Specifications concerning designations
for astronomical radiation sources outside the solar system

A look at the current literature reveals that unclear, ambiguous or confusing designations of astronomical sources of radiation are too often encountered. Therefore, all contributors to databases, and authors of papers, catalogs and surveys, are urged to adhere to the following set of specifications (developed and endorsed by the International Astronomical Union); otherwise, significant data may be irretrievably lost.

1. General recommendations

All source listings should always contain positional information and/or a second designation next to a principal designation in order to avoid ambiguities that can arise with a single designation.

2. Case of existing designations

- When existing designations are used in listings, they **should never be altered** (e.g., neither truncated, nor rounded, nor shortened).
- In a publication, the bibliographical reference for the designation should be given.

3. Creation of new designations

The *designation* of an astronomical source should consist of the following parts :

$$\boxed{\text{Acronym} \sqcup \text{Sequence} \sqcup \text{(Specifier)}}$$

Note that the ␣ is used here to denote a blank. It is used for emphasis in showing where spaces occur in a designation. (Users are expected to use an actual blank and not this character.) Parentheses are required if a specifier is included. Acronym and sequence are essential, specifier is optional; the number of blanks may be larger in machine-readable files to right justify numerical or tabular data.

The following examples illustrate the recommended form of astronomical designations :

NGC␣205
PKS␣1817–43
CO␣J0326.0+3041.0
H2O␣G123.4+57.6␣(VLSR=–185)
3C␣196

3.1 Acronym

The *acronym* (earlier called *origin*) is a code (i.e., alphanumerical string of characters) that specifies the catalog or collection of sources. It may be constructed from catalog names (e.g., NGC, BD), the names of authors (RCW), instruments or observatories used for large surveys (VLA, IRAS, 3C, 51W), etc – see helpful hints on creating acronyms.[1]

The following rules apply to the construction of **new** acronyms:

- an acronym shall consist of **at least three characters**.
- an acronym shall consist of letters and/or numerals only; **special characters**, including superscripts, subscripts, and blanks should be **avoided**.
- an acronym shall be **unique**; i.e., the appropriate reference literature (especially the *Second Dictionary of Nomenclature* — see below) should be checked to avoid duplication with existing catalog designations, constellation names, abbreviations of source types, etc.
- The title of a catalog shall **include the acronym by which it is to be known**, [e.g., Fifth Fundamental Catalogue (FK5)].
- **Avoid excessively long** acronyms. Conversely, users shall never abbreviate an acronym.

3.2 Sequence

The *sequence* (or *numbering*) is an alphanumeric string of characters, normally only numerical, that uniquely determines the source within a catalog or collection. It may be a sequence number within a catalog (e. g., HD␣224801), a combination of fields, or it may be based on coordinates. The way the sequence is constructed is called the *format* of the sequence; the symbols used are summarized in the Inventory of the Formats[2], a document which also includes examples of use and misuse.

3.2.1 Use of coordinates

Coordinate-based designations are *just "names"* and should have enough significant figures to unambiguously identify the sources. It is expected that *precise coordinates will be provided* in the paper (e.g., in a table), accompanied by any needed explanations and other relevant information.

If *coordinates* in any form are used to encode a source of radiation, a set of rules applies, which we will illustrate with a source, namely the QSO with coordinates:

$$\begin{array}{lll} \text{(J2000.0)} & \alpha = 00^h51^m09.38^s & \delta = -42^\circ\ 26'\ 33.8'' \\ \text{(B1950.0)} & \alpha = 00^h48^m48.97^s & \delta = -42^\circ\ 42'\ 52.1'' \end{array}$$

- A designation involving **only the coordinates**, often improperly referred to in the literature as an "IAU designation", is **not sufficient** to identify a source unambiguously. An *acronym* should also be given.

[1] http://cdsweb.u-strasbg.fr/creating.htx
[2] http://cdsweb.u-strasbg.fr/formats.htx

- *Equatorial Coordinates shall* **always** *be preceded by* **J** *if they are for the* **standard equinox of J2000.0** (i.e., IRCS position or FK5-based, Julian equinox 2000.0 system). They should be preceded by **B** if they are for the old standard equinox of B1950.0 (i.e., Bessel-Newcomb FK4-based, Besselian equinox 1950.0 system). Galactic coordinates shall be preceded by a **G**. The absence of a code at the beginning of recognizable equatorial coordinates will be interpreted, by default, as a missing **B**.

