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IMX – 1
Invertible RC Mixer
Users Guide

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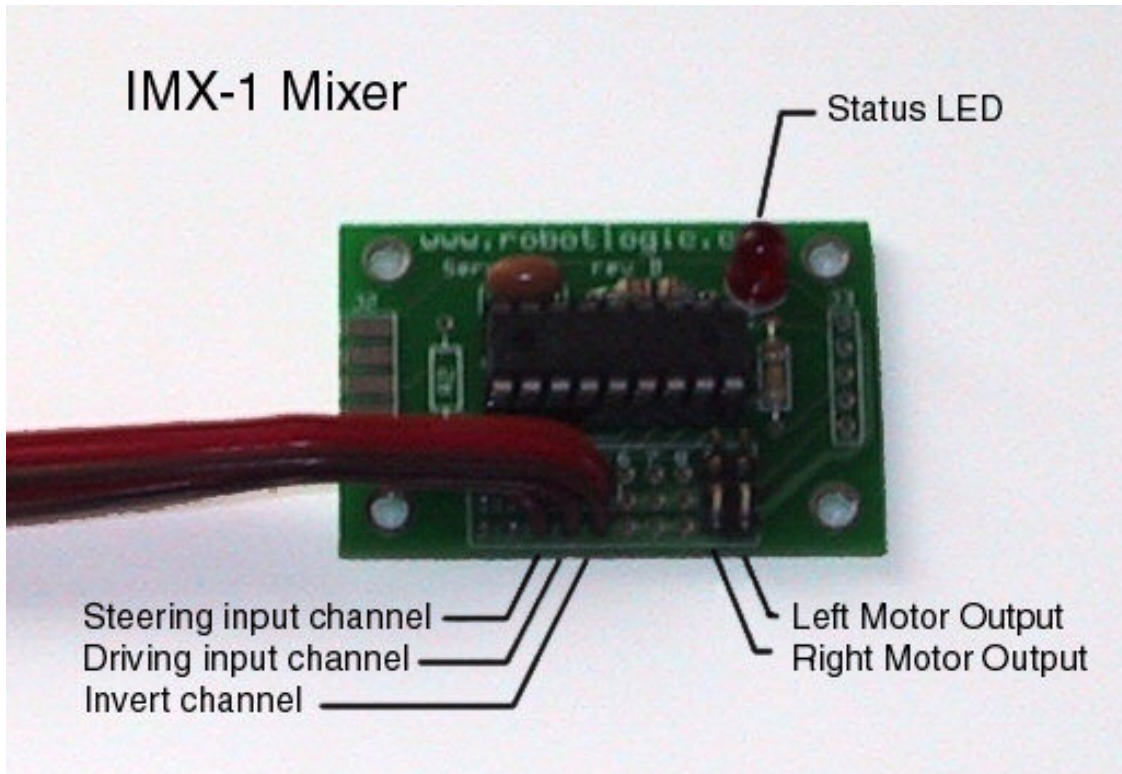
Introduction

The IMX-1 mixer allows single-stick driving for tank drive style robots. One feature that sets it apart from other mixers is the third input channel that is used to select inverted driving. This mixer is installed between your RC receiver and your speed controller(s).

Features

Inverted Driving

The third RC input channel is used to select inverted driving. This can be useful in two cases – your robot has been flipped over or you want to attack with the rear of your robot. In addition to the obvious problem of getting flipped over, if you are fighting another robot with an extremely powerful weapon, it may be useful to take the initial hit with the rear of your robot. Using this mixer, you will be able to drive backwards just as easily as you can drive forwards.

Failsafe

The IMX-1 acts as a failsafe. It will shut off all outputs whenever no signal or an invalid RC signal is detected. The incoming signal is constantly monitored and operation is resumed as soon as a valid RC signal is re-detected.

Optional Two Stick Driving
Some drivers prefer to drive their robots using two sticks (like the old battle-zone arcade game). The IMX-1 can be put into two-stick driving mode by dropping a dot of solder across solder pad 1 on the back of the board. We chose this method over jumpers or dip- switches to avoid having problems when the mixer is exposed to impacts in combat. The invert feature also works when using two-stick driving.

Signal Boosting
When used with the popular IFI speed controllers, there is no need for additional in-line signal boosters. The IMX-1 can drive up to three Victor 833 speed controllers per side (3 on left output and 3 on the right output).

Improved Mixing Algorithm
The mixing algorithm used by the IMX-1 mixer was specifically designed for combat robots. Unlike our mixer, some RC transmitters and mixers use an "add and clamp" algorithm that reduces the controllability of your robot. This "simple" way to do tank/elevon mixing will cause your motor outputs to clamp to their maximum everywhere outside an inscribed "diamond" in your joystick's range of motion. This means that when your stick is anywhere within a triangle in each corner of its range, your robot is trying to spin as fast as it can. Our algorithm gives you smooth proportional control all the way to the corners of your stick's travel. The only time your robot spins at its maximum speed is when you jam the stick all the way to the corner.

