

4015 Marine Automatic Antenna Tuner

Operating Manual



BCM401500/01

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Head Office:

Barrett Communications Pty Ltd
47 Discovery Drive, Bibra Lake, WA 6163 Australia
Tel: +61 8 9434 1700 Fax: +61 8 9418 6757
Email: information@barrettcommunications.com.au

www.barrettcomms.com

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Introduction



Antennas such as long-wires, vertical whips and loop configurations require an Antenna Tuning Unit to operate correctly.

Housed in a fully weatherproof enclosure, the 4015 Marine Antenna Tuning Unit (P/N BC401500) (ATU) will tune long wire antennas effectively from 2.5 to 10 metres and wire loop antennas or whip antennas over a frequency range of 2 to 30 MHz. Tuning is rapid, typically less than one second the first time RF is applied, either whilst the operator is talking or when the “Tune” control is activated on the transceiver.

The 4015 ATU features a memory facility that stores the configuration required to tune to a frequency. On any subsequent use of that frequency, the 4015 reconfigures to the stored settings in, typically, less than 130 milliseconds. Following initial tuning, the antenna’s VSWR is monitored. If any significant variation occurs, the 4015 will re-tune the antenna automatically.

Installation

The Barrett 4015 automatic antenna tuner is designed for use in land base station and maritime HF services. Primarily designed for operation with end-fed unbalanced antennas such as whips and long wires, the tuner is built in a waterproof impact resistant, moulded ABS plastic enclosure.

Antenna Selection

The 4015 automatic antenna tuner will operate into almost any end-fed antenna with a length exceeding 2.5 metres, providing an effective ground (earth) is used.

The antenna efficiency will be proportional to the length of the antenna and will be maximum when the length of the antenna approaches $\frac{1}{4}$ wavelength. It is advisable to limit the wire antenna to $\frac{1}{4}$ or $\frac{3}{4}$ wavelength at the highest frequency to be used.

Please contact Barrett Communications with your vessel's specifications for additional assistance.

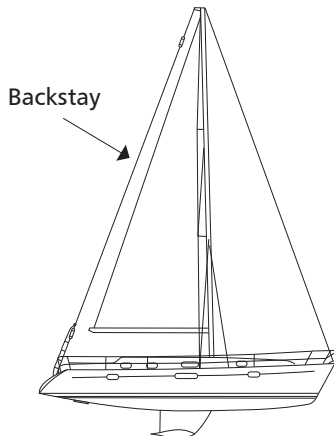
Antenna

On sailing vessels the antenna can either be an insulated backstay or a whip antenna mounted vertically, usually on the stern. Best performance will be achieved by using an insulated backstay as the radiating length will be longer than that available when using a whip.

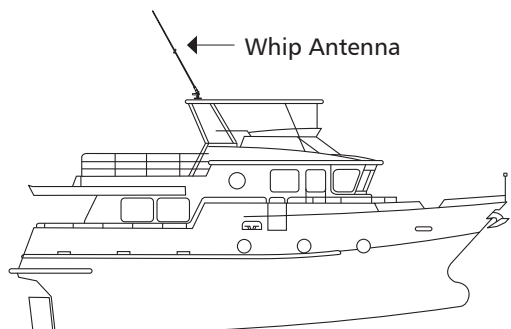
NOTES:

- The top insulator on the backstay should be approximately 300 mm from the mast and the bottom insulator should be at eye level above the deck.
- The distance between insulators should be greater than 10 metres and less than 35 metres.
- A whip antenna is generally used on small to medium sized power vessels. There are different length whips to suit the vessel length.

Yacht: Backstay operates as a long-wire antenna



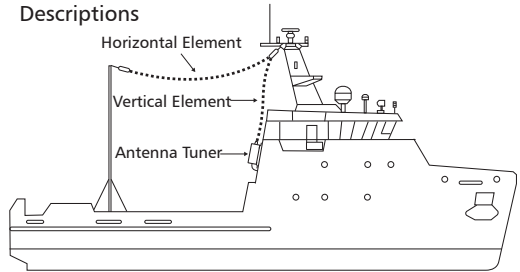
Large Power Boat:



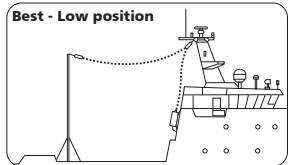
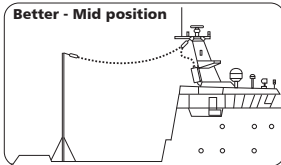
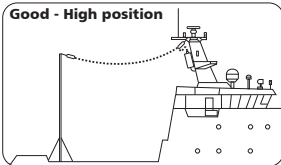
Ship:

There are many possible antenna configurations for a ship and tuner. The below illustrations are guides only.

