

**RMG SAILWINCH**



***SmartWinch***

**U S E R   G U I D E**

## Contents

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1. Introduction . . . . .	1
2. Summary of Features . . . . .	1
3. Special <i>SmartWinch</i> Features . . . . .	1
4. Batteries . . . . .	3
5. Wiring . . . . .	4
6. Standard Connections . . . . .	5
7. Alternate Connections . . . . .	5
8. Mounting . . . . .	6
9. Sheeting . . . . .	7
10. Setting Up . . . . .	8
11. Setting TX End Points, Travel and Battery Monitoring . . . . .	9
12. Adjusting Deceleration, Scaled Linear Travel, Speed & Dead Band . . . . .	10
13. Maintenance . . . . .	12
14. Warranty . . . . .	12
15. Mechanical Specifications . . . . .	13
16. Electrical Specifications . . . . .	13

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## 1. Introduction

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Thank-you for purchasing a *SmartWinch*. We hope you have many years of trouble free and successful sailing using our product. If there are any problems to be solved or queries to be answered please do not hesitate to call. Please take the time to read this booklet through. There are a few do's and don'ts, some very important points and some helpful hints.

## 2. Summary of Features

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- 3.8 to 9 volt operating range
- Optional battery monitoring and low battery shutdown
- Integral 5 volt regulator for single battery operation
- Travel adjustable from 1 to 6 revolutions depending on model
- Automatic shutdown when stalled
- *Dynamic* Pulse Width Modulation drive
- Programmable for TX end point limits for overrun protection
- Adjustable deceleration rate
- Adjustable Speed
- Adjustable Scaled Linear Travel.
- Adjustable Input Dead Bnad
- Ball bearing output.

## 3. Special *SmartWinch* Features

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### ***Dynamic* Pulse Width Modulation**

Servo systems use Pulse Width Modulation to reduce power and speed as the desired position is approached. This gives finer and smoother control when small movements are required. But the problem with standard P.W.M. is that as the desired position is approached, the reduction in power can cause the servo to stop short. This can result in excess power consumption, overheating and damage. This is what's happening when a servo is not moving but is buzzing. However, unlike other winches and servos the *SmartWinch* has dynamic P.W.M. If the *SmartWinch* controller detects that it has not reached the desired position, it will increase power up to 100% if necessary until it does. If once 100% power is reached and the *SmartWinch* is still not able to reach its desired position then the stall protection feature can be activated.

## **Stall Protection**

When a conventional winch becomes stalled, it will stay stalled until the problem is solved or the battery is flattened or the electronics damaged etc. But the *SmartWinch* knows when it is stalled and can protect itself by shutting down. The winch then signals that it is stalled by sounding a two-tone beep at 2 second intervals until reset. To reset the winch simply move the tx stick in the opposite direction or turn the TX or winch off and on again.

## **Battery Monitoring**

If desired, the winch can monitor NiCad or NimH packs of 5 or 6 cells or 6 volt sealed lead acid gel cells. 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 half way and hold there until the battery is replaced or voltage recovers.

## **Adjustable Deceleration Rate**

The time taken to decelerate from full speed to stopped can be adjusted. At minimum, deceleration takes around 1 second. Maximum is around 0.1 seconds. Depending on supply voltage used, the *SmartWinch* may over shoot and hunt so experimentation is advised. The default setting is 70% of maximum.

## **Scaled Linear Travel Response**

Travel response to the first 25% of TX stick movement out from close hauled is adjustable from 1:1 at minimum to a maximum of 4:1. The default setting is 1:1. 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 travel adjustment in some transmitters. However scaled linear has the advantage of consistent incremental travel over the first 25% of stick movement whereas exponential is constantly varying.

## **Variable Speed**

This feature is included for some non sailwinch applications where a certain speed is important. Also some skippers may prefer a slower sailwinch response to suit their particular sailing style. The default setting is maximum speed.

