ESU Smoke Unit

Instruction manual
2. Edition, December 2021

54677 Smoke Unit „Dual"

Content

1. EU Declaration of Conformity

ESU electronic solutions ulm GmbH & Co. KG, Edisonallee 29, D-89231 Neu-Ulm, herewith declares in its sole responsibility that the product complies in terms of

Product name: Smoke Unit „Dual"

Type number: 54677

with all relevant regulations regarding Electromagnetic Compatibility (2004/108/EG). The following harmonized standards were applied:

EN 55014-1:2006 + A1:2009: Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission

EN 55014-2:1997 + A1:2001 + A2:2008: Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 2: Susceptibility.

2. WEEE Declaration

Directive (RoHS) and Waste Electrical and Electronic Equipment Directive (effective in the European Union and other European countries with separate collection system).

This symbol displayed on the product, the packaging or in the documentation implies that this product may not be disposed of as household refuse. Instead the product should be taken to the suitable waste disposal facility for recycling of electrical and electronic products. By disposing of the product in the correct manner you help to avoid negative environmental effects and damage cause to someone´s health that may be caused by inappropriate disposal. Recycling of material will help to preserve our natural resources. For further information regarding recycling of this product please contact your local council, your collector of household refuse or the shop where you purchased this product. All brands or trademarks are registered trademarks of the respective owners and are not identified in all cases. One may not assume that due to a missing trademark or identification that a term or a picture are not a registered brand or trademark.

3. Important hints – Please read this first!

We congratulate you to your purchase of an ESU smoke generator. This manual aims to inform you step by step regarding the electrical connection of this module.

⚠ In order avoiding any defects or damages please read this manual carefully prior to installing the product!

- The smoke generator is exclusively to be used in electric model trains and model train layouts. It may only be operated with the components described in this manual.
- The smoke generator gets quite hot (more than 100°C). Avoid touching it and choose the location for installing it in such a manner that no damage can occur.
- Never turn the smoke generator upside down if its tank is filled. Leaking oil may lead to burns.
- Only work on the electrical connections when the power is turned off.
- Adhere to the wiring principles when connecting the product as presented in this manual.
- Protect the product against moisture and humidity.
- Wires may never touch any metal parts of the locomotive.
- For preventing short circuits please make sure there are no wires squeezed when reassembling the locomotive.

4. General properties

The ESU smoke generator Dual for G and 1 Gauge models as well as for larger 0 Gauge models generators realistic smoke and steam clouds of your models. Both an exhaust steam and a cylinder steam are integral to the housing. Two fan motors and two heating systems are separately controlled by the electronics subject to state of movement. Sensors keep the desired heating temperature independently of track voltage and fill level and prevents a burn out in case of an empty tank.

The smoke generator is optimised for operating with our LokSound 5 XL and LokSound 5 L decoders. In combination with these decoders the desired amount of smoke can be precisely adapted to the sound flow. When connected to an ESU decoder there is no need for any programming of the smoke generator.

5. Scope of delivery

With its dimensions of 69 x 33 mm (39 mm including the mounting tabs) the smoke generator is relatively compact. The electronics are separated from the mechanical part and connected with a wire harness.

The following parts are contained in the scope of delivery:
- Smoke generator with separate circuit board (connected with wire harness)
- Wire harness
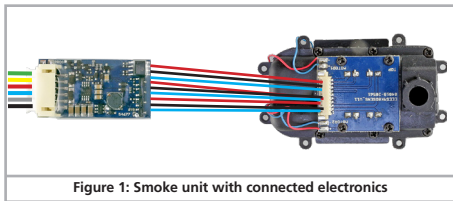- PVC tube (9 mm diameter) for cylinder steam

Figure 1: Smoke unit with connected electronics

6. Installation of the smoke generator

Install the smoke generator at a suitable spot below the exhaust. The spacing between the smoke generator and the opening of the body should be as small as possible, but you should assure a minimum distance of 1cm from the plastic locomotive body. Assure a straight line for the exhaust for allowing condensed smoke to drop back into the tank.

You may use the supplied silicone tube for establishing an airtight connection between smoke generator and the opening in the body. Shorten the silicone tubing as necessary.

