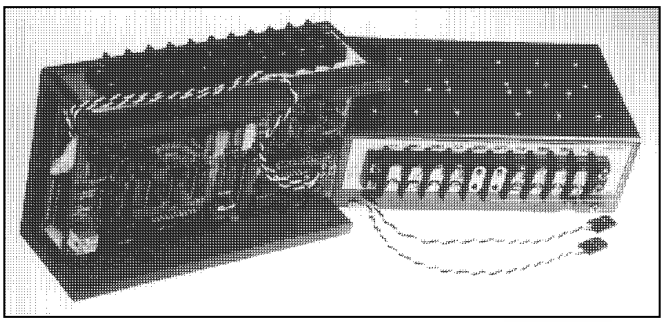
R/C Single FORWARD & REVERSE SPEED CONTROL

Help: **(541) 471-7135**

RSFR48E (V.LH) MANUAL



- **MODELS RSFR48E**
- **ROBOTS, TANKS & SINGLE SCREW BOATS**
- **INSTALLATION, WIRING, PROGRAMMING**
- **MASSIVE SINGLE CONTROLLER**

OVERVIEW: RSFR *DIRECTOR*s perform speed and direction functions for a single motor of a Radio/Controlled vehicle. They're used for robots, boats and subs and two **RSFR**'s can be used for tank steering. They require a single R/C channel to command. Each **RSFR** unit has a rugged forward/reverse speed control. In between stick positions are completely proportional, including reverse. Except for AM radio types, they are compatible with most model R/C systems including Futaba, Hitec, and JR, and control Direct Current Permanent Magnet field Brush commutated iron core wound rotor motors.

These instructions are for the **RSFR48E** which use the current circa 2008 "LH" control board. It has alphabetical delineated jumpers. *PLEASE* read and understand them before connecting power.

GETTING GOING: These units are factory shipped pre-programmed. It is ***strongly*** recommended to initially power up the unit in this mode with the default response curves as this configuration works well in the majority of applications. Later, after successful operation is verified THEN experiment with different curves and modes. Initially power the unit up gingerly with small fuses, low voltage and un-loaded motors as detailed below. Do NOT power the **RSFR** from batteries under charge, battery eliminator Power Supplies or chargers without consulting factory.

MOUNTING: Don't mount the unit directly adjacent to the R/C receiver. All applications that are at max ratings will require mounting the **RSFR** side-opposite-the-terminal-block to an additional heat sinking surface. Usually the metal frame of your vehicle is sufficient. While mounting monitor the mounting screw length; screws should not thread into the case more than 3/16". Do NOT drill into or near the controller. Protect the controller from the environment, especially metal shavings.

WIRING: G1 and G2 of the **RSFR** product MUST be connected together via the screw terminal at all times to establish a solid low resistance high current connection that is mechanically secure under high currents and temperature; this is in addition to supplied soldered connection. The **RSFR** is a special single version of our RDFR dual controller that has its two output H bridges paralleled. We connect the inputs of the two bridges together internally but the outputs are externally paralleled with the supplied jumpers to yield one massive output section. Do NOT remove these jumper straps. Follow the Layout below.

Ground = Battery Minus = G1

+12 to 48 VDC = Battery Positive via series fuse & switch = +2

MOTOR = Motor Brush a = Ma1

MOTOR = Motor Brush b = Mb2

SPECIFICATION CHART

PART Number	VOLTAGE Range	Con't Amps for Single Output	Start'g	Typ H-Leg Ohms	Approximate Size	Wgt Oz	Wire AWG
RSFR48E	9-55	130	374	.001	6.25 x 2.3 x 4.5"	43	6

