Traffic-Lighting the Easy Way with PROC REPORT and ODS

Andrew H. Karp
Sierra Information Services
Sonoma, CA
andrew@sierrainformation.com
www.SierraInformation.com

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Thanks for Attending

• Please hold questions until the end of the presentation….thanks!
• Copies of these slides, as a PDF, are available from
  • www.SierraInformation.com
Traffic-Lighting the Easy Way with PROC REPORT and ODS

- This paper shows you different ways to “traffic-light” the reports and analyses you generate with PROC REPORT and ODS
- “Traffic-Lighting” your output:
  - Assigns colors or other appearance attributes as a function of the data to be displayed
  - Draws attention to some parts of the output
  - Makes reports/analyses easier to understand

Getting Un-Stuck in the Traffic-Lighting

- Planning Your Traffic-Lighting Project:
  - What is it that you want to highlight?
    - Values in Columns/Cells?
    - Entire Rows?
  - What are the data values that will “trigger” different traffic-lighting elements?
    - What are “the rules”?
  - How will the report/output be generated?
  - How will the report/output be displayed?
Getting Un-Stuck in the Traffic-Lighting

- SAS Tools for Traffic-Lighting:
  - PROC REPORT
    - COMPUTE Blocks
  - Output Delivery System
    - ODS Style Statements in PROC REPORT
      - Also Available in TABULATE and PRINT
      - Style Templates for Other Procedures
  - Value Formats
    - Implementing “Decision Rules”

SAS Output Delivery System (ODS)

- Added to BASE SAS Software in Version 8
- Process by which the SAS System “delivers” output to “destinations”
- Completely revolutionized way that SAS users work with Procedure-generated output
- Provides complete control over what is being generated, where it is “delivered” and what it looks like.
Why You Should Learn About ODS:
- Create SAS-generated output as PDF, RTF, HTML, CSV or other files, including SAS data sets
- Control the appearance of output using Style Templates
- Combine output from multiple “PROC steps” into one customized report
- Facilitate generation of “final report” without tedious re-typing, cutting and pasting, or use of “PROC HIGHLIGHTER” or “PROC CUT and PASTE”
- Share SAS Output with Others

How it works:
- Procedure carries out the work/tasks specified in the PROC “step” or those which it carries out by default.
- Procedure generates one or more “data components” and “passes” them to the ODS.
- ODS binds each data component to a table component, consisting of a style template and a table template, resulting in an output object.
- Object is then “delivered” to all currently open “destinations”
The number and contents of Procedure-generated Data Components depend on both the specified Procedure and the defaults/options specified by the user.
A Data Component contains the “work” carried out by the PROC on the data stored in the SAS data set.

Generated by Procedure
Rules to Structure the Data Component
Rules to Control Appearance of Output (Fonts, Colors, Shading, etc.)

17 SAS-supplied Style Templates in 8.2; 43 SAS-supplied Style Templates in 9.1; PROC TEMPLATE is used to create customized ODS Style Templates
**SAS Output Delivery System (ODS)**

- **Output Delivery System**
  - **Output Object**
    - Destinations
  - **LISTING**
    - **OUTPUT**
    - **PDF**
    - **RTF**
    - **HTML**
    - **CSV**
  - **XML**
  - DOCUMENT

**ODS “Destinations”**

- **Default Destination is LISTING**
  - Output Window
- **Other Destinations Can Be Opened and Closed as Needed During Program Execution**
- **By Default, Output Objects are Not Saved after “Delivery” to the “Destinations”**
- **SAS 9: DOCUMENT Destination**
  - See my paper “A Peek at PROC DOCUMENT,” presented at the SAS Global Forum 2007 Conference
Example: Quality Control Reporting

- Analyst needs to generate reports and analyses at a company that duplicates DVDs.
  - Multiple assembly lines
    - accept/reject counts for each line
**Controlling Output Appearance**