6.1 Filling the system

The smoke distillate is filled into the tank through the exhaust opening. There is only one tank for both exhaust smoke and cylinder steam. Only use ESU smoke distillate (part number 51990). Using other liquids may cause damage to the paint finish, blocking the system or destroying the heater unit due to accumulated residue. Only activate the smoke function if somebody is present in well aired (ventilated) rooms. The maximum filling capacity is 3.5ml. This serves for about 10 minutes of operation.

⚠️ Never exceed the maximum filling capacity of the system. If in doubt, use a bit less rather than too much! The smoke generator cannot be damaged even when the tank is empty!

⚠️ Make sure the locomotive is on level ground when filling the tank, never on gradient´, do not turn the locomotive sideways or upside down! This avoids leaking distillate.

6.2. Wiring

Only use the supplied wire harness for connecting the smoke generator. Simply plug the 6-pole plug directly on the circuit board of the smoke generator.

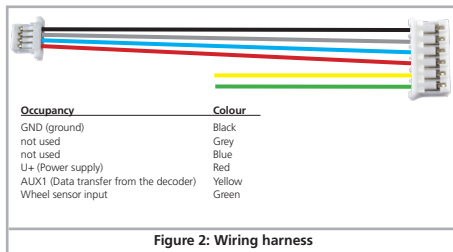The other end of the harness has a 4-pole plug as well as two separate wires.

Occupancy	Colour
GND (ground)	Black
not used	Grey
not used	Blue
U+ (Power supply)	Red
AUX1 (Data transfer from the decoder)	Yellow
Wheel sensor input	Green

Figure 2: Wiring harness

- The smoke generator receives the exhaust chuff pulses via the green wire. The pulses may be supplied directly by a HALL sensor or (preferably) be generated directly by the decoder.
- The smoke generator receives its commands via the yellow cable, when connected to a LokSound 5 XL or LokSound 5 L decoder.

6.3. Connecting with LokSound 5 XL & LokSound 5 L decoder

In this case the 4-pole plug is not needed. Cut it off and establish the connection as shown in Fig. 3 respectively in Fig. 4.

The smoke generator receives its commands via the yellow wire.

This MUST be connected to the AUX1 output of the decoder.

The AUX1 output is the only one that can supply the appropriate data for the smoke generator after it has been configured accordingly (also refer to chapter 6.1).

Figure 3: Connecting to LokSound 5 XL Decoder

Figure 4: Connecting to LokSound 5 L Decoder
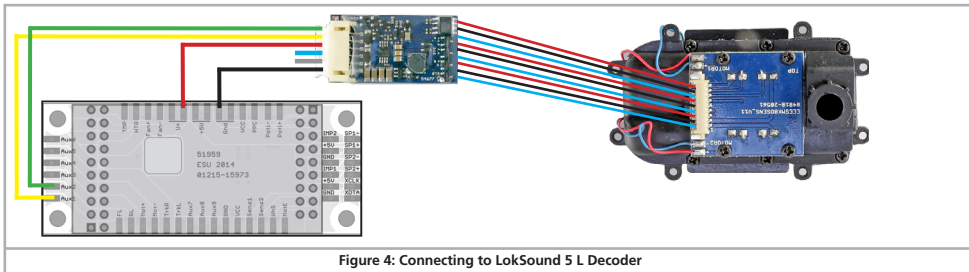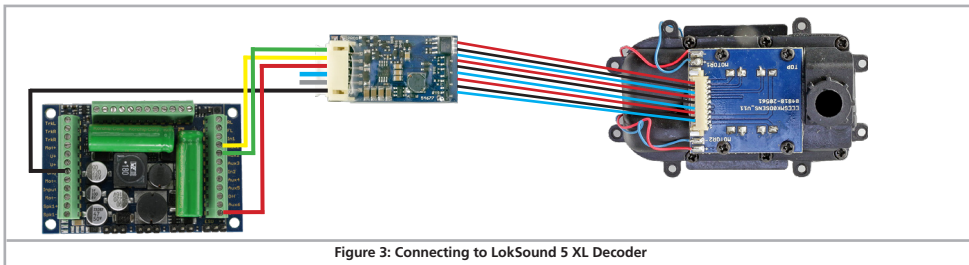
7. Programming the smoke generator

There are several options for adjusting the performance of the smoke generator. This helps to achieve optimum performance of the smoke generator in conjunction with your model. Subject to the decoder type different adjustments are required.

