

Maidenhead Locator System

Based on Wikipedia, the free encyclopedia - https://en.wikipedia.org/wiki/Maidenhead_Locator_System
Note that there have been inclusions, updates, diagram changes and edits applied to this base article.

The **Maidenhead Locator System** (a.k.a. **QTH Locator** and **IARU Locator**) is a [geocode system](#) used by [amateur radio](#) operators to succinctly describe their [geographic coordinates](#). Its purpose is to be concise, accurate, and robust in the face of [interference](#) and other adverse transmission conditions. The *Maidenhead Locator System* can describe locations anywhere in the world.

Maidenhead locators are also commonly referred to as *QTH Locator*, *grid locators* or *grid squares*, although the "squares" are distorted on any non-[equirectangular cartographic projection](#). Use of the terms *QTH locator* and *QRA locator* was initially discouraged, as it caused confusion with the older QRA locator system. The only abbreviation recommended to indicate a Maidenhead reference in Morse code and radio teleprinter transmission was **LOC**, as in **LOC KN28LH**.^[1]

John Morris [G4ANB](#) originally devised the system and it was adopted at a meeting of the [IARU](#) VHF Working Group in [Maidenhead](#), England in 1980.^[2]

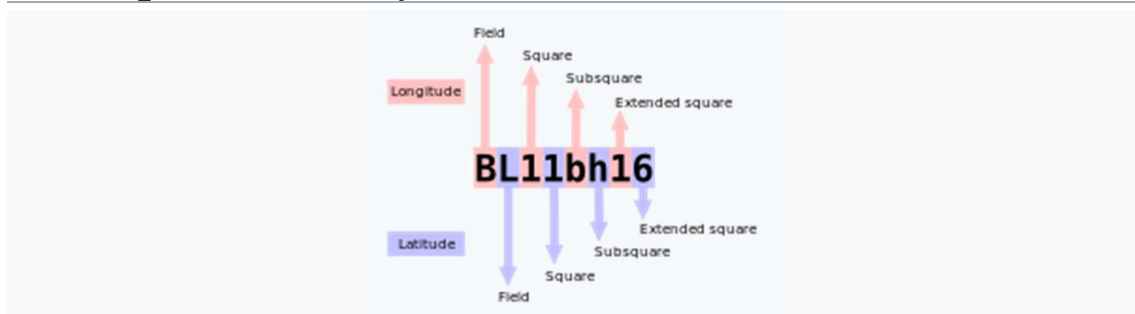
History

[Amateur radio contests](#) on [VHF](#) and [UHF](#) are often scored based on the distance of [contacts](#), typically 1 point per kilometre,^[3] so there is a need for amateurs to exchange their locations over the air. To facilitate this, following the growth of the sport in the 1950s, the German^[2] [QRA locator](#) system was adopted in 1959. The QRA locator system was limited to describing European coordinates, by the mid-1970s there was growing need for a global locator system.^[3]

By the time of their April 1980 meeting, in [Maidenhead](#), England, the VHF Working Group had received twenty different proposals to replace the QRA locator grid. That devised by Dr. John Morris (G4ANB) was deemed to be the best.^[3]

At the 1999 [IARU](#) Conference in Lillehammer it was decided that the latitude and longitude to be used as a reference for the determining of locators should be based on the [World Geodetic System 1984](#) (WGS-84).^[2]

Description of the system



A Maidenhead locator compresses [latitude](#) and [longitude](#) into a short string of characters, which is similar in concept to the [World Geographic Reference System](#) or GEOREF. This position information is presented in a limited level of precision to limit

The chosen coding uses alternating pairs of letters and digits, like so:

- In each pair, **the first character encodes longitude and the second character encodes latitude.**^[5]



To simplify manual encoding, the base for the first pair of letters—traditionally called a *field*—was chosen to be 18, thus dividing the globe into 18 zones of longitude of 20° each, and 18 zones of latitude 10° each. These zones are encoded with the letters "A" through "R".