- PROC PRINT has a very limited range of tools to control the appearance of your SAS-generated output
  - See:
    - Haworth, Lauren, “ODS for PRINT, REPORT and TABULATE”
    - Lund, Pete, “PDF Can Be Pretty Darn Fancy”
    - Karp, Andrew, “Getting Un-Stuck in the Traffic-Lighting”
  - So, I will use PROC REPORT instead
Controlling Output Appearance

• PROC REPORT
  • BASE SAS Module Procedure
  • Very powerful, has many tools and capabilities
  • Excellent resource for “customizing” and traffic lighting your output with a limited amount of coding.
    • Carpenter’s Complete Guide to the REPORT Procedure
      • http://www.sas.com/apps/pubscat/bookdetails.jsp?catid=1&pc=60966

PROC REPORT

```sas
proc report data=traffic.quality nowindows headline headskip split='*';
column assembly_line total_pieces passed passed_pct rejected rejected_pct;
define assembly_line / group 'Assembly-Line' width=12;
define total_pieces / analysis 'Total*Produced' width = 12 format=comma10.;
define passed / analysis 'Pieces*Accepted' format=comma10.;
define passed_pct / computed 'Accept*Rate' format=percent10.2 width=11;
define rejected / analysis 'Pieces*Rejected' format=comma10.;
define rejected_pct / computed 'Reject*Rate' format=percent10.2 width=11;
compute passed_pct;
  passed_pct = passed.sum / total_pieces.sum;
endcomp;
compute rejected_pct;
  rejected_pct = rejected.sum / total_pieces.sum;
endcomp;
rbreak after/summarize skip; * < generate column-totals;
title3 'Quality Control Report: Rejects by Assembly Line';
title4 'Reject / Accept Rates Computed by PROC REPORT';
title5 'Listing Destination Output';
run;
```
### PROC REPORT / LISTING Destination

**Traffic-lighting Your Reports the Easy Way**

**With PROC REPORT and ODS**

**Quality Control Report: Rejects by Assembly Line**

**Reject / Accept Rates Computed by PROC REPORT**

**Listing Destination Output**

<table>
<thead>
<tr>
<th>Assembly Line</th>
<th>Total Produced</th>
<th>Pieces Accepted</th>
<th>Accept Rate</th>
<th>Pieces Rejected</th>
<th>Reject Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>19,053</td>
<td>9,164</td>
<td>48.16%</td>
<td>889</td>
<td>4.84%</td>
</tr>
<tr>
<td>26</td>
<td>9,461</td>
<td>4,426</td>
<td>46.63%</td>
<td>975</td>
<td>10.32%</td>
</tr>
<tr>
<td>27</td>
<td>15,146</td>
<td>14,100</td>
<td>93.14%</td>
<td>1,038</td>
<td>6.85%</td>
</tr>
<tr>
<td>28</td>
<td>7,304</td>
<td>7,241</td>
<td>98.35%</td>
<td>162</td>
<td>2.05%</td>
</tr>
<tr>
<td>29</td>
<td>17,386</td>
<td>16,373</td>
<td>94.38%</td>
<td>1,623</td>
<td>9.07%</td>
</tr>
<tr>
<td>30</td>
<td>13,483</td>
<td>11,410</td>
<td>84.53%</td>
<td>2,073</td>
<td>15.41%</td>
</tr>
<tr>
<td>31</td>
<td>9,333</td>
<td>9,057</td>
<td>97.34%</td>
<td>276</td>
<td>2.64%</td>
</tr>
<tr>
<td>32</td>
<td>7,549</td>
<td>5,817</td>
<td>77.15%</td>
<td>1,733</td>
<td>22.85%</td>
</tr>
<tr>
<td>33</td>
<td>14,769</td>
<td>13,315</td>
<td>90.16%</td>
<td>1,454</td>
<td>9.84%</td>
</tr>
<tr>
<td>34</td>
<td>17,820</td>
<td>9,803</td>
<td>55.47%</td>
<td>3,017</td>
<td>23.52%</td>
</tr>
<tr>
<td>35</td>
<td>15,104</td>
<td>11,851</td>
<td>78.72%</td>
<td>2,539</td>
<td>15.92%</td>
</tr>
<tr>
<td>36</td>
<td>4,803</td>
<td>4,604</td>
<td>95.26%</td>
<td>229</td>
<td>4.74%</td>
</tr>
<tr>
<td>37</td>
<td>31,891</td>
<td>25,227</td>
<td>80.14%</td>
<td>5,864</td>
<td>18.82%</td>
</tr>
<tr>
<td>38</td>
<td>16,199</td>
<td>13,567</td>
<td>84.27%</td>
<td>2,533</td>
<td>15.73%</td>
</tr>
<tr>
<td>39</td>
<td>185,568</td>
<td>160,263</td>
<td>86.32%</td>
<td>25,395</td>
<td>13.68%</td>
</tr>
</tbody>
</table>

