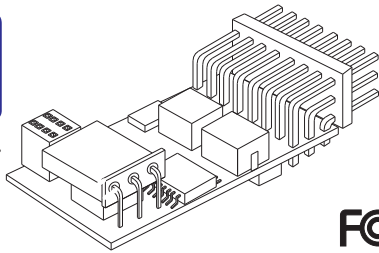


SL-8 HAM

S18H-OM-02

"Crystal-Less" RC Receiver RECEIVER OPERATION MANUAL



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Sombra Labs proudly introduces the SL-8 Receiver, the world's smallest and lightest 8-channel full-range, fully-synthesized "crystal-less" receiver. This compact, lightweight, ultra-narrowband receiver for RC aircraft, cars, and boats can process up to 16 PPM channels and seamlessly cover 50 MHz and 53MHz bands.

The Shadow Programmer, using Sombra Labs' patented "1-Click™" programming technology, allows for quick and easy programming of the SL-8 Receiver.

Several features make the SL-8 Receiver truly unique. Sombra Labs' patented "1-Click™" puts fully-programmable, user-selectable failsafe modes right into the SL-8 Receiver, making it the easiest way to safeguard your model while eliminating the need for separate failsafe devices. The SL-8 Receiver is the only receiver in the world to feature complete control over pin/channel mapping, and the "cascade" capability allows the use of two receivers in the same model to provide up to 16-channel operation.

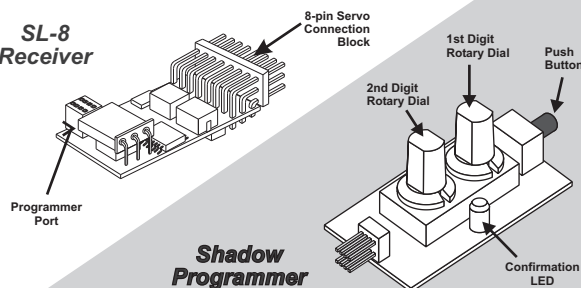
The SL-8 Receiver has excellent sensitivity and IP3 performance, and the most advanced DSP signal detection, noise control, and glitch-suppression algorithms. The receiver is compatible with most HAM FM/PPM radio systems.

SL-8 also provide the feature of Automatic Frequency Scanning (AFS), this feature allows the user to change the operational frequency of the SL-8 without the need of a Shadow programmer, of course a Shadow programmer can still be used to set operational and advanced programming features if desired!

TECHNICAL SPECIFICATIONS

- World's smallest, lightest 8-channel full-range receiver
- Cascading two SL-8 Receivers provides up to 16-channel operation
- Quick-and-easy patented "1-Click™" programming technology
- Three failsafe modes featuring patented "1-Click Failsafe™" technology
- Complete control of pin/channel mapping
- Dual conversion FM/PPM
- DSP processing
- Automatic Frequency Scanning with the included AFS programming connector
- Microprocessor-based decoding and digital frame filtering
- Sensitivity: $2\mu\text{V}$
- Size: 3.75 x 2.0 x 1.2cm (1.47" x 0.79" x 0.47")
- Weight: ~ 11g (including antenna & packaging)
- Antenna impedance: 50Ω
- Operating voltage: 3.5V – 9.0V DC

SL-8 Receiver



STEP 1: Mounting the Receiver

- Mount the SL-8 Receiver in the model so it is protected from vibration or shock.
- Use double-sided tape or Velcro® to mount the Receiver in the model.
- Position the Receiver where it will not contact other solid components.
- Mount the Receiver away from moving parts, sharp corners, and possible contaminants (fuel, dirt, etc.).
- Position the Receiver so the Shadow Programmer can be easily connected to it.

Antenna

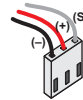
The SL-8 Receiver has a default antenna length of 39" that is optimized for full-range application. However, the antenna can be shortened to 18" for indoor or surface use.

Always conduct a range check when you first use the Receiver and after any changes to the antenna.

For models with primarily carbon fibre (CF) construction (for example, RC aircraft fuselage), we strongly recommend that the antenna exit the model as early as possible, with the least amount of antenna wire remaining close to or inside the model.

STEP 2: Connecting the Receiver

Servo Input Plugs



The caseless design of the SL-8 Receiver allows you to connect servos from various different servo manufacturers without modification to the input plugs (for example, trimming tabs).

