Western Reserve Model Yacht Club rev 11/15

Getting Started in Model Yachting (terms in *italics* defined in appendix)

A model sailboat is powered by sails, using the action of wind on and over the sails, affected by the hull shape, keel shape, and rudder. Most model sailboats have no motor (other than servos - motors that control sails, rudder, and other functions) - they sail by wind only. A motor "in case the wind stops??" Bah!! Even if there is absolutely flat, glassy water, there is almost always enough wind to get the boat back to shore!!

The skipper of an RC boat controls the boat using a ***transmitter*** **("TX")** built to send pulses to a ***receiver*** **("RX")** in the boat. These pulses are converted into movement by servos mounted in the boat that actually move the rudder and sails. One joystick on the TX generally controls the boat's rudder the other controls the boat's sails.

Classes: the term "Class" refers to a design or group of boats that can race together, boat-for-boat without handicapping and that meet a set of Class Rules. Further, classes may be a "one design"- meaning the boats or "Developmental" Class. **One-designs** are all built identically, or nearly identically, and since characteristics are set by the Class Rules, innovations are limited. There are also **"developmental classes**" where few factors that are controlled, and the builder is free to make changes and experiment. Since updates are common in **development classes,** the boats are generally much more expensive to buy and to remain competitive in the class.

Racing is done in clubs (there are some 300 in the USA and Canada), and there is racing at the club level, plus National and in some Classes World Championships. In North America, the **American Model Yacht Association** (AMYA- www.theamya.org) and the **Canadian Radio Yachting Association** (CYRA- http://crya.ca/) control the Rules and manage many of the classes. There are similar organizations in other countries, all over the World.

Popular AMYA One-Design classes
Sorted by approx. length in inches

Micro-Magic	21"
Dragon Force 65	26"
Victoria	31"
V-32 (Victor Model Products)	32"
Nirvana	32.5"
CR-914	36"
One-Design One Meter (ODOM)	39"
Soling 1 Meter (Victor Model Products)	39"
Seawind	39"
RC Laser	42"
Star 45	45"
US 12	46"
Soling 50 (Soling "M")	50"
EC-12 (East Coast 12)	58"
"J" Boat	85-95"

The most popular one-design is the Soling 1 Meter with over 10,000 boats existing in North America.

AMYA Developmental classes
Sorted by length

Footy	12"long
RG-65	26"
36-600	36"
US One Meter	39"
International One Meter	39"
Marblehead "M" (50-800)	50"
10-Rater	60-65"
AC	75"

The most popular developmental classes are the International 1 Meter and the Marblehead ("M" Class), each with about 300 boats in North America.

Radio Equipment

The "***radio***" is a term that usually applies to the **Transmitter ("TX"), and the Receiver ("RX")** used to control an RC boat. Transmitter/ receiver pairs are bought together as a system- and the receiver and transmitter generally are not interchangeable between brands. The **TX** transmits signals on the ultra-high frequency 2.4 gHz band. Channels (AM or FM) are not used much anymore, because the 2.4 gHz band equipment operates without interference among boats. No license is required to operate this equipment.

Model boats use aircraft radios. Car model radios (using a trigger and rotating wheel) are not a good choice.

Spektrum DX6-i TX

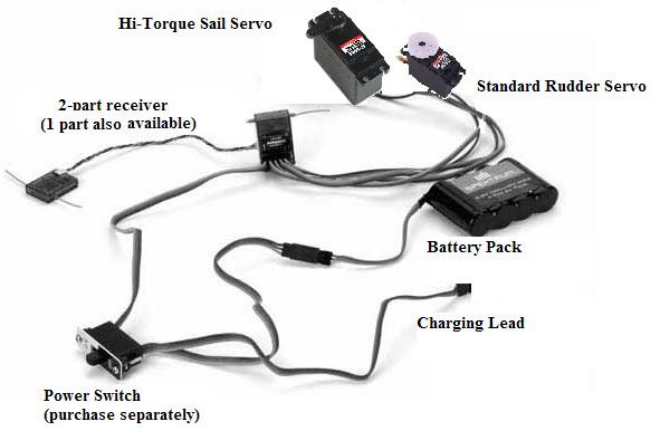
popular radio system

2.4 gHz - which is also called "spread spectrum"-operates on ultra-high frequencies, and the RX/TX actually seeks and selects a channel from among many.

This vastly improved (over AM and FM) spread spectrum technology allows for hundreds of R/C planes, boats etc. to operate at one time without interference, as well as for faster connections between radio transmitter and receiver.