The second pair of numbers, called a *square* and placed after the first pair of letters, uses a base number of 10, and is encoded using the digits "0" to "9". This is where the alternative name "grid squares" comes from. Each of these squares represents 1° of latitude by 2° of longitude. For additional precision, each square can optionally be sub-divided further, into *subsquares*. These are encoded into a second pair of letters, often (but not always) presented in lowercase. Again, to make manual calculations from degrees and minutes easier, 24 was chosen as the base number, giving these subsquares dimensions of 2.5' of latitude by 5' of longitude. The letters used are "a" through "x".

The resulting Maidenhead subsquare locator string is hence composed of two letters, two digits, and two more letters. To give an example, W1AW, the [American Radio Relay League's Hiram Percy Maxim Memorial Station in Newington, Connecticut](#), is found in grid locator [FN31pr](#). Two points within the same Maidenhead subsquare are always less than 10.4 km (6.5 mi) apart, which means a Maidenhead locator can give adequate precision from only six easily transmissible characters.

For even more precise location mapping, two additional digits were proposed and ratified as an *extended locator*, making it altogether eight characters long, and dividing *subsquares* into even smaller ones. Such precision has uses in very short communication spans. Beyond this, no common definition exists to extend the system further into even smaller squares. Most often the extending is done by repeating alternating subsquare and square rules (base numbers 24 and 10 respectively). However, other bases for letter encodings have also been observed, and therefore such *extended-extended* locators might not be compatible.

To summarise:

- Character pairs encode [longitude](#) first, and then [latitude](#).
- The first pair (a *field*) encodes with base 18 and the letters "A" to "R".
- The second pair (*square*) encodes with base 10 and the digits "0" to "9".
- The third pair (*subsquare*) encodes with base 24 and the letters "a" to "x".
- The fourth pair (*extended square*) encodes with base 10 and the digits "0" to "9".

(The fifth and subsequent pairs are not formally defined, but recursing to the third and fourth pair algorithms is a possibility, e.g.: BL11bh16oo66)

On [shortwave](#) frequencies, positions are reported at *square* precision, and on VHF and UHF, *subsquare* precision is used. At high microwave frequencies *extended square* and *extended subsquare* precision is often used.

Adoption and use

Like the QRA system before it, Maidenhead locators were enthusiastically adopted by radio amateurs beyond contesting, and it is now in widespread use.

Maidenhead locators are still used as part of the formulas for scoring in many [VHF](#) amateur radio contests and as the basis of earning awards like the American Radio Relay League's [VHF/UHF Century Club](#), URE TTLOC, etc. operating contests.

Under [IARU](#) Region 1 rules, VHF distance calculations are carried out between Maidenhead subsquare centres, assuming a *spherical* Earth. This results in a small

error in distance, but makes calculations simpler and, given the inherent imprecision in the input data used, it is not the biggest error source. Until the adoption of [WGS 84](#) as the official [geodetic datum](#) of the Maidenhead locator system in 1999,^[2] operators had usually specified their location based on their local national datum. Consequently, stations very near the edges of squares (at denoted precision) may have changed their locators when changing over to the use of WGS 84.

The [FT8](#) narrowband digital mode transmits Maidenhead locator square as part of standard messages, with the 4 character locator square being efficiently represented within 15 bits of the transmitted string.

In 2019 the [IARU](#) clarified the latest position on use of the IARU locator at various levels of precision.^[6]

Hardware and software support

In 1985, the Radio Society of Great Britain published a small set of [BASIC](#) language routines to convert from locator references to geographical coordinates (latitude and longitude) for further processing.^[7] A complete program in BASIC called *Universal Gridlocator* was made available the following year by ARRL for a nominal cost of US\$3.^[8] Many other utilities exist to convert latitude and longitude to locators, as this is a favourite [hack](#) for programmers who are also radio amateurs. [Perl](#) supports conversion between geographical coordinates and Maidenhead locators in module Ham::Locator by Andy Smith, available on [CPAN](#).^[9]