LED Status Indicator
The LED on your IMX-1 Mixer can be used to verify proper operation. Its behavior can indicate one of the following 4 states:

LED Behavior	Mixer Status
Off	No power
On – Solid	Valid signal, non-inverted driving
On – Rapid Blinking	Valid signal, inverted driving
On – Slow Blinking	Invalid signal or no signal detected

New with v1.02 Transmitter Trim Calibration
If your transmitter is not trimmed properly, your bot may drift slowly when the invert function is enabled. To ensure proper operation of the invert feature, we have added a trim calibration mode to the IMX-1. This helps you ensure that the "center pulse" from your transmitter matches the center that we use in the invert function.

If the IMX-1 detects that only the X-input is connected it goes into "trim calibration" mode. The LED will light up when your transmitter is emitting the center pulse that we expect. So, one at a time, plug the X-input of the IMX-1 into RC channel 1 and then 2, trimming them until the LED lights up.

Installation Instructions

Trim your radio.
- Plug servo lead 1 from the IMX-1 into RC channel 1 on your receiver. Connect a battery to your receiver and turn your transmitter on.
- Leaving the stick centered, trim channel 1 until the LED lights up (on some older radios you will have to just get the trim as close as you can).
- Plug servo lead 1 into RC channel 2 on your receiver.
- Leaving the stick centered, trim channel 2 until the LED on the IMX-1 lights up.

Connect the Mixer to your RC receiver.
- Plug servo lead 1 into the left-right RC channel on your receiver. For most RC systems, this will be channel 1
- Plug servo lead 2 into the forward-back RC channel on your receiver. For most RC systems, this will be channel 2
- Leave servo lead 3 disconnected for now. This is the "invert" channel.

Signal Test
- Connect your receiver battery and turn on your transmitter.
- The LED on the mixer should turn on when it detects a valid signal. If the LED does not turn on, check that the servo leads are plugged into the receiver completely in the proper orientation, your receiver is receiving power and your transmitter is on.

Connect Speed Controllers to the Mixer
- Using the cables that came with your speed controller, connect your right-side speed controller to output 1 on the mixer. Ensure that the connector is oriented such that the signal wire is near the center of the board and the ground wire is near the bottom edge of the board.
- Connect your left-side speed controller to output 2 on the mixer.

Initial Motor Test
- Support the chassis of your robot on blocks so that the wheels do not touch the ground.
- Power up the transmitter, receiver, and robot.
- Ensure that your transmitter is not inverting any channels.
- Ensure that the LED on the mixer turns on.
- Ensure that the speed controllers indicate that they are receiving a valid signal. (e.g. Victor 833 speed controllers will blink when not receiving a signal and turn on solid orange when receiving a valid signal)
- Push the joystick forward until the motors begin to turn. Observe the direction of rotation of your motors.
- If either side is not rotating forward, power down your robot and swap the polarity of the wires connecting the speed controller to the motor which was turning the wrong direction.

- Push the joystick to the left until the motors begin to turn. Observe the direction of rotation of your motors. If the direction is incorrect, you may have the left and right speed controllers connected to the wrong outputs on the mixer.
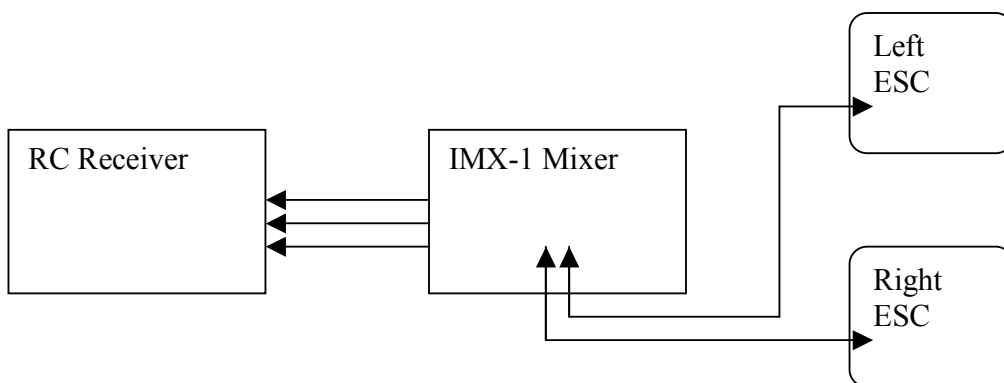- Complete testing by pulling the joystick back and then pushing the joystick to the right.

Setting Up the Invert Channel
- Once your robot is correctly responding to all of the normal controls you are ready to set up the invert channel.
- Plug servo lead 3 into an un-used channel on your RC receiver. This channel will be used to indicate to the mixer your desired driving orientation. When the servo pulse for this channel is at one extreme, the mixer will behave normally. When the channel is at the opposite extreme, the mixer will invert the forward-back control, allowing you to drive inverted or lead with the rear of your robot. On the Futaba 8UAPS transmitter, the channel 5 switch is ideal for controlling the invert function.

Final Testing
- Power up the robot and perform the same tests as were done in the initial motor test.
- Enable the invert feature and perform the same tests again.
- Pushing forward should cause the motors to spin backward
- Pulling back should cause the motors to spin forward
- Turning left and right should be un-changed.

Wiring Diagram

Acknowlegements

LEGAL DISCLAIMER: