

VIEWS

International SAS Programmer Community



News, Hints, Tips and Information for SAS® Users

Issue 42, 2nd Quarter 2008

There are a number of SAS-related events over the next few months, including 2 PhUSE Single Day Events in Switzerland and London where I will be presenting and will be very happy to meet any VIEWS members there. I have a number of articles from familiar sources again in this issue of *VIEWS News*: including some advice on adding extra features to SAS emails from LeRoy Bessler, and some tips on using regular expressions from the Amadeus Software Consultancy Team. Along with our regular sections, including some new and updated SAS 9.2 Formats, Options, and Functions, I hope you will find them all interesting and helpful.

If you would like to contribute an article, or discuss the possibility of doing so, please send an email to me at newsletter@views-uk.org. A list of possible subjects for your articles can be found on the *VIEWS* web site, and anyone is very welcome to add to that list by sending emails with your own questions to newsletter@views-uk.org.

Philip R Holland (Newsletter Editor)

Membership of *VIEWS* is **free** and you can register for notification of all future *VIEWS* events by emailing us at membership@views-uk.org, making certain you include your name and postal address. If you would like to receive email notification whenever a new issue of the free quarterly *VIEWS News* is published on the web site, please remember to also include your email address.

Did You Know?

If you have a useful hint or tip, please send it to the Editor, and share it with the *VIEWS* membership.

The Power To Email . . . with SAS Software

[SAS 9] In *VIEWS News* issue 39, I demonstrated how to send graphs as email attachments. Though those graphs were designed for a Blackberry, iPhone or other small screen, graphs of any size can be emailed by SAS as attachments. At this time, it remains impossible to embed a SAS/GRAPH image in the body of an email.

However, it is possible to embed tabular output, and to display linked images, including animated GIFs, about which I have written in the past, in the body of a SAS-sent email, by adding `CONTENT_TYPE="text/html"` to the `FILENAME` statement for the SAS email engine. With a plain text SAS email, you can include hyperlink(s) to let recipients click to anything on the LAN or on a web server, whereas an HTML-formatted SAS email lets you deliver a tabular report directly.

If you supplement the tabular report with a logo, or some other image, those image files must be on the LAN or on a web server. When the email delivery format is HTML, you can also include audio clips. Such audio files, too, must be on the LAN or on a web server.

With the `MAILTO` and `SUBJECT` parameters of HTML, email recipients with a simple click can open a blank email window that has the `TO:` and `SUBJECT:` slots preloaded with content of your choice. Among other things, `MAILTO` also lets you supply body text for the email.

Below is a picture of an example SAS-generated email:

Demo SAS Email Capabilities - Message (HTML)

File Edit View Insert Format Tools Actions Help

From: Le_Roy_Bessler Sent: Tue 5/13/2008 5:22 PM
To: Bessler, LeRoy
Cc:
Subject: Demo SAS Email Capabilities

Demo of SAS Email of PROC PRINT
Limited to one row of SASHELP.CLASS
Images above and (with link) below
Accompanied by an audio clip duet
Bottom Link uses MAILTO & SUBJECT



Name	Sex	Age	Height	Weight
Carol	F	14	62.8	102.5



Click above for graphic email article
[Click to request graphic email paper](#)

