

RMG SAILWINCH



SmartWinch

U S E R G U I D E

**E Series
Revision 2**

1	Introduction.....	1
2	Warranty.....	1
3	Summary of Features.....	1
4	Special <i>SmartWinch</i> Features.....	2
5	Power Supply.....	4
6	Wiring.....	5
7	Standard Connections.....	6
8	Alternate Connections.....	6
9	Mounting.....	7
10	Sheeting.....	7
11	Setup.....	9
11.1	Setup Introduction.....	9
11.2	Setup 1 Tx End Points and Travel.....	11
11.2	Setup 2 Auxiliary Settings.....	11
12	Maintenance.....	13
13	Mechanical Specifications.....	14
14	Electrical Specifications.....	14

The *SmartWinch* is manufactured by

RMG SAILWINCH
66 Radford Rd
Angaston SA 5353
Australia



Phone:	+61 8 8564 2444	International
	08 8564 2444	Australia
E-mail:	rob@rmsailwinch.com.au	
web:	www.rmsailwinch.com.au	

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. Warranty

- Warranty period is 12 months from the original end user purchase date
- Resale to another end user in the warranty period does not void warranty
- The evaluation of any claim can only be made by RMG Sailwinch
- Where no obvious cause of a fault is found then warranty will be assumed
- The benefit of the doubt will always go to the end user
- Where there is user damage that is not determined by us to have caused the fault, warranty will not be voided
- We make reasonable efforts to seal critical components of the *SmartWinch* however we can not guarantee that no moisture ingress will occur.
- Any fault caused by water voids warranty for the purposes of that fault only
- Stall protection can not be guaranteed due to numerous possible causes out of our control. See **Stall/Fault Mode** on page 2.

3. Summary of Features

- 3.8 to 9 volt operating range
- Integral 5 Volt 1 Amp BEC for Rx supply
- 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 signal deadband
- Adjustable ramp rate
- Very low on resistance MOSFET motor drive
- Stall protection
- Ball bearing output

4. Special *SmartWinch* Features

Description of Beeps

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

Startup beep. A 3 note tune sounds at startup.

Low Battery Warning. 5 rising tone notes at startup indicates battery is low.

3 beeps per second at startup indicates Setup Lead on Rx ground or signal pin.

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

2 notes (high, low) stall signal during normal operation indicates stall or fault.

Stall / Fault mode

The *SmartWinch* can detect when there is a fault and can protect itself by shutting down. When in stall mode the stall signal will sound at 2 second intervals. This can usually be reset by moving the Tx stick in the opposite direction. If this does not work, turn the winch off and on again. But check for the reason it stalled and resolve it before restarting. Please note that there are several reasons why stall protection may not prevent damage due to overload. These include cyclic overloading where the winch does not come to a complete stall before the commanded position is reached then run back causes the cycle to repeat, inadequate current supply resulting in the winch controller having a “brown out” causing a restart etc. Several factors can result in overheating that stall protection can not prevent.

Setup Lead

The Setup Lead is a single wire lead with small connector used to place the winch into Setup Mode for making adjustments. See Setup on page 9.

Special *SmartWinch* Features *user adjustable in Setup 1.*

Tx End Point Limits

The *SmartWinch* samples the Tx end points and stores these as input signal limits to prevent unwanted overrun.

Travel Adjustment

Travel can be adjusted between 100 % of maximum down to as low as 20%.

Battery Monitoring

If supply voltage is below the warning level a warning signal (5 rising tones) will sound as 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. If the voltage recovers the winch will return to user control. See Table 1 for levels. Default setting is battery monitoring OFF.

What happens if the battery pack size 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 the battery if left on till Low Battery Shutdown occurs. Changing battery pack capacity (mAh) has no effect on these settings.

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. This applies if only Battery Monitoring is turned on.

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.

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.

Ramp Rate (RMP)

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

5. Power Supply

Absolute voltage range is 3.8 to 9 volts. The table below shows various battery types, numbers of cells and capacity recommendations. Power supply connection must be made via the red and black power supply leads and not from the Rx.

Battery Table

Table 1

Type	Performance	Number of cells	Min capacity
LiPo/LiFe	###	2	600 mAh
NiCad	##	4 to 6	1000 mAh
NimH	#	4 to 6	2000 mAh
SLA	##	6V	1000 mAh

Snap In Battery Holders

Snap in battery holders must not be used. Their weak electrical connections can result in severe voltage drop which causes erratic system behaviour. Battery packs should be fully welded/soldered.

Battery Monitoring Voltage Levels

Table 2

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 NiCd/NimH 2 cell LiPo	>7.5	<=6.9	<=6.1
4	Battery Monitoring turned off			

6. Wiring

Voltage Regulator (BEC)

The *SmartWinch* contains a 5 volt, 1 amp BEC to supply to winch controller, radio receiver (Rx) and a standard power rudder servo. The winch motor runs on the full battery voltage via the MOSFET output circuit. Please note that using high power servos for rudder can cause Rx problems.