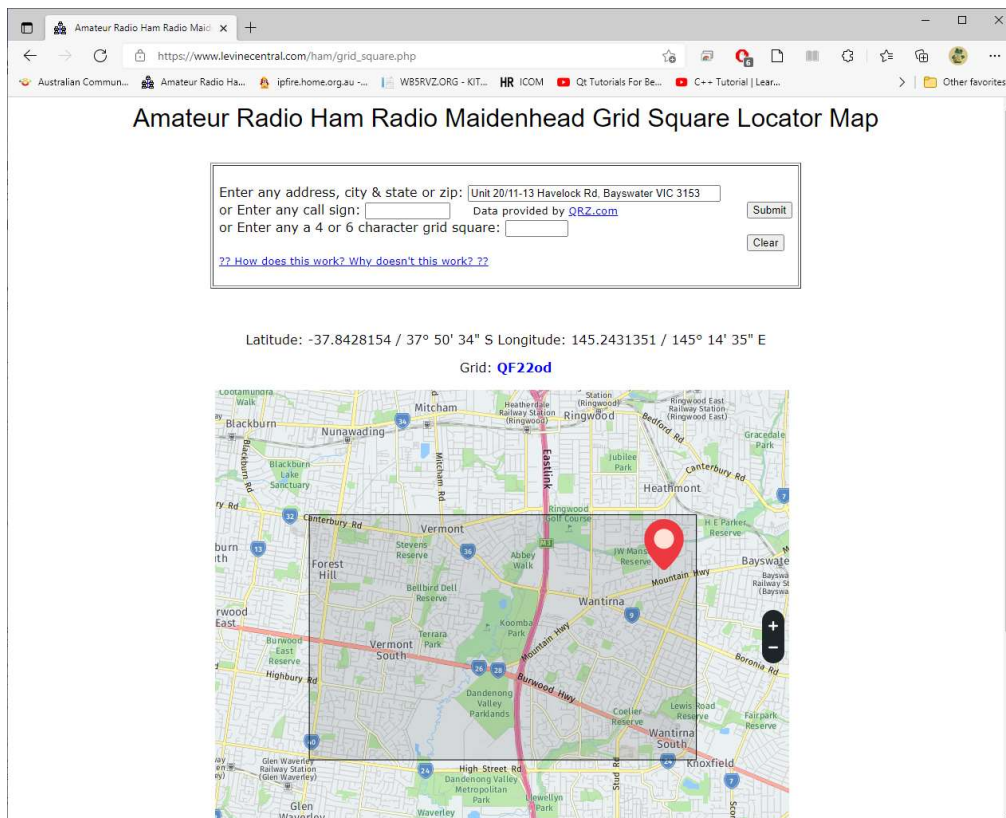
Many commercially available general purpose (civil) [Global Positioning System](#) (GPS) receivers (e.g. Garmin GPS-12) have the option to display positions in Maidenhead Locator format.^[10]

Recommended Site

The following Web Site is used by many Amateur Radio operators to calculate the grid square of a known station. It supports plugging in a basic address or in many instances a callsign.

- https://www.levinecentral.com/ham/grid_square.php

The example shows how to use this site to calculate the Maidenhead Locator address for the Wireless Institute of Australia (WIA) Headquarters in Bayswater, Victoria, Australia:



See also

- [World Geographic Reference System](#) (GEOREF)
- [Military Grid Reference System](#)
- [United States National Grid](#)
- [QRA locator](#)
- [QTH \(amateur-radio-wiki.net\)](#)