Here is the code used to send the above email:

```
%let Path1 =
  http://webpages.charter.net/wiillsu;
%let Path2 =
  http://www.views-uk.demon.co.uk/Newsletter;

filename anyname EMAIL
  FROM = 'Le_Roy_Bessler@wi.rr.com'
  SENDER = 'Le_Roy_Bessler@wi.rr.com'
  REPLYTO = 'bessler@execpc.com'
  TO = ('LeRoy.Bessler@assurant.com')
  SUBJECT = "Demo SAS Email Capabilities"
  CONTENT_TYPE = "text/html";

ODS NORESULTS;
ODS LISTING CLOSE;
ODS HTML BODY = anyname STYLE = styles.Minimal;

OPTIONS NOCENTER;
TITLE1 FONT = 'Verdana/Bold'
  "Demo of SAS Email of PROC PRINT"
J=L FONT = 'Verdana/Bold'
  "Limited to one row of SASHELP.CLASS"
J=L FONT = 'Verdana/Bold'
  "Images above and (with link) below"
J=L FONT = 'Verdana/Bold'
  "Accompanied by an audio clip duet"
J=L FONT = 'Verdana/Bold'
  "Bottom Link uses MAILTO & SUBJECT";

PROC PRINT DATA = sashelp.class LABEL NOOBS
  STYLE = [PREHTML = %UNQUOTE(%STR(%))
    
    <bgsound
  src="&Path1./welcome_male_voice.wav"
  loop=1>
    <bgsound
  src="&Path1./welcome_female_voice.wav"
  loop=1>
    %STR(%))
  POSTHTML = %UNQUOTE(%STR(%))
    <a href="&Path2./issue39.pdf">
    </a>
    <br>
    <font face="Verdana,Arial,Helvetica">
    <strong>
      Click above for graphic email article
    </strong>
    </font>
    <br>
    <a href="mailto:Le_Roy_Bessler@wi.rr.com?
  subject=Please send me the Extreme
  SAS/GRAPH paper">
    <font face = "Verdana,Arial,Helvetica">
    <strong>
      Click to request graphic email paper
    </strong>
    </font>
    </a>%STR(%))
  ];
WHERE Name EQ 'Carol';
RUN;

ODS HTML CLOSE;
```

The %UNQUOTE() function and the pair of %STR(%) alternatives to the standard single quote marks are needed in

order to be able to resolve the macro variables inside the mandatory double quote marks, which are nested within single quote marks.

At some future date, CONTENT_TYPE="image/gif" might work, and then you will be able to use SAS/GRAPH procedures just as the non-SAS/GRAPH procedure is used above.

For more about SAS email, please see Erik W. Tilanus's SAS Global Forum 2008 paper:

www2.sas.com/proceedings/forum2008/038-2008.pdf

For SAS-provided documentation, please see Online Doc:

support.sas.com/onlinedoc/913/getDoc/en/lrdict.hlp/a002058232.htm

For syntax for the HTML MAILTO command, see, e.g.:

www.ianr.unl.edu/internet/mailto.html

For more about using images in HTML, see my SUGI 28 paper:

www2.sas.com/proceedings/sugi28/013-28.pdf

If you would like display a video in an email, you should be able to adapt code from my SUGI 31 paper:

www2.sas.com/proceedings/sugi31/090-31.pdf

LeRoy Bessler, Assurant Health

PRX 1: Postcode validation

[SAS 9] Here is a program demonstrating the use of the PRX functions to validate postcodes. It is not sophisticated enough for use in production applications, but you may find it a useful base to build on.

```
DATA TEST;
  LENGTH inpc $12;
  RETAIN rx;
  INFILE DATALINES EOF = free;
  INPUT inpc $ 1-12;
  IF _N_ = 1 THEN
    rx = PRXPARSE("/^((([A-Z]\d)
      || "([A-Z]\d{2})"
      || "([A-Z]{2}\d)"
      || "([A-Z]{2}\d{2})"
      || "([A-Z]\d[A-Z])"
      || "([A-Z]{2}\d[A-Z])"
      || "\d[A-Z]{2}$)/");
  pos = PRXMATCH(rx, TRIM(UPCASE(inpc)));
  IF pos > 0 THEN PUT inpc " is valid.";
  ELSE PUT inpc " is invalid.";

  RETURN;
  free: CALL PRXFREE(rx);
  DATALINES;
OX29 9PG
....
```

First we use the PRXPARSE() function to parse a regular expression, which we store in variable rx. Then we use the PRXMATCH() function to see which of our input strings match rx. Note that we parse the expression once only, and when we hit end-of-file we use CALL PRXFREE() to release the memory it used. It's all very straightforward, apart of course from understanding that rather intimidating regular expression, which is here split into 7 sub-strings, purely for the sake of readability. But don't panic...

- The “/” characters just mark the beginning and end of the expression.
- “^” denotes the beginning of the input string, and “\$” the end of it. These are called “anchors”. Because we have used “\$”, we need to use the TRIM() function later.

- The first 6 sub-strings together contain, in brackets, a list of six alternatives for the first part of the postcode, the “outward code”. The “[|” character means “or”. Each of the six alternatives has its own set of brackets.
- The 1st alternative is “([A-Z]\d)”, which means “one letter followed by one digit”.
- The 6th is “([A-Z]{2}\d[A-Z])”, which means “two letters followed by a digit and a letter”.
- The 7th sub-string specifies a space followed by a digit and two letters, i.e. the second part of the postcode, the “inward code”.