Servo lead wires must be in the order shown. If the servo wires are in a different order, you must re-order the wires in the input plug. Check with your servo manufacturer about the colour and order of their servo wiring.

Servo Connection

Connect the servos to the appropriate pins on the servo connection block, making sure to connect the servo plug in the proper direction.

Always take care to know the current pin/channel mapping of the Receiver, and connect the proper servos or electronic devices (for example, motor speed controller) to the appropriate pins on the Receiver. In the default Master Mode, pin 1 = channel 1, pin 2 = channel 2, and so on. However, note that pin/channel mapping may be changed by reprogramming the SL-8 Receiver.

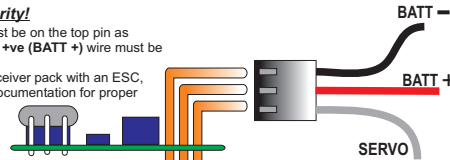
Receiver Battery Pack

A separate receiver battery pack may be connected to the SL-8 Receiver in any of the remaining pin locations.

Observe proper polarity!

The -ve (BATT -) wire must be on the top pin as shown in the drawing. The +ve (BATT +) wire must be on the middle pin.

When using a separate receiver pack with an ESC, consult the original ESC documentation for proper installation and usage.

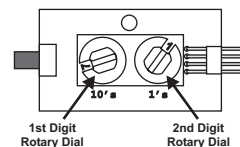


STEP 3: Using the Shadow Programmer

The easy-to-use Shadow Programmer uses Sombra Labs' patented "1-Click™" programming technology to program the SL-8 Receiver.

- Power up the SL-8 Receiver.
- On the Programmer, turn the two rotary dials to set the 2-digit value. You can turn the rotary dials with your fingers or a small flat-blade screwdriver.

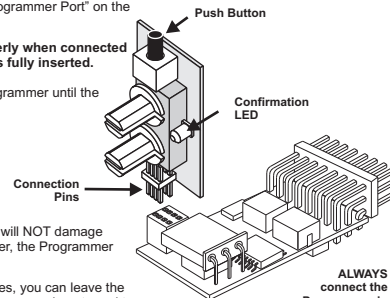
For example, to set the value 71:
Set the 1st dial (10's) to 7
Set the 2nd dial (1's) to 1



- Plug the Programmer into the "Programmer Port" on the SL-8 Receiver as shown.

The Programmer only works properly when connected in the direction shown with all pins fully inserted.

- Press the push button on the Programmer until the confirmation LED lights up.
- Unplug the Programmer.



Plugging the Programmer in reverse will NOT damage the Receiver or Programmer. However, the Programmer will not operate properly.

If you are programming multiple values, you can leave the Programmer connected to the Receiver; you do not need to remove and re-connect the Programmer each time.

ALWAYS connect the Programmer in this direction!

STEP 4: Setting the Receiver Channel

Use the Shadow Programmer to set the channel (frequency) of the SL-8 Receiver so it matches the channel of your transmitter. The Programmer uses Sombra Labs' patented "1-Click™" programming technology to quickly and easily set the Receiver's channel.

- Determine the channel (frequency) assignment of your transmitter. The SL-8 Receiver covers the following bands:
 - 50 Mhz - Channels 00 to 09 (Programmer number 50 to 59)
 - 53 Mhz - Channels 00 to 07 (Programmer number 60 to 67)
- Set the matching channel (frequency) value on the Programmer as per the included channel assignment sheet.
- Plug the Programmer into the SL-8 Receiver, program the value into the Receiver, and then unplug the Programmer.

STEP 5: Advanced Programming

You can use the Shadow Programmer, with Sombra Labs' patented "1-Click™" programming technology, for programming advanced functionality into the SL-8 Receiver:

- Factory reset
- Failsafe mode (patented "1-Click Failsafe™")
- Pin/channel mapping profile setup and recall

Factory Reset – Program Value 99

The Factory Reset feature brings the SL-8 to its factory default settings:

- Channel frequency: Reset to channel 04 (50.880 Mhz)
- Failsafe mode: Reset to Limited-Hold failsafe mode
- Pin/channel mapping profile: Reset to Master Mode
- User-defined mapping profiles: Both user-defined mapping profiles (User Mode 1 & 2) are reset to "Master mode" settings.
- DSP Mode: Reset to DSP ON

To reset the SL-8 Receiver to factory defaults, program the value 99.

