

**Table 6.2-1
DICOM VALUE REPRESENTATIONS**

VR Name	Definition	Character Repertoire	Length of Value
AE Application Entity	A string of characters with leading and trailing spaces (20H) being non-significant. The value made of 16 spaces, meaning "no application name specified", shall not be used.	Default Character Repertoire excluding control characters LF, FF, CR and ESC.	16 bytes maximum
AS Age String	A string of characters with one of the following formats -- nnnD, nnnW, nnnM, nnnY; where nnn shall contain the number of days for D, weeks for W, months for M, or years for Y. Example: "018M" would represent an age of 18 months.	"0"- "9", "D", "W", "M", "Y" of Default Character Repertoire	4 bytes fixed
AT Attribute Tag	Ordered pair of 16-bit unsigned integers that is the value of a Data Element Tag. Example: A Data Element Tag of (0018,00FF) would be encoded as a series of 4 bytes in a Little-Endian Transfer Syntax as 18H,00H,FFH,00H and in a Big-Endian Transfer Syntax as 00H,18H,00H,FFH. Note: The encoding of an AT value is exactly the same as the encoding of a Data Element Tag as defined in Section 7.	not applicable	4 bytes fixed
CS Code String	A string of characters with leading or trailing spaces (20H) being non-significant.	Uppercase characters, "0"- "9", the SPACE character, and underscore "_", of the Default Character Repertoire	16 bytes maximum
DA Date	A string of characters of the format yyyyymmdd; where yyyy shall contain year, mm shall contain the month, and dd shall contain the day. This conforms to the ANSI HISPP MSDS Date common data type. Example: "19930822" would represent August 22, 1993. Notes: 1. For reasons of backward compatibility with versions of this standard prior to V3.0, it is recommended that implementations also support a string of characters of the format yyyy.mm.dd for this VR. 2. See also DT VR in this table.	"0"- "9" of Default Character Repertoire Note: For reasons specified in the previous column, implementations may wish to support the "." character as well.	8 bytes fixed Note: For reasons specified in the previous columns, implementations may also wish to support a 10 byte fixed length as well.

<p>DS Decimal String</p>	<p>A string of characters representing either a fixed point number or a floating point number. A fixed point number shall contain only the characters 0-9 with an optional leading "+" or "-" and an optional "." to mark the decimal point. A floating point number shall be conveyed as defined in ANSI X3.9, with an "E" or "e" to indicate the start of the exponent. Decimal Strings may be padded with leading or trailing spaces. Embedded spaces are not allowed.</p>	<p>"0"- "9", "+", "-", "E", "e", "." of Default Character Repertoire</p>	<p>16 bytes maximum</p>
<p>DT Date Time</p>	<p>The Date Time common data type. Indicates a concatenated date-time ASCII string in the format: <u>YYYYMMDDHHMMSS.FFFFFFFF&ZZZZ</u> The components of this string, from left to right, are YYYY = Year, MM = Month, DD = Day, HH = Hour, MM = Minute, SS = Second, FFFFFFFF = Fractional Second, & = "+" or "-", and ZZZZ = Hours and Minutes of offset. &ZZZZ is an optional suffix for plus/minus offset from Coordinated Universal Time. A component that is omitted from the string is termed a null component. Trailing null components of Date Time are ignored. Non-trailing null components are prohibited, given that the optional suffix is not considered as a component. Note: For reasons of backward compatibility with versions of this standard prior to V3.0, many existing DICOM Data Elements use the separate DA and TM VRs. Standard and Private Data Elements defined in the future should use DT, when appropriate, to be more compliant with ANSI HISPP MSDS.</p>	<p>"0"- "9", "+", "-", "." of Default Character Repertoire</p>	<p>26 bytes maximum</p>
<p>FL Floating Point Single</p>	<p>Single precision binary floating point number represented in IEEE 754:1985 32-bit Floating Point Number Format.</p>	<p>not applicable</p>	<p>4 bytes fixed</p>
<p>FD Floating Point Double</p>	<p>Double precision binary floating point number represented in IEEE 754:1985 64-bit Floating Point Number Format.</p>	<p>not applicable</p>	<p>8 bytes fixed</p>
<p>IS Integer String</p>	<p>A string of characters representing an Integer in base-10 (decimal), shall contain only the characters 0 - 9, with an optional leading "+" or "-". It may be padded with leading and/or trailing spaces. Embedded spaces are not allowed. The integer, n, represented shall be in the range: $-2^{31} \leq n \leq (2^{31} - 1).$</p>	<p>"0"- "9", "+", "-" of Default Character Repertoire</p>	<p>12 bytes maximum</p>
<p>LO Long String</p>	<p>A character string that may be padded with leading and/or trailing spaces. The character code 5CH (the BACKSLASH "\ " in ISO-IR 6)</p>	<p>Default Character Repertoire and/or as defined by</p>	<p>64 chars maximum (see NOTE in 6.2)</p>

