Trouble-Shooting

Q. A.	The output is always zero? Is there power to both the motor controller and receiver? Are the connections correct? Is the receiver supply voltage too high or too low? (This can cause invalid inputs) Is the motor controller supply voltage/current too low? (Both the interface & motor controller have under voltage protection) Is the ignition switched on? Try testing the system by connecting a servo to the output of the receiver to check the input.
Q. A.	No Reverse? Is the receiver input calibrated properly? Does the controller give zero speed on stick centre? If not adjust the offset. Does the controller operate correctly with manual reverse input? If so then the reverse driver maybe damaged.
Q. A.	The output is unstable? Are the connections correct? Is the receiver giving a bad output due to signal transmission deficiencies? Is the board damaged?
Q. A.	The unit gets hot during operation? If this occurs you should discontinue use immediately. Under normal use the unit uses such little power that its temperature will not change at all. Check the board for short circuits.
Q. A.	The unit works but will not give maximum speed? Has the motor controller gain been adjusted to give full output with full stick displacement in BOTH forward and reverse directions? Is the supply voltage/current low?
Q. A.	The output dithers between two speeds or rises in steps? This is normal and a product of using a microprocessor to sample the RC input signal. You can minimise this by ensuring the gain is adjusted to give full output at full stick displacement. Quantisation error may be more noticeable on high speed motors or motors operating beyond their intended voltage rating.
Q. A.	The output is not symmetrical (forward and reverse peak) Is the transmitter signal symmetrical? Adjust the controller gain to give maximum output when the transmitter gives its lowest output for the full stick displacement. Is the motor controller set to asymmetric mode? Is the motor controller operating correctly?

Please visit the 4QD web-site for further support if you questions cannot be answered here.

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Instruction Manual

SMR-102 (board) and SMR-122 (boxed)

Single-Channel
Microprocessor Controlled
Radio Control Interface
with Failsafe System and opto isolation.

Contents

Foreword

The SMR-102 Interface board is a general purpose interface between a standard Radio-Control receiver and a 4QD motor speed controller.

It provides a proportional speed signal to the controller and includes an active failsafe system.

The unit is used extensively in High-power radio-control applications utilizing 4QD, Pro or NCC series motor speed controllers.

The mechanical layout of the SMR-102 board enables it to plug directly into an NCC controller. A boxed version is available which will suit all these controllers.

Features include proportional control of a single channel with an output resolution of 64 states over the full stick displacement. An on-board signal validation routine and failsafe give stable operation and "power-down" of the output in the event of transmission loss.

Please read this instruction manual carefully before operation and retain for further use.

4. Safety Considerations

The SMR-1X2 Interface board implements low-voltage microprocessor technology to control unlimited user-defined loads. The potential for the development of hazardous conditions is therefore great and safety recommendations should be adhered to fully.

Safe Operating Procedure

1. BEFORE powering up check the correct order of input connections fully and ensure the Output mode Jumper is set to the correct position.
2. BEFORE use check the unit for damage. DO NOT use the device if any connections are open-circuit or damaged.
3. Ensure the unit slots comfortably and firmly into the connector. If the unit is flexed or loose it may become damaged or fall out of the connector causing unexpected operating conditions.
4. Minimise noise and the possibility of connection failure by using short and properly terminated connection cables. DON'T twist wires together.

5! DO NOT make connections while the system is powered up. Radio Control requires signals to be synchronised.

6! DO NOT connect LED's or other I/O devices to the interface board. The unit is designed for use under minimal power supply power arrangements and any user modifications may cause the device to either stop functioning, or even worse, produce an unstable output that may oscillate out of control.

7! DO NOT touch the circuit while in operation. This may have adverse effects on performance.

8! DO NOT allow the unit to get wet and observe the operating temperature specifications.

Note:
Any experienced Radio Control user will know it is good practise NOT to switch off the transmitter during operation as this commonly produces an undefined output which will be reacted to until the failsafe activates. We also recommend that the Receiver is powered up and signals checked before applying power to the motor controller although this is not critical.