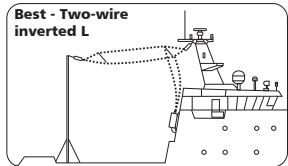
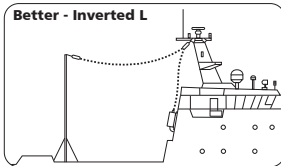
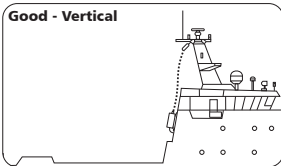
Descriptions



Tuner positions



Antenna wire positions



Please contact Barrett Communications with your vessel's specifications for additional assistance.

Transceiver and Tuner Mounting

1. Select a suitable position in the vessel to mount the transceiver. It should be a position that is out of the weather and easily accessible to the operator, whilst as close as practical to the 13.8 V DC power source.
2. Mount the transceiver to a solid fixing point using the mounting cradle. Make sure there is sufficient space at the rear of the transceiver to connect the power and antenna cables.

NOTES:

- The antenna tuner should be mounted as close to the antenna feed point as possible. In metal vessels the length of the feeder from the antenna tuner to the feed-through insulator, inside the vessel, should be kept less than 1 metre.
- The antenna feed cable should be a suitable high voltage cable. Care should be taken to avoid sharp points when terminating the cable to prevent corona discharges.
- The interconnect cable supplied with the antenna tuner should be routed away from other cables back to the transceiver and connected as indicated on page 10.

Ground (Earth) System

The ground (earth) system is a key part of the overall antenna system and consequently the system operation. An inadequate ground (earth) system is the primary cause of poor performance and tuning problems. There is little point in installing the antenna unless a good ground (earth) system or counterpoise can be provided.

Whichever method is used, the ground (earth) run from the ground (earth) plate to the antenna tuner should be as short as possible and use copper strap at least 50 mm wide (wider if available).

Metal Hulled Vessels

Metal hulled vessels provide an almost perfect ground (earth). The tuner ground (earth) terminal should be connected directly to the hull using the shortest possible ground (earth) strap. The point of connection to the hull should be prepared so that it is free of paint and rust to ensure a good contact area with minimum electrical resistance.

Wooden or Fibreglass Vessels

Wooden or fibreglass vessels present more of a problem to ground (counterpoise). Ideally the vessel should be fitted with an external copper ground (earth) sheet, connected to the interior of the vessel by suitable stud or an ground (earth) plate ("E" plate Barrett P/N BCA91700)

Should neither of these methods be available, acceptable ground points include stainless steel stanchion, through mast, through hull or a metal water tank.

NOTES:

- Do NOT connect the ground terminal to anything combustible i.e a gas or electrical pipe, fuel tank, engine or oil catch pan
- Ground cables should not be connected to more than one ground point.
- Consideration must always be given to the problem of electrolysis. Severe structural damage may occur if electrolysis is present. Consult your maritime experts for more information concerning electrolysis.

Corrosion

All connections in marine situations are subject to corrosion and oxidation. To minimise this all joints should be cleaned and have silicon grease applied before assembly. Under severe conditions joints should be protected with self vulcanising rubber tape.

