RIVET COUNTER
SCALETRAINS
EST. 2015
™

SD40-2
PRODUCT MANUAL

™

SCALE
T R A I N S

ScaleTrains.com

N 1:160 SCALE

AGES **14+**

Lok Sound™

INTRODUCTION

Thank you for your purchase of our **Rivet Counter™** SD40-2 locomotive. In this booklet you will find information in regards to maintenance, lubrication, body removal, storage and basic DCC instructions.

If you have purchased a DCC and Sound Equipped model, then you will have access to all the features of this outstanding locomotive. For those that have purchased the DCC and Sound Ready version, the DCC information contained in this manual will not be applicable to your model. All of our models are equipped with a a new type of connector called an E-24 interface should you decide to install DCC at a later date. Our SD40-2 should accept any E-24 decoder.

One new and exciting feature of your new Rivet Counter SD40-2 is that it has the latest version of ESU software installed which includes the "**Full Throttle**" feature. This allows even more realistic locomotive operation. We recommend that you download the "**Full Throttle**" **Quick Start Guide** and the decoder manual from the ESU website to learn all about this and other features of ESU decoders. Visit *www.LokSound.com* for more information.

Our DCC and Sound Equipped SD40-2 locomotive model is fitted with the **ESU LokSound™ V5** (ESU #58925) full-function DCC decoder. For more information and to download the decoder technical manual, visit the ESU website listed above. The manual document number is 51989.

For those purchasing a DCC and Sound Ready locomotive who want to install sound at a later time, the same decoder may be used. If you wish to install a non-sound decoder, **ScaleTrains™** recommends the **ESU LokPilot™** #59925. Please contact our sales department for assistance in selecting the proper decoder and programming for your operation. The manual for the non-sound decoder is document number 51986. That may also be downloaded from www.loksound.com. Either choice will allow you to get the most out of the sound or lighting functions designed for your locomotive.

Your state-of-the-art locomotive model is designed to utilize a single sugar cube type speaker, 11mm x 15mm, in the enclosure and wired back to the main board.

THE PROTOTYPE

The SD40-2, introduced in 1972, was the flagship of the "Dash-2" series, powered by a sixteen-cylinder 645E3 turbocharged prime mover. Its popularity was evident with nearly 4,000 units built and domestic production continuing until July 1984, making it one of EMD's most popular and beloved locomotives. Even today, many SD40-2 locomotives are still in service, serving their original owners and secondhand operators.

THE MODEL

Your ScaleTrains SD40-2 model is a meticulously designed and crafted model to match the prototype. DCC and Sound equipped SD40-2 models include an on-board sound system, featuring speakers designed to replicate the roar of the prototype. Also included are sounds for the horn, bell, and various auxiliary systems.

HANDLING

Due to the delicate nature of the model, it is advised that care should be taken when removing the model from its packaging and when placing it on the track to operate or test.

REMOVAL FROM PACKAGING

To remove the locomotive, carefully slide off the outer sleeve from the "clamshell" plastic holder cradling the model and set it aside.

Next, unsnap the plastic clamshell holder; note that one end is hinged and designed to snap into the top half of the holder. Do this on a flat surface to reduce the risk of the clamshell, or the model, from slipping from your grip and falling to the floor. Once the clamshell is fully open, carefullly remove the model. Reverse the procedure for storing the locomotive.

STORING YOUR MODEL

If you choose to store your model in its box, pay close attention to the model's orientation as you place it in the clamshell container. The model will only fit correctly one way (the nose toward the clamshell hinge). Improper placement may result in damage to small detail parts or railings on the model. Damage due to improper storage is not covered under the manufacturer's warranty. When handling the model, it is recommended to grip the model firmly at its mid-section and around the fuel tank while avoiding the fine details on the model that may be present.

DISASSEMBLY

When disassembling the locomotive, it is recommended that it be placed upside-down into a foam cradle to protect it from damage. In order to remove the body, simply remove the coupler box screws, couplers, and coupler boxes. Once the screws and coupler boxes are removed, the body shell can now be removed from the mechanism. Gently lift up on the body while paying close attention to small details. This should allow the body to be easily removed as only friction is holding it in place. To install crew figures in the cab, gently disconnect any handrails connected to the cab. There is a tab at the top rear of the cab where it connects to the long hood. Once the handrails are detached, the cab can be lifted up vertically. This will take a small amount of force to pop the tab loose to allow the cab to come up. Reassemble the model in the reverse order.
NOTE: If there are conduit pipes or other details that cross the separation between the cab and engine hood, the cab may not be removed without damage to these details.

