Dealer Information From Digital Yacht

Technical information on Digital Yacht products
for marine electronic installers

November 2014

A practical guide to Installing AIS

Digital Yacht Products

Class B AIS Transponders

The Digital Yacht Range

- Entry level transponder with internal GPS
- NMEA0183 and USB
- New IP67 plastic case
- Optional SPL2000 Splitter

- Mid-range transponder with external GPS
- NMEA0183, NMEA2000 and USB
- Aluminium case
- Optional SPL2000 Splitter or GV30 combo antenna

- Transponder with built-in splitter and Wi-Fi
- NMEA0183, NMEA2000, USB and Wi-Fi
- Larger Aluminium case
- Easy installation, ideal for larger yachts

Class B AIS Transponders

General Info

- Latest firmware is V1.10
- Firmware Update Tool available
- Standard LED indications on all units
- All units have an NMEA0183 low speed (4800 baud) input
- NMEA2000 units do not convert 0183 to 2000, just output AIS and GPS* PGNs
- Special configurations possible i.e. Two 38400 O/Ps or iNavX Autopilot O/P
- Built-in USB is not isolated so permanent connection to computer should use USB to NMEA adaptor

* Only GPS rapid update PGNs

	**Green indicator only** • The AIS transponder is powered up, has a position fix and has transmitted at least one vessel information report. Everything is working correctly.
	**Green indicator flashing** • Indicates possible Boot Loader (software corrupted) or PA Transmitter fault – contact Digital Yacht for advice on this condition.
	**Red indicator only** • During normal operation the AIS transponder has detected a system error. • Usually indicates low supply voltage but check cause of the error in proAIS2.
	**Red indicator flashing** • During normal operation the AIS transponder has detected a high VSWR reading, which usually indicates a VHF antenna or Splitter (if fitted) problem.
	**Green and Blue indicators** • The "Silent" switch has just been operated and transmitting has stopped. • Within 3 minutes the LED combination will change to Yellow and Blue.
	**Yellow and Blue indicators** • "Silent mode" has been activated using the optional silent mode switch or via proAIS2 and this combination of indicators is illuminated to show that the transmitter is disabled.
	**Red and Blue indicators** • This indicates that a system error has occurred whilst the unit is in "Silent mode" unless the cause of the error is removed, the unit will not be able to start transmitting again when "Silent mode" is exited.
	**Yellow indicator only** • The AIS radio channels are exceptionally busy so there is currently no available timeslot for transmission. • The unit has just exited silent mode and this yellow indicator will illuminate until the first AIS message has been sent. • The AIS transponder has been commanded by the local authority (via an AIS base station) to cease transmissions.
	**Yellow indicator flashing** • The unit has just turned on and is obtaining a position fix prior to transmitting its first vessel information report (typically takes 3-4 minutes). • Position fix has been lost. The AIS transponder will attempt to regain position fix for 30 minutes before entering an error state.
	**Red and Yellow indicators** • This is a new AIT2000 unit that has not yet been properly configured with an MMSI number. • The unit is only getting power via the USB cable.

Class B AIS Transponders

General Info

- USB connection is “fit for purpose” not mini-USB connector
- Every unit has a 4800baud NMEA0183 output for driving a DSC VHF radio
- All units have true dual channel AIS reception
- Every unit supports all current AIS messages including Class B Static, AtoNs, AIS SARTs, Base Stations and SAR Aircraft
- All units are supplied with a CD that includes proAIS2, SmarterTrack Lite and our NMEA Display program

