

# Jacobsen Declaration Exhibit C

The DIGITAL plus locomotive decoder LE130 is suitable for all DC motors in HO scale locomotives with continuous current draw of 1.0 Amp. or less. The characteristics of the decoder are:

- \* Control of the motor's rotational speed (load compensation). Regardless of the load, the motor's rotation speed is kept nearly constant. During extremely slow movement (for instance through sharp curves and over a series of turnouts), LE130 always provides the motor with enough voltage. This creates the impression that there is actually 100 tons moving.
- \* Selectable for operation with 14/27, or 28/55 speed steps.
- \* Operation on conventional DC layouts is possible. This feature may be disabled.
- \* Provides 1A continuous motor current.
- \* Four on/off function outputs with a current rating of 200 mA each. Two of the function outputs are dedicated for the directional headlights.
- \* Support for Advanced Consist Control and Extended Addressing
- \* Support for short form programming on the main for acceleration and deceleration trim
- \* Support for all form of programming as described in NMRA RP-9.2.3
- \* Programmable locomotive address, acceleration and brake momentum, speed curve and much more.
- \* Size: L 1.04" x W 0.67"x H 0.26"  
L 26.5 x W 17 x H 6.5 mm

## LE130

## Back EMF DCC Decoder

Art. No. 10130  
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*Digital*  
— *plus*  
by Lenz <sup>TM</sup>



**Table 1: LE130 Configuration Variables**

CV	Reg	Description	Range	Factory setting
1	1	<b>Locomotive address:</b> This is the number with which you select a locomotive in the DIGITAL plus system.	1-127	3
2	2	<b>Start voltage:</b> This is the voltage applied to the motor in speed step 1. Set this value so that the locomotive just starts moving in speed step 1.	1-15	1
3	3	<b>Acceleration Momentum:</b> Determines the rate of change of speed upon acceleration. A higher value leads to a slower acceleration.	1-31	1
4	4	<b>Brake Momentum:</b> Determines the rate of change of speed upon braking. A higher value leads to longer brake distance.	1-31	1
5	-	<b>Maximum speed</b> Determines the maximum speed that the locomotive will move. This allows you to operate your locomotives in a prototypical speed range.	1-10	10
-	5	<b>CV29 when the page/pointer register has a value of 1 or value of CV pointed to by Register 6 when register 6 is being used as a pointer register</b>	0-55	4
-	6	<b>Page/Pointer Register:</b> Used during programming for paging or indexing	0-127	1
7	7	<b>Version Number:</b> This location stores the version number of the decoder. This location is read only.	-	51
8	8	<b>Manufacturers Identification:</b> This value is the manufacturer ID of the decoder, (Lenz =99). This location is read only.	-	99
9	-	<b>EMF Frequency</b> Allows you to adjust the pulse rate frequency for finer motor control	0-15	4
17	-	<b>Extended Address High Byte</b>	192-231	0
18	-	<b>Extended Address Low Byte</b> The two byte address if used is contained in CV17+18	0-255	0
19	-	<b>Consist Address</b> The advanced consist address if used is stored in CV19	0-255	0

CV	R	Description	Range	Setting
29	*5	<b>Decoder Configuration, Byte 1:</b> Several decoder properties are set with this byte. Changes are best done in binary mode (see the information for the Hand Held LH100). The detailed properties are:	0-55	4
		bit 1 <b>locomotive direction:</b> 0 = normal: locomotive moves forward when the arrow on the Hand Held points up. 1 = inverted: locomotive moves forward when the arrow on the Hand Held points down.	0,1	0
		bit 2 <b>speed step mode:</b> 0 = Operation with 14 or 27 speed steps. This setting is selected when the locomotive decoder is used with a software below version 2.0, ROCO-Digital, LGB-Digital, Arnold Digital and with all other Digital systems that do not support the 28 speed step mode. 1 = Operation with 28 speed steps. This setting is selected when the locomotive decoder is used with a Command Station with software version 2.0 or higher. The Command Station has to be set to 28 speed step mode for the decoder address, if you are using this setting! Other Digital systems supporting the 28 speed step mode can use the decoder in this setting.	0,1	0
		bit 3 <b>Usage on conventional DC layouts:</b> 0 locomotive operates in digital mode only 1 locomotive can operate in both conventional DC and digital mode.	0,1	1
		bit 4 always 0	0	0
		bit 5 <b>speed curve:</b> 0 factory pre-set speed curve is used 1 user defined speed curve is used. Please enter the appropriate values into CV 67 to 80 before setting this bit.	0,1	0
		bit 6 <b>Extended Addressing</b> 0= Normal addressing 1=Two Byte extended addressing	0-1	0
		bit 7 always 0	0	0
		bit 8 always 0	0	0

CV	R	Description	Range	Setting
<b>30</b>	-	<b>Decoder Error Information</b>		
		bit 1 <b>Motor Short</b> If set short between motor and track	0,1	0
		bit 2 <b>Front Headlight Short</b> If set the front headlight is shorted	0,1	0
		bit 3 <b>Rear Headlight Short</b> If set the rear headlight is shorted	0,1	0
<b>60</b>	-	<b>Decoder Configuration, byte 2:</b> Similar to CV 29, but other properties are set with this byte:		
		bit 1 <b>Back EMF Control</b> If set back emf control is active	0,1	1
		bit 2 <b>Decoder Control Active</b> If set CV30 contains decoder error	0,1	1
		bit 3 <b>Brake momentum on DC operation.</b> This setting is only active with conventional DC operation disabled. (CV 29, bit 3 = 0) This setting can be used to achieve prototypical braking at red signal indications.  0 locomotive proceeds with track voltage dependent speed inside the conventional section.  1 locomotive brakes in the conventional section with pre set brake momentum.	0,1	0
		bits 4-8 not used		
<b>67 to 81</b>	-	<b>Values for user defined speed curve:</b> These registers are used for a user defined speed curve. The factory setting for these registers is 0. If you are trying to use this speed curve unmodified, your locomotive will not move!  The value in each register determines the velocity of the locomotive for each assigned speed step:  For the 14 speed step mode, speed step 1 is using the value in CV 67, speed step 2 the value in CV 68, speed step 3 the value in CV 69, etc.  For the 28 speed step mode, speed step 1 is using the value in CV67, speed step 3 the value in CV 68, speed step 5 the value in CV 69, etc. The intermediate speed steps are calculated by the decoder.	0-63	0