Basically- a simple 2.4 Ghz radio is fine. You will need (for most boats) only a 2-channel system, but most basic ones are 4 or 5 channel systems at least. There are also variations that are programmable so you can use the same TX for multiple models. plus adjust the sensitivity, servo travel and many other features.

Receiver system- in the boat: Below is a picture of a system as installed in the boat.



Prices for radio equipment are generally comparable online and at local hobby shops, considering freight (online) and the sales tax (locally). Do not assume that radios bought online are necessarily lower-priced. And, the local hobby shop will assist you in placing and setting your electronics up- online sellers will not. I personally will always buy locally if at all possible. **However**: talk with an expert on RC sailboats. Your hobby shop knows a lot about planes and RC cars; but they probably know little about RC sailing. They

might recommend equipment that is far more sophisticated than you need. Call someone in the local club, contact someone online. Or call us: **440- 259- 8037.**

Tactic and Spektrum are generally the low-price leaders; **Futaba, JR and Airtronics** are higher-priced product lines. Warranties are comparable among all brands- generally one year. I personally favor Spektrum; I have had several service contacts with Horizon (distributor w/ service for the Spektrum brand), and cannot say enough about how they took care of me as the customer. **We recommend** buying a radio from your local hobby shop (LHS). Further, we recommend buying **a radio brand that is like the ones used by other sailors in your club**. If you have questions, they can answer them. If you have a breakdown in your radio- likely another sailor can loan you one while you send yours in for repair, and you won't miss any sailing.

Basic radios: The **Tactic TTX410 and the Spektrum DXe**, are our two recommended choices for a "simple", reliable 2.4 Ghz radio. The Tactic TTX410 is about $ 80, and the Spektrum DXe is generally $ 90, both with a receiver. Both use 4 X AA batteries- either dry-cell AAs (like DuraCells), or rechargables. Both radios also have a port for a battery charger.

Also- buy a ***Mode 2*** **radio.** This is a radio with the "throttle" (sail control) on the left stick, and the rudder on the right. (Mode 1 radios are used mainly in Europe.)

"Better radios" You get extra features and adjustments plus more "model memory" in a more expensive radio, which means a single transmitter can run multiple boats. For example the Tactic TTX-410 and the Spektrum DX-e will each control one model, and you have to reset the radio to switch if you have 2 or more boats. If you are the type of hobbyist who goes "all in" with your fun, consider a radio with multiple-model memory; such as the **Spektrum DX-6i** with 10-model memory so you can sail several models on a single transmitter.

Range: a question new people ask is "How far can the boat be away, and still be under control?" The answer is- far enough away that you won't be able to see it- about 5/8 mile. The truth is that we generally sail close- the boats are fun to watch.

Power: The **RX AND servos** are both powered by a battery pack in the boat. This can be either 4.8 volt (4 "AA" cells), 6 volt (5 "AA" cells, or one of several other configurations).

Battery Capacity of batteries (expressed in *milliamp hours*- or "mAh")- this effectively dictates how long you will be able to sail without recharging or replacing the battery pack. More mAh (2300 vs. 1400 Mah for example) means longer sailing time. **Buy pack of at least 1000 Mah**, which should give you 3 hours of sailing. And, have a backup battery pack.

Transmitter batteries: Using dry-cell batteries is a good choice for the transmitter - a set of 4 will last at least 2-3 months for average sailor, and is far easier than trying to monitor the charge and recharge each use. It is pretty easy to carry a set of 4 fresh AA dry-cells in your tool bag. But, if you are an environmentalist, then rechargables work well in the transmitter, too.

Boat batteries: Dry-cells are not a good choice for the **boat** and will produce lower oomph from the servos AND less radio range as they run down. So use a 6 volt rechargable battery pack, of 1000+ mAh capacity and a simple wall charger, then buy a more sophisticated charger as you are able. A wall charger is about $ 12.

Comparing models of recommended 2.4 Ghz radio systems (these prices w/ receiver included)

	Tactic	**Spektrum**	**Spektrum**	**Futaba**	**Spektrum**
Feature	**TTX410 $80**	**DX-5e $100**	**DXe $89**	**4YF $99**	**DX-6i $199**
TX Channels	4	6	6	3	6
Programmable?	No	No	using computer/ phone	No	Field programmable
Voltage meter	LED Lights	LED Lights	LED Lights	LED Lights	Screen readout
Model memory	1	1	1	1	10
Exponentials*	Fixed	Fixed	Adjustable	Fixed	Adjustable
Strengths (IMHO)	Easy binding; internal antenna; incl. a neck strap and slide switch	Service Most sailors seem to use Spektrum	Service; antenna design improved over DX-5e	#1 brand in World	Service; antenna design not as robust as some; but very popular radio
Weakness (IMHO)	Service availability	Antenna is fragile		Receiver works ONLY w/ 4YF TX**	Cost vs. DXe; fragile antenna

*exponentials: computer radios allow you to set variable degrees of sensitivity on 2 settings by flipping a toggle. This is useful for the rudder- a lower setting means you are not over steering the boat, slowing it down.
** The Futaba 4Yf has a receiver that only works w/ a 4YF- you cannot "upgrade" to a different Futaba radio transmitter unless you buy a new receiver, then the original is unusable.