Message ID	Name	Description
1	Position report	Scheduled position report; (Class A shipborne mobile equipment)
2	Position report	Assigned scheduled position report; (Class A shipborne mobile equipment)
3	Position report	Special position report, response to interrogation; (Class A shipborne mobile equipment)
4	Base station report	Position, UTC, date and current slot number of base station
5	Static and voyage related data	Scheduled static and voyage related vessel data report; (Class A shipborne mobile equipment)
6	Binary addressed message	Binary data for addressed communication
7	Binary acknowledgement	Acknowledgement of received addressed binary data
8	Binary broadcast message	Binary data for broadcast communication
9	Standard SAR aircraft position report	Position report for airborne stations involved in SAR operations, only
10	UTC/date inquiry	Request UTC and date
11	UTC/date response	Current UTC and date if available
12	Addressed safety related message	Safety related data for addressed communication
13	Safety related acknowledgement	Acknowledgement of received addressed safety related message
14	Safety related broadcast message	Safety related data for broadcast communication
15	Interrogation	Request for a specific message type (can result in multiple responses from one or several stations)(4)
16	Assignment mode command	Assignment of a specific report behaviour by competent authority using a Base station
17	DGNSS broadcast binary message	DGNSS corrections provided by a base station
18	Standard Class B equipment position report	Standard position report for Class B shipborne mobile equipment to be used instead of Messages 1, 2, 3(8)
19	Extended Class B equipment position report	Extended position report for class B shipborne mobile equipment; contains additional static information(8)
20	Data link management message	Reserve slots for Base station(s)
21	Aids-tonavigation report	Position and status report for aids-to-navigation
22	Channel manage-ment(6)	Management of channels and transceiver modes by a Base station
23	Group assignment command	Assignment of a specific report behaviour by competent authority using a Base station to a specific group of mobiles
24	Static data report	Additional data assigned to an MMSI Part A: Name Part B: Static Data
25	Single slot binary message	Short unscheduled binary data transmission (Broadcast or addressed)
26	Multiple slot binary message with	Scheduled binary data transmission (Broadcast or addressed)

AIS Antennas/Splitters

Pros
- Single Antenna Solution
- Top of mast for Maximum Range
- Easy Installation – no cables to run
- No loss of performance

Cons
- 4x the cost of dedicated antenna
- Misses targets while VHF transmits

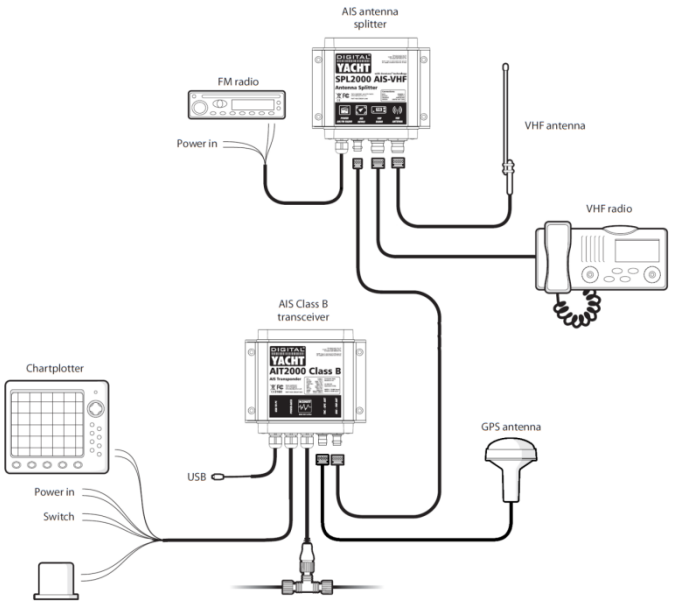
Vs

Pros
- Low Cost
- Backup Emergency Antenna for VHF
- Not affected by VHF voice activity

Cons
- Less Range at deck level (10-15NM)
- Installation can be time consuming/costly
- “Not Another Antenna !”