For more information about programming a value, see "STEP 3: Using the Shadow Programmer."

Failsafe Modes

Sombra Labs' patented "1-Click Failsafe™" is the quickest, easiest failsafe programming technology in the world.

The failsafe mode determines the behaviour of the connected servos if the SL-8 Receiver loses the signal from your transmitter. There are three different failsafe modes: Limited-Hold, Permanent-Hold, and a user-defined failsafe mode.

IMPORTANT!

Always check that the proper failsafe mode is set before each flight or use of your model. You can easily do this by turning off your transmitter (with the model still powered up) and observing the behaviour of the servos.

Limited-Hold Failsafe Mode – Program Value 98

Upon loss of a Tx signal, the Receiver outputs the last known good frame on the servo wires for 1.5 sec, after which time it eliminates the control signal until a good Tx signal is re-acquired. Servos will remain in their last known good positions, but will have no torque; most ESCs will cut the throttle signal to the motor.

To set Limited-Hold failsafe mode, program the value 98.

Permanent-Hold Failsafe Mode – Program Value 97

Upon loss of a Tx signal, the Receiver outputs the last known good frame on the servo wires indefinitely until a good Tx signal is re-acquired.

To set Permanent-Hold failsafe mode, program the value 97.

User-defined Failsafe Mode – Program Value 96

Upon loss of a Tx signal, the Receiver outputs the last known good frame on the servo wires for 1.5 sec, after which time it puts the servos to their pre-defined positions indefinitely until a good Tx signal is re-acquired.

To set the servo failsafe positions and activate the user-defined failsafe mode:

- Set all servos to their desired failsafe positions. (For example, in a nitro car, set steering to centered, and set throttle to full brake.)
- Program the value 96.

This stores the servo failsafe positions and puts the Receiver in the user-defined failsafe mode.

IMPORTANT!

If the Receiver is changed from the user-defined failsafe mode to another failsafe mode, the user-defined servo failsafe settings are lost and must be set up again when returning to the user-defined failsafe mode.

STEP 5: Advanced Programming (cont'd)

Pin / Channel Mapping Profiles

The SL-8 Receiver allows complete control over pin/channel mapping. There are four separate pin/channel mapping profiles that can be used to map pins to specific channels: two preset mapping profiles (Master Mode and Slave Mode) and two user-definable mapping profiles (User Mode 1 and User Mode 2.)

For more information about programming a value, see "STEP 3: Using the Shadow Programmer."

Master Mode – Program Value 02

Master Mode is the factory default pin/channel mapping profile that supports up to 8 servos on channels 1–8. Master Mode is typically used when you are using a single SL-8 Receiver in a model with up to 8 servos (on channels 1-8).

In Master Mode, the pin/channel mapping is as follows:

Pin	1	2	3	4	5	6	7	8
Channel	1	2	3	4	5	6	7	8

To set the SL-8 Receiver to Master Mode, program the value **02**.

Master Mode is a preset mapping profile and cannot be re-mapped like User Modes 1 & 2. Master Mode can be recalled at any time using "1-Click™" Recall to make it the operational mapping profile in the SL-8 Receiver.

Slave Mode – Program Value 03

Slave Mode is a pin/channel mapping profile that supports up to 8 servos on channels 9–16.

In Slave Mode, the pin/channel mapping is as follows:

Pin	1	2	3	4	5	6	7	8
Channel	9	10	11	12	13	14	15	16

Using two SL-8 Receivers in the same model (one Receiver in "Master Mode" and the other in "Slave Mode") lets you "cascade" the Receivers, providing up to 16 channel operation. The 1st Receiver (in Master Mode) would control channels 1–8, and the 2nd Receiver (in Slave Mode) would control channels 9–16. Your transmitter must be capable of supporting the total number of connected servos.

To set the SL-8 Receiver to Slave Mode, program the value **03**.

Slave Mode is a preset mapping profile and cannot be re-mapped like User Modes 1 & 2. Slave Mode can be recalled at any time using "1-Click™" Recall to make it the operational mapping profile in the SL-8 Receiver.

WARNING: If two SL-8 RX are used in the same model (one Receiver in "Master Mode" and the other in "Slave Mode") the receivers need to be at least 6 inches apart.

User Mode 1 (User-defined Mapping Profile 1)

You can remap any of the 8 pins on the SL-8 Receiver to any servo channel from 1–16, and save this user-defined mapping profile as "User Mode 1." Sombra Labs' patented "1-Click™" programming technology makes this feature extremely quick and easy to perform.