The output from our program tells us:

```
OX29 9PG is valid.
W1A 1AA is valid.
pe69bd is invalid.
RG126HE is invalid.
bs7 is invalid.
ip1 3bh is invalid.
XY7 3ZZ is valid.
GIR 0AA is invalid.
FIQQ 1ZZ is invalid.
BFPO 324 is invalid.
SAN TA is invalid.
NOTE: The data set WORK.TEST has 11
observations and 3 variables.
```

Some of our postcodes have been rejected because they do not contain a space in the middle, and one of them because it has too many spaces. “XY7 3ZZ” has been accepted, since it is correctly formatted and our program is not clever enough to know that there is no such post town as “XY”. The last four have been rejected, despite being valid, but they are all unusual types of postcode: Girobank, Falkland Islands, British Forces and Father Christmas! More detailed validation of the six standard types is also possible, since certain letters can never occur in certain positions. Enhancing the program to address all these issues is left as an exercise for the reader.

Amadeus Software Consultancy Team

PRX 2: Wild characters, escaping, character classes

[SAS 9] In *PRX 1: Postcode validation* (above) the “postcodes” example with the PRX functions made frequent use of “\d” to specify a single digit, and “[A-Z]” to indicate a single (upper case) letter. These are both examples of *character classes*. “[A-Z]” is a user-defined character class; “\d” is a pre-defined one. *Character class* is the standard Perl terminology, no longer used in the SAS documentation.

PRX stands for “Perl Regular eXpression”, and the Perl language comes from the wonderful world of UNIX, where lower case is good and upper case is quite different. You should not therefore be very surprised to learn that, while “\d” indicates a digit, “\D” indicates “any character other than a digit”.

Other classes that can be specified using similar syntax are:

- “\w” indicates a “word character” i.e. a-z, A-Z, 0-9 or underscore.
- “\W” any character other than a “word character”.
- “\s” indicates a “white space” character: space, tab, LF, FF, etc.
- “\S” any character other than white space.
- “\t” indicates a tab character.

User-defined character classes can be specified by putting a list of characters between square brackets. “-” can be used to indicate a range, and “^” for negation, though only if it is the first character within the square brackets.

You also need to know that “\” can be used anywhere within a regular expression as an “escape” character, to prevent the next character from having any special effect. Within square brackets, there are only 5 characters that have special effects; these are “[^\$-\\”.

Here are some examples of user-defined character classes using all of these features:

- “[aeiou]” matches any lower-case vowel.
- “[A-E?!d]” matches any of 5 upper case letters, question mark, exclamation mark, or any digit.
- “[^XYZ]” matches any character other than upper case X, Y or Z.
- “[^XYZ]” or “[X^YZ]” matches “^”, X, Y or Z.
- “[A-Z\\W]” matches A, “-”, Z, “\”, “/” or “[”.

Recall incidentally that we have already seen “^” used as an “anchor” denoting the beginning of the input string. We should not be confused by this character having a quite different meaning when found between square brackets.

One more easy piece of syntax before we give an example of all this: “.” is the “wild character”, denoting any single character. Formally speaking, it is a character class that matches any character except “new line”.

```
DATA TEST;
  LENGTH instr $40;
  RETAIN rx;
  INFILE DATALINES EOF = free;
  INPUT instr $ 1-40;
  IF _N_ = 1 THEN
    rx = PRXPARSE("/^[aeiou][A-E?!d]"
      || "\s[A-Z\\W\\W].\w/");
  pos = PRXMATCH(rx, instr);
  IF pos > 0 THEN PUT "Valid string: " instr;
    ELSE PUT "Invalid string: " instr;
  RETURN;
  free: CALL PRXFREE(rx);
  DATALINES;
aA AAA Should be valid.
bA A A Invalid first character.
a? A@A Should be valid.
a9 A&A Should be valid.
a- AAA Invalid second character.
aA-AAA Invalid third character.
aA -&A Should be valid.
aA ]%A Should be valid.
aA [AA Invalid fourth character.
aA A>_ Should be valid.
aA A>- Invalid sixth character.
RUN;
```

This program above uses 3 of the user-defined classes we considered earlier, together with “\s”, “\w” and “.”. Our regular expression uses “^” to anchor to the beginning of the input string, but this time we have not used “\$” to anchor to the end of the input string. The effect of this is that we are checking the first 6 characters of the input string, but don’t care about the rest. In our test data, what comes later is text describing the verdict we expect on the first 6 characters. In every case, we are right!