7.1. ESU LokSound 5 XL & LokSound 5 L decoder

You can configure the smoke generator in many ways to meet your personal preference. This can only be done with the ESU Lok-Programmer 53451 because some adjustments in the sound flow are necessary. First load the desired sound project into the Lok-Programmer followed by the individual adjustments. Sound and smoke control work closely together and are both essential for achieving optimal performance. As an example we illustrate the process with the sound file S0010 (class 50). All required settings have already been done. For all other sound projects you have to adjust the required settings.

7.1.1. Basic settings

Initially the output AUX1 must be configured in such a way that it provides the data for the smoke generator instead of functioning as an ordinary function output.

- Select "AUX1[1]" in the register "Function Outputs and select "Smoke generator with external circuit board". Then click on the last entry as shown in Fig. 5.

- Then the output connected to the green wire must be configured such that an exhaust trigger is transmitted. In this example it is AUX2.

- Select "Exhaust trigger" and adjust smoke and blower to the value 31 and the "Timeout" to 0. Fig. 6 shows the relevant settings.
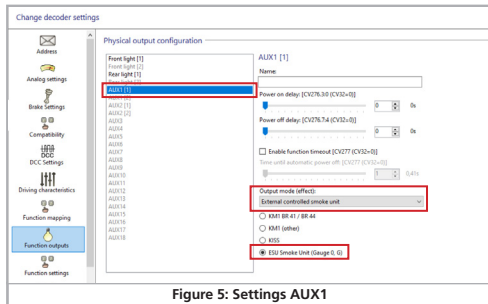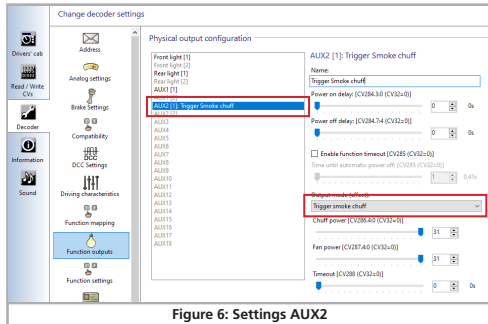

Figure 5: Settings AUX1

Figure 6: Settings AUX2

• Now you must assign the function button for triggering the smoke generator in the register "Function Mapping". Select the function "ESU Smoke generator" in the row of the desired function button. The ex-works setting for most LokSound 5 decoders is configured to F15.
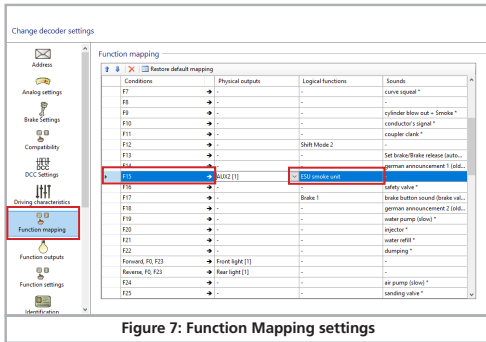

Figure 7: Function Mapping settings

7.1.2. Sound flow settings

The most important and comprehensive settings are found in the "Sound" register. Adjust the desired heating temperatures and the revs in the sound flow. Of course, for most projects this has already been set ex-works, so you hardly need to change any of these parameters.

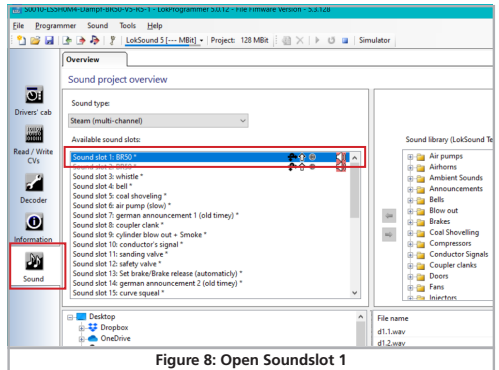First select sound slot 1 by double clicking it in the list of available sound slots.