AIS Antennas/Splitters

- Single Antenna is shared by the AIS and VHF
- Two intelligent switches sense when AIS or VHF is transmitting
- Class B transmission only lasts 26mS so the detection and switching has to be very fast
- VHF gets priority and whilst transmitting no AIS reception is possible
- When not transmitting both systems connect to the same aerial and receive the same RF
- Older splitters introduced a 3dB (half power) loss on VHF and AIS reception
- No losses in transmission as only one system connected to antenna
- Latest SPL2000 features “Zero Loss” Technology where the signal from the antenna goes through a pre-amplifier before being split

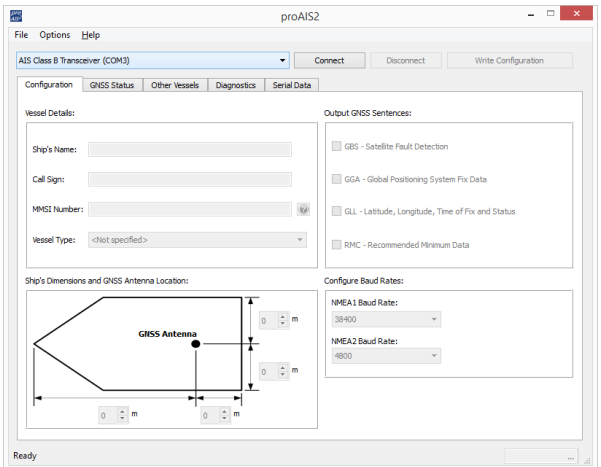


AIS Installations

proAIS2 for PC and Mac

IMPORTANT NOTES

- Latest V1.4 Release
- Double click Setup.exe to install on Windows or proAIS2.dmg for Mac
- USB drivers are automatically installed as part of the main install
- Do not insert USB cable until instructed to do so by the installer
- Run proAIS2 and connect to AIT2000

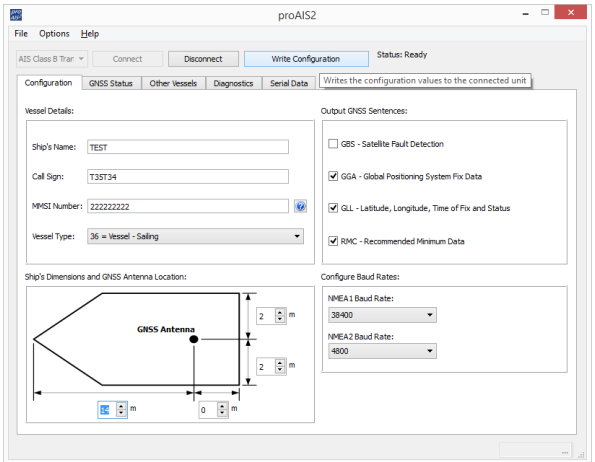


AIS Installations

proAIS2 Programming MMSI

AIS Transponder Configuration

- Can be done just using USB power
- Will receive AIS targets but no NMEA, GPS reception or Transmit
- Reset Tool Available to reset MMSI, the only “unchangeable” data

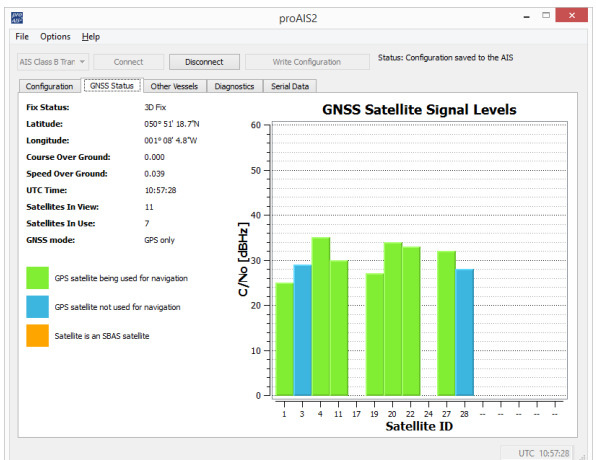


AIS Installations

proAIS2 GPS Monitoring

If using our new AIT1500 with internal GPS antenna or mounting the AIT2000/3000 GPS antenna below deck, testing GPS reception is critical