CLEANING

If kept out of its protective packaging for extended periods, it is likely your locomotive may accumulate dust or other debris. While unsightly, it can also potentially damage the finish of the model if allowed to accumulate. To remove light dust, it is recommended that a fine paint brush be used to gently knock off dust particles. For heavier accumulations, canned air dusters (commonly used for cleaning electronics), or air from an airbrush, can be used. Use care with compressed air so as to not dislodge small detail parts.

LUBRICATION

Your ScaleTrains locomotive represents hours of careful research and design work, and we are proud to present it to you. With the right care, it should provide years and years of model railroading enjoyment. Out of the box, the model should be ready for service and no lubrication should be necessary, as it has been carefully lubricated at the factory for optimum performance. If the need to lubricate should arise, please follow these guidelines:

- **Be sure to use a plastic-compatible lubricant!** Most household lubricants, such as "3-in-1" type oils, may damage the slippery engineering plastic found in the driveline of the model. Wherever possible, use lubricants designed specifically for model railroad or similar hobby uses, and if in doubt, check the label for any compatibility warnings.

- **Use the right type of lubricant in the right location!** For metal-to-metal bearing surfaces, the use of light or medium oils is recommended. For plastic-to-plastic applications, such as gears, light greases are recommended.

- **Always use lubricant sparingly!** As the saying goes, a little goes a long way. When applying lubricant to bearing surfaces, a tiny drop or dab applied with a fine point, such as a tooth pick, should be more than sufficient. Any excess lubricant oozing from a bearing surface should be carefully wiped away with a paper towel. Excess lubricant that migrates onto electrical pickups can impede power and DCC signal pickup, leading to erratic operation.

Lubrication points will be the same as would be expected in most any model locomotive. On the locomotive power trucks, the bearing is behind the wheel so a small drop of light plastic compatible oil can be used behind each wheel as necessary.

The interior of the model is filled with circuit boards and wiring for the many features of your locomotive. Because of this, great care must be taken when applying lubrication to areas that may require it inside the locomotive. Refer to the disassembly instructions and exploded diagrams to understand how to remove the body to access the inner workings of the locomotive. This information may be included with the model or available on our website.

To lubricate the locomotive, there are two main areas that require attention. The first is the motor bearings, which can be found between the motor ends and brass flywheels on the motor shaft. For this area, a small drop of oil is all that's needed. The second area is the worm shafts on top of the gearboxes. These also require a small drop of oil at both ends of the shaft. One end is where the driveshafts are attached to the metal worm shaft, while the other end is where the shaft slightly protrudes out of the outermost bearing.

To apply grease to the gearbox, you'll need to remove the worm cover and then remove the worm and shaft. Once these are out of the way, you can apply a small amount of grease to the top gearbox gear that contacts the worm gear. After applying the grease, you can re-install the worm and worm cover. As the locomotive runs, the grease will be distributed inside the gearbox and coat all the gears.

Whenever possible, avoid contact of the lubricant to the model's exterior finish. Oils and greases can harm the factory paint and lettering. Any excess that may make contact should be gently wiped away with a paper towel or other fine cloth.

Due to the delicate nature of the interior components inside the locomotives, if there is any concern, it may be best to contact your local dealer or contact us directly to help guide you through the lubrication process. Our support team is available by email at: *Support@ScaleTrains.com.*

OPERATING ON DC

DCC & SOUND READY MODELS

DCC & Sound Ready models are equipped with a blind plug (dummy plug) that allows the model to operate on a DC powered track right out of the box. No modification is necessary.

When operating a DCC & Sound Ready model, you will have directional headlights, and either number board or front ditch lights, but not both. Rear ditch lights (if equipped) will not operate on DC power unless the rear of the locomotive is designated as front by railroad practice.

DCC & SOUND EQUIPPED MODELS

DCC & Sound Equipped models are equipped with an ESU LokSound V5 DCC decoder that will allow operation on a DC powered track once sufficient electrical power is supplied. The *Start Up Cycle* will begin with the turnover of the engine prime mover sound. Once the Start Up Cycle has completed, the throttle may be advanced to move the locomotive.

