



The LE062XF is the industry's first truly universal decoder that is at home on all NMRA DCC systems. The characteristics of the decoder are:

- * Selectable for operation with 14/27, 28/55, 128 direct drive or 128 speed table mode with precision glide motor control.
- * Two on/off function outputs that can be configured for either directional lighting, or full Rule 17 lighting
- * Headlights can also be dimmed using an extra function.
- * Support for Advanced Consist Control and Extended Addressing
- * Operation on conventional DC layouts is possible. This feature may be disabled.
- * Full Support for operations mode programming (long and short) and full support for all forms of programming as described in NMRA RP-9.2.3
- * Rich set of properties which the user can set to customize the decoder to a particular locomotive.
- * Provides 1A continuous motor current.

LE062XF

Atlas N-Scale Long Universal DCC Decoder

Art. No.

First edition, 01 01

Digital

plus
by Lenz TM



NMRA Conformance
Warrant pending

The LE062XF Universal Decoder

The LE062XF represents a whole new concept to the evolution of DCC. Not only is the LE062XF designed to use with our own DIGITAL plus system, it is also designed to be at home on all the other popular NMRA DCC systems. To accomplish this we first designed a decoder to be in full conformance to the NMRA Standards and RPs and then augmented the decoder to work well with all other major systems on the market.

Although the LE062XF has a low price, it is packed with all the features you expect in a high-end decoder. Independent or directional lighting (that can be dimmed using a function), advanced consist control, extended addressing, operations mode programming and full support for all the various speed step modes including 128 step motor control, are but a few examples of the advanced features found in the LE062XF.



NMRA Conformance
Warrant pending

The NMRA awards its prestigious C&I label to products it has tested and found to be in full compliance with all NMRA DCC Standards, Recommended Practices and industry norms. We have submitted the LE062XF decoder for testing by the NMRA's C&I committee and expect a conformance warrant shortly.

Many characteristics of the LE062XF decoder can be programmed to customize the decoder to its locomotive. Please read "The Configuration Variables and Their Meanings" section later in this booklet for details on the configuration variables supported by the LE062XF. The LE062XF supports all forms of programming described in NMRA Recommended Practice 9.2.3 including the user friendly direct CV programming mode and the operations mode programming so that you can adjust values while the locomotive is in use. For example, you can operate the

decoder with the factory pre-set speed table or generate your own. You can set which end of the locomotive is the forward end. You can even decide whether or not you want to be able to operate on conventional DC layouts.

Preparing to Install the LE062XF

The locomotive must be tested for excellent operation on normal DC power before installing the decoder. Replace worn out parts and clean any dirt or oxidation from the wheels and pickups. Make sure that electrical contact is smooth. Now is also a good time to lubricate your locomotive. A locomotive that runs well under DC will run exceptionally well under DCC.

The LE062XF is quite small and will fit into Atlas N scale locomotives that have the long frame such as the SD60 locomotive.

Some advice on installing the decoder:

Although the LE062XF has many internal safeguards to prevent damage, you must not allow any metal part of the locomotive to touch the surface components of the decoder other than the decoder or motor pickup pads. This could cause a direct internal short circuit and the decoder will be destroyed.

The LE062XF decoder is not protected against static electricity and has sensitive electronic parts. Be careful in handling the decoder, especially around the microprocessor located on the top rear of the decoder.

<p>The LE062XF comes with 2 LEDs installed. The light outputs are only designed to drive these LEDs. The decoder's warranty is void if these LEDs are removed.</p>
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Step by Step Installation



Figure 1: Installing the LE062XF decoder

In the following steps, please refer to the instructions provided with your Atlas locomotive.

- 1) Remove the locomotive's body shell. Use care so as not to damage fragile parts.
- 2) Loosen the two screws that hold the frame together, these screws are located at the front and rear of the frame.
- 3) Carefully remove the light circuit board, which is located at the top of the frame.
- 4) Place the decoder so that the "Lenz LE062XF" label is at the top of the board and the two motor pads are at the bottom of the decoder. These motor pads will connect with the two copper motor contacts.
- 5) Carefully install the decoder between the two frame halves. Some pressure is needed to press the two frame halves together. This insures good electrical contact between the frame and the decoder.
- 6) Tighten the two screws that hold the locomotive frame together.
- 7) Carefully check that motor contacts are not touching either frame half. Look carefully down from the top through the frame cutouts to inspect this.