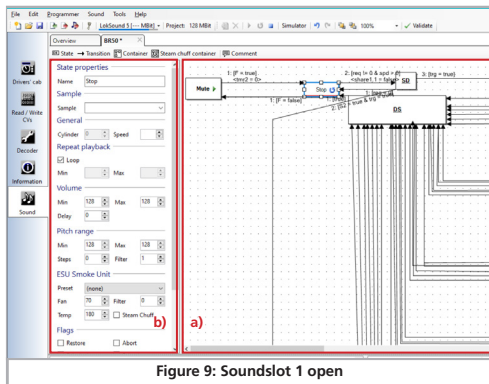**Figure 8: Open Soundslot 1**

Figure 9: Soundslot 1 open

This opens a window similar to Fig. 9:

a) Conditions and transitions

b) Properties of the selected condition respectively transition

The properties shown on the left of part b) change subject to what has been marked in the square at top right. Transitions are shown as white rectangles. Mark the "Stop" condition with the mouse as shown in the Fig. 9.
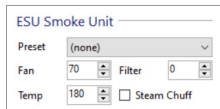
You will find the most interesting parameters in the chapter „ESU Smoke generator".

- Fan: Here you may adjust the revs of the fan motor. The higher the value the faster turns the fan and the more smoke is ejected. The value "255" means "full throttle" (maximum). Please determine suitable values for your model. High fan revs usually also require a higher temperature to assure that sufficient smoke is generated.

- Temperature: Here you may adjust the temperature in °C. Higher values generate more smoke but also lead to a high thermal load for the smoke generator. The maximum temperature of the smoke generator is internally limited and is also subject to the mechanics. The theoretically possible value of 255 °C will therefore not be reached in practice.

- Filter: Here you may adjust how quickly the fan motor responds to changes of the desired revs. The value 0 facilitates immediate adaptation while higher values effect a soft transition. In some case this may facilitate more realistic exhaust effects.

- Exhaust chuff: Enter this tick wherever smoke should be ejected. Only if you enter a tick at these positions the LokSound decoder will "instruct" the smoke generator to produce an exhaust chuff. Otherwise smoke will continuously be ejected (Diesel mode). It is necessary to enter meaningful values for every condition.

We recommend the following procedure:

STOP Condition:

Here low values should be entered, e.g.

Fan	59
Temperature	165
Filter	0
Exhaust chuff	Not applicable

SD Conditions ("Stop to Drive"), DS ("Drive to Stop"):
Here you may start with the following values:

Fan	42
Temperature	235
Filter	0
Exhaust chuff	Not applicable

"Coast" as well as "DCX" conditions

Fan	42
Temperature	155
Filter	0
Exhaust chuff	Not applicable

The actual speed steps are called Dx in all ESU projects. Some sound projects contain D1 to D4, others go up to D8. These are the normal exhaust chuffs.

Here you should experiment with the following values:

Fan	212
Temperature	220
Fan	0
Exhaust chuff	Set

For acceleration steps A (mostly A1 to A4, sometimes to A8) we recommend entering higher heating values and fan revs, e.g.

Fan	245
Temperature	235
Filter	0
Exhaust chuff	Set

You may mark several conditions simultaneously by holding down the shift button while marking the induval squares one after the other. If you now change the fan and temperature values, these changes are valid for all currently marked conditions.
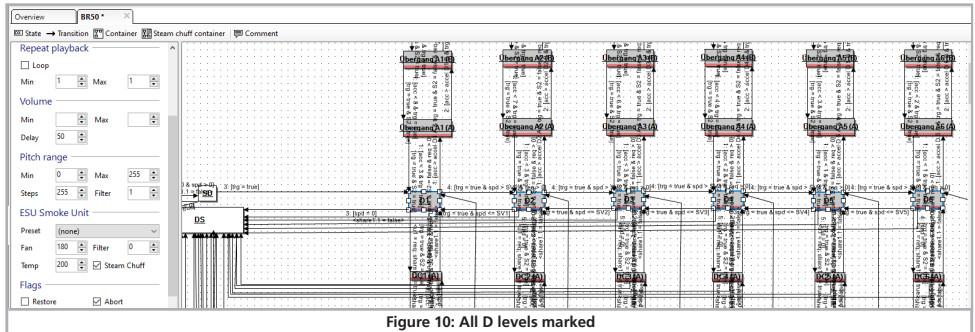

Figure 10: All D levels marked

If sound slot 2 is active in the list of available sound slots but is marked in grey, there is no reason to be concerned. This means that two sound channels are used for the exhaust chuff. A copy of the smoke motor in Sound slot 1 will automatically be generated and applied. Here you do not need to enter any changes.