DC OPERATION NOTE: Small train set power packs and some low output DC power packs may be able to supply enough voltage/current to activate the start up sound but lack the output capacity to cause the model to move. If this occurs, there is no cause for alarm. However, a higher output power supply should be used that does not exceed the input capacity of the decoder. See ESU decoder manual for details on power requirements.

Sound equipped models operating on DC will only have the *prime mover sound* that will increase through the notches as power is applied with the DC supply. DCC functions that are autonomically controlled on DC and that will be on are the front and rear headlights (directional), number boards, walkway lights (if equipped) and front ditch lights. Rear ditch lights will not operate nor will other sounds like the horn, bell, air compressor, etc. These sounds may only be user controlled when operating on DCC.

OPERATING ON DCC

DCC & SOUND READY MODELS

DCC & Sound Ready models (without a decoder) contain sensitive electronics and should not be operated on a DCC controlled track even if the DCC system is capable of doing so. DCC isn't A/C or DC, it is both! Confusing, to some degree, but it is a bi-polar, square wave, DC signal or alternating DC. Operating a DCC Ready model without a decoder installed on DCC causes the motor to buzz because it is alternating direction at the frequency of the DCC signal. This isn't good for the motor as it will heat up rapidly and could cause damage over time.

DCC & SOUND EQUIPPED MODELS

Operating your new model on DCC is the best way to get the most enjoyment out of all the state-of-the-art features that are built into the model whether yours is factory sound equipped or you have chosen to install a non-sound decoder. The first question in either case is:"How do I get started?" Below, we will be providing DCC instructions for factory sound equipped models.

GETTING STARTED

ScaleTrains models begin with the sound off when you first put the locomotive on the track and may be addressed initially using DCC address: 3. On DCC, pressing F8 will initiate the Start Up cycle. The Start Up cycle for your new locomotive is one of the most realistic in the hobby to date! During Start Up, the locomotive may not be moved until the cycle completes and the locomotive's prime mover sound settles down to an idling state. This can take from 40 seconds to one minute depending on the length of the recorded start cycle. Start Delay can be disabled by setting CV124 = 0 (default = 4). If you wish for the Start-Up cycle to begin when track power is applied, change the following CV settings in order:

CV31 = 16, CV32 = 3	CV31 = 16, CV32 = 4
CV419 = 32	CV307 = 32
CV435 = 32	CV339 = 16
CV451 = 32	
CV467 = 32	

ADDING A DECODER

There is no better way to get the most from your model than to operate using DCC. An ESU DCC decoder allows you to access all of the lighting outputs built into your model. If you are installing a sound decoder, you will have the most realistic model available today!

Due to space limitations in narrow hood diesel locomotives, the connector for N scale decoders is on the underside of the main circuit board toward the rear. To install an E-24 decoder, remove dummy plug that allows for DC only operation and snap the decoder of choice in place of using are as the samll pins that make the connection are small and delicate. It is recommended that the installer places a piece of Kapton tape around the main board and decoder to help with keeping the decoder securely in place.

SOUND VOLUME ADJUSTMENTS
MASTER VOLUME CONTROL CV63

When operating your model, it may be desirable to adjust the sound volume differently than programmed at the factory. Only one CV is necessary to adjust the Master Volume Control. CV63 moves all sound up or down depending on the setting. The ESU V5 DCC decoder will allow adjustments from 0 to 150%. The factory setting will vary depending on the model. You can read CV63 with your DCC system's program track to learn the default value for your model before making any adjustments. Volume settings from 0 to 128 are 0 to 100%. Settings from 129 to 192 are 101 to 150%.

Important Note: Settings between 129 and 160 (125%) are generally safe. Settings above 160 should be used with caution, especially with single or small speaker installations to keep from over driving and damaging your speakers.

INDIVIDUAL SOUNDS / VOLUME CONTROL

In addition to the master volume, the advanced functions of the ESU Loksound V5 decoder allows you to control the volume on each sound loaded in the decoder separately. Confusing? Not really. Think of your decoder like the mixing board of an event hall or concert venue. In these setups, you can control the input of each microphone, instrument, etc. to mix them and come up with the compostion you want. Your ESU decoder does the same with the individual input volumes for each sound and then the master volume to move all sound up or down at the same percentage, while keeping the sound mix the same.

