

RMG SAILWINCH



SmartWinch

U S E R G U I D E

**E Series
Revision 2**

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1. Introduction

Thank you for purchasing a *SmartWinch*. Please take the time to read this booklet. There are a few do's and don'ts, some very important points and some helpful hints. Please do not hesitate to call or email for assistance.

2. Summary of Features

- 3.8 to 9 volt operating range (4 to 6 cells or 2 cell LiPo/LiFe)
- Integral 5 Volt regulator for single battery operation
- Adjustable Tx end point limits
- Adjustable travel
- Adjustable battery monitoring with low battery shutdown
- Adjustable failsafe position for low battery shutdown
- Adjustable single or double ended Scaled Linear Travel
- Adjustable Input Deadband
- Adjustable Deceleration Rate
- MOSFET drive
- Thermal overload protection with automatic reset.
- Automatic shutdown when stalled
- Ball bearing output

3. Special *SmartWinch* Features

Description of Beeps

The *SmartWinch* uses several sound signals as well as those described in Setup.

Startup beep. A distinctive signal heard each time the controller starts up.

Low Battery Warning. Five rising tones at startup indicates battery is low.

Rapid repeated beep at startup indicates Setup Lead on Rx ground or signal pin.

One beep every 3 seconds at startup indicates no signal input from Rx.

Two tone (high/low) beeps during normal operation indicates stall or fault.

Stall Protection

When a conventional servo becomes stalled, it will stay stalled until the problem is solved. If not solved in time, the battery can be flattened or motor and output transistors may be overheated and possibly damaged. However the *SmartWinch* can detect when it is stalled and can protect itself by shutting down. The *SmartWinch* then signals that it is stalled by sounding a two-tone beep at 2 second intervals until reset. Stall mode can usually be reset by moving the Tx stick in the opposite direction.

Special *SmartWinch* Features *user adjustable in Setup 2*

Scaled Linear Travel (SLT)

Travel response to the first 25% of Tx stick movement from full in when single ended or both ends when double ended is adjustable from 1:1 at minimum to a maximum of 4:1. For example, if 50% is selected, each increment of the first 25% of the stick range results in half the travel of the default setting. This feature is similar to exponential adjustment in a computer Tx. However scaled linear has the advantage of consistent incremental travel over the first 25% of stick movement whereas exponential is constantly varying. Default is 1:1.

Low Battery Failsafe Position (LBS)

The default low battery failsafe position is booms half out. But this is only true if using a spool type drum. If a spiral drum is used then this position would be closer to full in and could make it difficult to get the boat ashore. To compensate for this the low battery failsafe position is also adjustable so you can choose to make it further out if desired. The range is from half to full travel.

Input Deadband (DB)

Input deadband is the amount dithering in the Rx signal that a servo can tolerate without responding to by constantly jittering. This is adjustable from 0.8 to 10 microseconds. Deadband adjustment allows the optimisation of Tx fine trim control. The default setting is 2 microseconds.

Battery Monitoring

The *SmartWinch* can monitor the battery for low voltage. If the voltage is below the warning level a warning signal (5 rising tones) will sound when the winch is switched on. If, during normal operation the voltage falls below the shutdown level, the winch will drive to the low battery shutdown position and hold there until the battery is replaced or voltage recovers when the *SmartWinch* will return to user control. See Table 1. Default is battery monitoring OFF.

Deceleration Rate (Dec)

The rate at which the *SmartWinch* decelerates from full speed to stop can be adjusted. The default setting is approximately 70 % of maximum.

Reset

The *SmartWinch* can be reset to factory default settings.

4. Batteries

Voltage Range

Absolute supply voltage range is from 3.8V to 9V. Should a voltage outside that range be applied the winch will not operate. No damage can be done unless reverse polarity or > 15 volts is used.

Pack Size

The minimum pack is 4 cells of NiCad or NimH. The maximum is 6 cells NiCad or NimH or 2 cell LiPo. Capacity (mAh) has little effect on performance, only battery life.

Recommended battery types. (in order of preference for best performance)

- *** 2 cell LiPo. Low voltage drop under load.
- ** NiCad or 6 Volt Gel Cell.
- * NimH. High voltage drop under load causes loss of output power.