---

**The PDF Destination**

- “Delivers” SAS-generated output to a Portable Document File (PDF)
- One of the most common “real-world” methods of “delivering” SAS output to non-SAS users
  - Recipient only needs the free Adobe™ Reader
- SAS creates the PDF directly; no need to have Adobe Acrobat or other products
- Many government agencies use PDF Destination to fulfill public reporting requirements and/or ad hoc information requests.
  - SAS Procedures “do the work” (i.e., the analyses)
  - ODS PDF destination delivers “the work” to a file that can be given to the recipient
  - Almost impossible for the recipient to change the data in the report
**PROC REPORT / PDF Destination**

```
ods listing close; /* do not send output to LISTING destination;
ods pdf file = 'C:\tragic_lighting\report1.pdf' style=sasdocprinter note;
proc report data=traffic.quality nowindows headline headskip split='';
column assembly_line total_pieces passed passed_pct rejected rejected_pct;
define assembly_line / group='AssemblyLine' line='1';
define total_pieces / analysis='TotalProduced' width=12 format=comma10.2;
define passed / analysis='PiecesAccepted' format=comma10.2;
define rejected / analysis='PiecesRejected' format=comma10.2;
define passed_pct / computed='AcceptRate' format=percent10.2 width=4;
define rejected_pct / computed='RejectRate' format=percent10.2 width=4;
compute passed_pct = passed.sum / total_pieces.sum;
compute rejected_pct = rejected.sum / total_pieces.sum;
endcomp;
break after / summarize skip; /* generate column-totals;
title1 'Quality Control Report: Rejects by Assembly Line';
title2 'Reject / Accept Rates Computed by PROC REPORT';
title3 'PDF Destination Output with SASDOCPRINTER Style Template';
run;
ods pdf close;
ods listing;
```
Highlighting Every Other Row

- Provide “visual relief” for reports with many rows
- Highlight either all the odd-numbered or all the even-numbered rows
- No need to revise program if the number of rows in the report changes over time

Highlighting Every Other (Even) Row

```
91  * use MOD function to determine if row is odd or even;
92  compute assembly_line;
93      line_count + 1;
94  if mod(line_count,2) = 0 then do;
95      call define(_row_,"style","style={font_weight=bold foreground=white
96           background = grey}");
97  end;
98  endcomp;
```

This COMPUTE BLOCK keeps a “running total” of the number of rows generated by PROC REPORT. The MOD (modulus) function tests if the row is ODD or EVEN numbered. In this example, EVEN numbered rows are displayed with a GREY background and WHITE text.
Highlighting Every Other (Even) Row

Traffic-Dependent Reports the Easy Way
With PROC REPORT and ODS
Quality Control Report: Rejects by Assembly Line
Highlighting The Even-Numbered Rows