Moreover, it is always best to operate potentially dangerous machinery with great care. Minimise risk by removing the possibility of danger until confidence is achieved. As an example, if using this unit with a vehicle make sure the wheels are off the ground until the interface has been setup correctly.

3. Failsafe Operation

The SMR-1X2 uses a failsafe system that offers features usually only found in expensive dedicated units.

5.1 Standard Receiver Output

The standard servo-drive in Radio Control applications is a 20 Hz PWM signal with a mark of 1.5mS at centre (zero position). When the stick is displaced from one extreme to the other, this mark changes from about 1.0mS to about 2.0mS.
The SMR-1X2 will reject signals that differ sufficiently from this standard.
When the signal quality is below an acceptable standard, SMR-1X2 enters failsafe mode, and all outputs are set to safe values.

5.2 Failsafe Algorithm

The failsafe algorithm used by the SMR-1X2 is simple and yet effective.

Each pulse is tested to determine whether it is likely to be a valid pulse, or just a section of random receiver output.

The results of this test are used to define whether the input signal can be trusted. If not, the SMR-1X2 goes into failsafe mode, and the outputs are set to zero.

A valid pulse must have a mark of between 0.8 and 1.2 ms, and must be followed by a space of at least 13 ms. All pulses that do not conform to this standard are treated as invalid.

The unit will enter failsafe mode if, over any 256mS period, no sequence of 5 consecutive valid pulses occurs. This works well because it is very unlikely that a random signal will contain a section that looks like 5 consecutive valid pulses.

When an invalid pulse is received, the output will correspond to the last valid input, unless, or until, the failsafe has activated.

Features

- Single Channel Radio-Controlled Electronic Speed Control utilizing Micro-controller technology
- 128-State PWM (Pulse Width Modulated) Proportional Output with Reverse Driver
- Advanced Failsafe System
- Configurable Output Modes (Switched/Proportional)
- Signal Validation and Rejection for Noise Immunization
- Low Power Consumption
- Compact and Lightweight Design for direct connection to 4QD, Pro and NCC motor speed**c** controllers.

Specifiations

Supply Voltage	5.7-32.0V (from host controller)
Supply Current	4.7mA
Power Consumption	24mW
Output Signal	
Output Method	2KHz PWM 0-100% Modulation / DC output
Output Voltage	4.3V Max
OFF->ON Switched Output Threshold	1.5(Centre) +-0.17mS
Resolution	7 Bits (6 bits Control + 1 bit Reverse Signal)
Radio Control Input	
Input Method	40-70Hz PWM 1.5mS Mark Centre [RC Standard]
Input Voltage	3.2V - 30V
Input Resistance	33Kohm
Failsafe Parameters	
Valid Input	0.8-2.2mS mark and >13mS Space
Fail Time-out	256ms
Fail Output	130mV Max
Dead Time	Approx 1500mS
Operating Temperature.	-30 - +60’C
Dimensions mm(")(max):	H 26.1(1.3) x W 35.6(1.4) x D 19.8(0.78)
Weight:	38g

*Note: the interface normally draws its power from the host controller's internal 9 or 12v supply.

1. Installation

1.1 Connections

The SMR-102 Interface connects directly to the NCC series Motor Controller to minimize setting up and wiring.

The SMR-122 is boxed, with flying leads and will connect directly to NCC, Pro or 4QD series controllers.

Connections to both versions are shown below: note that this is an illustration of the unboxed SMR-102.

Radio Control Input
The radio control receiver connection requires a ground (pin A), a signal input connection (pin C) and a power connection (pin B) which is only used to drive the opto-isolator.

When plugging the three pin connector into the receiver, ensure that the blue wire is closest to the notch at one end of the socket on the receiver.

Alternatively, if you have a servo to hand, you can connect it to your receiver and note which end of the socket the white wire goes to. When the interface is connected to the receiver, the blue wire should go to the same end of the receiver socket as the white wire from a servo.