  Ex: QSO␣004848–4242.8 = QSO␣B004848–4242.8 = QSO␣J005109–4226.5

  A galactic-based designation is inappropriate for extragalactic sources such as a QSO. Examples of galactic-based designations for sources within the Milky Way Galaxy may be found in section (Ex. H2O) and section (Ex. PN).

- The **"flag" letters J**, **B**, and **G** have a special role: the flag letter should immediately precede the coordinates and should be separated from the acronym by a *space* (␣). This space is particularly important, as there are acronyms ending with J, B, and G. The usage of other "flag" letters is discouraged.

- Coordinates shall contain **leading zeroes** (in α and δ) and the **plus or minus sign** : *+BB.bb* or *–BB.bb*, *+DDMMSS.s* or *–DDMMSS.s*

- **Coordinates** shall be specified as *LLL.ℓℓ+BB.bb* or *LLL.ℓℓ–BB.bb* for galactic coordinates, and as *HHMMSS.ss+DDMMSS.s* or *HHMMSS.ss–DDMMSS.s* for equatorial coordinates (*without spaces*); more or fewer fractional digits may be used as appropriate, but one should not omit the leading *HH* or $\pm DD$.

  Ex: QSO␣004848–4242.8 could have been designated by QSO␣0048–427 or QSO␣0048–42

- Coordinates using an *even number of digits* (in either α or δ), fewer than seven, are expressed in the sexagesimal system. The sequences *HHMM.mm* or *DD.dd* where *mm* and *dd* are **decimal parts of a minute or degree**, respectively, **should be avoided**. If the number of digits is odd and fewer than six, the **right-most digit** represents a decimal part of hours, degrees or minutes (as, e.g., in the PKS–style *HHMM+DDd* or in IRAS source designation *HHMMm+DDMM*) and *not* tens of minutes or seconds (e.g.. the formats *HHMMS* or *+DDM* should be avoided). If the number of digits is more than six, the digits in excess of six are decimal parts of seconds of time for α or of angle for δ ; explicit use of the decimal points is encouraged (e.g., *HHMMSS.ss* or *DDMMSS.s*).

- Coordinates shall be **truncated** (not rounded), thus defining a unique (small) field on the sky in which the source is located. The truncation should also operate when the right-most digit represents a decimal part. The right-most digit of the field *HHMMm* should be computed as $m = int(SS/6)$. The same should be done when transforming from *+DDMM* to *DDd* (as in the PKS-style) with $d = int(MM/6)$.

  Ex: QSO␣004848–4242.8 could be named QSO␣00488–4242 but not QSO␣00484–4242 (wrong truncation of α) nor QSO␣00488–4243 (rounded δ).

- Designations that include coordinates shall be treated like proper names; therefore, they shall **not be changed** even if the positions change or become more accurately known.

  Ex: BD␣+25␣9 stays, even though its declination has now changed to +26 degrees due to precession from its original position (at the 1855 equinox).

3.3 Specifier

The *specifier* is optional and allows one to indicate other source parameters. However, they are not required syntax and are enclosed in parentheses.

3.4 Punctuation and special characters

If the designation requires the use of punctuation or special characters, the recommendations are the following :

- **␣** (blank character) should be used as separator rather than a ".", or "/".
- **_** (underscore) may be used in place of a blank, if necessary, such as within an electronic catalog where blanks would be problematic.
- **–** should be reserved for the minus sign as much as possible. However, if there is no ambiguity with the minus sign, it may be used as a separator although such usage is discouraged.
- **.** should be reserved for a decimal point.
- **/** (slash) should be used for concatenation of the sources quoted.

  Ex: DR␣21/23 refers to DR␣21 and DR␣23, not (DR␣21, DR␣22, DR␣23)
- **:** should be reserved to indicate subdivision (subcomponent).