<table>
<thead>
<tr>
<th>Assembly Line</th>
<th>Total Produced</th>
<th>Pieces Accepted</th>
<th>Accept Rate</th>
<th>Pieces Rejected</th>
<th>Reject Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>10,053</td>
<td>9,164</td>
<td>91.16%</td>
<td>880</td>
<td>8.84%</td>
</tr>
<tr>
<td>27</td>
<td>15,146</td>
<td>14,108</td>
<td>93.15%</td>
<td>1,038</td>
<td>6.85%</td>
</tr>
<tr>
<td>29</td>
<td>7,003</td>
<td>6,741</td>
<td>96.95%</td>
<td>162</td>
<td>2.30%</td>
</tr>
<tr>
<td>31</td>
<td>17,996</td>
<td>16,373</td>
<td>91.98%</td>
<td>1,623</td>
<td>9.02%</td>
</tr>
<tr>
<td>33</td>
<td>13,480</td>
<td>11,410</td>
<td>84.59%</td>
<td>2,070</td>
<td>15.41%</td>
</tr>
<tr>
<td>35</td>
<td>9,333</td>
<td>9,057</td>
<td>97.04%</td>
<td>276</td>
<td>2.96%</td>
</tr>
<tr>
<td>37</td>
<td>7,446</td>
<td>5,937</td>
<td>77.75%</td>
<td>1,723</td>
<td>22.25%</td>
</tr>
<tr>
<td>39</td>
<td>14,769</td>
<td>13,315</td>
<td>90.16%</td>
<td>1,454</td>
<td>9.84%</td>
</tr>
<tr>
<td>41</td>
<td>12,293</td>
<td>10,000</td>
<td>81.11%</td>
<td>1,013</td>
<td>8.89%</td>
</tr>
<tr>
<td>43</td>
<td>15,184</td>
<td>11,651</td>
<td>76.73%</td>
<td>3,533</td>
<td>23.27%</td>
</tr>
<tr>
<td>45</td>
<td>4,833</td>
<td>4,604</td>
<td>95.26%</td>
<td>229</td>
<td>4.74%</td>
</tr>
<tr>
<td>47</td>
<td>31,094</td>
<td>25,227</td>
<td>81.14%</td>
<td>5,864</td>
<td>18.86%</td>
</tr>
<tr>
<td>49</td>
<td>16,100</td>
<td>13,567</td>
<td>84.27%</td>
<td>2,533</td>
<td>15.73%</td>
</tr>
<tr>
<td>51</td>
<td>185,658</td>
<td>160,263</td>
<td>86.32%</td>
<td>25,395</td>
<td>13.68%</td>
</tr>
</tbody>
</table>

In this example, the ODD numbered rows are displayed with a GREY background and WHITE text.
Highlighting Every Other ODD Row

Traffic-Lighting Your Reports the Easy Way
With PROC REPORT and ODS
Quality Control Report: Rejects by Assembly Line
Highlighting the Odd-Numbered Rows