## **Input Dead band**

Input dead band is the amount dithering in the RX signal that a servo can tolerate without responding to by constantly jittering. This is now adjustable from 2 to 15 microseconds. Dead Band adjustment allows the optimisation of TX fine trim control. The default setting is 10 microseconds.

Table 1

Level	Detect	Warn	Shutdown
1. 6V gel cell	< 6.5	< 5.1	< 5.0
2. 5 cells	> 6.5	< 5.5	< 5.0
3. 6 cells	> 7.5	< 6.6	< 6.0

### Battery Monitoring Voltages

## 4. Batteries

### Voltage Range

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 > 12 volts is used. While the winch will operate down to 3.8 volts, the minimum should be a 4 pack of NiCad or NimH. This will give room for voltage drop as the battery pack discharges.

### Pack Size

The recommended battery pack is 5 or 6 NiCad or NimH cells or a 2 cell LiPo. Alternatively a 6V sealed lead acid gel battery may be used. These days with higher cell energy densities, AA size NiCad or NimH cells can have capacities of up to about 2500 mAh. With these high capacities it is also feasible to use AAA size cells with a significant weight saving.

### 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. 4, 5 or 6 cell packs should be fully soldered.

### Battery Life

Battery life depends on many variables. But as a rough guide, provided you have a good low friction sheeting system, you could expect to get about 12 to 16 races of about 10 to 15 minutes duration in conditions of around 8 to 10 knots from a 5 pack of 1000mAh AA's.

## 5. Wiring

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### 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 rudder servo. This allows for the use of only one battery pack inside the yacht. The motor runs on the full battery voltage via the MOSFET output circuit.

### Supply Leads

Wiring and connectors from winch supply leads to battery pack must be at least 0.5mm<sup>2</sup> 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 will cause severe voltage drop between battery and winch and should not be used. All joints should be soldered and then coated with Vaseline petroleum jelly to protect from corrosion (black wire). Use Vaseline on servo connectors also.

### 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 output circuit could be ***seriously*** damaged.

### Servo Connector (RX Lead)

The connector supplied is compatible with JR, Futaba, Hitec etc. Take care when inserting connector into receivers other than JR or Hitec. 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)

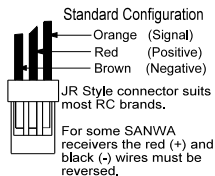


Fig. 1 Servo Connector

## 6. Standard Connections

In most cases the best circuit for winch, radio and battery is also the simplest as shown in figure 3.

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

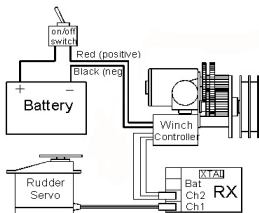


Fig. 3 Standard Connections

## 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 4. This is because the winch regulator and or servo lead may not be able to supply the current needed by extra servos causing a voltage drop.

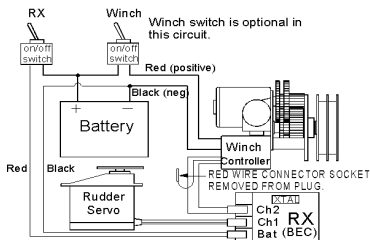


Fig. 4 Alternate Connections

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.

Winch switch can be omitted in this case as the winch will not operate when rx is turned off. RX must be able to take full battery voltage.

## 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 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. Before fitting the drum give the area around the 'V' ring seal an extra coat of Vaseline.

### 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 at left to assist in below deck installation.

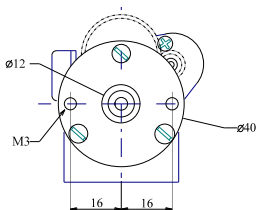


Fig. 5 Mounting Dims.

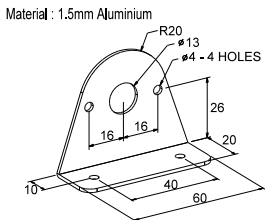


Fig. 6 Mount Bracket



## 9. Sheeting

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### Drum Size vs Performance

Unless specified otherwise when ordering, the 280D and 280DL are supplied with a 26mm drum. The 380D and 380HD are supplied with a 32mm drum. If faster or slower performance is desired an extra drum may be purchased. Write or phone for pricing. Our web site has details of several other drum options.