Amadeus Software Consultancy Team

Formats, Options, and Functions

This section is devoted to the description of useful, or unusual, SAS Formats, Options, and Functions.

[SAS 9.2] The new formats and informats for reading standard XML (ISO 8601) date, datetime and time values in SAS 9.2, **B8601DAw.** and **E8601DAw.**, **B8601DTw.d** and **E8601DTw.d**, and **B8601TMw.d** and **E8601TMw.d**, replace the equivalent formats and informats in SAS 9.1, **ND8601DAw.** and **IS8601DAw.**, **ND8601DTw.d** and **IS8601DTw.d**, and **ND8601TMw.d** and **IS8601TMw.d**, but with more functionality for reading partial and truncated values. The date informats are comparable with **YYMMDDw.**, and the time informat **E8601TMw.d** is comparable with **TIMEw.d**. Full details of all of the new ISO 8601 formats and informats can be found in: support.sas.com/documentation/cdl/en/lrdict/59540/HTML/default/a003169814.htm and [a003169817.htm](http://support.sas.com/documentation/cdl/en/lrdict/59540/HTML/default/a003169817.htm).

[SAS 9.2] The new function **CMISS()** counts the number of missing character and/or numeric arguments, equivalent to **SUM(0, MISSING(arg1), MISSING(arg2), ...)**. The existing, and related, function **NMISS()** converts the arguments to numeric values first before counting missing arguments.

[SAS 9.2] The existing **ECHOAUTO** and **NOECHOAUTO** system options determine the inclusion or exclusion of SAS source code from **autoexec.sas** in the SAS Log. However, from SAS 9.2, **ECHOAUTO** also requires the **SOURCE** system option.

PhUSE News

PhUSE 2008 has already started !!!

Once the Call for Papers was circulated and the abstract submission tool opened it didn't take long for our first paper abstract to be submitted on 21 March 2008. For me, this really marked the beginning of the conference in earnest! All the stream chairs, who have been meeting regularly since November last year, have now stepped up a gear and are pro-actively working towards encouraging leading experts from within the industry to submit papers in to our 13 streams. I hope fond memories of previous PhUSE conferences will inspire you to volunteer to present a paper at the annual conference in Manchester in October. The Call for Papers remains open and the deadline has been extended until **16 June 2008**, so it's definitely still not too late to be part of PhUSE 2008. Submit a paper now at www.phuse.eu/Submit-a-Paper.aspx.

The main theme for this year's conference will be "Working in a Global Environment". Clinical Development has undergone fundamental changes over the past ten years with most organizations working more and more globally. This change has significantly impacted the process of planning, conducting and analysing clinical trials and has dramatically increased in complexity that ultimately affects the world of Statistical Programming in a profound way.

Through different sessions we will endeavour to highlight various aspects of these new challenges and required skill sets by having speakers from all parts of the industry (Pharma, CRO, BPO), and different levels within their organizations (from hands-on programmers to management), share their experience with colleagues from within the Pharmaceutical industry.

I am really looking forward to welcoming you to PhUSE 2008.

Olivier Leconte, 2008 PhUSE Conference Chair

PhUSE "The Society" Offering

The PhUSE Society was launched in January 2008 and membership is steadily rising. By becoming a member of the society, alongside the usual offering of access to the member's only website, monthly mailings, quarterly newsletters and e-learning, the following benefits are also available at no extra charge:

PhUSE Single Day Events

PhUSE are pleased to announce that in 2008, single day events are taking place in Novartis, Basel, Switzerland on Wednesday 28 May and The Royal Statistical Society, London, UK on Wednesday 11 June. The event will feature papers and presenters that have won a best-in-stream paper award at one of the previous three PhUSE conferences. These events are free to members and registration is available through the website.