User Mode 1 differs from Master Mode and Slave Mode in that you can change and save the pin/channel mapping profile for later use. You can then use "1-Click™" Recall to recall User Mode 1 to make it the operational mapping profile in the SL-8 Receiver.

For more information about programming a value, see "STEP 3: Using the Shadow Programmer."

Setting Up and Saving User Mode 1 – Program Value 91

Use the Shadow Programmer "1-Click™" Setup to set up and save the mapping profile for User Mode 1 as follows:

1. Program the value **91**. (This starts programming for User Mode 1.)
2. Program the value "2+<pin number>" for the pin you want to map. Acceptable values are 21–28 (for pins 1–8, respectively).

For example, to map pin 5, program the value **25**.

3. Program the value of the channel you want to map to the selected pin. Acceptable values are 01–16 (for channels 1–16, respectively).

For example, to set the selected pin to channel 7, program the value **07**.

4. Repeat steps 2–3 until you have completed all pin/channel mapping.
5. To save the setup and end the programming sequence, program the value **30**.

Example of User Mode 1 Programming

In this example, the desired pin/channel mapping is the following:

Pin	1	2	3	4	5	6	7	8
Channel	1	2	3	4	7	9	12	8

To map the pins/channels as per the table above, program values in the following order:

02	(Sets Master Mode – since pins 1–4 already use that mapping)
91	(Start programming User Mode 1)
25	(Remaps pin 5...)
07	(... to channel 7)
26	(Remaps pin 6...)
09	(... to channel 9)
27	(Remaps pin 7...)
12	(... to channel 12)
30	(Ends programming)

Note that you do not need to re-define the mapping for ALL pins if the pin/channel mapping is already done. In this example, pins 1 to 4 and 8 are already mapped to the proper channels (channels 1–4, respectively) when Master Mode is initially set.

Recalling User Mode 1 – Program Value 00

User Mode 1 can be recalled at any time using "1-Click™" Recall.

To recall User Mode 1 to make it the operational mapping profile, program the value **00**.

User Mode 2 (User-defined Mapping Profile 2)

You can remap any of the 8 pins on the SL-8 Receiver to any servo channel from 1–16, and save this user-defined mapping profile as "User Mode 2." User Mode 2 is set up, saved, and recalled in a similar manner to User Mode 1, although different program values are used.

Sombra Labs' patented "1-Click™" programming technology makes this feature extremely quick and easy to perform.

Like User Mode 1, User Mode 2 differs from Master Mode and Slave Mode in that you can change and save the mapping for later use. You can then use "1-Click™" Recall to recall User Mode 2 to make it the operational mapping profile in the SL-8 Receiver.

For more information about programming a value, see "STEP 3: Using the Shadow Programmer."

Setting Up and Saving User Mode 2 – Program Value 92

Use the Shadow Programmer "1-Click™" Setup to set up and save the mapping profile for User Mode 2 as follows:

1. Program the value **92**. (This starts programming for User Mode 2.)
2. Follow steps 2–5 in "Setting Up and Saving User Mode 1" for setting up and saving the mapping profile for User Mode 2.

Recalling User Mode 2 – Program Value 01

User Mode 2 can be recalled at any time using "1-Click™" Recall.

To recall User Mode 2 to make it the operational mapping profile, program the value **01**.

DSP Functionality

The SL-8 Receiver is the first DSP receiver in the world that allows the user to turn OFF the DSP functionality. Turning OFF the DSP will permit the use of a trainer setup. In addition, it can also help in locating the source of glitches in the model.

To turn OFF DSP, program the value **95**.

To turn ON DSP, (factory default), program the value **94**.

For more information about programming a value, see "STEP 3: Using the Shadow Programmer."

Automatic Frequency Scanning - AFS

AFS (Automatic Frequency Scanning) is an advanced feature that allows the change of operational frequency without the need of a programmer! Please note that the SL-8 is backwards compatible with the Shadow Programmer and either the programmer or the AFS can be used to program a new operating frequency. To initiate AFS process, please follow these steps:

CAUTION !!

NEVER attempt the AFS process with the motor connected to the ESC. Disconnect the motor from your ESC or disconnect the ESC completely from the SL-8 receiver and use a freshly charged 4.8v-6V battery to power the receiver for the AFS process. Similarly, gas/glow engines on the model should be **POWERED-DOWN** during the AFS process.

