



Marine Engineering and Electronics

A Basic Yacht installation

Notes:

This document is designed to give the reader an idea of what he or she could be expecting in options for a basic installation of electronics on a Yacht.

The prices quoted are RRP as found on the internet, and in no way constitute an agreement to supply the items at the quoted price. These prices are a guide only. The prices available may go up or down during the lifetime of this document.

Where installation prices are quoted these are estimates, and will vary from boat to boat.

Network Diagrams are again not final solutions, and are guides only.

A Basic Yacht Installation

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Introduction

There is a lot of flashy electronics out there to tempt us, but do we need all of it. Price will be a factor in what we eventually install on our boat, but there are some basics we should have. The following document is to outline the basics and the costs between a budget installation, middle of the range and top end. Based on a typical 25 to 35 ft yacht.

The basics we need are.

1. Depth
2. Water speed
3. Wind speed and direction
4. GPS position (chartplotter)
5. VHF Radio

It would be a good idea is all the electronics talk and share their information, in the case of the VHF and the GPS (Chartplotter) this is essential for the DSC functionality.

A budget Installation

Instruments

NASA Marine offer a budget range of instruments, so this will form the base of our installation.

NASA Wind, Speed and Depth



Instruments	Price RRP
Clipper Depth	£155.00
Clipper Speed	£155.00
Clipper Wind	£220.00
Total	£530.00

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Each Instrument comes with transducers, and cables. The Speed and Wind do have and NMEA output so they can talk to another device. They are not networked, so a NMEA multiplexer may be needed to combine the Wind and Speed information together, so it can be passed on.

NASA do do a combined Speed and Depth instrument, there is some cost saving on the instrument head. But there is no NMEA output.



Instruments	Price RRP
Clipper Speed/Depth	£208.00
Clipper Wind	£220.00
Total	£428.00

VHF

Now there are budget VHF Radios on the market, but as this is a safety piece of equipment, we should be spending a little more on this than a budget radio. Icom have a good name in radios so we will consider the Icom range.

Icom M323



GPS (Chartplotter)

Now there are a lot to choose from when it comes to chartplotters, the screen size is the factor when it comes to price, as you would expect the larger the display the larger the price. The smallest

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screen size is in the 5" range, at this size it will do the job, however to start getting the benefit of the chart detail a 7" is a better option. In this budget installation we will consider a 5" as our option. Garmin has a good name so we will choose from the Garmin range.