Pharmaceutical Programming

Pharmaceutical Programming is the official journal of PhUSE. It is an international journal with a focus on programming in the regulated environment of the pharmaceutical and life sciences industry. The journal will serve as a knowledge repository and a forum for exchange between programmers working around the world. Access to the journal is free to PhUSE members and will be available in print and online.

The 'Call for contributions' is now open for the second issue and if you are interested in publishing an article, please contact the journal editor Dirk Spruck: dirk.spruck@phuse.eu.

PhUSE Conference

PhUSE is very happy to announce that the PhUSE 2008 conference will be held in the UK for the first time and will run from 12-15 October in The Midland Hotel, Manchester. Both registration and call for contributions are now open. More details about the conference can be found on the PhUSE website.

Please contact the PhUSE Office at office@phuse.eu for more details on how to join the PhUSE Society, or visit www.phuse.eu.

Stephen Bamford, PhUSE Society

In Brief

- Back issues of *VIEWES News* are available from the *VIEWES* web site, and also from the *VIEWES News* page on www.sasCommunity.org.
- Phil Mason now has a SAS tips newsletter, which can be requested by going to www.woodstreet.org.uk and then clicking on Tips. Previous tips can also be found on the web site.
- More SAS hints and tips can be found on the SAS FAQ pages www.hollandnumerics.com/sasfaq and also on the Amadeus Software Tips pages at www.amadeus.co.uk/TipsList.aspx?ST=1.
- Looking for a SAS-related job? Try the following web pages: www.hollandnumerics.com/careers and www.amadeus.co.uk/Careers.aspx.

Diary

Are you organising an event that would be of interest to the VIEWS readership? Let us know as we are interested in all non-profit making events related to SAS.

May 2008

28 PhUSE Single Day Event, Basel, Switzerland

Featuring stream-winning papers and presenters from the 3 PhUSE conferences in Heidelberg, Dublin and Lisbon. See the PhUSE web site www.phuse.eu for further details.

June 2008

11 PhUSE Single Day Event, London

Featuring stream-winning papers and presenters from the 3 PhUSE conferences in Heidelberg, Dublin and Lisbon. See the PhUSE web site www.phuse.eu for further details.

11 SAS Special Interest Groups, Marlow

SAS UK are running Special Interest Groups on a range of subjects. There will also be free certification tests available on a first-come first-served basis. For more details please visit the web site, www.sas.com/uk/events/sigs.

18 How-To Seminar for SAS Programmers, Oxfordshire

See the Amadeus Software web site www.amadeus.co.uk for further details.

26 SAS9 Business Intelligence-Delivered, Oxfordshire

See the Amadeus Software web site www.amadeus.co.uk for further details.

September 2008

11 How-To Seminar for SAS Programmers, Oxfordshire

See the Amadeus Software web site www.amadeus.co.uk for further details.

October 2008

13-15 PhUSE Conference, Manchester

The Pharmaceutical Users Software Exchange (PhUSE) conference is the premier programming event for the pharmaceutical industry in Europe. See www.phuse.eu for more details.

22 SAS9 Business Intelligence-Delivered, Oxfordshire

See the Amadeus Software web site www.amadeus.co.uk for further details.

21-22 SAS Forum UK, Telford, Shropshire

The SAS Forum UK is held each year and focuses on the latest SAS software releases. For more details please go to www.sas.com/uk/events/sasforum.

November 2008

20 How-To Seminar for SAS Programmers, Oxfordshire

See the Amadeus Software web site www.amadeus.co.uk for further details.

December 2008

11 SAS9 Business Intelligence-Delivered, Oxfordshire

See the Amadeus Software web site www.amadeus.co.uk for further details.

March 2009

22-25 SAS Global Forum, National Harbor, MD, USA

The SAS Global Forum (SGF, formerly called SUGI) is held each year and focuses on the technical aspects of SAS software. See www.sasglobalforum.org for more details.

application form. Please send your queries about any VIEWS events to event@views-uk.org, and don't forget to look at the web site for the latest news.

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VIEWS News is published quarterly by VIEWS International SAS Programmer Community. VIEWS is a not-for-profit organisation. Our Mission Statement and Rules can be viewed on our web site together with a list of current committee members.

All VIEWS event information will be posted and/or emailed to registered members of VIEWS, and will include an event