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Prevent Culture Shock with SAS® National Language Support Formats

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ABSTRACT

Working in different cultures results in a wide variety of data presentation among different regions and languages. If you have trouble showing data that complies with local cultures or customer habits, SAS® National Language Support (NLS) formats are here for you! This paper shows you the power of NLS formats to translate SAS® output into meaningful results for users anywhere in the world. This paper demonstrates how using NLS formats in typical user scenarios gives you great usability and flexibility for your data presentation.

INTRODUCTION

SAS formats are used to display dates, numeric, or any other data in a variety of ways. Each SAS format applies a specific pattern to create a result that is meaningful in your output. It is especially important to present results correctly if people from many cultures your output are to view.

For example, if you see a date written as "11/09/18", can you tell which year and month it refers to? You might say that it's simple: The date is "November 9, 2018". This is correct if you live in America. However, people living in China think it is "September 18, 2011", and in Australia and France it is "September 11, 2018". As you see, the date is interpreted according to assumptions made by the person who sees the value.

In fact, this example is about *datestyle*—the order of year (Y), month (M), and day (D) elements displayed in a date. Datestyle is locale-sensitive. Table 1 shows how datestyles are different around the world.

Datestyle	Locale count	Locale Example (Language_Region)
DMY	104	English_Australia, French_Canada, German_Germany, Italian_Italy, Russian_Russia, Spanish_Spain
MDY	8	English_Philippines, English_UnitedStates, Persian_India
YMD	23	Chinese_China, Hungarian_Hungary, Japanese_Japan, Korean_SouthKorea, Polish_Poland ,Swedish_Sweden

Table 1. Datestyle for Locales that SAS Supports

Another example where cultural diversity might get you into trouble is monetary data presentation. Each territory or country usually has its own currency symbol. Some currency symbols are not familiar to people, such as the Vietnamese Dong (₫). The position of a currency symbol also varies. Some symbols are displayed before the numbers, and others are displayed after. Furthermore, some locales require an extra space between the number and the currency symbol.

The problem is challenging. How can you provide data presentation for all these cultural scenarios without making your SAS code complicated? The SAS® National Language Support formats, NLS, or NL, formats, are right here to serve you!

The NL formats cover a wide range of data categories, including time, date, time zone, number, currency, and percentage. Each category of NL formats also provides rich functionality combinations to help your products bridge the culture gap.

USING NL FORMATS TO PREVENT CULTURE SHOCK

Basic SAS data processing flow includes data access, management, presentation, and analysis. NL formats play on the stage of data presentation. They are your key to accurate international presentation of data.

NATIVE EXPRESSIONS FOR TARGET LOCALE

Still in use today, the original SAS formats display results that are appropriate for users who are in the United States. However, those can create results using only a single pattern. They cannot compensate for cultural requirements.

NL formats are the bridge between numbers and the changing forms of culture, so we will look at how you can use NL formats to internationalize your SAS programs.

Sample 1 is a report that is generated without NL formats. The content of the report does not change, no matter what SAS LOCALE is specified. This is not a good customer experience and might be misleading.

```
proc print data = sashelp.retail;
  format SALES dollar.
         DATE.;
run;
```

The SAS System

Obs	SALES	DATE	YEAR	MONTH	DAY
1	$220	01JAN80	1980	1	1
2	$257	01APR80	1980	4	1
3	$258	01JUL80	1980	7	1

Sample 1. PROC PRINT without NL Formats

The previous report could be presented for customers in any region by clearly indicating the currency for SALES and providing native date presentation for the DATE column. The change is significant using NL formats.

```
option locale = Spanish_Mexico;
proc print data = sashelp.retail;
format SALES nlmnlusd.
       DATE  nldate.;
run;
```

Sistema SAS

Obs	SALES	DATE	YEAR	MONTH	DAY
1	220 US$	01 de enero de 1980	1980	1	1
2	257 US$	01 de abril de 1980	1980	4	1
3	258 US$	01 de julio de 1980	1980	7	1

Sample 2. NL Formats for Spanish_Mexico Locale

Compared with the code in Sample 1, you can see that the NLMNLUSD and NLDATE format replace DOLLAR and DATE. These two NL formats automatically generate the corresponding localized output according to the Spanish_Mexico locale. But you can execute this SAS program for other countries and no extra code modification is needed. The output of formats automatically changes according to the current locale. Sample 3 shows the result when locale is set to French_France, Korean_SouthKorea, and Vietnamese_Vietnam respectively.