	shall not be present, as it is used as the delimiter between values in multiple valued data elements. The string shall not have Control Characters except for ESC.	(0008,0005).	
LT Long Text	A character string that may contain one or more paragraphs. It may contain the Graphic Character set and the Control Characters, CR, LF, FF, and ESC. It may be padded with trailing spaces, which may be ignored, but leading spaces are considered to be significant. Data Elements with this VR shall not be multi-valued and therefore character code 5CH (the BACKSLASH “\” in ISO-IR 6) may be used.	Default Character Repertoire and/or as defined by (0008,0005).	10240 chars maximum (see NOTE in 6.2)
OB Other Byte String	A string of bytes where the encoding of the contents is specified by the negotiated Transfer Syntax. OB is a VR which is insensitive to Little/Big Endian byte ordering (see Section 7.3). The string of bytes shall be padded with a single trailing NULL byte value (00H) when necessary to achieve even length.	not applicable	see Transfer Syntax definition
OF Other Float String	A string of 32-bit IEEE 754:1985 floating point words. OF is a VR which requires byte swapping within each 32-bit word when changing between Little Endian and Big Endian byte ordering (see Section 7.3).	not applicable	2 ³² -4 maximum
OW Other Word String	A string of 16-bit words where the encoding of the contents is specified by the negotiated Transfer Syntax. OW is a VR which requires byte swapping within each word when changing between Little Endian and Big Endian byte ordering (see Section 7.3).	not applicable	see Transfer Syntax definition
PN Person Name	A character string encoded using a 5 component convention. The character code 5CH (the BACKSLASH “\” in ISO-IR 6) shall not be present, as it is used as the delimiter between values in multiple valued data elements. The string may be padded with trailing spaces. The five components in their order of occurrence are: family name complex, given name complex, middle name, name prefix, name suffix. Any of the five components may be an empty string. The component delimiter shall be the caret “^” character (5EH). Delimiters are required for interior null components. Trailing null components and their delimiters may be omitted. Multiple entries are permitted in each component and are encoded as natural text strings, in the format preferred by the named person. This conforms to the ANSI HISPP MSDS Person Name common data type. This group of five components is referred to as	Default Character Repertoire and/or as defined by (0008,0005) excluding Control Characters LF, FF, and CR but allowing Control Character ESC.	64 chars maximum per component group (see NOTE in 6.2)