Electrical Checkout

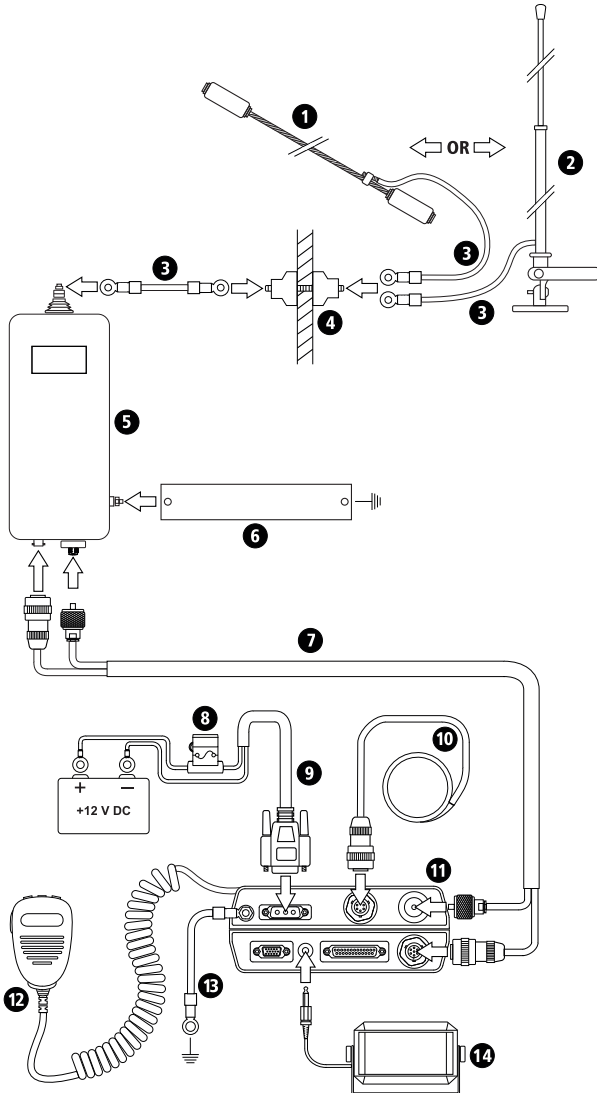
1. After mechanical installation is complete, select the highest frequency to be used on the transceiver. A directional watt-meter may be inserted in the coaxial transmission line between the transceiver and the tuner, if desired, although the internal tuner of the 4050 transceiver is accurate.
2. The tune mode on the transceiver is then activated. Upon application of RF energy, the tuner should start to tune, indicated by the 'clattering' of the tuner relays. After a few seconds the relay noise will cease. The transceiver should indicate "Tune OK" and the watt-meter reflected power should indicate a low value consistent with a VSWR of better than 2:1.
3. Select the lowest desired frequency on the transceiver and repeat the above procedure.

The result should be the same, except that the tune cycle may take longer. If the above procedure does not give the results as indicated, check that the antenna length and connections are correct and re-check all ground (earth) connections.

NOTE:

- When received, the Barrett 4015 automatic antenna tuner memory system will usually not have any pre-stored tuning information appropriate to your installation. To allow the 4015 to 'learn' its tuning information simply proceed from one channel to the next allowing the normal tune cycle to take place. Each successful tune is 'memorised' so that when that channel is re-selected, the tuner will almost instantaneously retune to that frequency.

Connection Details For a 4050 Transceiver and 4015 Automatic Antenna Tuner in a Marine Installation



- 1 Sailing vessel back stay antenna or longwire antenna
- 2 Marine Whip Antenna
- 3 Tinned high voltage antenna feeder cable. Rated to withstand the voltages of up to 10000V that can occur in HF transmission. Flexible 56/0.30 stranding.
- 4 Feed Through Insulator (P/N BCA91701)
- 5 Barrett 4015 Marine Automatic Antenna Tuner (P/N BC401500)
- 6 Copper Earth Strap 50 mm (w) x 0.5 mm (d) x appropriate length
- 7 Control cable 6 m - integral coaxial/control with connectors to suit 4000 series (P/N 4019-00-02)
- 8 Fuse, in-line, with spare
- 9 DC Power Cable
- 10 External GPS Receiver option (P/N BCA40009)
- 11 Barrett 4050 HF SDR Transceiver(rear) (P/N BC405000)
- 12 Microphone (P/N BCA40010)
- 13 Ground (earth)
- 14 Extension speaker supplied with transceiver (P/N BCA40015)

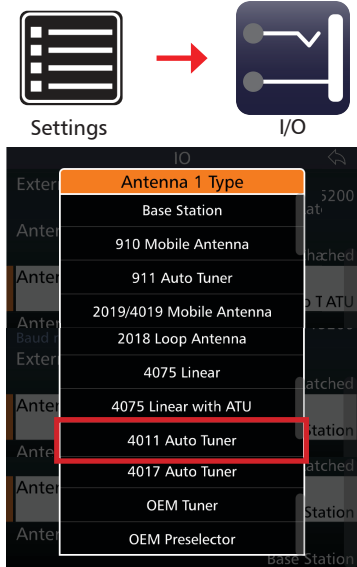
Setting the Tuner in a 4050

From the Settings menu of a Barrett 4050 HF SDR Transceiver, select I/O followed by Antenna 1 type (if using in the antenna 1 position).

Select 4011/4015 Auto Tuner.

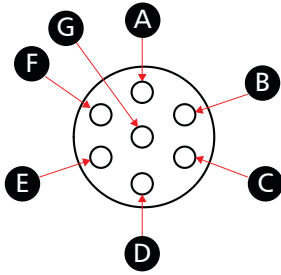
NOTE:

Earlier versions may not show 4011/4015 Auto tuner and should, instead, select 4011 Auto Tuner.