- Use GNSS Status Page of proAIS2
- Green = Used for Navigation
  Blue = Not used for Navigation
  Yellow = Satellite is SBAS
- Values should be 15dBHz of better

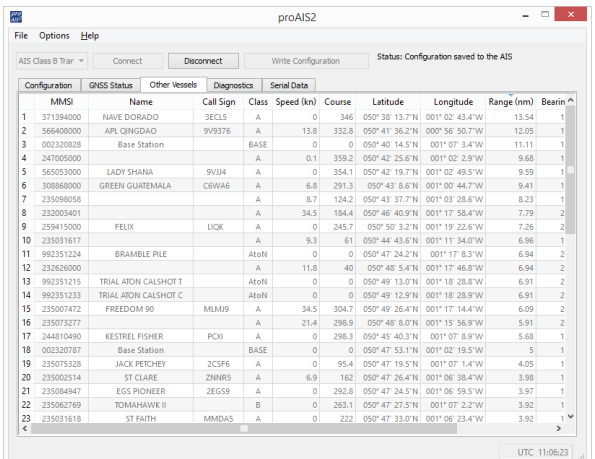


AIS Installations

proAIS2 AIS Reception

AIS Reception can be checked using the “Other Vessels” page of proAIS2

- Even a bad antenna will give some reception
- Click twice on the Range Column header to sort by range descending
- Turn ON any “noisy” equipment i.e. LED Lighting and check that the number of targets remains the same
- Restart proAIS2 to refresh list and allow 3 minutes for all targets to appear

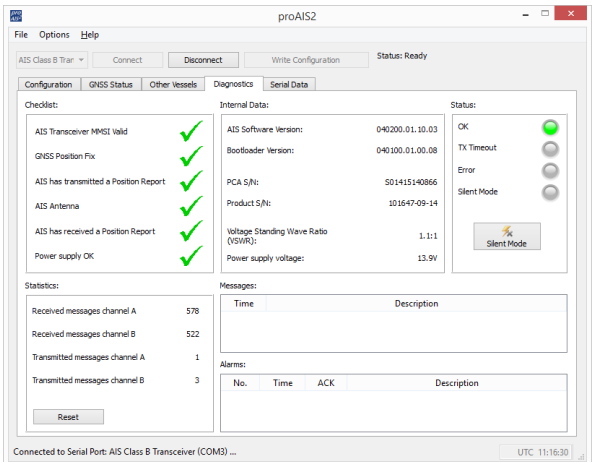


AIS Installations

proAIS2 Diagnostics

The proAIS2 “Diagnostics” page is an invaluable source of information

- Image shows normal operation
- Key things to check
  - Supply Voltage
  - Voltage SWR (ideally <2:1)
  - No Alarms
- “***DSC Start/Stop***” Message is normal
- Occasional “***TX attempt failed (msg 18 CP busy)***” message is normal



AIS Installations

proAIS2 Demonstration

Now we will have a live demonstration of proAIS2 showing how to….

- Configure a new transponder
- Check GPS operation
- Monitor the AIS Vessel reception
- Show Power, Position Lost and VSWR alarms
- Reset the MMSI using Reset program

A practical guide to Wireless NMEA

Digital Yacht Products

Wireless Interfacing

iPad/Tablet Navigation

Digital Yacht now produces eight different Wireless NMEA products

- WLN10 (1xNMEA0183@4800)
- WLN10HS (1xNMEA0183@38400)
- AquaWear WLN20 (2xNMEA0183)
- NavLink (NMEA2000)
- PilotLink (Pilot Plug for Class A)
- iAIS (AIS Receiver with Wi-Fi)
- AIT3000 (AIS Transponder with Wi-Fi)
- iNavHub (Wi-Fi Router 1xNMEA0183)