Garmin 557

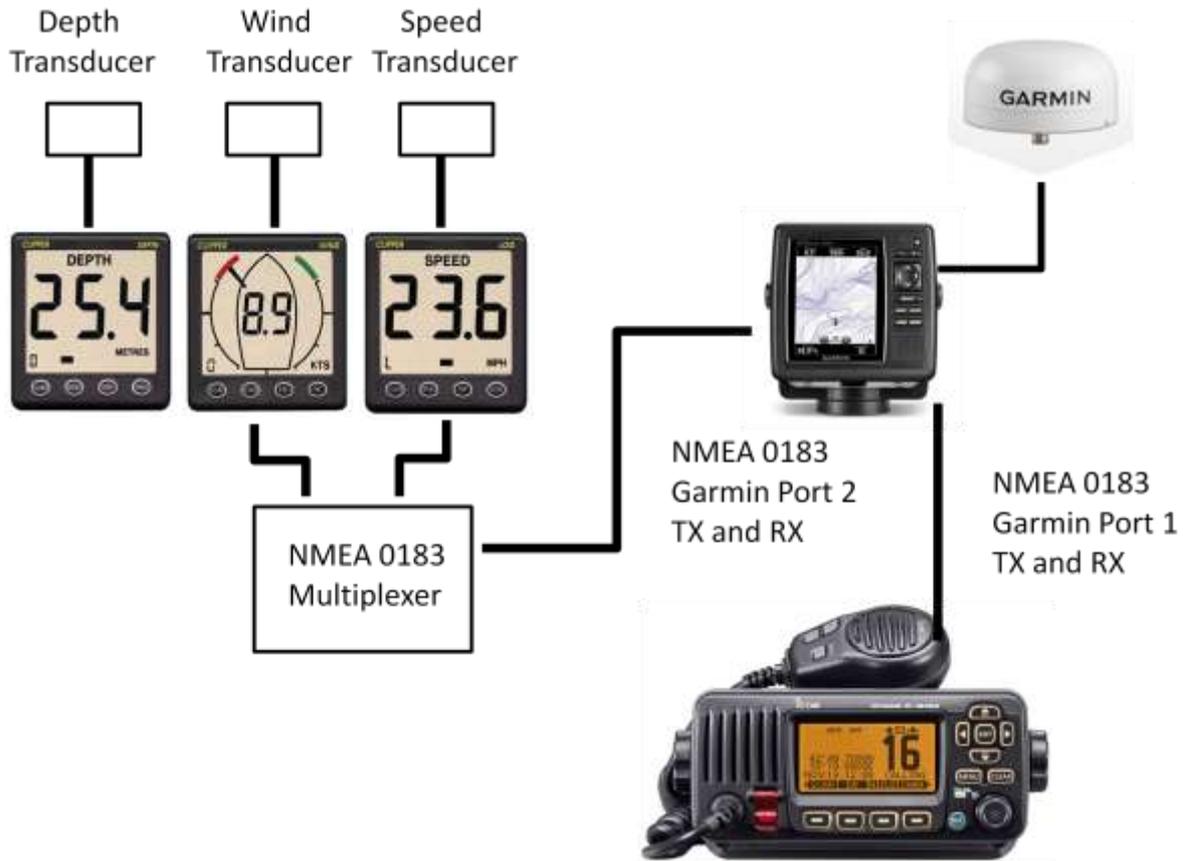


The Garmin 557 comes with an internal GPS antenna, so if the installation of the plotter is at the binical, this antenna may suffice. If there is a risk that the plotter may not get a clear view of the sky, then it is essential to have an external GPS antenna, mounted in a position where it will have a good view of the sky. Don't forget, it may work fine on a nice day in the marina, but out at sea on a wet and windy day when you need the plotter the GPS signal may not be good enough for the internal antenna.

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Network Diagram

Now we need to put it all together, and work out the price, not just for the electronics but anything needed to interconnect them.



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Installation Costs

For the cost of this set up we have the following guide.

Electronics	Price RRP
Clipper Depth	£155.00
Clipper Speed	£155.00
Clipper Wind	£220.00
VHF ICOM M323	£180.00
Garmin 557 GPS Plotter	£600.00
External GPS antenna	£52.00
Actisense NMEA Multiplexer	£180.00
Total Equipment Price	£1,542.00
Guide price for installation (based on 3 days, and mast down)	£330.00
Misc Cable etc	£50.00
Cable Glands	£35.00
Total	£1,957.00

Middle of the Range Installation

We are not going to change the items, but look at using higher priced items, and a 7" plotter. With a higher price comes better build quality, more functionality, and warranty periods/after sales support.

Instruments

For our instrument we will look at using the Raymarine i40 range for Speed, Depth, and Wind.

Raymarine I40 Depth, Speed, and Wind



There is one drawback with the 140 displays, they are not the standard size, and should you be replacing old instruments, there will have to be some making good on the holes left by the old instruments. This can be easily done by producing a panel which will mount the I40's and cover the old holes. The panel can be made from hard wood, or from acrylic sheet. If the old instruments are above the companionway, it may be time for a new panel anyhow.

Electronics	Price RRP
Raymarine i40 Depth	£245.00
Raymarine i40 Speed	£235.00
Raymarine i40 Wind	£370.00
Total	£850.00

The cost of making a new panel, will depend upon the material being used, but the labour cost would be in the region of 2 Hours (typically £70)

VHF

The VHF will remain the same, as we didn't go for a budget one in the previous example. Due to its important safety considerations.

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GPS Chartplotter

We are now going to go up to a 7" Chartplotter. Comparing a like for like between Raymarine, and Garmin there is not a lot in the price, but this is where the compatibility of Instruments talking to the plotter come into things. The I40 use an data bus known as "Seatalk" which is an old Raymarine only system. In both cases, and if we were considering another manufactures equipment, this Seatalk has to be converted to something else.

Manufacturer	Raymarine Seatalk
Raymarine	Seatalk NG
Garmin	NMEA 0183 or NMEA 2000 (N2K)

If we keep it all Raymarine so the badges all stay the same. We would be looking at an Raymarine E7. Keeping it all Raymarine would allow us to get a 3 year on board warranty, however to get this the equipment would have to be installed by a Raymarine authorised dealer, this could increase the installation costs.

Raymarine E7



Keeping it all Raymarine we would need to convert the Instruments Seatalk to Seatalk NG

Seatalk to Seatalk NG Converter.