Snap In Battery Holders

Snap in battery holders are **not** recommended. Their weak electrical connections can result in severe voltage drop which may cause erratic winch behaviour. Compounding this problem is that in most cases these packs only have servo size wiring which can not supply the current required by the winch. Battery packs should be fully soldered.

Battery Monitoring Voltage Levels

Table 1

Level	Battery pack	Detect	Warn	Shutdown
1	4 cells	<=6.2	<=4.7	<=4.4
2	5 cells or 6V Gel	>6.2	<=5.7	<=5.0
3	6 Cells or 2 cell LiPo	>7.5	<=6.9	<=6.1
4	Battery Monitoring turned off			

5. Wiring

Regulator

The *SmartWinch* contains a 5 volt regulator which can supply up to 1 amp of current to the controller circuit, radio receiver (Rx) and a standard power rudder servo. This allows for the use of only one battery pack. The *SmartWinch* motor runs on the full battery voltage via the MOSFET output circuit. Please note that using high power servos for rudder can cause radio glitching.

Supply Leads

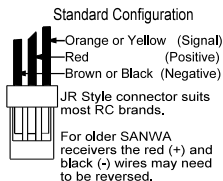
Wiring and connectors from *SmartWinch* supply leads to battery pack **must be at least 0.5mm² (20 AWG)** cross section and rated at least 3 Amps. Switches used should be rated at least 3 Amps also. **Standard servo size wiring is not adequate.** It can cause severe voltage drop between battery and *SmartWinch* and should not be used. All joints should be soldered and then coated with Vaseline petroleum jelly or Silicone grease to protect from corrosion (black wire). Use on servo connectors before inserting into the Rx as well.

Supply Polarity

Power supply / battery lead connectors **must** be polarised so that it is impossible to accidentally reverse the supply polarity. The control circuit and radio gear is protected by the voltage regulator and will not be damaged by reverse polarity **but** the MOSFET output circuit is likely to be **seriously** damaged.

Servo Connector (Rx Lead)

The connector supplied is compatible with most radio brands such as JR, Futaba, Hitec etc. Take care when inserting connector into receivers other than JR or Hitec. It is possible to insert the connector the wrong way around in some brands receivers. As the + lead is centre then reverse connection into the Rx will not do any harm except that the system will not work.



Make sure that polarity is correct. In the case of Sanwa receivers, check the polarity of the Sanwa servo leads first as early Sanwa receivers require the centre lead to be negative. (see figure 1)

Fig. 1 Servo Connector

6. Standard Connections

In most cases the best circuit for *SmartWinch*, radio and battery is also the simplest as shown in figure 2.

In this system there **must be no receiver battery connection**. Power for receiver is supplied by the *SmartWinch* internal 5 Volt regulator.

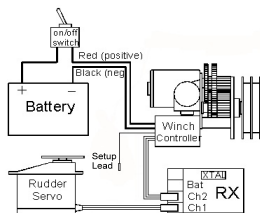


Fig. 2 Standard Connections

7. Alternate Connections

If more than just winch and a rudder servo is used it is advisable to bypass the winch's internal voltage regulator and connect the battery direct to the Rx. See Figure 3. This is because the *SmartWinch* regulator may not be able to supply the current needed by extra servos resulting in voltage drop to the Rx.

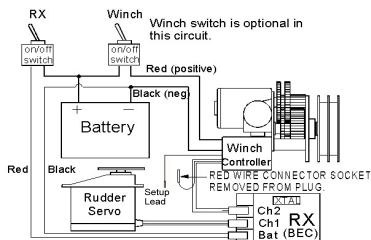


Fig. 3 Alternate Connections

Servo connector lead red wire **must** be disconnected when Rx battery socket in use. Remove the red wire socket from the connector and tape it back to the lead.

These circuits show the use of switches. Switches are not essential and can be omitted.

When power is connected directly into the Rx, make sure the Rx and servos can handle the full battery voltage. In most cases 6 cell NiCad / NimH or 2 cell LiPo can not be used in this configuration. In the case of those battery sizes being used for *SmartWinch* supply, a second 4 or 5 cell pack should be used for the Rx.

8. Mounting

Deck Mounting

The recommended method of mounting the winch is to fix it to the underside of the deck with output shaft passing through the deck. Maximum deck thickness is 3mm.

