**How the Software Finds a Callsign's Country 🗺️**

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Ever wonder how logging software instantly knows that 3D2R is Rotuma and not just Fiji? It uses a rapid, step-by-step process to decode your callsign, following a precise set of rules. This guide explains that process from start to finish.

**The Core Ingredients** Before diving into the steps, let's understand the key components the software uses:

* **DXCC** (DX Century Club): This is the premier award in ham radio for contacting 100 different "entities." An entity is usually a country but can also be a distinct territory or island (like Hawaii or Puerto Rico). Our main goal is to identify this DXCC entity.
* **WAE** (Worked All Europe): A popular award for contacting European entities. The software also keeps track of a few special sub-entities (like the Shetland Islands or Sicily) that count separately for this award.
* **CTY.DAT**: This is the software's brain. It's a universal database file that acts as a master list, mapping thousands of callsign prefixes (like K, G, VE2) and even some full, specific callsigns to their correct DXCC entity, CQ Zone, ITU Zone, and Continent. This file is meticulously maintained by AD1C, [www.country-files.com](https://www.country-files.com).

**The Step-by-Step Lookup Algorithm** When you enter a callsign, the program follows this exact sequence of checks. It stops as soon as it gets a positive match.

**1. Cleanup and Preparation** First, the callsign is standardized to ensure it can be matched reliably.

* It's converted to UPPERCASE.
* Any characters after a hyphen (-) are removed (e.g., W1AW-1 becomes W1AW).

**2. Stripping Common Suffixes** Next, the software checks for and removes common suffixes from the end of the callsign. This is done early to simplify the call before the main rules are applied. The suffixes that are removed include:

* Portable indicators: /P, /M, /B
* Low power indicator: /QRP
* Numeric indicators: /0, /1, /2, /3, /4, /5, /6, /7, /8, /9 For example, W3AAA/0 becomes W3AAA, and G/DL0AAA/P becomes G/DL0AAA.

**3. The VIP List: Exact Callsign Matches** The software then checks its list of special, "exact match" callsigns. These are unique stations, like =4U1UN (United Nations HQ), that have their own entity. If the callsign is on this VIP list, its country is found immediately, and the search ends.

**4. At Sea: The Maritime Mobile (/MM) Rule** If the callsign ends with /MM, the software identifies it as a "Maritime Mobile" station. Because the station is on a vessel at sea, its country is set to Unknown/Undefined. This rule is very specific to /MM and is not affected by the common suffix stripping in step 2.

**5. The "KG4" Exception: A Special Length Rule** Callsigns beginning with KG4 are unique and are judged by their length:

* If the callsign is 5 characters long and follows the pattern of KG4 plus two letters (e.g., KG4NA), it is resolved to the specific Guantanamo Bay entity found in CTY.DAT (if available).
* For any other length (like KG4A or KG4ABC), it is the United States (by looking up the general 'K' prefix).

**6. Decoding Callsigns with Slashes (/)** If a slash still exists in the callsign after the initial suffix stripping, the software splits it into parts and applies a strict set of rules.

* **Rule 1: Prefix / Prefix (F/DL)** -> If both parts are valid prefixes, it's ambiguous. The result is Unknown.
* **Rule 2: Prefix / Callsign (MM/KD4D)** -> If only the first part is a valid prefix, that part determines the country. Result: Scotland.
* **Rule 3: Callsign / Prefix (KD4D/VY2)** -> If only the second part is a valid prefix, that part determines the country. Result: Canada.
* **Rule 4 (CEPT Rule)**: If neither part is a valid prefix, the script applies the CEPT Rule. This assumes a format of [Visited Country Prefix]/[Home Callsign]. The country is then determined by looking up the first part of the callsign.

**7. The Final Check: Longest Prefix Match** If a callsign makes it through all the special rules above, the software performs the standard lookup. It does this by finding the longest possible prefix in its database from AD1C, [www.country-files.com](https://www.country-files.com) that matches the beginning of the callsign. For example, when looking up N1MM, it checks:

* Is N1MM a prefix? (No)
* Is N1M a prefix? (No)
* Is N1 a prefix? (Yes, for the United States) -> Match Found!

**8. Advanced Lookup: Getting Both DXCC and WAE Information** Beyond the basic lookup, the software offers a more comprehensive function that returns details about both the primary DXCC entity and any relevant WAE (Worked All Europe) entity.

* **get\_cty (Basic Lookup)**: This function (explained in steps 1-7) returns a CtyInfo namedtuple which provides the single best entity match based on the CtyLookup instance's wae setting (set during initialization). The DXCC field in this tuple will contain the primary prefix, which might include an asterisk if it's a WAE-specific entity (\*4U1V).
* **get\_cty\_DXCC\_WAE (Comprehensive Lookup)**: This new function is designed to give you a fuller picture. It internally performs separate lookups to identify both the primary DXCC entity and, if applicable, the WAE-specific entity, regardless of how the CtyLookup instance itself was initialized. It returns a FullCtyInfo namedtuple.

**9. Understanding the Return Values**

* **CtyInfo (returned by get\_cty):** This tuple represents the single entity found.
  + name: The human-readable name of the DXCC/WAE entity.
  + DXCC: The primary prefix of the resolved entity (e.g., 'K', 'CE0Y', or '\*4U1V').
  + CQZone: The CQ Zone number.
  + ITUZone: The ITU Zone number.
  + Continent: The continent abbreviation (e.g., 'NA', 'EU').
  + Lat: Latitude (string).
  + Lon: Longitude (string).
  + Tzone: Time Zone (string).
* **FullCtyInfo (returned by get\_cty\_DXCC\_WAE):** This tuple provides a comprehensive view with distinct fields for DXCC and WAE.
  + DXCCName: The human-readable name of the primary DXCC entity (e.g., "United States").
  + DXCCPfx: The primary prefix of the DXCC entity (e.g., "K").
  + CQZone: The CQ Zone number (derived from the primary DXCC entity, if possible, otherwise from the WAE entity).
  + ITUZone: The ITU Zone number (derived from the primary DXCC entity, if possible, otherwise from the WAE entity).
  + Continent: The Continent abbreviation (derived from the primary DXCC entity, if possible, otherwise from the WAE entity).
  + Lat: Latitude (string).
  + Lon: Longitude (string).
  + Tzone: Time Zone (string).
  + WAEName: The human-readable name of the WAE entity (e.g., "Vienna Intl Ctr"), or "None" if not applicable.
  + WAEPfx: The WAE prefix (e.g., "\*4U1V"), or "None" if not applicable.