If, at some stage, subcomponents or multiplicity of sources is recognized, the current practice is to name the subcomponents with letters or numerals such as W 51 A. Alternatively the subcomponent receives a standard designation which may be added to the sequence of the parent source with a colon; e.g., ABELL␣1644:[D80]␣053 where D80 refers to Dressler's *catalog of morphological types in 55 rich clusters of galaxies* (1980ApJS...42..565D). For further elaboration on designating subcomponents and also on finding the reference to a subcomponent refer to current practices regarding subcomponents[3].

3.5 Examples

3.5.1 Examples of complete designations

Designation	Position	
Acronym␣Sequence␣(Specifier)	α(J2000.0)	δ(J2000.0)
	$h\ m\ s$	$^\circ\ '\ ''$
RX␣J1426.8+6950	14 26 49.3	+69 50 21
PSR␣J1302–6350	13 02 47.72	−63 50 08.5
PN␣G001.2–00.3	17 49 36.9	−28 03 59
TYC␣1234–545–1	03 32 53.6417	+15 32 59.314
AC␣211␣(=1E␣2127+119; M␣15)	21 30 15.54	+11 43 39.0
R␣136:a3␣(30␣Dor)	05 38 42.4	−69 06 03
BD␣–03␣5750	00 02 02.4	−02 45 59

[3]http://cdsweb.u-strasbg.fr/subcomponents.htx

The examples in the table above are from pre-existing designations. A look at the *Second Dictionary of Nomenclature* reveals that unique 2-letter combinations for acronyms are nearly exhausted. That is the reason for the change in the rule for **new acronyms** where at least **three characters** are now required. Note that "R␣136" is a **pre-existing designation**, and thus it **is not altered** when creating the designation for a subcomponent even though "R␣136" does not conform to the rules for creating a new acronym.

3.5.2 Examples of improper designations

BD␣4°14	use of "deg symbol", declination sign missing
N221	no space, unclear source : NGC or N in LMC ?
GRO␣J317-85	leading zero missing
P␣43578	one letter acronym is ambiguous
RC␣0401+0456	missing flag letter **J** for Julian 2000 equatorial coordinates, corrected to RC␣J0401+0456 in an erratum

3.6 Helpful Hints

There are further documents which provide help on:

- creating acronyms[4]
- use of formats[5]
- current practices regarding subcomponents[6]

4. Advice on designations

Advice on specific problems may be obtained from representatives of the "Clearing house", a subset of the Working Group on Designations of IAU Commission 5:

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[4]http://cdsweb.u-strasbg.fr/creating.htx
[5]http://cdsweb.u-strasbg.fr/formats.htx
[6]http://cdsweb.u-strasbg.fr/subcomponents.htx

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5. Further information

For general information, in particular about existing designations, consult the following references :

Lortet, M.-C., Borde, S., Ochsenbein, F. 1994, *The Second Reference Dictionary of the Nomenclature of Celestial Objects*, A&AS, 107, 193 and related publications:

- The complete paper edition appeared as *Publication Spéciale du CDS*, **24**, Volumes I and II. Observatoire Astronomique de Strasbourg; a postscript version is available from CDS at URL ftp://cdsarc.u-strasbg.fr/pub/dic2
- The "On-line" version of the Dictionary is updated regularly and is available on the World-Wide-Web at **http://vizier.u-strasbg.fr/viz-bin/Dic**; mirror copies can be accessed at **http://vizier.nao.ac.jp/viz-bin/Dic** or **http://vizier.cfa.harvard.edu/viz-bin/Dic**

Fernandez, A., Lortet, M.-C., Spite, F. 1983, The first Dictionary of the Nomenclature of Celestial Objects, A&AS, 52, No 4

Lortet, M.-C., Spite, F. 1986, First Supplement to the First Dictionary of the Nomenclature of Celestial Objects, A&AS, 64, 329

Dickel, H. R., Lortet M.-C., de Boer, K. S. 1987, Designation and Nomenclature for Diffuse Radiating Sources , A&AS, 68, 75

Jaschek C. 1989, Data in Astronomy, Cambridge University Press