Always remove the "AFS Connector" from servo pin 8 once the AFS process successfully completes, any attempt to fly the model with the connector in place can result in unpredictable behavior of the model.

Ignoring this "CAUTION" note could result in **PERSONAL INJURY** due to sudden motor movements during the AFS programming procedure

- 1) Turn ON your transmitter, making sure that it is in FM-PPM mode and is operating in either one of the 50 MHz or 53 MHz bands.
- 2) For the remainder of the process keep the transmitter aside and don't touch any sticks or buttons.
- 3) Insert the "AFS Connector", included with the SL-8 Rx, on servo pin-8 of the SL-8 receiver.
- 4) Power cycle the SL-8 receiver. The AFS process will start and is indicated by small oscillatory servo movements.
- 5) The AFS process is complete once the servo movement stops. Move the transmitter sticks to confirm control. The SL-8 is now ready to operate on this new frequency and will remember this frequency assignment until re-programmed either through AFS or through the Shadow Programmer (this frequency will be remembered even if the SL-8 is power-cycled). At this point the "AFS Connector" should be removed from the servo pin 8 **AND the receiver should be power cycled for proper operation.**
- 6) If for any reason the transmitter doesn't get the controls after the AFS is finished (servos stop moving), or if the AFS takes longer than 2 minutes to complete, power-cycle the receiver with the "AFS Connector" in place to start the process again. Please note that in extremely busy RF environment there is a very small possibility that it takes a few tries (e.g. 2-3) to acquire your channel frequency, however, the whole process even with re-tries will not take more than 3 minutes. *

*** It is imperative that the sticks/buttons on the transmitter are not moved during the AFS process, otherwise the SL-8 will not capture the transmitter frequency.**

WARRANTY

The SL-8 Receiver and Shadow Programmer are warranted against manufacturer defects in material and workmanship for a period of 1 year from the original date of purchase (verified by dated, itemized sales receipt). During this period our warranty liability shall be limited to repairing the unit to our original specification. Sombra Labs will replace or repair, at its own discretion, any component that is found to be factory defective at no cost to the purchaser. A copy of the sales receipt must accompany any warranty repair. Modifications will void any warranty and are done at the owner's risk.

This warranty does not apply to:

- ◆ Consequential or incidental losses resulting from the use of this product
- ◆ Damage resulting from accident, misuse, abuse, neglect, electrical surges, static electricity, reversed polarity on connectors, improper voltage or current
- ◆ Failure to operate the product as specified in this operation manual

Sombra Labs can not be legally responsible for **ANY** damage caused to the model and/or personal injury or any other material damage resulting by the use of this receiver. Sombra Labs liability is **ONLY** limited to the repair or replacement of the receiver.

CUSTOMER SERVICE

For technical assistance please contact the hobby dealer from which you purchased your Sombra Labs product.

Sombra Labs Inc., Ottawa, Canada
Support@sombralabs.com www.sombralabs.com

COMPLIANCE

FCC

This device complies with Part 15 of the 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.

Industry Canada - This device is fully IC (Industry Canada) compliant.

AMA - This device meets all AMA-91 guidelines.



PROGRAMMING QUICK REFERENCE

Receiver Channel

Feature	Program Value
Channel Frequency (50MHz)	50–59
Channel Frequency (53MHz)	60–67

Factory Reset

Feature	Program Value
Factory Reset	99

Failsafe Mode

Feature	Program Value
Limited-Hold Failsafe	98
Permanent-Hold Failsafe	97
User-defined Failsafe (setup and activation)	96

Pin/Channel Mapping Profiles – Preset Modes

Feature	Program Value
Master Mode (recall)	02
Slave Mode (recall)	03

Pin/Channel Mapping Profiles – User-defined Modes

Feature	Program Value
Start User Mode 1 Programming	91
Start User Mode 2 Programming	92
Identify Pin Number to Map	2 + (pin number)
Identify Channel Number to Map to Pin	01–14
End User Mode Programming Sequence	30
Recall User Mode 1	00
Recall User Mode 2	01

DSP Functionality

Feature	Program Value
DSP ON (Factory Default)	94
DSP OFF	95



Sombra Labs Inc.

Sombra Labs Inc. Ottawa, Canada
Support@sombralabs.com www.sombralabs.com

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