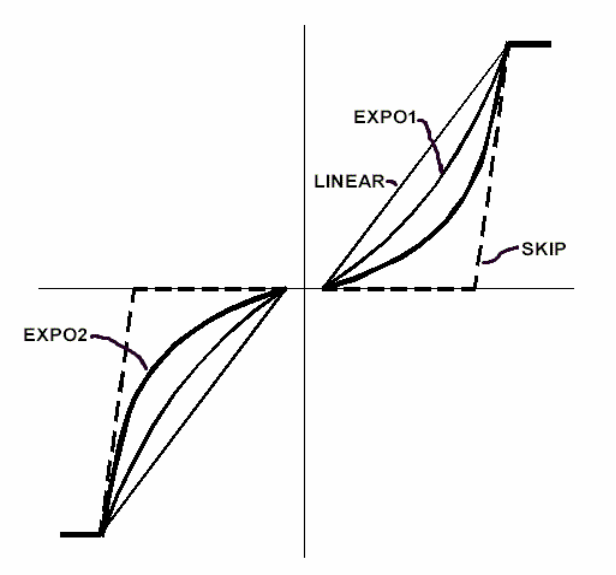
POWER & MOTOR: Observe battery polarity. The SPEC CHART shows the wire size for battery power and motor wiring; use minimum practical length and keep this wiring separated from the R/C receiver and Servo Command Pulse cable. It is permissible to ground your chassis at a single point to battery minus but don't use the chassis to conduct power. Power with positive the +2 power terminals; start with a 5-10 amp fuse and work your way up to the smallest amperage fuse which will support your normal operation. NAPA auto parts has a variety of plastic cased hi-amp fuses. Vantec doesn't recommend thermal Circuit Breakers.

The motor must NOT be connected to anything but the Vantec unit and the RFI suppression components described below. Improper mounting of the motor may create a motor to case short.

Install an AC MOV of suitable voltage or a .001 ufd 100V ceramic disc capacitor (yellow) directly across motor brushes or across the motor leads no more than 8 inches from the motor. Some motors come with the capacitors already installed saving you the trouble. These components help prevent RFInterference. MOVs help protect the controller by shunting damaging voltage spikes naturally produced by the inductive motor windings. If not supplied, select an AC MOV voltage 120% above your battery voltage. If after testing you experience jerky operation you probably still have RFI. Stubborn RFI cases may require that each motor have installed two yellow .001 ufd ceramic disc capacitors, one from each brush to the motor case and series ferrite toroid chokes. PCM type radio control systems are recommended to combat RFI.

OPTIONAL BRAKE RELEASE or CLUTCH ENGAGEMENT: Unless you *specifically* ordered this *extra cost* option ignore the BRK node, the Brake/Clutch coil, and *skip this paragraph.* This option is a 2 Amp current sink output that turns on when there's a "motion" command. Use a flyback diode across your coil.

SERVO COMMAND PULSE: The input plugs into your receiver like a servo and is engraved "S". Universal JR style connectors may be supplied in lieu of Futaba "J" connectors. They can be harmlessly plugged into a Futaba receiver incorrectly but for the controller to operate it must be plugged in so that the Vantec controllers brown or black wires lines up with the black wire of a Futaba servo. Plug a Futaba servo in an unused adjacent receiver channel to make this easy. If your



controllers connectors are missing the red wire don't worry.

If you decide to Y-connect the **RSFR** with another device or another **RSFR** be aware some **R/C** receivers don't have adequate **SCP**ulse drive without a "peanut" amplifier; contact the factory for this easy solution if a direct Y fails to work.

Use the full length supplied R/C antenna and locate it away from other wires and metal structures.

OPERATION: We ***strongly*** recommend you begin initial operation with 12 volts, 5-10 amp fuses and un-loaded motors and/or mechanically disconnected chain drives or belts. Work your way up in voltage, amperage, and mechanical load. Think of fuses as recording amp meters. If the **RSFR** becomes too hot to hold cease operation and investigate the cause. Use transmitter trims to set motor "off". Assignment of right/left motors, motor(s) polarity, and transmitter servo reversing switches have numerous combinations; select the correct combination experimentally but **NEVER reverse the motor battery polarity.** Operation that is punctuated with ½ second hesitations indicates your battery voltage is dropping below 9 volts, usually observed during motor starting or lugging. If the battery is new and charged, the motor may be too big for the "cranking amps" rating of the battery. Slower acceleration response curves described below may mitigate this.