Sealing

Prior to fixing the winch to the underside of the deck, the mounting face, spigot and "V" ring seal on the shaft immediately below the hexagonal section of the output shaft should be given a liberal coating of Vaseline petroleum jelly or Silicone grease to form a seal. Coat the two M3 mounting screws as well.

Below Deck Mount

For below deck mounting it is usually best to mount the winch with shaft horizontally. You may wish to make a bracket such as the one below to assist in below deck installation.

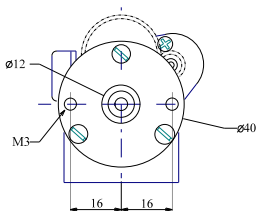


Fig. 4 Mounting Dims.

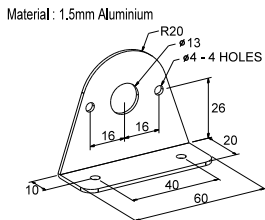


Fig. 5 Mount Bracket

9. Sheeting

Drum Size vs Performance

Unless specified otherwise when ordering, the 280ES and 280EL are supplied with a 26mm drum. The 280EF, 380ES and 380EH are supplied with a 32mm drum. If faster or slower performance is desired an extra drum may be purchased. Our web site has details of several other drum options.

Using a smaller diameter means more revolutions are required and therefore sheet speed is slower. However with smaller diameter a higher sheeting force is achieved. And vice versa if larger diameter is used. Similar changes in sheeting performance can be achieved by changing the supply voltage.

Sheeting Systems

There are many ways to approach the sheeting on an R/C yacht and no one method can be considered to be "the best way". The two main categories of sheeting systems used on drum type winches are described below. Either system can be used above or below deck.

- **Single sheet - tension line.** This is where only one side of the drum is used and light tension is applied by an elastic tension line which is attached to the deck. Its purpose is to prevent the loss of wraps around the drum during sheeting out.
- **Double sheet - return line.** Where instead of an elastic tension line a return line is attached the top side of the drum. As the winch sheets out the return line is winding in maintaining tension on the load sheet. As the winch is sheeted in the return line will wind out.

Figure 6 shows a typical arrangement for a double sheet above deck system. To make this a single sheet tension line system, simply replace the return line with an elastic tension line. Attach it to the sheet splitter and a fixed point near the stern to give as much length to the elastic material as possible.

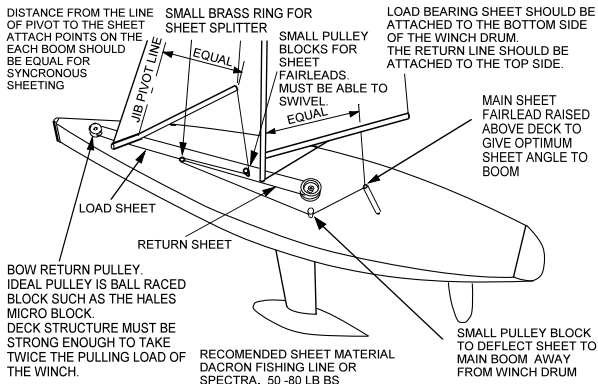


Fig. 6 Sheeting

10. Setup

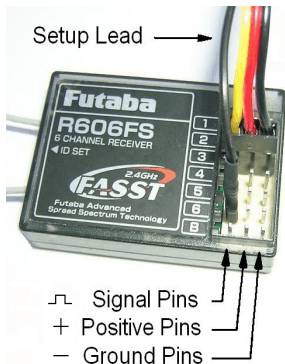
There are two separate setup procedures. Setup 1 calibrates the *SmartWinch* to the Tx end points and sets travel. In most cases Setup 1 is all that is needed. It is strongly recommended that Tx end points and travel be set using Setup 1 and not by using end point adjustment (EPA) if available from your Tx. Setting travel by Tx EPA does not give overrun protection. The *SmartWinch* is a powerful servo and can do damage in the case of overrun.

Setup 2 has several auxiliary adjustments which all have default settings which will be adequate for most skippers. See page 2 for details of these features.

Setup is entered by connecting the **Setup Lead** to a spare signal pin in the Rx. The Setup Lead is the single wire with small connector which comes from the *SmartWinch* controller box.