References

- ¹ [^] [Jump up to: ^a ^b](#) Eckersley, R.J., G4FTJ (1985). *Amateur Radio Operating Manual* (third ed.). Potters bar, UK: [Radio Society of Great Britain](#). pp. 64–66. [ISBN 0-900612-69-X](#).
- ² [^] [Jump up to: ^a ^b ^c ^d](#) ["The Locator System"](#) (PDF). [qrz.ru](#). Retrieved 13 July 2014.
- ³ [^] [Jump up to: ^a ^b ^c](#) Rosvall, Folke, SM5AGM. ["The Locator System"](#). [jonit.com](#). Retrieved 30 January 2017.
- ⁴ [^] Tyson, Edmund, N5JTY (January 1989). ["Conversion between geodetic and grid locator systems"](#) (PDF). *QST Magazine*. Newington, CT: [American Radio Relay League](#). pp. 29–30, 43. Retrieved 9 March 2018.
- ⁵ [^] Paige, Bruce, KK5DO (2000). ["Maidenhead grid squares"](#). [amsat.org](#). [AMSAT](#). Retrieved 10 September 2012.
- ⁶ [^] Talbot, Andy, G4JNT (16–23 September 2017). "Clarification and extension of the IARU locator system". In Green, Dennis, ZS4BS (ed.). [Report of the 24th IARU Region 1 General Conference](#) (PDF). 24th IARU Region 1 General Conference. Landshut, DE: [International Amateur Radio Union](#) Region 1. p. 42. Appendix A, paper LA17 C5 17. Retrieved 19 September 2020.
- ⁷ [^] Morris, John, GM4ANB (1985). *Amateur Radio Software*. Potters Bar, UK: Radio Society of Great Britain. pp. 129–161. [ISBN 0-900612-71-1](#).

8. [^] Overbeck, Wayne (December 1986). "A universal grid-locator program for your personal computer". *QST Magazine*. Newington, CT: [American Radio Relay League](#). pp. 30–31.
9. [^] ["Ham Locator v 0.1000"](#). cpan.org. CPAN module.
10. [^] Burlingame, L.A., N7CFO (2010). ["GPS units that support the Maidenhead grid system"](#). n7cfo.com. Retrieved 9 September 2012.
11. [^] Jump up to: <https://www.amateur-radio-wiki.net/qth/>. Retrieved 10 August 2021.

Maps with Maidenhead Locator grid

- ARRL World Grid Locator Atlas. Newington, CT: [American Radio Relay League](#). 2007. Containing all 32,400 Maidenhead Locator Squares
- IARU Locator of Europe. Potters Bar, UK: [Radio Society of Great Britain](#). 1984.
- IARU Locator of Western Europe. Potters Bar, UK: [Radio Society of Great Britain](#). 1985. (scale 1:2,000,000)
- ARRL Amateur Radio Map of North America. Newington, CT: [American Radio Relay League](#). 2003.

External links

- ["Amateur Radio Maidenhead Grid Square Locator and Distance Calculator"](#). karhukoti.com.
- ["View full dynamic Maidenhead locator grid in Google Maps"](#). sotamaps.org. Click on the [Position] control in the map area to activate.
- ["ABC of Grid Locator System"](#). HamRadio India.
- ["Grid Locators and Grid Squares"](#). ARRL.
- ["An explanation of the \[Maidenhead\] system and how it came into being"](#). jonit.com. From the field hunter's web page.
- ["Map grid square"](#). levinecentral.com. [Maidenhead] grid square for any location or amateur radio call sign
- ["Find QTH"](#). no.nonsense.ee. Archived from [the original](#) on 14 September 2013. Retrieved 26 June 2014. QTH locator or Maidenhead grid square, at arbitrary sub-level, and approximate distance, midpoint and bearing between two squares.
- ["Generate a KML file that outlines a grid position"](#). w8an.net.
- ["Maidenhead locator"](#). dev.unclassified.de. C# class to convert between geographic coordinates and Maidenhead locators, including distance calculation
- ["View Maidenhead grid on Google Earth"](#). earthpoint.us.

Source

This article (with minor edits and the addition of the “recommended Site” section) is based on the following:

- https://en.wikipedia.org/wiki/Maidenhead_Locator_System

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