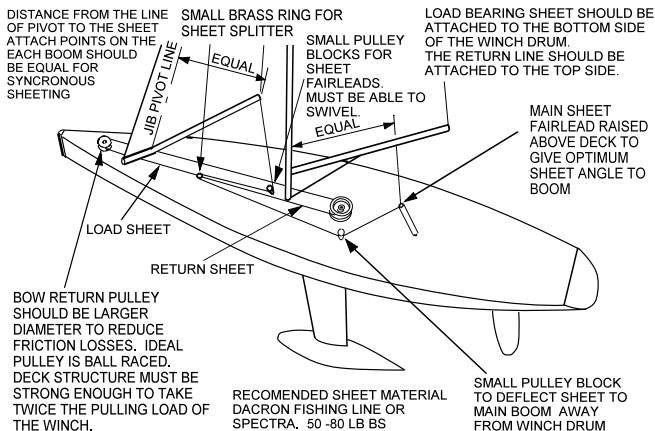
The size of drum affects the way the winch performs. Smaller diameter means more revolutions are required therefore sheet speed is slower. However with smaller diameter a higher sheeting force is achieved. And vice versa if larger diameter is used. Similar changes in sheeting performance can be achieved 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. It's 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 7 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.



## 10. Setting Up

Fig. 7 Sheeting

It is not essential to perform the setup procedure to use the winch. Each winch has “factory default” settings. However, setting TX end points and Travel is recommended to give the overrun protection.

Setup can be performed as many times as desired. Each time setup is performed, the previous settings are overwritten.

### Normal Operation

To use the winch, the TX **must** be switched on before the *SmartWinch*. If the TX is switched on after the *SmartWinch*, the *SmartWinch* will not operate other than to allow entry to setup mode. Setup mode is not entered unless a long beep is heard. The earliest this can happen is 10 seconds after turning the winch on. If setup mode is accidentally entered, just turn the *SmartWinch* off then restart with the TX on.

## **11. Setting TX End Points, Travel and Battery Monitoring**

These settings must be done in sequence. For example, to make an adjustment to travel, the TX end points must be set at the same time.

1. Start with; Winch **off**, TX **on**, RX lead plug **out** of RX, TX stick at close hauled and trim set to minimum.

*When the winch is switched on with the plug out of RX, it will countdown by sounding a single beep once per second for the first 9 seconds.*

2. Turn winch on and wait 10 seconds till the **3 quick beep** signal then push plug into the RX within 2 seconds.

*If a single long beep is heard, setup mode has been entered and the TX end point for close hauled position has been sampled. If not then restart the procedure..*

3. Pull plug out of RX.

4. Move TX stick (**not** trimmer) to opposite end for sails full out then push plug into RX.

*A long beep will indicate that the TX end point for sails full out position has been sampled.*

5. Pull plug out of RX

*A 3 beep signal indicates that the TX end points have been stored. The winch can be turned off now if travel or battery setting changes not needed. Otherwise continue on to step 6.*

6. Detach the sheet lines or remove the drum.

*When the plug is next inserted, the winch will drive itself to the travel starting point. The winch must be free to drive to this position. If not sure then remove the drum or disconnect the sheets.*

7. Move TX stick back to close hauled then push plug in RX.

*Once travel starting point is reached, it will sound 2 beeps. You can now drive the winch using the TX. Install the drum and setup the sheets so that the main boom is at close hauled when TX stick is at close hauled. Take care when driving the winch with sheets attached as it is set for maximum travel at this time and it would be easy to overrun. The winch will drive at 1/3rd normal speed during this travel setting phase of setup.*

8. Drive winch out (using TX stick) till the main boom is at the desired fully sheeted out position. With the winch in this position, pause for at least one second without moving the winch, then remove RX plug.