Wireless Interfacing

Wireless NMEA Spec

Digital Yacht's Wireless NMEA format is NMEA0183 data (ASCII) encapsulated in TCP or UDP network packets. This "open" standard is already supported by many apps and new apps are constantly being released that support our products

- All products (except iNavHub) have the same IP address = 169.254.1.1 and the same Port = 2000
- Original firmware used Ad-Hoc networking but for the last 2 years we have used Access Point (Infrastructure) which is Android and Win8 compatible
- Complete NMEA0183 sentence in one network packet for reliability…

IP Header	IP Payload
<Header>	<$GPRMC,092750.000,A,5321.6802,N,00630.3372,W,0.02,31.66,280511,,,A*43>

Wireless Interfacing

TCP versus UDP

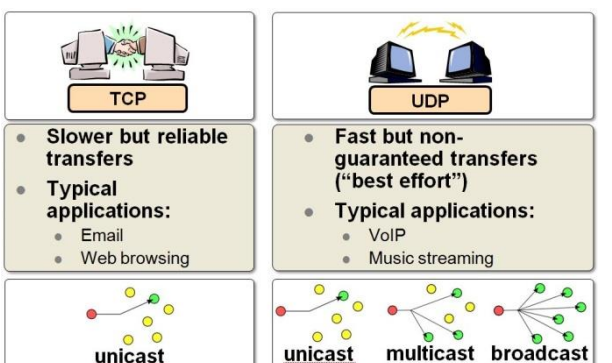
- TCP is a more reliable one to one bi-directional connection with error checking and hand shaking – requires an IP address and Port number
- UDP is simpler, faster and is broadcast on network address xxx.xxx.xxx.255 to multiple devices/listeners – just requires a Port number

TCP Segment Header Format

Bit #	0 – 7	8 – 15	16 – 23	24 – 31
0	Source Port		Destination Port	
32	Sequence Number			
64	Acknowledgment Number			
96	Data Offset	Res	Flags	Window Size
128	Header and Data Checksum		Urgent Pointer	
160...	Options			

UDP Datagram Header Format

Bit #	0 – 7	8 – 15	16 – 23	24 – 31
0	Source Port		Destination Port	
32	Length		Header and Data Checksum	



Wireless Interfacing

Setting Up the Connection

- Scan for a wireless network, the device you are using should be set to get network settings automatically (DHCP)
- All DY Wireless products (except iNavHub) have no wireless security and an SSID in the form…

  "DY-*Product Name*-XXXX"

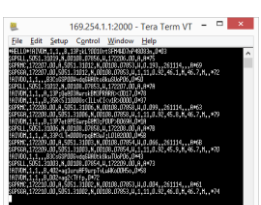
  Where *Product Name* = iAIS, NavLink, AIT3000, etc.
  and XXXX = a unique four digit number
- Simply join the DY wireless product's network, up to 7 devices can connect to the network (up to 100 for iNavHub)
- Once connected, go to your App of Navigation Program and configure a TCP or UDP connection using the IP address and/or Port number previously given

Wireless Interfacing

Testing TCP/UDP

How you test the wireless TCP/UDP data connection will depend upon the device you are using

- For iOS use our free iAIS App
- For Android use a free app called TCP/UDP Terminal
- For Windows TCP use Tera Term and for UDP use UDP Client/Server
- For Mac and LINUX I would install a copy of OpenCPN or use terminal



Wireless Interfacing

iNavHub + NTN10

As we have mentioned, iNavHub is different to the rest of our wireless NMEA products

- iNavHub is a fully functioning Wireless Router with an NMEA0183 interface
- Configurable SSID and security via a normal router web interface
- Has a 192.168.1.1 IP address and 255.255.255.0 subnet
- Can have up to 100 devices connected, or more if you change the DHCP range
- By default operates at 38400 baud in UDP mode but can be configured via a Windows program (supplied)
- For vessels with existing wireless network, our new NTN10 is an NMEA0183 to Network server

Wireless Interfacing

Wireless NMEA Demonstration

Now we will have a live Wireless NMEA demonstration showing….