	<p>a Person Name component group.</p> <p>For the purpose of writing names in ideographic characters and in phonetic characters, up to 3 groups of components (see Annex H examples 1 and 2) may be used. The delimiter for component groups shall be the equals character “=” (3DH). The three component groups of components in their order of occurrence are: a single-byte character representation, an ideographic representation, and a phonetic representation.</p> <p>Any component group may be absent, including the first component group. In this case, the person name may start with one or more “=” delimiters. Delimiters are required for interior null component groups. Trailing null component groups and their delimiters may be omitted.</p> <p>Precise semantics are defined for each component group. See section 6.2.1.</p> <p>Examples:</p> <p style="padding-left: 40px;">Rev. John Robert Quincy Adams, B.A. M.Div. “Adams^John Robert Quincy^^Rev.^B.A. M.Div.” [One family name; three given names; no middle name; one prefix; two suffixes.]</p> <p style="padding-left: 40px;">Susan Morrison-Jones, Ph.D., Chief Executive Officer “Morrison-Jones^Susan^^Ph.D., Chief Executive Officer” [Two family names; one given name; no middle name; no prefix; two suffixes.]</p> <p style="padding-left: 40px;">John Doe “Doe^John” [One family name; one given name; no middle name, prefix, or suffix. Delimiters have been omitted for the three trailing null components.]</p> <p style="padding-left: 40px;">(for examples of the encoding of Person Names using multi-byte character sets see Annex H)</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. This five component convention is also used by HL7 as defined in ASTM E-1238-91 and further specialized by the ANSI MSDS. 2. In typical American and European usage the first occurrence of “given name” would represent the “first name”. The second and subsequent occurrences of the “given name” would typically be treated as a middle name(s). The “middle name” component is retained for the purpose of backward compatibility with existing standards. 		
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	<p>3. The “Degree” component present in ASTM E-1238-91 is absorbed into the “Suffix” component.</p> <p>4. The implementor should remain mindful of earlier usage forms which represented “given names” as “first” and “middle” and that translations to and from this previous typical usage may be required.</p> <p>5. For reasons of backward compatibility with versions of this standard prior to V3.0, person names might be considered a single family name complex (single component without “^” delimiters).</p>		
SH Short String	A character string that may be padded with leading and/or trailing spaces. The character code 05CH (the BACKSLASH “\” in ISO-IR 6) shall not be present, as it is used as the delimiter between values for multiple data elements. The string shall not have Control Characters except ESC.	Default Character Repertoire and/or as defined by (0008,0005).	16 chars maximum (see NOTE in 6.2)
SL Signed Long	Signed binary integer 32 bits long in 2's complement form. Represents an integer, n, in the range: $-2^{31} \leq n \leq (2^{31} - 1).$	not applicable	4 bytes fixed
SQ Sequence of Items	Value is a Sequence of zero or more Items, as defined in Section 7.5.	not applicable (see Section 7.5)	not applicable (see Section 7.5)
SS Signed Short	Signed binary integer 16 bits long in 2's complement form. Represents an integer n in the range: $-2^{15} \leq n \leq (2^{15} - 1).$	not applicable	2 bytes fixed
ST Short Text	A character string that may contain one or more paragraphs. It may contain the Graphic Character set and the Control Characters, CR, LF, FF, and ESC. It may be padded with trailing spaces, which may be ignored, but leading spaces are considered to be significant. Data Elements with this VR shall not be multi-valued and therefore character code 5CH (the BACKSLASH “\” in ISO-IR 6) may be used.	Default Character Repertoire and/or as defined by (0008,0005).	1024 chars maximum (see NOTE in 6.2)

<p>TM Time</p>	<p>A string of characters of the format hhmmss.frac; where hh contains hours (range "00" - "23"), mm contains minutes (range "00" - "59"), ss contains seconds (range "00" - "59"), and frac contains a fractional part of a second as small as 1 millionth of a second (range "000000" - "999999"). A 24 hour clock is assumed. Midnight can be represented by only "0000" since "2400" would violate the hour range. The string may be padded with trailing spaces. Leading and embedded spaces are not allowed. One or more of the components mm, ss, or frac may be unspecified as long as every component to the right of an unspecified component is also unspecified. If frac is unspecified the preceding "." may not be included. Frac shall be held to six decimal places or less to ensure its format conforms to the ANSI HISPP MSDS Time common data type.</p> <p>Examples:</p> <ol style="list-style-type: none"> 1. "070907.0705 " represents a time of 7 hours, 9 minutes and 7.0705 seconds. 2. "1010" represents a time of 10 hours, and 10 minutes. 3. "021 " is an invalid value. <p>Notes:</p> <ol style="list-style-type: none"> 1. For reasons of backward compatibility with versions of this standard prior to V3.0, it is recommended that implementations also support a string of characters of the format hh:mm:ss.frac for this VR. 2. See also DT VR in this table. 	<p>"0"- "9", "." of Default Character Repertoire</p>	<p>16 bytes maximum</p>
<p>UI Unique Identifier (UID)</p>	<p>A character string containing a UID that is used to uniquely identify a wide variety of items. The UID is a series of numeric components separated by the period "." character. If a Value Field containing one or more UIDs is an odd number of bytes in length, the Value Field shall be padded with a single trailing NULL (00H) character to ensure that the Value Field is an even number of bytes in length. See Section 9 and Annex B for a complete specification and examples.</p>	<p>"0"- "9", "." of Default Character Repertoire</p>	<p>64 bytes maximum</p>
<p>UL Unsigned Long</p>	<p>Unsigned binary integer 32 bits long. Represents an integer n in the range:</p> $0 \leq n < 2^{32}$	<p>not applicable</p>	<p>4 bytes fixed</p>
<p>UN Unknown</p>	<p>A string of bytes where the encoding of the contents is unknown (see Section 6.2.2).</p>	<p>not applicable</p>	<p>Any length valid for any of the other DICOM Value Representations</p>