Connector

Control Connector



Signal

- A. GND and shield
- B. Unused
- C. Unused
- D. Scan
- E. Tuned
- F. ATU V+
- G. Unused

Level

- Ground and cable shield
- Unused
- Unused
- ATU Scan line
- ATU Tuned signal
- ATU Voltage 13V8
- Unused

Warranty Statement

Barrett Communications (hereafter referred to as 'Seller') provides a three (3) year warranty on all Barrett products from the date of shipment from the Seller. A one (1) year warranty from the date of shipment from the Seller is provided for all batteries.

Each warranty guarantees acceptable performance of the product under normal recommended conditions for the duration of the warranty period. In cases of accident, abuse, incorrect installation or maintenance by a non-Seller representative, subjection to abnormal environmental conditions, negligence or use other than those in accordance with instructions issued by the Seller, the warranty shall be voided. In addition, this warranty shall not cover low performance – specifically the distance or quality of transmission and reception - due to unfavourable environmental or locational conditions. Nor shall this warranty cover the quality of transmission and reception of transceivers mounted in vehicles or vessels that have not been sufficiently electrically suppressed.

Should any fault due to bad design, workmanship or materials be proven at any time within the warranty period, the Seller will rectify such fault free of charge provided that the equipment is returned, freight paid, to Barrett Communications Pty Ltd head office or to an authorised service centre. The repaired or replaced product will remain covered under and throughout the term of the original warranty period up to its expiration. No repair or replacement will extend the warranty term past the original thirty-six (36) month anniversary of the original date of shipment from the Seller.

Firmware and software (pre-installed, stand-alone or provided as an update), hereafter referred to as 'Software', is guaranteed to perform acceptably within the specifications provided by the Seller, provided that the Software is within the warranty period.

Should Software not perform acceptably, the Seller will use all commercially reasonable efforts to correct such nonconformity as reported to the Seller directly or via a support representative. The Seller is not obliged to update Software under warranty if the nonconformity is caused by a) the use or operation of the Software in an environment other than intended or recommended by the Seller in relevant documentation, or b) modifications made to the Software not authorised or undertaken by the Seller or a representative of said Seller.

Subject to the matters set out in this warranty, no liability, expressed or implied is accepted for any consequential loss, damage or injury arising as a result of a fault in the equipment and, all expressed or implied warranties as to quality or fitness for any purpose are hereby excluded.

This warranty does not extend to products supplied by the Seller which are not designed or manufactured by it. The Seller will however make every endeavour

to ensure that the purchaser receives full benefit on any warranty given by the original equipment manufacturer.

This warranty is restricted to the original purchaser except where the original purchaser is a reseller authorised by the Seller who has purchased for the purpose of resale, warranty shall be extended to the reseller's customer.

Contact Details

Our customer / dealer technical support department can be contacted via land mail, email, telephone or via support ticket on the technical support web page.

<https://www.barrettcommunications.com.au/support/>

Barrett Communications Pty Ltd Head Office:

PO Box 1214, Bibra Lake WA 6965 AUSTRALIA

Toll Free Tel: 1800 999 580 (Within Australia)

Tel: +618 9434 1700

Fax: +618 9418 6757

email: support@barrettcommunications.com.au

Telephone support from the Australian office is available from 7:30 am to 4:00 pm local time Monday to Friday.

Barrett Communications – Europe:

Unit 9, Fulcrum 2 Victory Park, Solent Way,
Whiteley Hampshire PO15 7FN United Kingdom

Tel: +44 (0) 1489 880 332

Fax: +44 (0) 1489 565 422

email: support@barrettcommunications.co.uk

Telephone support from the UK office is available from 8:30 am to 5:00 pm local time Monday to Friday.

Barrett Communications Corporation USA:

90 Office Parkway
Pittsford, N.Y. 14534
United States of America

Tel: +1 585 582 6134

email: support@barrettusa.com

Telephone support from the USA support office is available from 8:30 am to 5:00 pm local time Monday to Friday.

Head Office:

Barrett Communications Pty Ltd
47 Discovery Drive, Bibra Lake, WA 6163, Australia
Tel: +61 8 9434 1700 Fax: +61 8 9418 6757
Email: info@barrettcommunications.com.au

Europe:

Barrett Communications - Europe
Unit 9, Fulcrum 2, Solent Way, Whiteley, Hampshire, PO15 7FN, United Kingdom
Tel: +44 (0) 1489 880 332 Fax: +44 (0) 1489 565 422
Email: uksales@barrettcommunications.co.uk

USA:

Barrett Communications USA Corp.
90 Office Parkway, Pittsford, NY 14534, United States of America
Tel: +1 585 582 6134
Email: sales@barrettusa.com

www.barrettcomms.com