7.1.3. Optimising functions

In the final step you can optimize further options in the "Smoke generator" register. Fig. 11 show all available options.
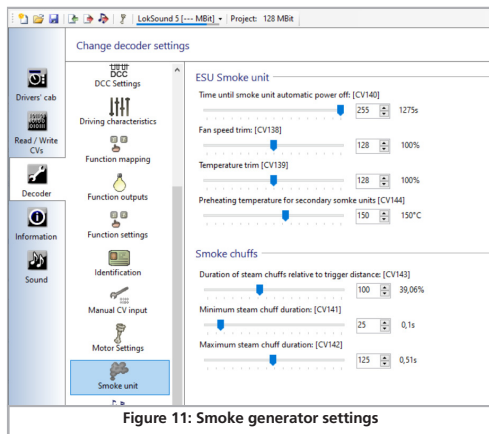

Figure 11: Smoke generator settings

- Time until automatic switch off: Here you can set an automatic switch-off time. Generally, a duration of about 10 minutes is practical. This prevents excessive current draw when the tank is empty. Whenever the smoke generator is turned off automatically one must reactivate it by turning it off and then on again.
- Adaptation of the fan speed: Here you can adjust the fan speed relative to the values set in the sound flow.
- Adaptation of the heating temperature: Here you can adjust the temperature relative to the values set in the sound flow.
- Preheating temperature for secondary smoke generators: If so desired, one can preheat the cylinder steam for achieving a faster response. Please bear in mind that the preheating is active, until the smoke generator is switched on and therefore draws extra current.
- Duration of exhaust chuffs: Subject to wheel diameter and installation situation the exhaust chuffs may be a bit short. Increase the value for triggering more powerful exhaust chuffs. The duration is given in a ratio to their interval in %. A value of 50% triggers exhaust chuffs whose duration is half of their interval.
- Minimum duration of exhaust chuffs: Regardless of how quickly the pulses from the wheel sensor arrive, the duration of the exhaust chuffs will never fall below the value set here.
- Maximum duration of exhaust chuffs: Here you may adjust and limit the duration of the exhaust chuffs to the desired value.

7.2. Cylinder steam function

For utilising cylinder steam you must first establish a mechanical connection between the outlet of the smoke generator (in front, at the bottom) and the opening on the locomotive.

Ideally the outlet is located between the cylinders. Some silicone tube is supplied with the smoke generator.

Cylinder steam outlet

Figure 12: Cylinder steam outlet
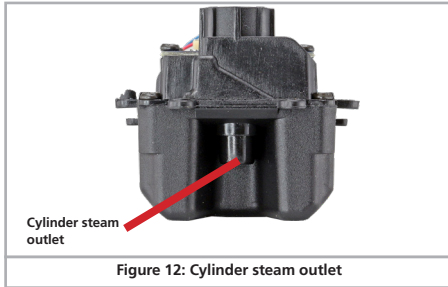
Now all you need to do is set appropriate values for heating temperature and fan speed in the "Cylinder blow-out" register. In our example this is entered in sound slot 9 "Cylinder blow-out".

The LokSound decoder "assumes" in case of sound slot greater than 4 that this must be cylinder steam and transmits the relevant commands to the smoke generator. The number of the sound slot facilitates triggering the corresponding smoke generator. Sound slots 1 and 2 control the main exhaust, all sound slot 4 or higher control cylinder steam.

Finally, please make sure that you write the CV values AND the sound to the decoder once again. The entries regarding the smoke generator will only be written in conjunction with the sound data.