<table>
<thead>
<tr>
<th>Assembly Line</th>
<th>Total Produced</th>
<th>Pieces Accepted</th>
<th>Accept Rate</th>
<th>Pieces Rejected</th>
<th>Reject Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>10,052</td>
<td>9,184</td>
<td>91.36%</td>
<td>868</td>
<td>8.64%</td>
</tr>
<tr>
<td>29</td>
<td>9,461</td>
<td>8,425</td>
<td>88.63%</td>
<td>975</td>
<td>10.37%</td>
</tr>
<tr>
<td>37</td>
<td>12,149</td>
<td>11,106</td>
<td>91.36%</td>
<td>1,043</td>
<td>8.64%</td>
</tr>
<tr>
<td>45</td>
<td>7,962</td>
<td>7,144</td>
<td>97.62%</td>
<td>182</td>
<td>2.38%</td>
</tr>
<tr>
<td>29</td>
<td>17,000</td>
<td>16,229</td>
<td>95.85%</td>
<td>771</td>
<td>4.15%</td>
</tr>
<tr>
<td>39</td>
<td>13,480</td>
<td>11,410</td>
<td>84.59%</td>
<td>2,070</td>
<td>15.41%</td>
</tr>
<tr>
<td>31</td>
<td>9,920</td>
<td>9,072</td>
<td>91.04%</td>
<td>278</td>
<td>2.80%</td>
</tr>
<tr>
<td>22</td>
<td>7,540</td>
<td>6,917</td>
<td>77.91%</td>
<td>1,723</td>
<td>22.09%</td>
</tr>
<tr>
<td>33</td>
<td>12,700</td>
<td>11,715</td>
<td>92.15%</td>
<td>985</td>
<td>7.85%</td>
</tr>
<tr>
<td>34</td>
<td>12,820</td>
<td>9,860</td>
<td>76.67%</td>
<td>3,617</td>
<td>23.33%</td>
</tr>
<tr>
<td>30</td>
<td>15,103</td>
<td>11,601</td>
<td>77.20%</td>
<td>3,502</td>
<td>21.27%</td>
</tr>
<tr>
<td>36</td>
<td>4,830</td>
<td>4,601</td>
<td>95.20%</td>
<td>229</td>
<td>4.74%</td>
</tr>
<tr>
<td>38</td>
<td>16,108</td>
<td>13,862</td>
<td>86.31%</td>
<td>2,246</td>
<td>13.69%</td>
</tr>
<tr>
<td>38</td>
<td>185,856</td>
<td>166,283</td>
<td>88.52%</td>
<td>25,285</td>
<td>13.65%</td>
</tr>
</tbody>
</table>

Traffic-Lighting Values in Cells

- One of the most commonly asked “how hard would it be” questions...
  - How can we change the appearance of data in the cells of a report based on a “decision-rule”?  
  - Can we do this WITHOUT manual intervention in the report generation process? Can SAS do it for us “automatically”?  
    - YES!
I created Value Formats that assigns colors to ranges of data values.

In the next PROC REPORT “step,” an ODS Style Statement was used to “style” the values in the column displaying each assembly line’s rejection rate.

The “rules” contained in the Format are used to decide what color (blue, green or red) is used to display the percentage in the output report.

Value Formats that will be used to assign colors to the values appearing in the PROC REPORT output.
### Traffic Lighting Values in Cells