Sailing time: The results below are "typical":

Average

Battery mAh Capacity	Servo Draw: 300 mAh (150 in/oz. sail winch) Light Wind	400 mAh (200 in./oz. sail winch) Light wind	600 mAH (200 in./oz. sail winch) Heavy air	500 mAh Digital servos (300 in/ oz. sail winch)
1000	3.0 hr.	2.5 hr.	1.6 hr.	2.0 hr.
1500	5.0 hr.	3.7 hr.	2.5 hr.	3.0 hr.
2000	6.0 hr.	5.0 hr.	3.3 hr.	4.0 hr.
2500	8.0 hr.	6.0 hr.	4.0 hr.	5.0 hr.

Servos:
Two servos are plugged into ports on the RX. Most plug the **sail servo into "Throttle"** and the **rudder servo into the "Aileron"** for a Mode 2 radio. Skippers can pick servos independently of their choice of radio. **Digital servos** are ½ the weight for a given torque range and also much more costly than analog servos. Otherwise, the two servo types are interchangeable.

Servo selection is driven by several criteria:

Sail Winch Torque: A sail control requires a surprising amount of torque to trim in the sails when it is windy- about 200 in./oz. Another variable is the **voltage** provided by the battery- 6 volts provides a lot more torque than does 4.8 volts.

The **HiTec HS-755/ 765** (about $30) series are very popular, reliable sail servos. The HS-765HB is a variation that has more turn (140 vs. 90 degrees), and includes a single-arm sail arm, meaning you don't have to build a sail arm. $35 or so.

The most popular analog rudder servo is the **HiTec HS- 311** (or HS-322), both are less than $12.

Servo Cost: from $ 5 to well over $200. **Buy a major brand servo** (HiTec or Futaba), AND buy what the local sailors use; in the event of a servo failure, chances are someone will have a replacement in their box they will sell you, and after 3 – 5 minutes and with no modification to your boat- you are back to sailing.

Summary- general advice:

1. Buy a boat in a class that is raced locally.
2. Likewise, buy the brand of radio and servos used by the local sailors.
3. Consider buying TWO boats- a used one (you can start sailing immediately!), and a kit. It also helps to have a finished boat to refer to as you build the kit. Once you build your boat, you will know it backwards and forwards. Then sell the used boat to another beginner. And, don't buy a kit assuming you will get it done in a hurry and sail- it takes a LOT longer than you think to build a kit. If you wait until April to buy a kit- you might not get it in the water that sailing season!!!
4. Go online- most AMYA Classes have extensive information on building and sailing the boats available on Class websites and Yahoo interest groups.

Appendix: definitions

ghz- gigahertz- Measure of wavelength of a radio signal. 2.4 gHz is the wavelength used by cell phones, and is almost universal for model sailboats.

Keel – appendage projecting from the bottom of a sailboat- the keel serves two purposes- to prevent side slippage of a sailboat under the influence of the wind, and through its weight, to keep the sailboat upright under the influence of the wind.

Milliamp hours (mAh)- measure of the capacity of a battery pack- a 1000 mAh pack will run a device that draws 1 ampere of electricity for one hour; it will run a device that draws ½ amp for two hours, etc.

mHz - megahertz- Measure of wavelength of a conventional radio signal. 72 megahertz is one channel used in model aircraft FM band. AM and FM bands are almost never used since 2.5 gHz is available.

Mode 2 – a radio that has its throttle stick (usually controlling the sail servo) on the left side, aileron (usually rudder control) on the right side.

Receiver (RX)- accepts signals from the transmitter and sends them as pulses to the rudder and sail servos.

RC or R/C: abbreviation for radio control.

Sail winch: the servo that controls the sheets, operating the sails.

Servos: motors operated through pulse signals from a receiver, to move a control.

Transmitter/ TX: accepts commands from the operator, then translates the signals, sending them as pulses through the Receiver, to the rudder and sail control.