- How to use Test Tools to display TCP and UDP data
- Live Wireless NMEA data on a variety of hardware
- How wireless NMEA is typically setup on apps and programs
- Tools to survey the Wi-Fi networks
- How to configure the wireless products

A practical guide to replacing GPS antennas

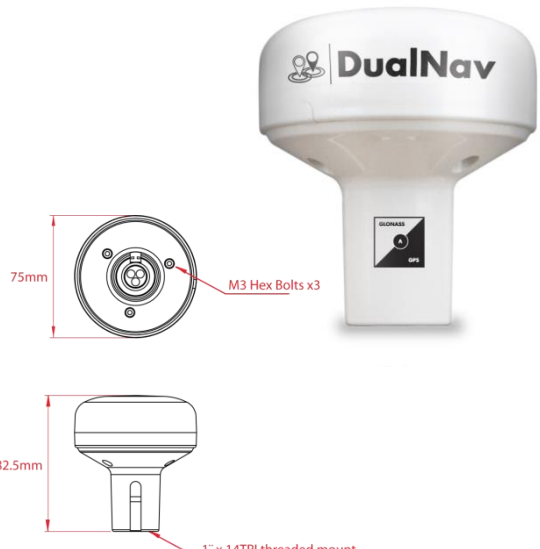
Digital Yacht Products

DualNav™ Technology

GPS150 - Replacing Smart GPS

The perfect drop-in replacement for a failed smart GPS antenna i.e Raystar 120/125, Garmin GPS 17, Standard Horizon, Icom, C-Map, etc.

- Simple four wire connection
- DIP switches to configure operating mode
- GPS, GLONASS or GPS+GLONASS modes
- 4.8K, 38.4K or 115K (Turbo) baud rates
- 1Hz, 6Hz or 10Hz updates



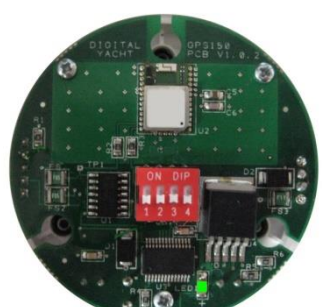
DualNav™ Technology

GPS150 Configuration

Switches 1234	MODE	SATELLITES	BAUD	RATE	NMEA DATA
	GPS 105 Mode (default)	GPS	4800	1 HZ	GGA/GLL/RMC/GSV/GSA/VTG/ZDA*
	GPS 6Hz Mode 4800 Baud	GPS	4800	6 HZ	RMC
	GPS+GLONASS Minimum Sentences	GPS+GLONASS	4800	1 HZ	RMC/GSV/GSA*
	GPS+GLONASS All Sentences 1Hz	GPS+GLONASS	38400	1 HZ	GGA/GLL/RMC/GSV/GSA/VTG/ZDA
	GPS+GLONASS All Sentences	GPS+GLONASS	38400	6 HZ	GGA/GLL/RMC/GSV/GSA/VTG/ZDA**
	GPS+GLONASS Standard Sentences	GPS+GLONASS	38400	10 HZ	GGA/RMC/GSV/GSA**
	GLONASS 1Hz All Sentences	GLONASS	4800	1 HZ	GGA/GLL/RMC/GSV/GSA/VTG/ZDA*
	GLONASS 6Hz Minimum Sentences	GLONASS	4800	6 HZ	RMC
	GPS+GLONASS (No Satellite Info)	GPS+GLONASS	4800	1 HZ	RMC/GGA
	Full "Turbo" Mode	GPS+GLONASS	115000	10 HZ	GGA/GLL/RMC/GSV/GSA/VTG/ZDA**