**Traffic-Lighting Your Reports the Easy Way with ODS and PROC REPORT**

Quality Control Report: Rejects by Assembly Line

Assigning Colors to the Reject Rates

<table>
<thead>
<tr>
<th>Assembly Line</th>
<th>Total Produced</th>
<th>Pieces Accepted</th>
<th>Accept Rate</th>
<th>Pieces Rejected</th>
<th>Reject Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>10,053</td>
<td>9,164</td>
<td>91.10%</td>
<td>889</td>
<td>8.84%</td>
</tr>
<tr>
<td>26</td>
<td>9,401</td>
<td>8,426</td>
<td>89.53%</td>
<td>975</td>
<td>10.37%</td>
</tr>
<tr>
<td>27</td>
<td>15,166</td>
<td>14,108</td>
<td>93.15%</td>
<td>1,058</td>
<td>6.85%</td>
</tr>
<tr>
<td>28</td>
<td>7,603</td>
<td>7,741</td>
<td>99.95%</td>
<td>162</td>
<td>2.05%</td>
</tr>
<tr>
<td>29</td>
<td>17,906</td>
<td>16,373</td>
<td>90.98%</td>
<td>1,623</td>
<td>9.02%</td>
</tr>
<tr>
<td>30</td>
<td>13,489</td>
<td>11,410</td>
<td>84.50%</td>
<td>2,079</td>
<td>15.41%</td>
</tr>
<tr>
<td>31</td>
<td>9,333</td>
<td>9,057</td>
<td>97.04%</td>
<td>274</td>
<td>2.96%</td>
</tr>
<tr>
<td>32</td>
<td>7,540</td>
<td>5,817</td>
<td>77.15%</td>
<td>1,723</td>
<td>22.85%</td>
</tr>
<tr>
<td>33</td>
<td>14,769</td>
<td>13,315</td>
<td>90.10%</td>
<td>1,454</td>
<td>9.81%</td>
</tr>
<tr>
<td>34</td>
<td>12,820</td>
<td>9,809</td>
<td>76.47%</td>
<td>3,011</td>
<td>23.53%</td>
</tr>
<tr>
<td>35</td>
<td>15,184</td>
<td>11,651</td>
<td>76.71%</td>
<td>3,533</td>
<td>23.27%</td>
</tr>
<tr>
<td>36</td>
<td>4,833</td>
<td>4,604</td>
<td>95.26%</td>
<td>229</td>
<td>4.74%</td>
</tr>
<tr>
<td>37</td>
<td>31,091</td>
<td>25,227</td>
<td>81.14%</td>
<td>5,864</td>
<td>18.86%</td>
</tr>
<tr>
<td>38</td>
<td>16,100</td>
<td>13,567</td>
<td>84.27%</td>
<td>2,533</td>
<td>15.73%</td>
</tr>
<tr>
<td>39</td>
<td>185,658</td>
<td>149,263</td>
<td>80.32%</td>
<td>28,395</td>
<td>13.68%</td>
</tr>
</tbody>
</table>
Changing Appearance of Rows Based on Data in a Cell

- **COMPUTE** Block
  - Allows you to compute new columns in the report, or to test values in the columns as the PROC builds your report
  - Two Papers by Art Carpenter
    - "Advanced PROC REPORT: Doing More in the COMPUTE Block"
    - "In the COMPUTE Block: Issues Associated with Using and Naming Variables"

- **CALL DEFINE** Statement

```sql
/* assign colors to the rows based on acceptance rates; */
/* assign macro variable constants; */
%let color1 = cx356655; /* green; */
%let color2 = cffff60; /* yellow-lash; */
ods listing close;
cd c:traffic_lighting:traffic3.pdf style=asnodcprinter notec;
proc report data=traffic_quality nowindows headline headskip oplist="";
column assembly_line total_pieces passed_pct rejected_pct;
define assembly_line / group 'Assembly_Line' width=12;
define total_pieces / analysis 'TotalProduced' format=comma10. width = 11;
define passed / analysis 'PiecesAccepted' format=comma10.;
define rejected / analysis 'PiecesRejected' format=comma10.;
define rejected_pct / computed 'RejectedRate' format=percent10.2 width=11;
define passed_pct / computed 'AcceptedRate' format=percent10.2 width=11;
call define_row._,'style',"style={[foreground=white font_weight=bold
background=&color1]};" end;
call define_row._,'style',"style={[foreground=red font_weight=bold
background=&color2]};" end;
```
Changing Appearance of Rows Based on Data in a Cell

Traffic-Lighting Your Reports the Easy Way with ODS and PROC REPORT
Quality Control Report: Rejects by Assembly Line
Assigning Background Colors to the Reject Rates