To control so many sounds on a single decoder, ESU has utilized CVs above the normal cap of 255 by indexing the CV. Indexing can be a complicated subject but to simplify it, you must use three CVs to set the volume of an individual sound CV. We will use CV31, CV32 and the CV for the sound slot's volume (see Sound CV chart).

Important Note: The following CVs MUST be set first before adjusting the sound slot volume: CV31 =16 and CV32 = 1.

SOUND SLOT VOLUME CHART

Below are the individual sounds for your locomotive and the CVs that control the volumes. Remember, before adjusting these CVs, you MUST set CV31 = 16 and CV32 = 1. Failure to set these first will result in the decoder ignoring your command or you will program something unintentionally.

MUST first set CV31 = 16 and CV32 = 1 to adjust slot volumes 1 to 32

Sound Slot	Sound	Volume CV	Default Setting	
1	Prime Mover	259	109	
2	Empty	267		
3	Horn	275	192	
4	Bell	283	40	
5	Coupler	291	60	
6	Dyn Brake Fan	299	75	
7	Air Compressor	307	71	
8	Radiator Fan	315	70	
9	Emerg. Brake Snd	323	60	
10	Automatic Brake	331	59	
11	Independent Brake	339	63	
12	Indep. Bail Off	347	50	
13	Sanding valve	355	30	
14	Hand Brake	363	60	
15	Cab Door	371	80	
16	Engine Hood Door	379	80	
17	Air Dryer	387	80	
18	Dryer on Shutdown	395	80	
19	Reverser lever	403	50	
20	Reverser Center	411	50	
21	Isolation Switch	419	30	
22	Alarm Bell 1	427	30	
23	Flange Squeal	435	52	
24	Short Air Let Off	443	80	
25	Traction Motor	451	80	
26	Start Delay	459	60	
27	Manual Notch Logic	467	20	
28	Empty	475	30	
29	GP38-2 26L Brake Set/Rel.	483	50	
30	Alerter 1	491	50	
31		499		
32	Cooling Shutters	507	35	
	2nd Ben Brake Squeal	259	80	Set CV32 = 2
	Gear Shift Sound	267	128	Set CV32 = 2

FUNCTION CHART

Function	Description	Notes:
F0	Headlight Front/Rear	Directional
F1	Bell	Choose Bell sound via CV164
F2	Horn	Choose Horn sound via CV163
F3	Coupler	
F4	Dynamic Brakes	Models without D/B go to idle when F4 is on while moving
F5	Not in Use	
F6	Ditch Lights	OFF if F12 active
F7	Flange Squeal	
F8	Startup / Mute	Number Boards, Walkway come on
F9	Drive Hold	OFF if F10 active
F10	Independent Brakes	
F11	Radiator Fan	
F12	Dimmer - Headlight	Turns off F6 while active
F13	Air Dryer	
F14	Numberboards OFF	Turns NB OFF after F8 startup
F15	Isolation Switch	
F16	Air Dryer on Shutdown	
F17	Brake Set/Release - Automatic	
F18	Sanding Valve	
F19	Short Air Let Off	
F20	Compressor	
F21	Hand Brake	
F22	Cab Door	
F23	Engine Hood Door	
F24	Reverser Center	Locks out throttle controls when ON
F25	Shutters Open/Closed	
F26	Manual Notch - UP	
F27	Manual Notch - DOWN	
F28	Manual Notching Setup	Toggle ON/OFF to use F26 or F27
F29	Load Simulator	Primary Load
F30	Automatic Brake	
F31	Sound Fader	

Information for function mapping, sound slots and more can be found in ESU technical manual #51989 for the Loksound V5 DCC decoder. The document is available for download at *www.LokSound.com*.

BASIC DCC FUNCTIONS
F0 HEADLIGHTS

Like most models, in DCC, F0 will illuminate the headlight in the direction of travel, forward or backward. You may dim either light by pressing F12. Please note that headlights are only illuminated in the direction of travel. In DC operation, the headlights are illuminated automatically and directionally controlled and are on all the time if sufficient power is applied to the track.