Figure 13: Soundslot 9 Cylinder steam smoke generator settings

7.3. Firmware update with the LokProgrammer

Of course, the firmware of ESU smoke generators can be updated with the LokProgrammer. However, the smoke generator must be removed from the model and directly connected to the LokProgrammer. There are two separate solder points for this purpose. They are marked with "PROG". Fig. 14 shows where they are located. These two outputs must be wired to the LokProgrammer. Disconnect all other wires to the decoder by removing the white plug. The connection to the smoke generator does not have to be separated.
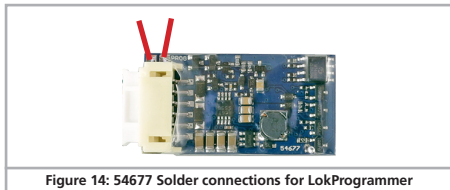

Figure 14: 54677 Solder connections for LokProgrammer

8. Support

Should you have questions regarding your smoke generator to which you have not found the right answer in this manual please first contact your hobby shop. The people there are your competent contact for all questions relating to model trains. In difficult cases, you can contact us directly. Look first on our website under «Support / FAQ» to see whether the question has already been answered. If this is not the case, we ask you to make these available to us either in our support forum or to contact us by e-mail. We also provide a telephone hotline, which should only be used in the case of really special requests.

For Germany

by phone:	+49 (0) 731 - 1 84 78 - 106
	Tuesday & Wednesday
	from 10.00 to 12.00 o' clock
by Fax :	+49 (0) 731 - 1 84 78 - 299
by E-Mail:	www.esu.eu/kontakt
by mail:	ESU GmbH & Co. KG
	Edisonallee 29
	D-89231 Neu-Ulm

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For USA, Canada, Australia

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	Tuesday & Thursday
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by Fax :	+1 866-591-6440
by E-Mail:	support@loksound.com
by mail:	ESU LLC
	1304 Jordan Ave
	Montoursville PA 17754

www.loksound.com

9. Guarantee certificate

24 months warranty from date of purchase

Dear customer,
Congratulations on purchasing this ESU ECoS command station. This quality product was manufactured applying the most advanced production methods and processes and was subject to stringent quality checks and tests.

Therefore ESU electronic solutions ulm GmbH & Co. KG grants you a warranty for the purchase of ESU products that far exceeds the national warranty as governed by legislation in your country and beyond the warranty from your authorised ESU dealer.

Manufacturer's warranty of 24 months from date of purchase.

Warranty conditions:

This warranty is valid for all ESU products that have been purchased from an authorised ESU dealer.

Any service, repair or replacement under this warranty requires proof of purchase. The filled in warranty certificate together with the receipt from your ESU dealer serves as proof of purchase. We recommend keeping the warranty certificate together with the receipt.

In case of a claim please fill in the enclosed failure report card as detailed and precise as possible and return it with your faulty product.

Please use the appropriate postage when shipping to ESU.

Extend of warranty / exclusions:

This warranty covers free of charge repair or replacement of the faulty part, provided the failure is demonstrably due to faulty design, manufacturing, material or transport. Any further claims are explicitly excluded.

The warranty expires:

- In case of wear and tear due to normal use.
- In case of conversions of ESU – products with parts not approved by the manufacturer.
- In case of modification of parts.
- In case of inappropriate use (different to the intended use as specified by the manufacturer).
- If the instructions as laid down in the user manual by ESU electronic solutions ulm GmbH & Co. KG were not adhered to.

There is no extension of the warranty period due to any repairs carried out by ESU or replacements.

You may submit your warranty claim either with your dealer or by shipping the product in question with the warranty certificate, the receipt of purchase and the fault description directly to ESU electronic solutions ulm GmbH & Co. KG at:

ESU GmbH & Co. KG
- Guarantee Section -
Edisonallee 29
D-89231 Neu-Ulm

Trouble shooting sheet

1. Personal data **(Please write in block letters)**

Name: .... _____

Street: .... _____

_____

ZIP/City: .... | | | | | | _____

Country: .... _____

Email: .... _____

Phone: .... _____

Date: .... _____

Signature: .... _____

2. Error

☐ No Function (please describe the error in more detail)

3. Error description (use extra page if needed)

_____
_____
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_____
_____
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4. Receipt

Please enclose your receipt / invoice. Otherwise no warranty possible!

5. Additional information:

_____
_____
_____
_____
_____
_____

6. Your retailer:

Retailer's stamp or address