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Network diagram



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Installation Costs

Electronics	Price RRP
Raymarine i40 Depth	£245.00
Raymarine i40 Speed	£235.00
Raymarine i40 Wind	£370.00
New panel Costs	£100.00
VHF ICOM M323	£180.00
Raymarine E7	£1,100.00
Raymarine Raystar 125 GPS antenna with Seataalk to Seataalk NG converter	£240.00
Total Equipment Price	£2,470.00
Guide price for instalation (based on 3 days, and mast down) No onboard warrenty	£330.00
Misc Cable etc	£50.00
Cable Glands	£35.00
Total	£2,885.00

Approx installation cost with on board warranty £1092.00, giving a total cost of £3647.00

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Top of the range

Now we will look at a top of the range installation, which will add a few extra s, as well as a higher end price product. We will include Radar, and AIS.

There is a significant price jump here with the instruments. Most manufactures are going away from dedicated Instrument heads controlling dedicated transducers. The display is just a display, with the transducer information connected on a data bus, which means you can configure a display to give you any data that is available on the bus. With chartplotter also being able to give you a display of the data on the bus, it could all be done with one display. The chartplotter.

If you forget how to get to the page that shows you the depth this could be a bit of a problem.....

Separate instrument heads for Wind, Speed, and Depth should be considered as a must to avoid user interface problems.

As we are now going to be looking at greater integration of our electronics we will need now to stick to one manufacturer. This way the now feature rich products will not lose any of their features across converters.

Warranty

Simrad and Raymarine offer onboard warranty, Raymarine it is 3 years from the date of commission, Simrad from the date of purchase. With date of purchase, it could take a month to get it installed, and if the boat is out of the water for the winter, you could lose 6 months of warranty with the equipment doing nothing. The down size of on board warranty is that it has to be installed by an approved dealer.

Garmin still offer a warranty, but no onboard warranty. The end user would have to remove the faulty item and return it to Garmin, and incur any investigation cost to identify the faulty item.

In the Middle of the range installation this cost to get onboard warranty was £762. this represents 1/4 of the full cost of equipment and installation without on board warranty. As the complexity of the installation increases the cost of the installation will increase. the decision is yours.

Instruments

We will look at a Garmin system, using their GMI 20 instrument display, and will assume that we will have a separate display for Wind, Speed, and Depth. These systems are now using NMEA 2000 or N2K as it is sometimes called. So the transducer connect to the bus rather than direct to the instrument. Buying the individual parts can be costly, and you need to make sure you get the right parts. Now these systems come in bundles which help in this matter.

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Garmin GMi 20 Display



We assume that we will have 3 displays. There will be some additional cost as the transducers will need to be connected on a NMEA 2000 Bus

Electronics	Price RRP
Garmin GMi 20 and Wind, Depth and Speed Transducer Bundle	£900.00
Garmin GMi 20 Display (Speed)	£395.00
Garmin GMi20 Display (Depth)	£395.00
Connectors	
NMEA 2000 T piece x 5	£85.00
NMEA 2000 Terminators x 2	£18.00
Cables approx	£50.00
Total	£1,843.00

VHF

This time we are going to look at a more than basic VHF. the reason for this is we are going to add into our installation and AIS capability. We are also going to look at the other option you can get with a VHF. Hailer option, Fog horn option, and second station options.

If we keep it Garmin we are going for the Garmin VHF 300i AIS, and a second station Garmin GHS 10i

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Garmin VHF300i with AIS



Equipment	Price RRP
Garmin VHF 300i AIS	£799.00
Garmin GHS 10i remote spk/mic	£130.00
Load hailer	£100.00
Total	£1,029.00

This does mean that our VHF cost is quite high for the extra features, so although we did say we would stay all Garmin we will look at bringing in a different brand of VHF to see if we can get the same features but at a lower cost. We may lose some functionality tho.

The Standard horizon GX2100e does offer the same functions as the Garmin VHF but at a largely different price.

Standard Horizon GX2100e



Equipment	Price RRP
Standard Horizon GX2100e	£270.00
CMP-30 / RAM3 Remote Station	
Microphone	£110.00
Load hailer	£100.00
Total	£480.00

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With a saving of £549 the standard Horizon may become an option. The advantage with the Garmin is it is known as a Black box VHF, so you only see the microphone, so you are not cluttering up the chart table area with a large VHF head unit.