Supply Leads

Wire size from winch supply leads to battery pack **must be at least 0.5mm² (20 AWG)** cross section. Switches and connectors used should be rated at least 3 Amps. **Standard servo size wiring is not adequate.** It can cause severe voltage drop between battery and winch and should not be used.

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 BEC 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. However this will not do any harm except that the Rx will not operate.

7. Standard Connections

In most cases the best circuit for system power is as shown in figure 1. In this system there **must be no Rx battery connection**.

Power for Rx is supplied by the winch BEC (5V).

The use of switches in either system is optional.

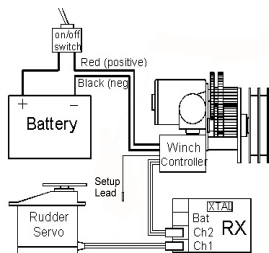


Fig. 1 Standard Connections

8. Alternate Connections

If a high power rudder servo or more than one standard power servo is used it is advisable to bypass the winch BEC and power the Rx directly.

In this case, the servo lead red wire **must** be disconnected.

When this method is used, 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 without the use of a BEC Rx or separate BEC to reduce the voltage into the Rx.

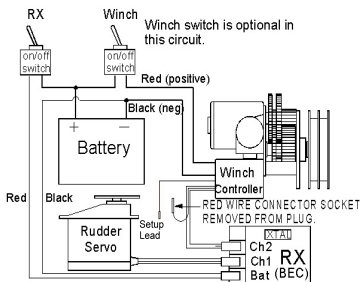


Fig. 2 Alternate Connections

9. Mounting

Deck Mounting

It is recommended to fix the winch to the underside of the deck with drum mounted above deck. Maximum deck thickness is 2.5mm when using the supplied screws. Use csk screws for deck thicknesses above 2.5mm up to a maximum of 4.5mm. Do not use screws longer than those supplied.

Before 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.

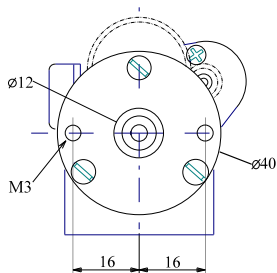


Fig. 3 Mounting Dims.
Material: 1.5mm Aluminium

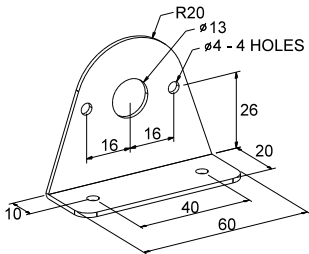


Fig. 4 Mount Bracket

10. Sheeting

Drum Size vs Performance

If faster or slower performance is desired a different drum may be used. Our web site has details of several drum options. Using a smaller drum slows sheeting speed and vice versa. However with smaller diameter a higher sheeting force is achieved and vice versa.

Sheeting Systems

There are a few different methods that can be used for sheeting on an R/C yacht and no one method can be considered to be "the best way". Two basic categories of sheeting systems used on drum type winches are described below. The purpose in all methods is to keep the load bearing line off the drum from becoming slack.

Single Line With Elastic Tension Line

In this case only one side of the drum is used and a long elastic line is used to give tension. The elastic line attaches to a fixed point on the boat.

Endless Loop

Instead of an elastic tension line a return line is attached the top side of the drum. As the winch is winding the load bearing line out, a return line is winding in maintaining tension on the load line. As the winch is sheeted in the return line will wind out. Figure 5 is an example of a deck mounted endless loop system.

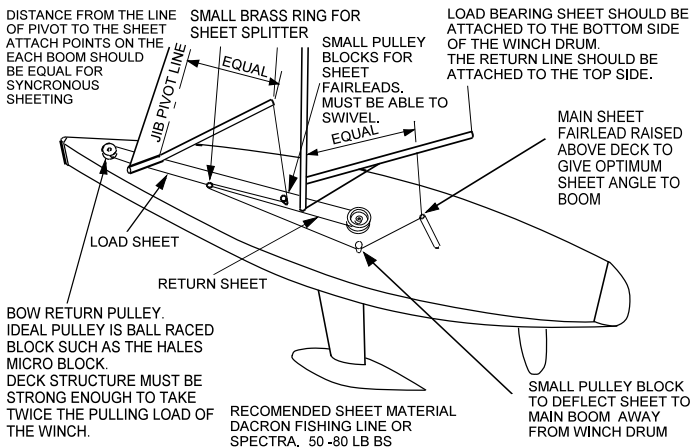


Fig. 5 Sheeting

11. Setup

11.1 Introduction

The *SmartWinch* has several adjustable features. Adjustments are made by placing the winch in setup mode. Setup is entered by connecting the **Setup Lead** to a spare signal pin in the Rx. The **Setup Lead** is the single wire with a small connector.

Figure 6 (below) shows a typical multi channel Rx. If using a two channel Rx the rudder servo lead will need to be removed to access a signal pin. The **Setup Lead** is shown connected to a signal pin. For normal operation, leave the Setup Lead connected to any spare center pin (positive). Allowing the lead to dangle free in the bilge is a recipe for corrosion and setup lead failure.