US Unsigned Short	Unsigned binary integer 16 bits long. Represents integer n in the range: $0 \leq n < 2^{16}$.	not applicable	2 bytes fixed
UT Unlimited Text	A character string that may contain one or more paragraphs. It may contain the Graphic Character set and the Control Characters, CR, LF, FF, and ESC. It may be padded with trailing spaces, which may be ignored, but leading spaces are considered to be significant. Data Elements with this VR shall not be multi-valued and therefore character code 5CH (the BACKSLASH “\” in ISO-IR 6) may be used.	Default Character Repertoire and/or as defined by (0008,0005).	$2^{32}-2$ Note: limited only by the size of the maximum unsigned integer representable in a 32 bit VL field minus one, since FFFFFFFFH is reserved.

6.2.1 Ideographic and phonetic characters in Data Elements with VR of PN

Character strings representing person names are encoded using a convention for PN value representations based on component groups with 5 components.

For the purpose of writing names in ideographic characters and in phonetic characters, up to 3 component groups may be used. The delimiter of the component group shall be the equals character “=” (3DH). The three component groups in their order of occurrence are: a single-byte representation, an ideographic representation, and a phonetic representation.

Any component group may be absent, including the first component group. In this case, the person name may start with one or more “=” delimiters. Delimiters are also required for interior null component groups. Trailing null component groups and their delimiters may be omitted.

The first component group shall be encoded using a single-byte character set with no Code Extensions. The character set shall be the one specified by the Attribute Specific Character Set (0008,0005), value 1. If Attribute Specific Character Set (0008,0005) is not present, the default Character Repertoire ISO-IR 6 shall be used.

The second group shall be used for ideographic characters. The character sets used will usually be those from Attribute Specific Character Set (0008,0005), value 2 through n, and may use ISO 2022 escapes.

The third group shall be used for phonetic characters. The character sets used shall be those from Attribute Specific Character Set (0008,0005), value 1 through n, and may use ISO 2022 escapes.

Delimiter characters “^” and “=” are taken from the character set specified by value 1 of the Attribute Specific Character Set (0008,0005). If Attribute Specific Character Set (0008,0005), value 1 is not present, the default Character Repertoire ISO-IR 6 shall be used.

At the beginning of the value of the Person Name data element, the following initial condition is assumed: if Attribute Specific Character Set (0008,0005), value 1 is not present, the default Character Repertoire ISO-IR 6 is invoked, and if the Attribute Specific Character Set (0008,0005), value 1 is present, the character set specified by value 1 of the Attribute is invoked.

At the end of the value of the Person Name data element, and before the component delimiters “^” and “=”, the character set shall be switched to the default character repertoire ISO-IR 6, if value 1 of the Attribute Specific Character Set (0008,0005) is not present. If value 1 of the Attribute Specific Character Set (0008,0005) is present, the character set shall be switched to that specified by value 1 of the Attribute.