*Three beeps indicates that the new travel setting is stored. If you do not wish to make any changes to your battery monitoring settings, switch winch off now and setup is complete.*

*Or if you wish to change the existing battery monitoring settings then perform either step 9a or 9b.*

- 9a To enable battery monitoring, push plug into RX and wait till you hear either 1, 2 or 3 quick beeps. **Battery must be fully charged** for correct detection of number of cells.

- 9b To disable battery monitoring, push plug into RX and immediately pull it out again (within about 1 second).

*If three rising tones have sounded, 9b was performed and battery monitoring is now off. If 1, 2 or 3 quick beeps were heard then step 9a was performed and battery monitoring is turned on. The number of beeps corresponds to the battery monitoring level set. See table 1.*

Once setup is complete, the winch must be switched off.

## **12. Adjusting Dec Rate, Scaled Linear Travel, Speed & Dead Band**

For a description of these features, see page 2. Each of these settings has a separate entry point and can be adjusted independently. For optimum setting of these features it is important to already have the *SmartWinch* set for TX end points. However setting end points does not need to be done each time one of these adjustments is made.

For each setting, start with; *SmartWinch* turned **off**, TX turned **on**, TX trim set to **minimum**, RX lead plug **out** of RX and TX stick in desired position. For each adjustment, select close hauled for minimum, full out for maximum or an intermediate position as desired. Note that the *SmartWinch* will not drive while making these adjustments. There is no need to remove drum or sheets.

## **Deceleration Rate Adjustment**

- 1 Turn Winch on and wait **14 seconds** till the **3 rising tones** signal then push plug into RX within 2 seconds.

*If a single long beep is heard, the adjustment has been noted. If not then the plug was not inserted in time so turn winch off and start again.*

- 2 Pull plug out of RX.

*A 3 quick beeps signal will indicate the new setting has been saved. Turn winch off.*

## **Scaled Linear Travel Adjustment**

- 1 Turn Winch on and wait **17 seconds** till the **2 quick beeps** signal then push plug into RX within 2 seconds.

*If a single long beep is heard, the adjustment has been noted. If not then the plug was not inserted in time so turn winch off and start again.*

- 2 Pull plug out of RX

*A 3 quick beeps signal will indicate the new setting has been saved. Turn winch off.*

## **Speed Adjustment**

- 1 Turn Winch on and wait **20 seconds** till the **3 quick beeps** signal then push plug into RX within 2 seconds.

*If a single long beep is heard, the adjustment has been noted. If not then the plug was not inserted in time so turn winch off and start again.*

- 2 Pull plug out of RX

*A 3 quick beeps signal will indicate the new setting has been saved. Turn winch off.*

## **Input Signal Dead Band Adjustment**

- 1 Turn Winch on and wait **23 seconds** till the **4 quick beeps** signal then push plug into RX within 2 seconds.

*If a single long beep is heard, the adjustment has been noted. If not then the plug was not inserted in time so turn winch off and start again.*

- 2 Pull plug out of RX.

*A 3 quick beeps signal will indicate the new setting has been saved. Turn winch off.*

## 13. Maintenance

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- Spray the winch motor only with water repellent lubricating sprays. Apply the spray 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.
- Try to keep gears clean. Greasing is not necessary. Grease will only attract grit which can damage the gears and will make the winch very noisy.

## 14. Warranty

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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.

## 15. Mechanical Specifications

Table 2

Specification	280D (DL)	380D (HD)	Unit
Max Power	10.7	14.3	Watts
No Load Speed	4.4(3.1)	3.5	revs/sec
No Load Speed	359 (286)	312	mm/sec
Stall Torque	15.9 (19.9)	29.9	kg.cm
Standard Drum	26	32	mm
Maximum Turns	4.8 (6)	6 (9.6)	revs
Travel Range	70-405 (85-490)	80-610 (130 - 975)	mm
Dimensions	74x54x59	79x54x60	mm
Weight	134	168 (175)	gm

## 16. Electrical Specifications

Table 3

Specification	280D (DL)	380D (HD)	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. Performance specifications may vary depending on supply battery voltage and capacity and drum size etc.