Obs.	SALES	DATE	YEAR	MONTH	DAY
1	220 US$	01 janvier 1980	1980	1	1
2	257 US$	01 avril 1980			
3	258 US$	01 juillet 1980			

OBS	SALES	DATE	YEAR	MONTH	DAY
1	US$220	1980년 01월 01일	1980	1	1
2	US$257	1980년 04월 01일			
3	US$258	1980년 07월 01일			

Obs	SALES	DATE	YEAR	MONTH	DAY
1	220 US$	01 tháng một 1980	1980	1	1
2	257 US$	01 tháng tư 1980	1980	4	1
3	258 US$	01 tháng bảy 1980	1980	7	1

Sample 3. NL Formats for Different Locales

MEET YOUR NEEDS FOR MONETARY EXPRESSION

NLMNY format is a universal format for monetary presentation that is based on the current SAS LOCALE option. NLMNY sets the appropriate currency symbol and complies with the local habit of digital expression for the numbers. For example, NLMNY is used in this code segment:

```
data test;
   infile datalines;
   input sales 1-10;
    datalines;
    123456.789
   -123456.789
   ;
run;
proc print data = test;
   format sales nlmny.;
run;
```

Sample 4 shows the output of the SAS code using some randomly selected locales. In addition to the currency symbol and its position, you can see that the symbol that is used for the grouping separator and decimal point is also adapted for the specified locale. For example, the United State uses comma as the grouping symbol, and France uses a space. Also, the dot and comma are used as separator characters for both South Korea and Vietnam, but the usage of each character is swapped in the two regions.

English_UnitedStates

Obs	sales
1	$123,456.700
2	($123,456.000)

French_France

Obs.	sales
1	123 456,700 €
2	-123 456,000 €

Korean_SouthKorea

OBS	sales
1	₩123,456.700
2	-₩123,456.000

Vietnamese_Vietnam

Obs	sales
1	123.456,700 ₫
2	-123.456,000 ₫

Sample 4. Output with NLMNY for Different Locales

NLMNY uses local currency symbols, and NLMNYI writes the monetary format using an international expression. Currency is represented by the 3-letter ISO international currency code instead of the local currency symbol. Sample 5 shows the results for the same set of locales when the NLMNY format is replaced with NLMNYI in the previous code.

English_UnitedStates

Obs	sales
1	USD123,456.700
2	(USD123,456.000)