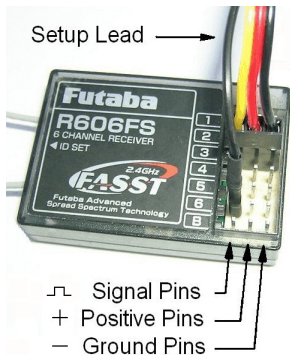


Fig 6 Setup Lead

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 (red wire).

Signal pins are the inside row (white or yellow)

The inside row pin of the Rx battery connector is *not* a signal pin and can not be used for Setup.

If the Setup Lead is connected to a signal or ground pin when the winch is turned on, there will be a rapid repeated beep. Reposition it to a center pin for normal operation.

Setup 1 sets Tx end point limits and sets travel. The default end points are 900 to 2100 micro seconds and travel is maximum.

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 not essential to operate the *SmartWinch*. Travel can be set using a Tx EPA if available. However this is a powerful servo which can do damage if overrun occurs. Setup 1 is a simple and safe way to adjust travel.

Setup does not correct faults. If the winch has a problem Setup will not solve it. Settings can be overwritten thousands of times so you can experiment with different settings as much as you like.

Setup 1 Tips

If 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.

Set the booms closer in to center line than normal when setting up at step 4 (but not so tight that the winch 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.

Setup 2 Tips

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*.

Batteries **must** be fully charged to turn Battery Monitoring On.

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 RMP 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.

- 1 Remove drum if first time for Setup 1 or after reset done in Setup 2. Turn radio and winch on and check that the winch is responding to the Tx.
- 2 Place Tx stick at **full in** position and adjust trim all the way in the same direction as the stick.
- 3 Connect Setup Lead to Rx signal pin and wait for a sound signal then **immediately** move the stick to full out.

About 3 seconds after connection there will be a ring tone like sound signal. About 3 seconds after moving the stick to full out another ring tone will indicate that the Tx end points have been saved. The winch can not move at this time.

- 4 Move Tx stick back to **full in** and wait for a third long beep.

After the 3rd ring tone the winch can be driven by the Tx stick.

- 5 Fit drum and manually adjust the lines to set the main boom at full in. Ensure Tx stick remains at close hauled for this step.
- 6 Using the Tx stick, drive the winch out until the booms are at the desired full out position.

The winch will run at a lower speed at this time. Take care not to go too far out as travel is set to maximum at this time.

- 7 With the winch still at the new **full out** position, remove Setup Lead from Rx.

The SmartWinch will automatically restart with the new settings.

This completes Setup 1. If no more adjustment is required then push the Setup Lead onto a spare centre pin for storage during normal winch use.

- 1 Turn radio and winch on and make sure the winch is responding to the Tx stick.
- 2 Place Tx stick at desired position. (*see **Tx Stick Position** on page 10*)
- 3 Push the Setup Lead onto a spare RX signal pin.

About 3 seconds after connection a ring tone like signal will sound. Starting 4 seconds later there will be one beep per second upto 10 beeps.

- 4 Remove the Setup Lead immediately the required number of beeps has sounded. See table 3 below.

If you accidentally pulled the lead out at the wrong number of beeps then just turn the SmartWinch off now and the previous setting will not change.

- 5 Hold the Setup Lead onto a signal pin until the startup signal then remove the Setup Lead from the Rx. There is no need to push it completely onto the pin for this step. Just hold in place.

*The startup signal indicates that the SmartWinch has restarted with the new setting. **This completes Setup 2.** If no more Setup is required then push the Setup Lead onto a spare centre pin for storage during normal winch use.*

Setup 2 Beeps Count

Table 3

<u>Beeps</u>	<u>Setting</u>	see page 3 for description of these features.
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	Ramp Rate (RMP)	
10	Reset ALL settings to default. Drum must be removed first.	

12. Maintenance

- For the motor, a regular drop or two of light machine oil to the shaft bushings or a spray with water repellent lubricating sprays will keep the motor going for years. If spray is used, apply directly *into* the motor. Avoid getting spray on electrical wires or feedback potentiometer and controller enclosure grommet. **Note: These sprays may contain flammable propellants. Allow some time 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 and spigot.
- Drain the boat of water as often as 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.

13. Mechanical Specifications

Table 4

Specification	280EF	280ES (EL)	380ES (EH)	Unit
Max Power	10.7	8.6	14.3	Watts
No Load Speed	6.1	4.1(2.9)	3.5	revs/sec
No Load Speed	0.48	0.79 (0.99)	0.96	sec/300mm
Stall Torque	12.2	15.4 (19.3)	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 5

Specification	280EF	280ES/EL	380ES/EH	Unit
Idle (Stationary) Current	23	23	23	mAmps
No Load Running Current	550	450	650	mAmps
Stall Current	12	7	18	Amps
Maximum Supply voltage	9	9	9	Volts
Minimum Supply voltage	3.8	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.