Shadow-3

"Crystal-Less" RC Receiver

RECEIVER OPERATION MANUAL

S3-OM-04

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Sombra Labs Inc.

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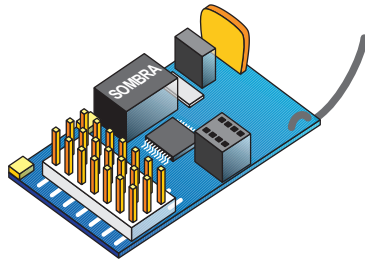
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Sombra Labs proudly introduces the Shadow-3 Receiver, the world's smallest and lightest 7-channel full-range, fully-synthesized "crystal-less" receiver. This compact, lightweight, ultra-narrowband receiver for RC aircraft, cars, and boats can process up to 14 PPM channels and seamlessly cover 72MHz (air) and 75MHz (surface) bands.

The Shadow Programmer, using Sombra Labs' patented "1-Click™" programming technology, allows for quick and easy programming of the Shadow-3 Receiver.
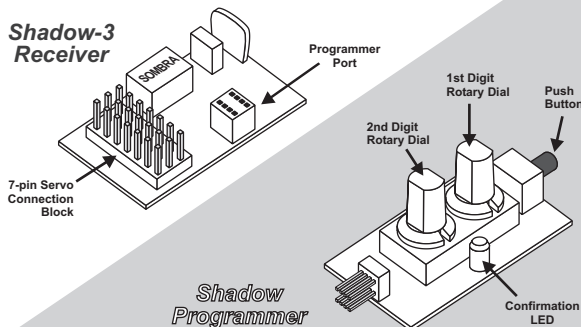
Several features make the Shadow-3 Receiver truly unique. Sombra Labs' patented "1-Click Failsafe™" puts fully-programmable, user-selectable failsafe modes right into the Shadow-3 Receiver, making it the easiest way to safeguard your model while eliminating the need for separate failsafe devices. The Shadow-3 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 14-channel operation.

The Shadow-3 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 popular FM/PPM radio systems and high-rate transmitters, and features automatic positive/negative transmitter shift detection. In-field frequency re-programming is 100% reliably achieved even in busy RF environments (RC events, competitions, etc.).

TECHNICAL SPECIFICATIONS

- World's smallest, lightest 7-channel full-range receiver
- Cascading two Shadow-3 Receivers provides up to 14-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
- Microprocessor-based decoding and digital frame filtering
- Sensitivity: < 2µV
- Size: 3.6 x 2.2x 1.2cm (1.4" x 0.86" x 0.47")
- Weight: ~ 8g (including antenna & packaging)
- Antenna impedance: 50Ω
- Operating voltage: 3.5V – 9.0V DC
- Operating temperature: -20°C to +80°C (-4°F to 176°F)

Shadow-3 Receiver

Shadow Programmer

Programmer Port
1st Digit Rotary Dial
Push Button
2nd Digit Rotary Dial
7-pin Servo Connection Block
Confirmation LED

STEP 1: Mounting the Receiver

- Mount the Shadow-3 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 Shadow-3 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

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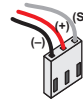
The caseless design of the Shadow-3 Receiver allows you to connect servos from various different servo manufacturers without modification to the input plugs (for example, trimming tabs).

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 Shadow-3 Receiver.

EXAMPLE: 2-channel electric RC car

A steering servo typically connects to receiver channel 1, and a speed controller (ESC) typically connects to receiver channel 2. In default Master Mode, that would be pin 1 and pin 2, respectively.

Receiver Battery Pack

A separate receiver battery pack may be connected to the Shadow-3 Receiver in any of the remaining pin locations.

Observe proper polarity!

The **–ve** wire must be on the pin closest to the edge of the Receiver, and the **+ve** 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.

Pin 1
Pin 7
Signal
+ve
–ve
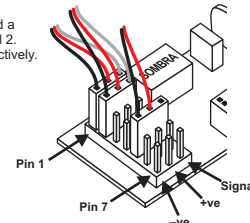
STEP 3: Using the Shadow Programmer

The easy-to-use Shadow Programmer uses Sombra Labs' patented "1-Click™" programming technology to program the Shadow-3.

1. Power up the Shadow-3 Receiver.

2. 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

1st Digit Rotary Dial
2nd Digit Rotary Dial

3. Plug the Programmer into the "Programmer Port" on the Shadow-3 Receiver as shown.

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

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

5. Unplug the Programmer.

Push Button
Confirmation LED
Connection Pins

ALWAYS connect the Programmer in this direction!

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.
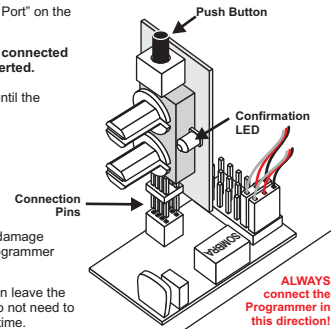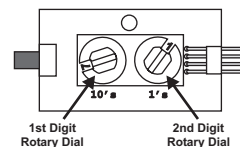
STEP 4: Setting the Receiver Channel

Use the Shadow Programmer to set the channel (frequency) of the Shadow-3 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.

1. Determine the channel (frequency) assignment of your transmitter. The Shadow-3 Receiver covers the following bands:
   - 72 MHz : Channels 11–60
   - 75 MHz : Channels 61–90

2. Set the matching channel (frequency) value on the Programmer.

3. Plug the Programmer into the Shadow-3 Receiver, program the value into the Receiver, and then unplug the Programmer.

For more information about programming a value, see "STEP 3: Using the Shadow 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 Shadow-3 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 Shadow-3 to its factory default settings:
- **Channel frequency:** Reset to channel 44 (72.670 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 Shadow-3 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 Shadow-3 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:

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

2. 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 Shadow-3 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 7 servos on channels 1–7. Master Mode is typically used when you are using a single Shadow-3 Receiver in a model with up to 7 servos (on channels 1–7).

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

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

To set the Shadow-3 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 Shadow-3 Receiver.

Slave Mode – Program Value 03

Slave Mode is a pin/channel mapping profile that supports up to 7 servos on channels 8–14.

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

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

Using two Shadow-3 Receivers in the same model (one Receiver in "Master Mode" and the other in "Slave Mode") lets you "cascade" the Receivers, providing up to 14 channel operation. The 1st Receiver (in Master Mode) would control channels 1–7, and the 2nd Receiver (in Slave Mode) would control channels 8–14. Your transmitter must be capable of supporting the total number of connected servos.

To set the Shadow-3 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 Shadow-3 Receiver.

WARNING: *If two Shadow 3 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 7 pins on the Shadow-3 Receiver to any servo channel from 1–14, 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 Shadow-3 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 21–27 (for pins 1–7, 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 01–14 (for channels 1–14, 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
Channel	1	2	3	4	7	9	12

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 1–4 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 7 pins on the Shadow-3 Receiver to any servo channel from 1–14, 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 Shadow-3 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 Shadow-3 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."

PROGRAMMING QUICK REFERENCE

Receiver Channel

Feature	Program Value
Channel Frequency (72MHz)	11–60
Channel Frequency (75MHz)	61–90

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