PROGRAMMING JUMPERS: The Jumpers are factory set for the popular default response curve 14 which has slight exponential response, full speed gain, and wide deadband as well as fast acceleration braking as noted by the shaded sections in the jumper tables. To make a change set the programming jumpers for the functions that suit your application. Jumper ON = installed = present= closed. Pin pairs to receive the Jumpers are in row down the center of the top circuit board.

Because the **RSFR** is a paralleled version of the RDFR series only certain sections of the programming table are applicable. Jumper JPF=ON and Jumper JPH=OFF establishes the single Servo Command Pulse input mode using the "S" input and must remain so configured. Note this configuration ***mandates*** you choose a separate set of response curves within the "S=STEERING INPUT CURVES" chart for JPG, JPI, JPC and JPE. Leaving the relevant jumpers off will result in indeterminate response.

The four response curves set the joystick to motor speed PWModulation relationship. They are jumper selectable: LINEAR, mild EXPOnential1(a), moderate EXPOnential2(B) and SKIP.

The EXPOnential modes spread the slow speed operation to facilitate precise low speed control.

The SKIP algorithm is an exceptionally wide deadband for certain specialized boating applications, not a normal **RSFR** application

Gain selection: most users prefer HI gain to achieve the maximum possible speed with the stick straight up. Gain calibration is based upon a Futaba FP-9CAP with 100% ATV, 100% Dual Rate, no trim, centered at 1.53 ms, and factory defaults. This gain works well with other popular radios. Adjustment of gain may also be made at the transmitter using the ATV function or servo travel adjustment potentiometer.

Deadband is the joystick movement around center that produces no action; it makes "off" easy to find. None, Normal, Normal+, and Wide are available.

Notch defines the starting duty cycle so that your motor isn't driven with a non-rotating but power wasting fractional duty cycle. The bigger the notch the greater the first increment of duty cycle or speed.

Ignore the Vari-Brake entry in the jumper table.

BRAKING AND REVERSING: the optically isolated outputs are Pulse Width Modulated full H-bridge circuits. For speed control the bottom half of the bridge is modulated while the diagonal upper bridge leg is held on. Sequenced electro-dynamic braking shunts the motor by modulating both top legs of the bridge. With a command to "stop" the brake is gently ramped from 0 to 100% duty cycle. When an R/C command changes direction the brake is abruptly sequenced to first bring the motor to a halt, then the reversing PWM power is accelerated up to the commanded speed. This forced timed sequencing minimizes motor "plugging" and stress on your mechanical components. The implementation and timing of these functions is user selectable via jumpers BraKe1-2, ACceLeration1-2; jumpers B,D,J & L. Longer acceleration times are easier on mechanical components and starting currents imposed upon the battery.

These units are principally used in high current applications and are factory strapped for 338 Hz PWM switching frequency to realize maximum current capacity and low EMI/RFInterference for Radio Control environments. Changing the PWM chop rate to 21 KHz reduces the current capability of these products and introduces a host of new problems, including RFI. It is NOT recommended; especially not for competitive robots.

Noise in audio systems from the PWM is usually caused by modulation of the battery system by the PWM rate AND no filtering of the power going to audio components, or a poor ground scheme. Those problems are best addressed directly rather than resorting to the 21 KHz PWM chop rate.