F4 DYNAMIC BRAKES

If F4 is pressed on a dynamic brake (DB) equipped locomotive, it will go through its normal DB cycle. If F4 is pressed on the non-dynamic brake locomotive, it will drop to Idle and hold until it is turned off.

F6 DITCH LIGHTS

Some locomotives are equipped with working front and rear ditch lights (based on the prototype). Also, some will have ditch lights that flash when the horn is blown. Some modelers may prefer to change the ditch lights to their preference. The CVs below will allow you to configure them to suite your operating preference.
NOTE: Ditch lights will only function in DCC operation.

For Flashing Ditch Lights:	For Non-Flashing Ditch Lights:
CV31=16, CV32=8	CV31=16, CV32=8
---------------------	---------------------
CV309=4	CV309=0

F7

Pressing F7 will activate the Flange Squeal noise.

F8 START UP / MUTE / SHUT DOWN

Press F8 to initiate the engine start sequesnce. It will take 45 seconds to one minute to complete before the model will move. Press F8 while moving and the sound will mute. Press F8 while the locomotive is sitting still and the engine shutdown sequence will begin.

F9 DRIVE HOLD

See ESU documentation on use of drive hold in the decoder manual.

F12 HEADLIGHT DIMMER

Toggle F12 On/Off to dim the headlight in the direction of travel.
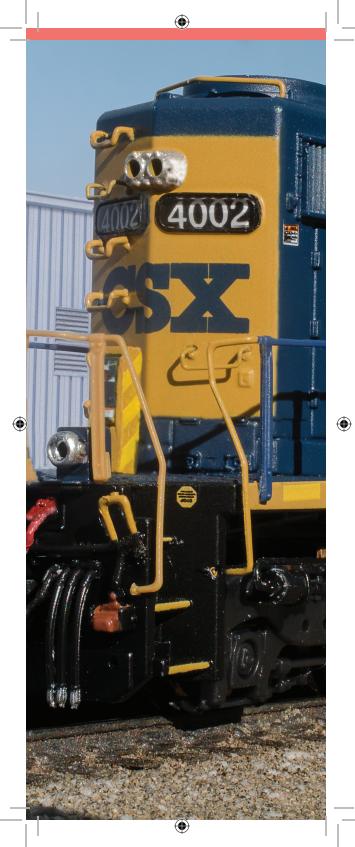NOTE: F12 will turn off ditch lights if equipped and on when activated.

F14 NUMBERBOARDS

One of the advanced features of your ScaleTrains locomotive is to have independent control of the numberboards from the other lighting on your model. When pressing F8 to begin the Startup sequence, you will note that the numberboards are automatically illuminated. If you choose to have them off, as if they were a trailing unit in a consist, pressing F14 will toggle them OFF. Pressing F14 again will turn them back on.

BASIC PROGRAMMING NOTES

DCC & SOUND EQUIPPED MODELS

Customizing the programming in your DCC & Sound Equipped model is yet another way to get more enjoyment from your investment. With a few basic guidelines, customizing can be easily done. You may also wish to have the manual for your DCC system handy as well in case a refresher is necessary.

It is recommended that you use **Paged Mode** programming to adjust CV settings on your DCC system's programming track. While this is the recommended mode, **Direct Mode** may also be used and in many cases, except a decoder reset, some adjustments can be made with **Programming on the Main** (i.e. address programming, master volume change, horn or bell choice, etc). An auxilliary programming track booster is not necessary to program an ESU decoder and can interfere with programming in some instances. CVs cannot be adjusted if you are operating your DCC & Sound Equipped model on a DC powered track.

If you will operate your Rivet Counter HO locomotive on DCC, it is recommended that you download, read and understand the appropriate Loksound decoder manual for the decoder in use in your model. The V5 manual is document # 51989 on the ESU download webpage at www.LokSound.com and is correct for all DCC & Sound Equipped models produced after January 2019.

DIGITRAX CV PROGRAMMING FOR CVs OVER 255

Some older Digitrax DCC systems do not allow programming of CVs above 255. In order to make full programming possible, we have implemented an assistance tool. This helps to write the number of the CVs desired temporarily into two assisting CVs (so-called address registers), since the usual CVs cannot be reached. Afterwards, the value of the CV desired will be programmed into another assisting CV (value register). When the value register is written, the content will be copied to the actual desired position and the assisting CV will be set back. Consequently, 3 CVs have to be programmed to write one CV. These three CVs are described in the following text:

CV96 - Name Offset CV - Saves the CV number that should be actually programmed in hundreds. Value Range: 0 to 9.

CV97 - Address CV - Saves the CV number that should be actually programmed in units of tens. Value Range: 0 to 99.

CV99 - Value CV - Saves the value of the CV that should be actually programmed. Value Range: 0 to 255.

Example: Need to program CV317 to value of 120.

Program the value of the CV number in hundreds into CV96.

In this example: CV96 = 3

Program the value of the CV number in tens and ones into CV97.

In this example: CV97 = 17

Program the desired value of the target CV into CV99.

In this example: CV99 = 120

BASIC PROGRAMMING NOTES (continued)

As soon as you have programmed CV99, the value of CV99 will be transferred into CV317. When the programming is finished, CVs 96, 97, and 99 will be set back automatically.

This procedure is ONLY needed when programming CVs above 255 on some older Digitrax DCC systems.

NOTE: Please make sure that index CV32 is set to 1 and Index CV31 is set to 16 before you change any of the individual sound volume CVs. Please refer to the decoder manual as necessary for additional CV information. CVs 31 & 32 are not required to adjust the Master Volume, CV63.

Below are some of the basic information points about the V5 decoder and its capabilities:

From the factory, the model is set to default DCC address 03.

- The decoder can be set to a 2 or 4 digit address with normal addressing on all DCC systems.

- Supports **CV1 Short Address** 1-127

- Supports **CV17/18 Long Address** 128-9999. Please add 32 to the default value in **CV29 Configuration** for the decoder to recognize a four-digit address and other config settings.

- Supports **NMRA Consisting using CVs 19 (consist address), CV21 (consist function control F1 to F8), CV22 (FL and F9 to F12 (FL is F/R directional headlight).**

- The decoder may be reset on the program track by setting CV8 = 8. *NOTE:* See important information on decoder resets in the **CV8 Resetting the Decoder** section.

- Manufacturer's ID: CV8 = 151

- ESU has added additional function button capabilities (see Function Chart) that may be controlled in a consist using **CV109 (F15 to F22) and 110 (F23 to F30)**. CV109 programs the same as CV21, CV110 (the same as CV22 in regards to bit values).

CV2 Start Voltage (Vmin or Vstart)

Sets the minimum speed or voltage applied to the motor on throttle speed step 1. This can be customized to preference but is generally set where the locomotive will either almost move consistently at SS1 or will crawl on SS1. A setting between 1 to 3 is common.

CV3 Acceleration Rate

Sets the amount of time it will take for the decoder to apply the max voltage set by CV5 to the motor speeding up. The setting in CV3 is multiplied by 0.896 seconds to calculate the time. The CV range is 0 to 255.

CV4 Deceleration Rate

Sets the amount of time it will take for the decoder to reduce the max voltage set by CV5 to zero when stopping. The setting in CV4 is multiplied by 0.896 seconds to calculate the time. The CV range is 0 to 255.

CV5 Maximum Voltage (Vmax, Vfull)

Sets the maximum speed that the locomotive will move. If one model runs faster than another at full throttle, reducing CV5 on the faster locomotive so that they are closer in speed will allow you to run differing locomotives together. The CV range is 0-255 with 255 applying the maximum voltage the decoder can supply to the motor. CV5 must always be greater than CV6 to prevent erratic operation.

CV6 Midrange Voltage (Vmid, Vhalf)

Sets the midpoint of the speed range. A lower setting in CV6 will have smaller increases in speed (voltage to motor) from Vstart to Vmid with throttle speed step advances. Once you reach the Vmid set voltage, larger increases will occur from Vmid to Vmax as you advance the throttle.

CV8 RESETTING THE DECODER

Should it become necessary to reset the decoder to factory specs, place the unit on the programming track of your DCC system and:

1. Enter Paged Mode programming,
2. Enter/read CV8,
3. Set/Program the value 8 into CV8.

That's it! You have just reset the decoder to factory CV settings. This does not affect the sounds on your decoder other than any volume settings that you may have changed. They will be returned to factory settings.

NOTES:

- After a reset, CV8 will again read 151.
- CV1 Short Address will be active again and set to 03
- CV17/18 and CV29 will return to factory defaults

DO NOT reset the decoder using POM (Programming on the Main) as the decoder requires a power cycle OFF to ON to complete the reset cycle. Failure to do so may result in the decoder not properly resetting.

CV17 Long Address (Ad4) - High Byte

The value entered in CV17 determines the higher value (first two digits) of a long address entered into the decoder. See chart on pg. 114 of ESU V5 decoder manual #51989.

CV18 Low Address (Ad4) - Low Byte

The value entered in CV18 determines the lower value (second two digits) of a long address entered into the decoder. See chart on pg. 49 of ESU V5 decoder manual #51989.

Manually Programming a Long (Ad4) Address:

The following information is the same as that found in the decoder manual for determining and programming a long address manually. Some DCC systems have automated methods for entering a long address that you may prefer to use.

To programm a long address, you need to calculate the values for **CV17** and **CV18** and enter them into the decoder. Please note that it is not possible to program addresses via the programming mode "POM" Programming on Main.

To program the long address proceed as follows:

- First you determine the desired address, for instance 4007.
- Then you look for the appropriate address range in **Fig. 2**.

The value to be entered into **CV17** can be found in the column on the right. In our example, it is 207.

The value for **CV18** is established as follows:

   desired address   4007 minus first address in the
                                    address range - 3840

      =================================
                        equals value for CV18 167

- Program CV17 = 207
- Program CV18 = 167

Your decoder is now programmed to address 4007.*

* You must still program Bit 5 of CV29 to recognize the long address.

Address Range			Address Range			Address Range		
From	To	CV17	From	To	CV17	From	To	CV17
0	255	192	3584	3839	206	7168	7423	220
256	511	193	3840	4095	207	7424	7679	221
512	767	194	4096	4351	208	7680	7935	222
768	1023	195	4352	4607	209	7936	8191	223
1024	1279	196	4608	4863	210	8192	8447	224
1280	1535	197	4864	5119	211	8448	8703	225
1536	1791	198	5120	5375	212	8704	8959	226
1792	2047	199	5376	5631	213	8960	9215	227
2048	2303	200	5632	5887	214	9216	9471	228
2304	2559	201	5888	6143	215	9472	9727	229
2560	2815	202	6144	6399	216	9728	9983	230
2816	3071	203	6400	6655	217	9984	10239	231
3072	3327	204	6656	6911	218			
3228	3583	205	6912	7167	219			
Fig. 2 CV17 Table								

CV29 Configuration Register

The Configuration Register, CV29, tells the decoder how to behave in a number of ways from speed steps, to speed curves, and whether to recognize a short or long address. See figure 3 to learn how the default value was reached on the ScaleTrains locomotive.

CV	Name	Description			Range	Default
29	Configuration Register	This CV configures the decoder for regular operation				Value
		Bit	Function	Value		14
		0	Normal direction of travel	0	0	
			Reversed direction of travel	1		
		1	14 Speed steps DCC	0		
			28/128 speed steps DCC	2	2	
		2	Disable analog operation	0		
			Enable analog operation	4	4	
		3	Disable RailCom®	0		
			Enable RailCom®	8	8	
		4	Speed curve (CV2, 5 & 6 LS5 DCC On	0	0	
			Speed curve CV67-94	16		
		5	Short address (CV1) active in DCC	0	0	
	Fig. 3 CV29		Long address (CV17 + 18) active in D	32		

CV163 / 164 Alternate Horn And Bell Sounds

Your new Rivet Counter locomotive will come to you with the correct horn and bell right out of the box per the specific prototype. In case you would like to use different horn or bell sounds, we have provided an assortment for you:

CV163 Horns (Sound CV9)
CV163=0 Nathan P-5 R24
CV163=1 Leslie S-3K-R
CV163=2 Nathan K-5LA
CV163=3 Nathan P-3
CV163=4 Nathan P-5A
CV163=5 Leslie RS-3L

CV163=6 Nathan K-5L-R24
CV163=7 Nathan K-3LA
CV163=8 Leslie S-5T-RRO
CV163=9 Nathan K-3LA-R2
CV163=10 Leslie S-3L-R
CV163=11 Leslie RS3-L