* GSA/GSV/ZDA sentences output every 4 seconds

** GSA/GSV/ZDA sentences output every second



LED State	Description
LED ON	Configured correctly for 4800 baud
LED Slow Flash	Configured correctly for 38400 baud
LED Quick Flash	Configured correctly for 115K baud (Turbo Mode)
LED Flashes once every 2 seconds	Unused Mode Selected (check DIP switches)
LED Flashes twice every 2 seconds	Power Up Sequence Failed*

Also consider this accessory…

MA700 - Replacing Passive GPS

The perfect drop-in replacement for any failed passive GPS antenna (Coax Cable)

- Small FME Connector for easy cable routing
- Supplied with TNC Adaptor
- Tuned for GPS and GLONASS
- Wide LNA voltage range 2.7v to 5.5v
- Supplied with 1” x 14TPI base that can be removed for surface/deck mount

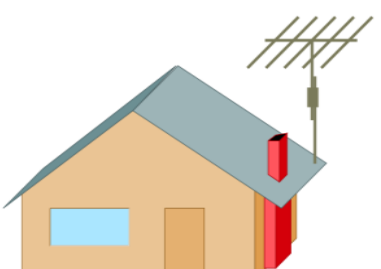
A practical guide to Long Range Wi-Fi

Digital Yacht Products

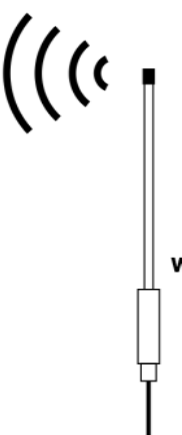
Long Range Wi-Fi

WL510 + iNavConnect

It is important that the Marina Hotspot
is not providing IP addresses in the same ranges
as those used by the WL450/WL510 or iNavConnect
i.e. 192.168.20.xxx
or 10.xxx.xxx.xxx

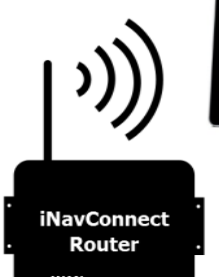


Marina Hotspot



WL450/WL510
Antenna

IP Address of WL450 or WL510
IP = 192.168.10.20
Mask = 255.255.255.0



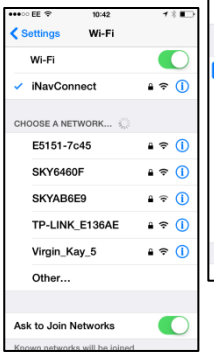
iPad

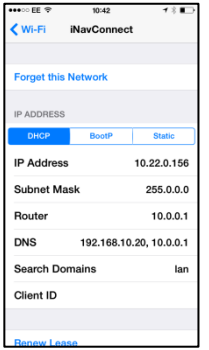
Wireless devices connected to iNavConnect
should get these network settings;

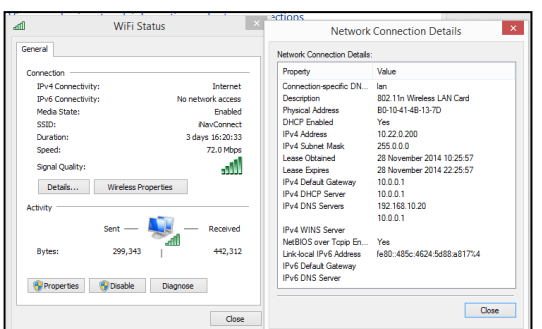
IP = 10.22.0.xxx
Mask = 255.0.0.0
Gateway = 10.0.0.1
DNS = 192.168.20.20
Secondary DNS = 10.0.0.1