GPS Chartplotter

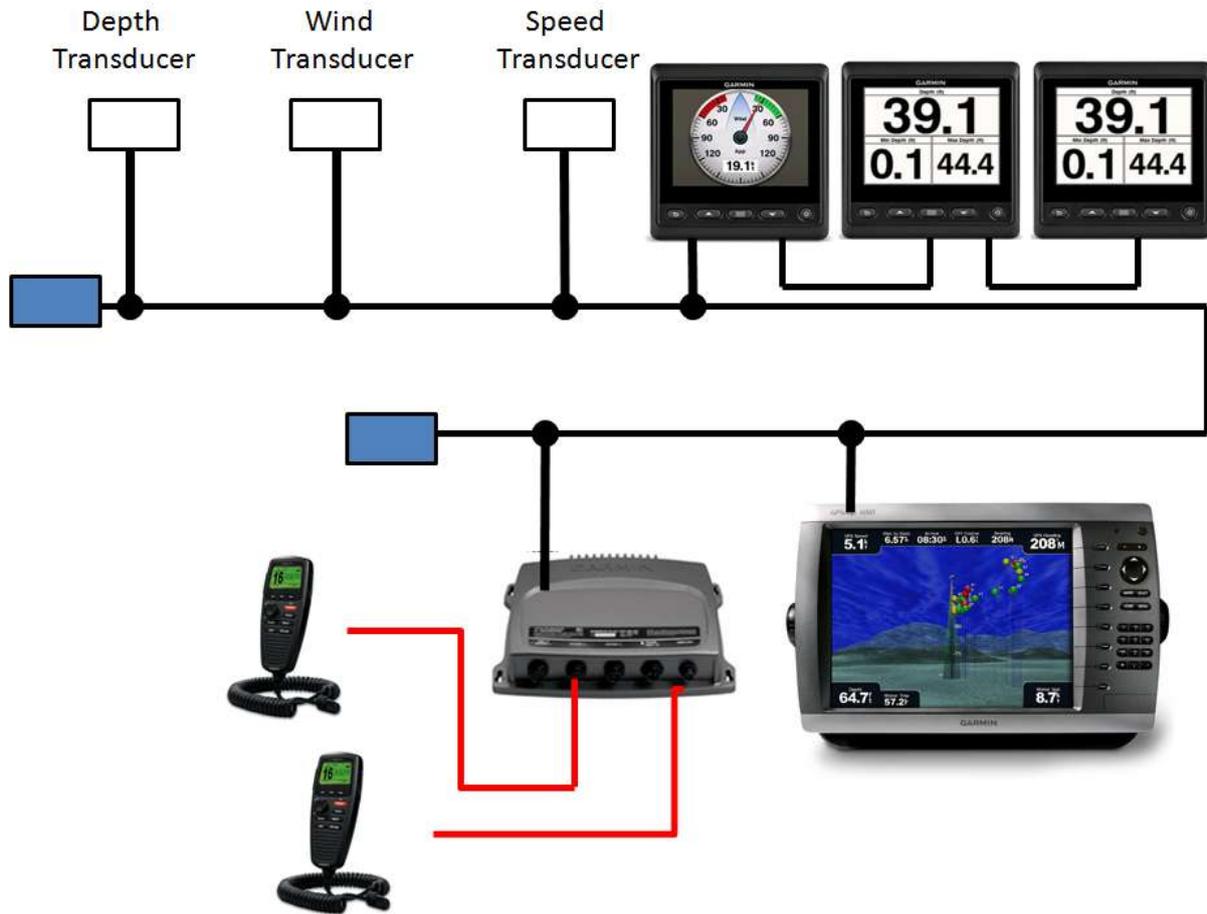
We will be going for something larger than the 7" in the Garmin range. The Garmin GPSMAP 4010 which is a 10" chartplotter.

Garmin GPSMAP 4010



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Network Diagram



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Installation Costs

Electronics	Price RRP
Garmin GMi 20 and Wind, Depth and Speed Transducer Bundle	£900.00
Garmin GMi 20 Display (Speed)	£395.00
Garmin GMi20 Display (Depth)	£395.00
Connectors	
NMEA 2000 T peice x 5	£85.00
NMEA 2000 Terminators x 2	£18.00
Cables approx	£50.00
Garmin VHF 300i with AIS	£799.00
Garmin GHS 10i remote spk/mic	£130.00
Load hailer	£100.00
Garmin GPSMAP 4010	£1,800.00
Additional T Pieces and Cable	£100.00
Guide price for installation (based on 4 days, and mast down) No onboard warranty	£840.00
Misc Cable etc	£50.00
Cable Glands	£35.00
Total	£5,697.00