DUAL INPUT					SIN gle	CR oss	S=STEERING INPUT CURVES				T=THROTTLE INPUT CURVES			
MIXED MODES		GAIN	NOTCH	Dead band at Center		(non-mix)	B2^4	B3^8	BO^1	B1^2	BO^1	B1^2	B2^4	B3^8
SEPARATE CURVES	CURVE NAME				JPF	JPH	JPG	JPI	JPC	JPE	JPK	JPM	JPO	JPQ
LINEAR	4	HI	NONE	NONE	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
LINEAR	5	HI	NONE	NORM	OFF	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
LINEAR	6	HI	slight	WIDE	OFF	OFF	ON	OFF	OFF	ON	OFF	ON	ON	OFF
SKIP	7	HI	NONE	WIDE+	OFF	OFF	ON	OFF	ON	ON	ON	ON	ON	OFF
expoA	8	HI	NONE	NORM	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON
expoA	9	HI	slight	WIDE	OFF	OFF	OFF	ON	ON	OFF	ON	OFF	OFF	ON
EXPOB	10	HI	NONE	NORM	OFF	OFF	OFF	ON	OFF	ON	OFF	ON	OFF	ON
EXPOB	11	MED	NONE	NORM	OFF	OFF	OFF	ON	ON	ON	ON	ON	OFF	ON
LINEAR	12	HI	MED	NORM+	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	ON	ON
LINEAR	13	HI	MED	WIDE	OFF	OFF	ON	ON	ON	OFF	ON	OFF	ON	ON
expoA	14	HI	MED	NORM+	OFF	OFF	ON	ON	OFF	ON	OFF	ON	ON	ON
expoA	15	HI	MED	WIDE	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON
NON-MIXED					SIN gle	Non-Mix	MOTOR OUTPUT #1 = Input S				MOTOR OUTPUT #2=Input T			
					OFF	ON	Select Curve from Steering Curves Above				Select Curve from Throttle Curves Above			

SINGLE INPUT		HOLD1	HOLD2		SIN gle	CR oss	S=STEERING INPUT CURVES				T=THROTTLE INPUT CURVES			
Input S only					O	(non-mix)	B2^4	B3^8	BO^1	B1^2	BO^1	B1^2	B2^4	B3^8
		JPN	JPP		JPF	JPH	JPG	JPI	JPC	JPE	JPK	JPM	JPO	JPQ
		ON	X		ON	OFF	Select Curve from Steering Curves Above				S commands Motor #1			
		X	ON		ON	ON	S commands Motor #2				Select Curve from Throttle Curves Above			

GENTLE BRAKE RAMP		BK1	BK2
Brake Ramp 0-100% Time in milliseconds	Motor Armature at 100%	JPJ	JPL
640 ms	Shorted	OFF	OFF
71 ms	Open	ON	OFF
1.3 Seconds	Shorted	OFF	ON
320 ms	Shorted	ON	ON

REVERSING BRAKE & ACCELERATION RAMPS		ACL1	ACL2
Brake Ramp 0-100% Time in milliseconds	Acceleration Ramp Time	JPB	JPD
320 ms	290 ms	OFF	OFF
71 ms	74 ms	ON	OFF
640 ms	590 ms	OFF	ON
160 ms	150 ms	ON	ON

PWM RATE	
	JPA
338 Hz	OFF
21.5KHz	ON
Not Recommended	

CURRENT LIMITING: In the **RSFR** the two outputs are paralleled and current limiting is adjusted by the Motor #1 drive at the "ONE" trim pot. The adjacent adjustment pot is factory set for the particular model controller, about 500 amp. Vantec suggests using the factory setting. As controller temperature increases the current limiting function reduces current further in concert to protect your overheating motor.

The limiting function holds the current steady beginning at the adjusted setting current even as the load doubles. Further load increase causes the current to dramatically fold back. Thus the current supplied actually reduces with increasing load to protect the controller and motor. Note that it is possible to reduce the current limit setting to the point the motor fails to start.

Most users do not have an accurate super hi current load to enable reproducing the factory setting so Vantec recommends not altering the factory adjustment.

IMPORTANT DISCLAIMERS: These products are not safety devices nor for use in life-critical or life-support systems. The **RSFR** comes with a limited one year warranty based upon a fixed repair charge for units not tampered with or abused. Please see www.vantec.com for details. For dual channel controllers with these features see our RDFR spec sheet. Specifications and price subject to change without notice. Patented. Some trade names & trademarks owned by others.

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