French_France

Obs.	sales
1	123 456,700 EUR
2	-123 456,000 EUR

Korean_SouthKorea

OBS	sales
1	KRW123,456.700
2	-KRW123,456.000

Vietnamese_Vietnam

Obs	sales
1	123.456,700 VND
2	-123.456,000 VND

Sample 5. Output with NLNMYI for Different Locales

The preceding examples demonstrate the NL monetary formats that switch the currency symbol according to the SAS LOCALE. Now you might want to know whether you can show different currencies simultaneously. This is a common financial reporting requirement. The answer is YES! The NLMNI<XXX> and NLMNL<XXX> series of formats are the solution. NLMNL formats creates outputs with the local currency symbol and NLMNI is for international currency expression. The <XXX> included in the format name is the 3-lettered ISO currency code that specifies the currency that you need. This example shows how NLMNI<XXX> works for multicurrency in a single locale.

```
option locale = English_UnitedStates;
data product;
  infile datalines;
  input product $ 1-20 price 22-25;
  datalines;
  WOW tortilla chips 2.49
  Buttery popcorn    1.99
  pepper sticks      1.49
  ;
run;
/* Converts the price with exchange rate against dollar */
data convert;
   set product;
   price_au = price*1.3753;/* 1 USD = 1.3753 AUD */
   price_zh = price*6.9418;/* 1 USD = 6.9418 CNY */
   price_jp = price*112.49;/* 1 USD = 112.49 JPY */
   price_eu = price*0.873; /* 1 USD = 0.873  EUR */
   price_hu = price*277.81;/* 1 USD = 277.81 HUF */
   price_uk = price*0.7778;/* 1 USD = 0.7778 GBP */
   format price    nlmnlusd.2
          price_au nlmnlaud.2
          price_zh nlmnlcny.2
          price_jp nlmnljpy.2
          price_eu nlmnleur.2
          price_hu nlmnlhuf.2
          price_uk nlmnlgbp.2;
run;
proc print data = convert label;
   Label price = "US dollars"
       Price_au= "Australian dollar"
       Price_zh= "Renminbi"
       Price_jp= "yen"
       Price_eu= "Euro"
       Price_hu= "Hungarian Forint"
       Price_uk= "pound";
run;
```

The SAS System

Obs	product	US dollars	Australian dollar	Renminbi	yen	Euro	Hungarian Forint	pound
1	WOW tortilla chips	US$2.49	AU$3.42	RMB17.29	¥280.10	€2.17	Ft691.75	£1.94
2	Buttery popcorn	US$1.99	AU$2.74	RMB13.81	¥223.86	€1.74	Ft552.84	£1.55
3	pepper sticks	US$1.49	AU$2.05	RMB10.34	¥167.61	€1.30	Ft413.94	£1.16

Sample 6. NLMNL<XXX> for English_UnitedStates Locale

In Sample 6, the locale setting is English_UnitedStates. The prices of each product are displayed simultaneously with different local currency symbols for the US, Australia, China, Japan, European Union, Hungary, and Great Britain. Similarly, you can also use the NLMNI<XXX> formats instead of NLMNL<XXX> to display currency with ISO international currency codes. The result is shown below in Sample 7.

The SAS System

Obs	product	US dollars	Australian dollar	Renminbi	yen	Euro	Hungarian Forint	pound
1	WOW tortilla chips	USD2.49	AUD3.42	CNY17.29	JPY280.10	EUR2.17	HUF691.75	GBP1.94
2	Buttery popcorn	USD1.99	AUD2.74	CNY13.81	JPY223.86	EUR1.74	HUF552.84	GBP1.55
3	pepper sticks	USD1.49	AUD2.05	CNY10.34	JPY167.61	EUR1.30	HUF413.94	GBP1.16

Sample 7. NLMNI<XXX> for English_UnitedStates Locale

RICH COMBINATIONS FOR DATE AND TIME

Date and time data contain many pieces with various possibilities for present different combinations of elements. Sometimes you need detailed information of date, time, and even week and time zone information. Here is an example.

Friday, January 1, 1960 05:58:41 AM -0500

vendredi 1 janvier 1960 05:59:15 -0500

1960 年 1 月 1 日 星期五 上午 05 时 59 分 15 秒 -0500

1960 년 1 월 1 일 금요일 오전 05 시 59 분 15 초 -0500

วันศุกร์ที่ 1 มกราคม G 1960, 05 นาฬิกา 59 นาที 54 วินาที -0500

Sometimes you just want concise information of year and month—for example:

Jan 1960

janv. 1960

60 年 01 月

60 년 01 월

มกราคม 1960

SAS offers abundant NL formats to present date and time data, supporting dozens of information combinations. The following table shows some of the combinations that are possible when formatting the date, time, or datetime values using NL formats.

Note: Most NL formats are locale-sensitive. Depending on the locale, the output from the format might be much more complicated than what you see in Table 2 below.