<p>There must be NO electrical contact between the motor contacts and any part of the frame</p>
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Place the locomotive (without the body) on the programming track and read back the locomotive's address from the decoder. If the decoder is properly installed, you will be able to read back the factory pre-set address 03. If your system does not support reading decoder properties, observe carefully the decoder's behavior while on a low current programming track. Each time you try to program the decoder you can observe the decoder's acknowledgement by looking for a brief and minor jerk of the locomotive. A successful acknowledgement means you have successfully installed the decoder.

Remove the locomotive from the track, and if necessary correct any wiring errors. Reinstall the body and retest it on the programming track. Once you can successfully program the decoder, it is ready for use.

Programming the locomotive decoder LE062XF

The LE062XF decoder supports all forms of both service mode and operations mode programming. Using any of these programming methods, many features such as the locomotive's address acceleration and configuration can be customized to the individual locomotive that the decoder is installed in. The properties will be saved in non-volatile memory locations on the locomotive decoder so they retain their value even after the power has been removed for years. The values are set electronically, which means that the locomotive does not need to be opened after initial installation of the decoder to read or later modify any CV value. These memory locations are called "Configuration Variables, or CVs" by the NMRA. The LE062XF has a total of 128 CVs. Not all of them are used at this time as many are reserved for future use.

Any NMRA DCC Command Station, such as the DIGITAL plus LZ100 and a Hand Held LH100 or an Interface LI100, can be used to program the locomotive decoder LE062XF. With several entry level systems such as the ROCO 'DIGITAL is cool' command station, only CV #1 (locomotive address) can be set

unless you use a separate programmer. More advanced DCC systems support the ability to set many more CVs. The LE062XF supports all modes and can be programmed by all NMRA DCC programmers. Specific details for reading and writing the decoder's configuration variables can be found in the manuals of the appropriate equipment.

Note: In order for new programmed values to take effect after a service mode operation, the decoder must go through a power reset. If your command station does not support automatic power reset, simply rock the locomotive off the track after programming.

The configuration variables and their meaning

The new line of Lenz advanced XF decoders, (version 4.4), support a full range of features which are set up using a variety of configuration variables. All the configuration variables are numbered. These numbers are used during programming and are identical for all decoders that conform to the NMRA standards independent of the manufacturer. The following table lists the various CVs supported in the LE062XF decoder. Both the New CV numbers and the older Register numbers are provided for cross-reference.

Please note: Some CVs (such as CV29) have specific meanings for each bit. The bit assignments in this table use a bit numbering scheme of 0-7 to correspond the NMRA convention for universal bit numbering. DIGITAL plus LH100 handhelds version 2.3 and older use a scheme of 1-8 to refer to the individual bits rather than 0-7. (Bit 0 in this table is displayed as a "1" on LH100 handheld, Bit 1 is identified as "2"...)The bit numbers in () within these tables contain the LH100 bit numbers.

Table 1: LE062 Configuration Variables

CV	R e g	Description	Range	Factory setting
1	1	Locomotive address: This is the number with which you select a locomotive in the DIGITAL plus system.	1-127	3

**Note: in the factory setting field the numbers in the () are decimal.

CV	R	Description	Range	Setting
2	2	Start voltage: 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	4
3	3	Acceleration Momentum: Determines the rate of change of speed upon acceleration. A higher value leads to a slower acceleration.	1-31	1
4	4	Brake Momentum: Determines the rate of change of speed upon braking. A higher value leads to longer brake distance.	1-31	1
-	5	Contains CV29 (see CV29 below)	0-55	6
-	6	Page Register: Normally this CV is not modified directly by a user. For correct operation, this CV should be set to have a value of 1 after any use.	0-127	1
7	7	Version Number: This location stores the version number of the decoder. This location is read only.	-	44
8	8	Manufacturers Identification: This value is the manufacturer ID of the decoder, (Lenz =99). This location is read only.	-	99
17	-	Extended Address High Byte	192-231	0
18	-	Extended Address Low Byte The two byte address if used is contained in CV17+18	0-255	0
19	-	Consist Address The advanced consist address if used is stored in CV19	0-255	0
23	-	Acceleration Trim This Configuration Variable contains additional acceleration rate information that is to be added to or subtracted from the base value contained in CV3	0-255	0
24	-	Deceleration Trim This Configuration Variable contains additional braking rate information that is to be added to or subtracted from the base value contained in CV4	0-255	0
29		Decoder Configuration, Byte 1: Several decoder properties are set with this byte. Changes are easiest if done in binary mode, but can also be done by adding the decimal () for all the features desired together and writing the total into CV29. The detailed properties are:	0-55	6