<table>
<thead>
<tr>
<th>Assembly Line</th>
<th>Total Produced</th>
<th>Pieces Accepted Rate</th>
<th>Accepted Pieces</th>
<th>Rejected Pieces</th>
<th>Rejected Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>10,054</td>
<td>8,184</td>
<td>81.16%</td>
<td>1,870</td>
<td>8.44%</td>
</tr>
<tr>
<td>26</td>
<td>9,401</td>
<td>8,426</td>
<td>89.63%</td>
<td>975</td>
<td>10.37%</td>
</tr>
<tr>
<td>27</td>
<td>15,146</td>
<td>14,038</td>
<td>93.15%</td>
<td>1,038</td>
<td>6.85%</td>
</tr>
<tr>
<td>28</td>
<td>7,602</td>
<td>7,741</td>
<td>97.95%</td>
<td>162</td>
<td>2.05%</td>
</tr>
<tr>
<td>29</td>
<td>17,996</td>
<td>16,373</td>
<td>90.99%</td>
<td>1,623</td>
<td>9.02%</td>
</tr>
<tr>
<td>30</td>
<td>13,180</td>
<td>11,410</td>
<td>87.59%</td>
<td>2,070</td>
<td>15.41%</td>
</tr>
<tr>
<td>31</td>
<td>9,333</td>
<td>9,057</td>
<td>96.74%</td>
<td>276</td>
<td>2.96%</td>
</tr>
<tr>
<td>32</td>
<td>7,540</td>
<td>5,917</td>
<td>77.15%</td>
<td>1,723</td>
<td>22.85%</td>
</tr>
<tr>
<td>33</td>
<td>15,800</td>
<td>13,513</td>
<td>86.13%</td>
<td>2,417</td>
<td>9.43%</td>
</tr>
<tr>
<td>34</td>
<td>12,820</td>
<td>9,803</td>
<td>76.47%</td>
<td>3,017</td>
<td>23.53%</td>
</tr>
<tr>
<td>35</td>
<td>15,184</td>
<td>11,651</td>
<td>76.73%</td>
<td>3,533</td>
<td>23.27%</td>
</tr>
<tr>
<td>36</td>
<td>4,833</td>
<td>4,601</td>
<td>95.26%</td>
<td>220</td>
<td>4.74%</td>
</tr>
<tr>
<td>37</td>
<td>31,091</td>
<td>25,227</td>
<td>81.14%</td>
<td>5,861</td>
<td>18.86%</td>
</tr>
<tr>
<td>38</td>
<td>16,100</td>
<td>13,567</td>
<td>84.27%</td>
<td>2,533</td>
<td>15.73%</td>
</tr>
</tbody>
</table>

Displaying Graphics in Your Report

- Use the PREIMAGE or POSTIMAGE Style attributes
- Example: Display a left arrow image on those rows where the reject rate is 10% or more
  - Otherwise, don’t display an arrow
Graphics File

Displaying Graphics Images

```plaintext
12 let graphics_file = 'C:\traffic_lighting.pct';
19  oes pdf file = 'c:\traffic_lighting\Traffic4.pdf' style=asdocprinter notoc;
249  proc report data=traffic_quality nowindows headline headskip split='"';
250  column assembly_line total_pieces passed
251  passed_pct=computed accepted % format=percent10.2 width=12;
252  define assembly_line / group 'Assembly LINE' width=12;
253  define total_pieces / analysis 'Total Pieces' format=comma10. width = 11;
254  define passed / analysis 'Pieces Accepted' format=comma10. ;
255  define rejected / analysis 'Pieces Rejected' format=comma10. ;
256  define rejected_pct/computed 'Rejected Rate' format=percent10.2 width=11;
257  define rejected_pct / group 'Rejected Rate' format=percent10.2 width=11;
258  define arrow / computed 'center'; * create a 'blank' column-header;
259  compute passed_pct;
260  passed_pct = passed_sum / total_pieces; endcomp;
261  compute rejected_pct;
262  rejected_pct = rejected_sum / total_pieces; endcomp;
263  compute arrow char;
264  if rejected_pct >= .10 then do;
265    call define('col_"style",'style='proimage =
266       '&graphics_file\left_arrow.jpg vjust=center just=center');
267  end; endcomp;
```

```plaintext
268  oes display left arrow when reject rate is 10% or higher;
269  run;
270  oes pdf close;
271  oes listing;
```
### Displaying Graphics Images

Traffic-Lighting Your Reports the Easy Way with ODS and PROC REPORT
Quality Control Report: Rejects by Assembly Line Display Left Arrow When Reject Rate is 10% or Higher