Date and Time Output Elements Combinations	NL formats			Sample (locale = English_UnitedStates)
	Date	Datetime	Time	
Year+month+day	NLDATE NLDATEL NLDATEM NLDATES	NLDATMDT		December 23, 2018 Dec 23, 2018 12/23/2018
Year+month+day+week name	NLDATEW			Sunday, December 23, 2018 Sun, Dec 23, 2018
Year+month+day+time		NLDATM NLDATML NLDATMM NLDATMS		January 1, 1960 05:59:01 AM Jan 1, 1960 05:59:01 AM 01Jan1960:05:59:01 01/01/1960 05:59:01
Year+month+day+time+timezone		NLDATMZ		01Jan1960:05:59:01 -0500 01/01/60 05:59 -0500 01/01/60 05 -0500
Year+month+day+time+week name		NLDATMW		Friday, January 1, 1960 05:59:01 AM Fri, Jan 1, 1960 05:59:01 AM
Year+month+day+time+week name+timezone		NLDATMWZ		Friday, January 1, 1960 05:59:01 AM -0500 Fri, Jan 1, 1960 05:59:01 AM -0500
year+month	NLDATEYM NLDATEYML NLDATEYMM NLDATEYMS	NLDATMYM NLDATMYML NLDATMYMM NLDATMYMS		December 201 Dec 2018 12/2018
Year+quarter	NLDATEYQ NLDATEYQL NLDATEYQM NLDATEYQS	NLDATMYQ NLDATMYQL NLDATMYQM NLDATMYQS		4th quarter 2018 Q4 2018 2018/4
Year+week number	NLDATEYW YYWEEKU/V/W	NLDATMYW		Week 51 2018 2018W51 18W51
year+week number+day number in the week	WEEKU/V/W			2018-W51-01 2018W5101
year+week number+day number in the week+time		DTWEEKV		1959-W53-05:05:59:01 1959W5305:05:59:01 1959W5305:05:59 1959W5305:05
Month+day	NLDATEMD NLDATEMDL NLDATEMDM NLDATEMDS	NLDATMMD NLDATMMDL NLDATMMDM NLDATMMDS		December 23 Dec 23 12/23
Year	NLDATEYR	NLDATMYR		2018 18
Week name	NLDATEWN	NLDATMWN		Sunday Sun
Month name	NLDATEMN	NLDATMMN		December Dec
Time (24)		NLDATMTM	NLTIME	05:59:01
Time (12)+am/pm		NLDATMAP	NLTIMAP	January 1, 1960 05:59:01 AM 01/01/1960 05:59:01 AM
Time+timezone		NLDATMTZ		05:59:01 -0500

Table 2. NL Date, Datetime, and Time Formats

NL FORMATS NAMING RULE

SAS provides more than one hundred NL formats. The NL formats naming convention can help you easily find the format needed, as natural as phonics. Here is the structure of NL formats name:

Prefix + Category[+Subcategory] [+Postfix]

1. Most NL formats names start with prefix "NL", which means that all locales are supported. But there are also locale-specific formats such as those Japanese series starting with "J" and locale insensitive formats such as "YY/DT" series for week number.
2. The category provides a hint about the data type to format. The subcategory is for additional description. Table 3 lists the most commonly used category and subcategories.

Component	Value	Description	Sample Format
Category	MNY	monetary	NLMNY
	NUM	numeric	NLNUM
	PCT	percentage	NLPCT
	DATE	date	NLDATE
	DATM	datetime	NLDATM
	TIME	time	NLTIME
Subcategory	**I**	use ISO currency symbol for current locale	NLMNYI
	MN/WN	month name/week name	NLDATEMN NLDATMWN
	W	year+month+day+week name	NLDATEW
	YM/YQ/YR	year+month / year+quarter / year	NLDATMYR

Table 3. Frequently Used Category and Subcategory

3. The postfix often indicates some special handling for the format. For example, a postfix of L, M, or S indicates that the value is formatted using the long, medium, or short expression for the current locale, respectively. Z indicates that time zone information is included.