Ignition cable
A second 3 core cable is provided. Pins E and F (red and Blue) are ignition - these control the host controllers's standard powering arrangement.

The ignition should be used as a master failsafe or power-on switch.

An auxiliary ground (pin D) is also provided, but not normally used except to power, for instance, a battery condition meter or other low-power circuitry.

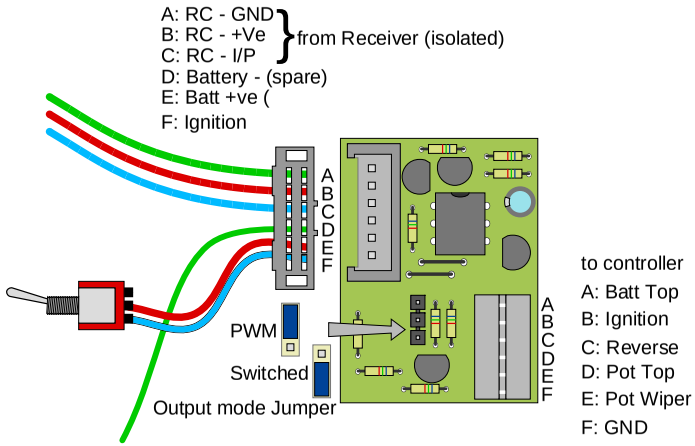
1.2 Wiring the Interface

The interface can be wired using either custom terminated cables or a combination of the standard RC 3-way plug and an ignition connection.

The RC Input should be connected directly to a single receiver output channel. It is possible that many of these units can be used together to control multiple motors or devices from a single multi-channel receiver.

Caution!
The Interface derives its power from the host controller pot top (output pin D) and will not operate if the controller is powered down or the ignition is switched OFF.

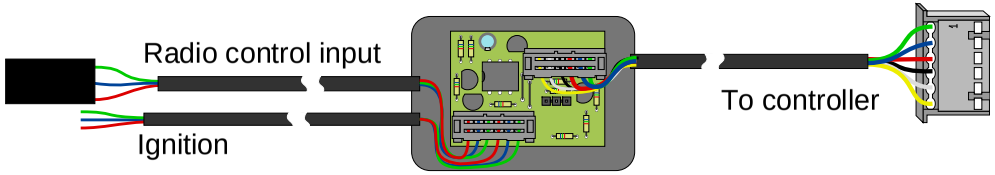
The Ignition connections from the controller (pins E and F) are live at full Battery+. Mistakes in wiring can easily cause damage to the unit. Check your wiring carefully before use!



1.3 Mounting the Unit

The SMR-102 connects directly to the NCC series motor controllers as an expansion board plugging straight into the input connector. During installation, ensure that the power to the host controller is OFF, and that the unit fits firmly and securely into the connector before powering-up.

The SMR-122 is a box with flying leads, as illustrated below.



2. Calibration

2.1 Aligning Centre Stick position

The SMR-1X2 Interface board requires calibration before use as does any other Radio Control system. Manual calibration can be made by adjusting the joystick offset on the radio-control transmitter until the centre points align. This should be adjusted to just above the point where the interface board gives zero output and the reversing signal is off.

2.2 Scaling the Output for Maximum Resolution

To maximize the use of the available resolution given by the Interface unit the maximum and minimum stick positions should be calibrated. This can be achieved by adjusting the Controller Gain (See motor controller manual) to be just above full-speed when the stick position is at its maximum. You should calibrate this for the stick end-stop that gives the least output to ensure full-speed can be reached in both directions.

Full details on configuring the motor controller's Gain Control can be found in the relevant motor controller manual.

2.3 Setting the Output Mode

The SMR-1X2 maybe configured to give either Proportional or Switched output modes. In Switched output mode the output is either ON or OFF depending on the stick position.

To enable Switched mode, set the Output Mode Jumper as illustrated in the diagram opposite. The jumper setting will take effect when the unit is powered-up or the Failsafe activates.