Long Range Wi-Fi

Checking the Chain







LINK 1 – The Wireless Device

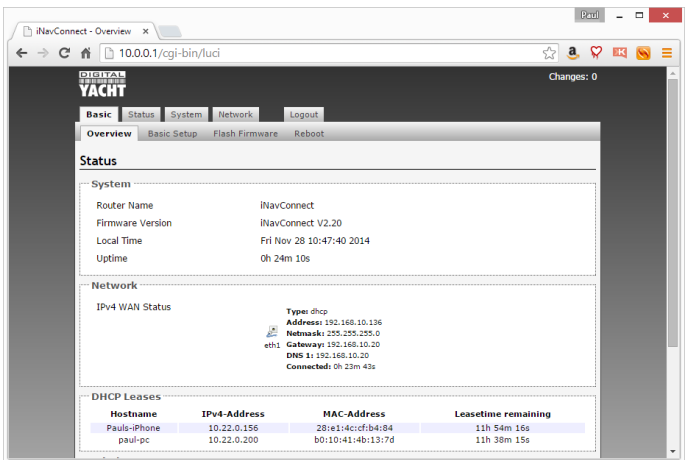
- Check IP address is valid and not 169.254.xxx.xxx (self assigned)
- Check Gateway address is correct
- Check Primary DNS = 192.168.10.20
  Secondary DNS = Gateway Address

Long Range Wi-Fi

Checking the Chain

LINK 2 – The Router (iNavConnect/iNavHub)

- Open a browser on your wireless device
- Enter Gateway IP address
- Login to router
- Check WAN Status, should show a valid IP address in the same range as the WL450/WL510

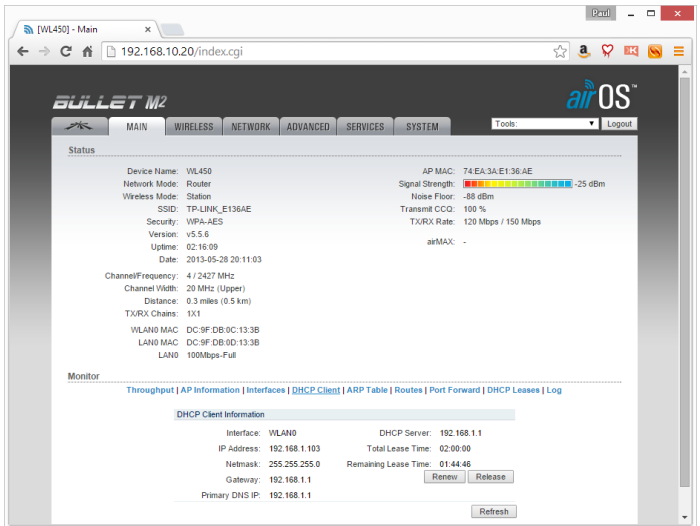


Long Range Wi-Fi

Checking the Chain

LINK 3 – The WL450/WL510

- Open a browser on your wireless device
- Enter IP address 192.168.10.20
- Login to WL450/WL510
- Check coloured Signal Strength indicator is showing a good signal
- Click on "*DHCP Client*" text above graphs to see network settings the WL450/WL510 has received from the hotspot



Long Range Wi-Fi
Common Problems

The following issues are known to cause connection problems…

- Hotspot is using the same IP address range as iNavConnect/iNavHub or the WL450/WL510
- Auto-Login feature of iOS devices, see our blog post for more info… http://digitalyacht.net/2014/08/06/using-ipadiphone-to-login-to-marina-hotspots/
- Strange characters in SSID – particularly if trying to connect to a phone that has been set up for personal hotspot/tethering i.e. "*Tom's Phone*" http://digitalyacht.net/2014/09/26/whats-in-a-name-good-and-bad-ssids/
- WEP passwords not being selected correctly i.e. ASCII/HEX or length
- MAC or IP address blocking to stop High Power Wi-Fi systems

Long Range Wi-Fi

Practical Demonstration

Now we will have a live Long Range Wi-Fi demonstration showing….

- How to reset a WL450 and WL510
- Using Discovery Tool to access a WL450/510
- How to change iNavConnect/iNavHub SSID and Password
- Connecting to Marina Hotspot