Example

If you want to find a format that could generate this output:

Friday, January 1, 1960 12:20:34 AM -0500

you can derive the NL format name like this:

1. You want a National Language format that support all locales. This leads to prefix "NL".
2. You would like to get datetime output, so the category should be "DATM".
3. In addition to the regular year, month, day, and time, the output needs to include week name (subcategory "W") and time zone (postfix "Z") information.

Put the requirements as follows:

Support all locales	**Da**te + **tim**e	**W**eek name	time**Z**one
↓	↓	↓	↓
Prefix	Category	Category2	postfix
NL	**DATM**	**W**	**Z**

Sample 8. Find NLDATMWZ by Output Request

Now combine the fields from the last line, and you can find the desired NL format, NLDATMWZ. Please see all existing naming components in appendix Reference 1. Naming Components for National Language Formats.

IN-DEPTH UNDERSTANDING FOR FLEXIBLE USAGE

Now that you understand how to select your NL formats, we will look inside. This section shows you the working mechanism of NL formats and shares some helpful tips for using them in your SAS programs.

POWERFUL LOCALE DATA BACKGROUND

The formatting process is based on *patterns*. A *pattern* is the rule that normalizes the behavior of the formatter. In the sample Java code below, the pattern "*dd-MMM-yy*" is provided as a parameter for the format object.

```
DateFormat format = new SimpleDateFormat ("dd-MMM-yy");
```

The directives in the pattern string indicate the data category and presentation. "MMM" specifies that month is represented as text. For example, in English, "July" would be displayed as "Jul". This mechanism is very convenient. You can customize any output by specifying the corresponding pattern string. However, a fixed pattern does not meet the expectations of customers everywhere. The formatted output might not be acceptable in places where cultural habits are quite different.

SAS NL formats work differently than those in Java because they rely on the SAS Locale repository. The embedded repository contains all format patterns and native resources that are used in every region. NL formats are a set of programs for formatting and also a system that binds a wealth of cultural information. When you use an NL format, you do not need to specify a pattern because the SAS Locale Repository already knows all patterns for all locales that SAS supports, and it also knows more comprehensively and specifically. This powerful locale data background is the most essential character of NL formats.

MAGIC IN WIDTH, PATTERN, AND FORMATTING

SAS NL formats require a *width* to indicate the length of the returned result. If you do not explicitly specify a width, a default width is used.

NL formats always try to use the best local characters for perfect native data presentation within the specified space. This principle implies that each NL format is bound to a set of patterns. Each pattern has its own weight or priority. NL formats automatically match the best pattern for the specified width. Once you know the weight rule, you can get the most desirable presentation by setting the proper width.

Table 4 demonstrates the rule for date, time, and datetime formatting for the English_UnitedStates locale.

Format Width	Output	Width Adaptation
18	November 26, 2018	Long pattern with local characters
16	Nov 26, 2018	Short pattern with local characters
11	11/26/2018	Try the pattern that do not have local character: 2-digit month + separator + 2-digit day + separator + 4-digit year
8	11/26/18	Losing year digits: 2-digit month + separator + 2-digit day + separator + 2-digit year
6	112618	Losing separators: 2-digit month + 2-digit day + 2-digit year
5	11/26	Losing trailing year information: 2-digit month + separator + 2-digit day
4	1126	Losing separator: 2-digit month + 2-digit day
3	11	Losing trailing day information： 2-digit month

Table 4. Width Adaptation for Date String

The monetary and numeric series of NL formats automatically adjust the precision according to the format width. Table 5 shows how monetary output changes of varying width and decimal values when using NLMNY to format the number 12345.6789 for the Chinese_Singapore locale.

