pressing the F2 key till the LZ100 LED turns on again.

North American Warranty

Lenz GmbH does everything it can do to ensure that its products are free from defects and will operate for the life of your model railroad equipment. From time to time even the best-engineered products fail either due to a faulty part or from accidental mistakes in installation. To protect your investment in Digital Plus products, Lenz GmbH offers a very aggressive 10 year Limited Warranty.

This warranty is not valid if the user has altered, intentionally misused the Digital Plus product, or removed the product's protection, for example the heat shrink from decoders and other devices. In this case a service charge will be applied for all repairs or replacements. Should the user desire to alter a Digital Plus Product; they should contact Lenz GmbH for prior authorization.

Year One: A full repair or replacement will be provided to the original purchaser for any item that that has failed due to manufacturer defects or failures caused by accidental user installation problems. Should the item no longer be produced and the item is not repairable, a similar item will be substituted at the manufacturers discretion. The user must pay for shipping to an authorized Lenz GmbH warranty center.

Year 2 and 3: A full replacement for any item will be provided that has failed due to manufacturer defects. If the failure was caused by accidental user installation or use, a minimal service charge may be imposed. Should the item no longer be produced and the item is not repairable, a similar item will be substituted at the manufacturers discretion. The user must pay shipping to and from the authorized Lenz GmbH warranty center during this portion of the warranty period.

Year 4-10: A minimal service charge will be placed on each item that has failed due to manufacturer defects and/or accidental user installation problems. Should the item no longer be produced and the item is not repairable, a similar item will be substituted at the manufacturers discretion. The user must pay shipping to and from the authorized Lenz GmbH warranty center during this portion of the warranty period.

Please contact your dealer or authorized Lenz GmbH warranty center for specific instructions and current service charges prior to returning any equipment for repair.

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FC This equipment complies with Part 15 of FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CE Please save this manual for future reference!