Ensure the *SmartWinch* is working ok with your radio gear before running setup. Setup may be done as often as you like. Should the *SmartWinch* not behave as expected immediately after doing Setup then simply redo Setup.

Figure 7 (below) shows a typical multi channel Rx. In the case of a two channel Rx the rudder servo lead will need to be removed to access the signal pin.



Ground pins are the outside row and are used by the black (or brown) wire of the servo lead.

Positive pins are the center row and are used by the red wire.

Signal pins are the inside row and correspond to the white, yellow or orange wire of the servo lead.

Fig 7 Setup Lead

The Setup Lead in this picture is shown connected to a signal pin.

Note that the inside row pin of the Rx battery connector is not a signal pin and can not be used for entering setup.

For normal operation the Setup Lead should be connected to any spare positive (center) pin. If the Setup Lead is connected to an Rx signal or ground pin at startup, the *SmartWinch* will beep rapidly and must be removed to allow normal operation.

Before starting Setup

- * Read pages 8, 9 and Setup Notes on pages 11 and 12.
- * Setup 2 is locked out until travel (Setup 1) has been set.
- * For Setup 2, the drum and sheets may be left attached unless performing *Reset To Defaults*.
- * Batteries **must** be fully charged to turn Battery Monitoring On.

10.1 Setup 1

Tx End Point Limits and Travel

- 1 Turn Radio and *SmartWinch* on and ensure *SmartWinch* is operating normally (responding to Tx stick). Remove Drum if first time adjusting travel.
- 2 Place Tx stick at **sails full in** position and adjust trim all the way in the same direction as the stick.
Leave trim in this position throughout procedure.
- 3 Push Setup Lead onto a spare Rx signal pin. *After about 3 seconds there will be a long beep. (sounds like a phone ring)* Immediately this long beep is heard, move the Tx stick all the way to the full out. *About 3 seconds later another long beep will sound indicating the Tx end points have been saved. If travel adjustment is not required then remove the Setup Lead now and the SmartWinch will restart itself with the new Tx end point limits. If travel adjustment is required, leave Setup Lead in place and continue on to the next step.*
- 4 Move Tx stick back to **full in** and wait for another long beep.
- 5 Fit drum and sheets and manually set booms to full in.
- 6 Drive winch out via Tx stick till booms are at full out position. *The SmartWinch will run at low speed at this time. Take care not to go too far out as travel is currently set to maximum.*
- 7 With booms at **full out**, remove Setup Lead from Rx. *The SmartWinch will automatically restart with the new settings.*

This completes Setup 1

Setup 1 Notes

If the *SmartWinch* is removed and reinstalled in same boat with the same Tx or if Rx only is replaced then Setup 1 does not need to be re-done. If the Tx is changed then only Setup 1 steps 1 to 3 needs to be redone. If the Tx sail control channel is reversed then Setup 1 steps 1 to 3 must be redone.

If you have a computer radio, once travel is set, take care when adjusting Tx end points from the Tx. This will either reduce travel or result in dead stick.

It is recommended to set the booms closer in to center line than normal when setting up at step 4 (but not so tight that the *SmartWinch* is under load). Later when trimming sails for racing the Tx trimmer, EPA or ATL can be used to vary full in sail trim. This will not effect full out position.

If Tx trimmer was left in center at Step 1 and subsequently moved inward dead stick will occur. It is best to leave Tx trimmer at minimum for Setup.

10.2 Setup 2

Auxiliary Settings

- 1 Turn Radio and *SmartWinch* on and ensure *SmartWinch* is operating normally (responding to Tx stick).
- 2 Place Tx stick at desired position. (*see "Tx Stick Position" page 12*)
- 3 Push the Setup Lead onto a spare RX signal pin. *After about 3 seconds there will be a long beep. (sounds like a phone ring) Starting 4 seconds later there will be one beep per second upto 10 beeps.*
- 4 Remove the Setup Lead immediately after the required number of beeps. See table 2 on page 12. *If you accidentally pulled the lead out at the wrong number of beeps then just turn the SmartWinch off now and the settings will not change.*
- 5 Replace the Setup Lead onto a signal pin, wait for the startup signal then remove the lead. *The startup signal indicates that the SmartWinch has restarted with the new setting.*

This completes Setup 2

For a description of these features, see page 2.