Width.Decimal	Output	Width Adaptation
13.4	S$12,345.6789	Currency + grouping separator + 4-digit decimal
12.4	S$12345.6789	Losing grouping separator
11.4	S$12345.679	Reduce decimal accuracy by round up
10.4	S$12345.68	Reduce decimal accuracy by round up
9.4	S$12345.7	Reduce decimal accuracy by round up
8.4	S$12346	Remove decimal part
6.4	S$12E3	Use science notation
5.4	S$1E4	Reduce science accuracy by round up
4.3	****	Width is too short

Table 5. Width Adaptation for Money Presentation

TYPOGRAPHY OPTIONS

NL formats attempt to make full use of the space and produce the best native rendering possible. Sometimes for typography purposes, especially in case of massive amounts of data, you might want to use a special modifier option on the NL Format that you use. The example below shows output from NLDATE for the English_UnitedSates locale.

```
options locale = English_UnitedStates;
data dval;
infile datalines;
```

```
    input date mmddyy8.;
    datalines;
    01/25/02
    02/25/02
    03/24/02
    04/25/02
    05/25/02
    06/24/02
    07/25/02
    08/25/02
    09/24/02
    10/25/02
    11/25/02
    12/24/02
    ;
    run;
    proc print data = dval;
      format date nldate17.;
run;
```

Obs	date
1	January 25, 2002
2	February 25, 2002
3	March 24, 2002
4	April 25, 2002
5	May 25, 2002
6	June 24, 2002
7	July 25, 2002
8	August 25, 2002
9	09/24/2002
10	October 25, 2002
11	November 25, 2002
12	December 24, 2002

Sample 9. NLDATE for English_UnitedStates Locale

With a fixed width of 17, you can see that the format of the date value in the ninth observation differs from the others. This occurs because the format length is not long enough to display the month name, "September", and the other elements of the date value. The NLDATE format selected a shorter pattern so that all elements can be displayed.

The NL uniform series of formats are designed to assist with scenarios such as this. The format names of the uniform formats end with L, which uses a long pattern, M for a medium length pattern, or S for short pattern. Before you try to make full use of format length, the uniform formats first ensure a consistent layout. They precalculate and predict all possible output lengths before determining the most appropriate pattern to use.

The examples below show results from the previous code where NLDATE was replaced with NLDATEL, NLDATEM, and NLDATES.

NLDATEL.

Obs	date
1	January 25, 2002
2	February 25, 2002
3	March 24, 2002
4	April 25, 2002
5	May 25, 2002
6	June 24, 2002
7	July 25, 2002
8	August 25, 2002
9	September 24, 2002
10	October 25, 2002
11	November 25, 2002
12	December 24, 2002

NLDATEM.

Obs	date
1	Jan 25, 2002
2	Feb 25, 2002
3	Mar 24, 2002
4	Apr 25, 2002
5	May 25, 2002
6	Jun 24, 2002
7	Jul 25, 2002
8	Aug 25, 2002
9	Sep 24, 2002
10	Oct 25, 2002
11	Nov 25, 2002
12	Dec 24, 2002

NLDATES.

Obs	date
1	01/25/2002
2	02/25/2002
3	03/24/2002
4	04/25/2002
5	05/25/2002
6	06/24/2002
7	07/25/2002
8	08/25/2002
9	09/24/2002
10	10/25/2002
11	11/25/2002
12	12/24/2002

Sample 10. NLDATEL/M/S for English_UnitedStates Locale

The NL format uniform series selects the appropriate pattern to be sure that all data is presented in the same style within the specified width.

CONCLUSION

SAS NL formats cover a wide variety of data categories and provide a rich set of features. Using NL formats let you write your code once while addressing culture diversity in data presentation. The simple NL formats naming rules can help you easily find the NL format that works best for your presentation needs. The internal design of NL formats is rigorous and logically smart. NL formats can save time and energy by addressing cultural details and also leaving space for flexible usage.