CV	Description	Range	Setting
	bit 0 locomotive direction: Locomotive's relative direction: This bit sets the direction the locomotive will move when told to move forward in digital mode. 0 = locomotive's direction is normal 1 = locomotive's direction is inverted	0,1	0 (1)
	bit 1 Headlight mode: 0 = Operation with 14 or 27 speed step systems. This setting is selected when the locomotive decoder is used with any Digital system that does not support 28 speed step mode. If the headlights turn on and off as the speed is increased, the command station is configured for 28 speed step mode, and the decoder is in 14 speed step mode. 1 = Operation with 28, 55 or 128 speed steps. If you use this setting, the Command Station must also be configured to use 28 speed step mode or 128 speed step mode for the decoder's address, otherwise the headlights can not be controlled.	0,1	1 (2)
	bit 2 Usage on conventional DC layouts: 0 = locomotive operates in digital mode only 1 = locomotive can operate on either conventional DC and on DCC	0,1	1 (4)
	bit 3 always 0	0	0
	bit 4 speed curve: 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 (16)
	bit 5 Extended Addressing 0= Normal addressing 1=Two Byte extended addressing	0-1	0 (32)
	bit 6 bit 7 always 0	0	0
50	Decoder Configuration, byte 2: Similar to CV 29, but used to set other properties		0
	bit 0 not used		
	bit 1 [2] 0 = CV23 and CV24 are not active 1 = CV23/CV24 are active and contain the acceleration and deceleration trim values that are added to CV3 or CV4.	0,1	0 (2)

CV	Description	Range	Setting
	bit 2 [3] Brake momentum on DC operation. Used to achieve prototypical braking at red signal indications if conventional DC control CV29.2 is disabled. (CV 29 bit 2 = 0) 0 = locomotive proceeds with track voltage dependent speed inside the conventional DC section. 1 = locomotive brakes in the conventional DC section with pre set brake momentum.	0,1	0 (4)
	bits 3-7	not used	
51	Lighting Special Effects		0
	bit 0 (1) 0 = the headlights are directional. 1 = the lights are independent per Rule 17. F0 controls the front headlight and F1 the rear headlight or a separate function.	0,1	0 (1)
	bit 1 (2) 0 = function dimming disabled 1 = the value in CV52 is used for headlight/function dimming. If CV51.0 = 0 then F1 dims the headlight if on.	0,1	0 (2)
	bit 2 (3) 1= if CV51.0 and CV51.2 both =1 (dimming and Rule17 are both active), F4 dims F0	0,1	0 (4)
	bit 3 (4) 1= if CV51.0 and CV51.2 both =1 (dimming and Rule 17 are both active), F4 dims F1	0,1	0 (8)
	bits 4-7	Not used	
52	Dimming CV - contains the value used for dimming. 0 is dark 255 is max brightness	0-255	0
67 to 94	Values for user defined speed curve: 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 the odd CVs are used If you are using 128 speed step mode and you have activated the user defined speed table, the intermediate speed steps are calculated by the decoder.	0-255	0
105	User Identification #1	0-255	255
105	User Identification #2	0-255	255
128	Decoder Software Version – read only		03

Creating a Speed Curve

One common feature is to set a specific operating speed curve for your locomotives. This is usually done to have dissimilar locomotives have the same performance characteristics or to have the locomotives perform more prototypically. Start by writing down how you want to assign the internal speed settings to the speed steps, for example by making up a table as shown below.

In the following description, we will assume the decoder is properly installed and tested. We also assume you are familiar with the general process of programming for your system.

Speed step in 14/27 mode	Speed step in 28 mode	Internal speed setting	CV / register
1	1	1	67
	2	6	68
2	3	12	69
	4	16	70
3	5	20	71
	6	24	72
4	7	28	73
	8	32	74
5	9	36	75
	10	42	76
6	11	48	77
	12	54	78
7	13	60	79
	14	69	80
8	15	78	81
	16	85	82
9	17	92	83
	18	105	84
10	19	118	85
	20	127	86
11	21	136	87
	22	152	88
12	23	168	89
	24	188	90
13	25	208	91
	26	219	92
14	27	240	93
-	28	255	94

In 128 speed step mode the decoder internally averages the speed table to obtain the correct speed step value.

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 accidental user installation or use caused the failure, 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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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!

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