CV164 Bells (Sound CV10)
CV164=0 EMD 8475495 Steel Bell 057 (Default)
CV164=1 EMD 8004156 Bronze Bell # 3
CV164=2 UKM B443 Steel Bell 001
CV164=3 Graham-White E-Bell 004
CV164=4 Transonic E-Bell 001
CV164=5 WC Hayes 0333 M-Bell 001
CV164=6 Milw E-Bell
CV164=7 Empty

CV165 / CV166 Sound Options - Brake Squeal And Air Dryer
CV165=0 Composition Shoe #1
CV166=1 SD-M Cast Iron Shoe #1

CV166=0 SD40-2 Air Dryer (Default)
CV166=1 SD40-2 Air Dryer #2
CV166=2 SD40-2 Air Dryer #3
CV166=3 SD40-2 Air Dryer #4

CV168 Smart Start (Sound CV14)
CV168=0 No Smart Start Cycle - Default
CV168=1 - 3 Minute Cycle
CV168=2 - 6 Minute Cylcle
CV168=3 - 9 Minute Cylcle
CV168=4 - 12 Minute Cylcle
Etc.....
CV168=255 - 765 Minute Cycle

CV21, 22, 109 & 110 Advanced Consist Lighting Control

In order to control lighting functions in an Advanced Consist, CVs are used to determine what lights will be active and available to an operator in a consist. Using the chart below, determine what functions you wish to be active on the locomotive when it is in a consist. Make note of that CV's assigned numeric value. Add the values for each function controlled by a particular CV (CV21, 22, etc.) and program the cumulative total in the CV to activate those functions. This will only affect the functions when it is in an Advanced Consist and not when it is operating as a single locomotive or other consist.

ADVANCED CONSISTING - FUNCTION CONTROL
Loksound vs DCC

Advanced Consist Function Group 1							
CV#	F1	F2	F3	F4	F5	F6	F7	F8
21	1	2	4	8	16	32	64	128

Advanced Consist Function Group 2							
CV#	F0*	F9	F10	F11	F12	F13	F14	F15
22	1	2	4	8	16	32	64	128

Advanced Consist Function Group 3							
CV#	F16	F17	F18	F19	F20	F21	F22	F23
109	1	2	4	8	16	32	64	128

Advanced Consist Function Group 4							
CV#	F24	F25	F26	F27	F28	F29	F30	F31
110	1	2	4	8	16	32	64	128

*For FRONT only to operate, enter 1. For REAR only to operate, enter 2.

SCALE TRAINS

PRODUCT SUPPORT
U.S. 844-9TRAINS; 844-987-2467 Ext. 2
Support@ScaleTrains.com

ScaleTrains
4901 Old Tasso Rd NE,
Cleveland, TN 37312 USA

www.ScaleTrains.com
SIGNUP FOR OUR WEEKLY NEWSLETTER
www.ScaleTrains.com/newsletter

ScaleTrains.com, Inc. (ScaleTrains) warrants products purchased from our website to be free from defects in material and workmanship for a period of two (2) years from the date of purchase. Products purchased directly from ScaleTrains are automatically registered and a receipt is not required for proof of purchase.

ScaleTrains warrants products purchased from an authorized Select Retailer to be free from defects in material and workmanship for a period of one (1) year from the date of purchase. The warranty period can be extended to two (2) years by registering the product within 30 days of purchase on our website at www.ScaleTrains.com/warranty. Be sure to retain the receipt as proof of purchase as it may be required in the event your model requires warranty service by our Service Center.

If the product fails during the limited warranty period, carefully pack the model in the original packaging. Be sure to include an explanation of the issue(s) along with your name, address, phone and email. If the product(s) were purchased from a Select Retailer, include a legible copy of the sales receipt.

Ship item(s) for repair to our Service Center at...
    ScaleTrains Service Center
    4901 Old Tasso Road NE
    Cleveland, TN 37312

We recommend using a trackable shipping service. Shipping damage incurred on the way to our service center and costs associated with shipping are not covered under warranty.

Damages due to improperly storing, handling, or packaging are not covered under warranty.

If ScaleTrains.com deems the product to be defective, we will either (1) repair (2) replace the item, or (3) offer a store credit redeemable at ScaleTrains.com toward a future purchase. This determination is at the sole discretion of ScaleTrains.

ScaleTrains has the final decision on all warranty matters. The warranty policy is subject to change without notice.

SXT82027 • Rev 9-23 • ESU V5 Decoder