APPENDIX

NAMING COMPONENTS FOR NATIONAL LANGUAGE FORMATS

Prefix	Category	Subcategory	Postfix	Sample Format
NL Support all SAS locales	**MNY** monetary	-	-	NLMNY
		I Use ISO currency symbol	-	NLMNYI
	NUM numeric	- Use local grouping separator and decimal symbol	-	NLNUM
		I Use internationalized grouping separator “, ” and decimal symbol“.”	-	NLNUMI
	PCT percentage	- Use local grouping separator and decimal symbol	-	NLPCT
		I Use internationalized grouping separator “, ” and decimal symbol“.”	-	NLPCTI
	MNI Specified currency. Use ISO currency symbol.	**ISO** ISO international currency symbol name. You can find a detailed list in the SAS online document.	-	NLMNIUSD,
	MNL Specified currency. Use local currency symbol.	**ISO** ISO international currency symbol name. You can find a detailed list in the SAS online document.	-	NLMNLUSD,
	DATE date	- year+month+day	**-/L/M/S** traditional/Uniform series	NLDATE NLDATEL
		MD month+day	**-/L/M/S** traditional/Uniform series	NLDATEMD NLDATEMDM
		MN month name	-	NLDATEMN

		W year+month+day+week name	-	NLDATEW
		WN week name	-	NLDATEWN
		YM/YQ year+month/year+quarter	**-/L/M/S** traditional/Uniform series	NLDATEYM NLDATEYQS
		YR year	-	NLDATEYR
	DATM date+time	- year+month+day+time	**-/L/M/S/Z** traditional/Uniform series/timezone	NLDATM NLDATML
		MD month+day	**-/L/M/S** traditional/Uniform series	NLDATMMD NLDATEMMDM
		W year+month+day+time+ week name	**-/Z** no timezone/timezone	NLDATMWZ
		WN week name	-	NLDATMWN
		YM/YQ year+month/year+quarter	**-/L/M/S** traditional/Uniform series	NLDATMYQ NLDATMYQM
		YR year	-	NLDATMYR
		TM time	**-/Z** no timezone/timezone	NLDATMTM
		DT year+month+day	-	NLDATMDT
		AP time+am/pm	-	NLDATMAP
	TIM time	**E** time	-	NLTIIME
		AP time+an/pm	-	NLTIMAP
	STR string	**MON/WK/QTR** month name/weekday name/quarter string	-	NLSTRMON
J special Japanese locale	**DATE** date+time	**MD** month+day	**-/W** half width/full width	JDATEMD
		MON/MN month no/have postfix	**-/W** half width/full width	JDATEMON JDATEMNW
		WK week	-	JATEWK
		YM year+month	**-/W** half width/full width	JDATEYM
		YMD/YD year+month+day no/have postfix	**-/W** half width/full width	JDATEYMD JDATEYDW
		QTR/QR quarter no/have postfix	**-/W** half width/full width	JDATEQTR JDATEQRW
		SEM/SM semester no/have postfix	**-/W** half width/full width	JDATESEM JDATESMW
		YT year+month+day+time	**-/W** half width/full width	JDATEYT
	NENGO calendar era +date +time	**-** year+month+day	**-/W** half width/full width	JNENGO JNENGOW
		T year+month+day+time	**-/W** half width/full width	JENNGOT JNENGOTW
	TIME time	**H** hour	**-/W** half width/full width	JTIMEH
		HM/M hour+minute no/have postfix	**-/W** half width/full width	JTIMEHM JTIMEMW

		HMS/S hour+minute+second no/have postfix	**-/W** half width/full width	JTIMEHMS JTIMESW
YY/DT locale no diff	**WEEK** week number	**U/V/W** Different algorithm for start of week	-	YYWEEKU

Reference 1. Naming Components for National Language Formats

REFERENCES

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RECOMMENDED READING

- *SAS® 9.4 National Language Support (NLS): Reference Guide, Fifth Edition*

SAS Institute Inc. 2018. "Values for the LOCALE= System Option" in *SAS® 9.4 National Language Support (NLS): Reference Guide, Fifth Edition*. Cary, NC: SAS Institute Inc. Available http://support.sas.com.

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