Beeps	Setting
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1	Single ended Scaled Linear Travel (SLT)
2	Double ended Scaled Linear Travel (SLT)
3	Low Battery Shutdown Position (LBS)
4	Input Signal Deadband (DB)
5	Battery Monitoring ON
6	Battery Monitoring OFF
7	Deceleration Rate (DEC)
10	Reset ALL settings to default. Drum must be removed before reset is performed.

Setup 2 Notes

Setup 2 is locked out if travel (Setup 1) has not been set.

If the Setup Lead is removed at 8 or 9 beeps or not removed within 1 second of the 10th beep, the *SmartWinch* will restart without changing any settings.

If the Setup Lead is removed at 5 beeps, a number of beeps will be heard indicating the battery monitoring level set. (*See Table 1*)

Tx Stick Position

For SLT, DB and DEC place Tx Stick at **full in** for *minimum*, **full out** for *maximum* or an intermediate position as desired.

For LBS, drive boom to desired shutdown position between half way and full out.

For Reset or Battery Monitoring On or OFF the Tx stick position is not relevant.

What happens if the battery pack size (Voltage) is changed?

If Battery Monitoring is off there are no implications when changing battery pack size. If Battery Monitoring is on then redo Setup 2 Battery Monitoring ON.

Changing to a lower voltage battery without redoing Setup 2 will result in premature shutdown. Changing to a higher voltage pack will result in over discharging of the battery if left on till Low Battery Shutdown occurs. Changing battery pack capacity (mAh) has no effect on these settings.

11. Maintenance

- For the motor, a regular drop or two of light machine oil to the bushings or a spray with water repellent lubricating sprays will keep the motor going for years. If spray used apply directly *into* the motor. Avoid getting spray on electrical wires or feedback potentiometer and controller enclosure grommet. **Note: These sprays contain flammable propellants and solvents. Allow a few minutes for the flammable components to evaporate before running the winch.**
- Maintain a coating of white petroleum jelly (Vaseline) or Silicone grease on all electrical connectors inside the yacht to protect against 'black wire' corrosion.
- Regularly re-pack the white petroleum jelly or Silicone grease under the drum of deck mounted winches to protect the ball bearing. Regularly remove the drum and re-coat the area around the shaft.
- Drain the boat of water as often as is required to keep the level of water in the boat to an absolute minimum. After each days sailing drain boat and leave hatch off to allow the boat to breathe and dry out. This is important for all of the boat's electrics.
- Do not attempt to seal the motor in any way. It must be able to breathe for cooling purposes and also to dry out should moisture get in. It is not possible to seal the motor so any attempt will only make corrosion worse.
- Try to keep gears clean. Greasing is not necessary for Acetal (black plastic) gears. The exception to this is the 380EH. The 380EH metal gears should be greased.

12. Warranty

Your new SmartWinch is covered by a 12 month warranty. Should any faults be found and are considered by RMG SailWinch to be our fault, we will repair and return the winch to you free of charge. If you wish to make a warranty claim, the winch must be returned directly to RMG Sailwinch.

13. Mechanical Specifications

Table 3

Specification	280EF	280ES (EL)	380ES (EH)	Unit
Max Power	10.7	10.7	14.3	Watts
No Load Speed	6.1	4.4(3.1)	3.5	revs/sec
No Load Speed	0.48	0.84 (1.06)	0.96	sec/300mm
Stall Torque	12.2	15.9 (19.9)	29.9	kg.cm
Standard Drum	32	26	32	mm
Maximum Turns	3.2	4.8 (6)	6 (9.6)	revs
Travel Range	40-320	70-405 (85-490)	80-610 (130 - 975)	mm
Dimensions	73x55x50	74x56x54	85x65x53	mm
Weight	134	134	168 (175)	gm

14. Electrical Specifications

Table 4

Specification	280EF 280ES 280EL	380ES 380EH	Unit
Idle (Stationary) Current	23	23	mAmps
No Load Running Current	550	650	mAmps
Stall Current	12	18	Amps
Maximum Supply voltage	9	9	Volts
Minimum Supply voltage	3.8	3.8	Volts

Performance specifications based on a constant voltage supply of 6V and standard drum size. Actual performance specifications will vary depending on supply battery voltage and drum size etc. Specifications may change.