<table>
<thead>
<tr>
<th>Assembly Line</th>
<th>Total Produced</th>
<th>Pieces Accepted</th>
<th>Pieces Accepted Rate</th>
<th>Pieces Rejected</th>
<th>Rejected Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>10,053</td>
<td>9,164</td>
<td>91.16%</td>
<td>889</td>
<td>8.84%</td>
</tr>
<tr>
<td>26</td>
<td>9,401</td>
<td>8,026</td>
<td>89.03%</td>
<td>975</td>
<td>10.37%</td>
</tr>
<tr>
<td>27</td>
<td>15,146</td>
<td>14,088</td>
<td>93.15%</td>
<td>1,058</td>
<td>6.85%</td>
</tr>
<tr>
<td>28</td>
<td>7,903</td>
<td>7,741</td>
<td>97.05%</td>
<td>162</td>
<td>2.05%</td>
</tr>
<tr>
<td>29</td>
<td>17,996</td>
<td>16,373</td>
<td>90.98%</td>
<td>1,623</td>
<td>9.02%</td>
</tr>
<tr>
<td>30</td>
<td>13,489</td>
<td>11,410</td>
<td>84.59%</td>
<td>2,079</td>
<td>15.41%</td>
</tr>
<tr>
<td>31</td>
<td>9,333</td>
<td>9,057</td>
<td>97.04%</td>
<td>276</td>
<td>2.96%</td>
</tr>
<tr>
<td>32</td>
<td>7,540</td>
<td>5,817</td>
<td>77.15%</td>
<td>1,723</td>
<td>22.85%</td>
</tr>
<tr>
<td>33</td>
<td>14,789</td>
<td>13,315</td>
<td>90.16%</td>
<td>1,454</td>
<td>9.84%</td>
</tr>
<tr>
<td>34</td>
<td>12,820</td>
<td>9,803</td>
<td>76.47%</td>
<td>3,017</td>
<td>23.53%</td>
</tr>
<tr>
<td>35</td>
<td>15,184</td>
<td>11,651</td>
<td>76.73%</td>
<td>3,533</td>
<td>23.27%</td>
</tr>
<tr>
<td>36</td>
<td>4,833</td>
<td>4,684</td>
<td>95.20%</td>
<td>229</td>
<td>4.74%</td>
</tr>
<tr>
<td>37</td>
<td>31,093</td>
<td>25,227</td>
<td>81.14%</td>
<td>5,864</td>
<td>18.86%</td>
</tr>
<tr>
<td>38</td>
<td>10,100</td>
<td>13,567</td>
<td>84.27%</td>
<td>2,533</td>
<td>15.73%</td>
</tr>
</tbody>
</table>

### The Ultimate Management Report

- Conditionally assign one of three “smiley faces” depending on each assembly line’s acceptance rate
The Ultimate Management Report

```plaintext
compute happy/char;
if .9 <= passed_pct <= 1 then do;
call define(_col_,"style","style=['preimage =
"&graphics_file\happy-face.jpg" vjust=center just=center']");
end;
else if .80 <= passed_pct < .90 then do;
call define(_col_,"style","style=['preimage =
"&graphics_file\happy-face-2.jpg" vjust=center just=center']");
end;
else do;
call define(_col_,"style","style=['preimage =
"&graphics_file\frowny-face.jpg" vjust=center just=center']");
end;
endcomp;
```

---

Traffic-Lighting Your Reports the Easy Way With PROC REPORT and GDS Display a Smiley Face in the Report

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Line</th>
<th>Total Produced</th>
<th>Accepted</th>
<th>Acceptance Rate</th>
<th>Pieces Rejected</th>
<th>Rejection Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>10,053</td>
<td>9,106</td>
<td>91.10%</td>
<td>980</td>
<td>8.84%</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>9,601</td>
<td>8,426</td>
<td>87.40%</td>
<td>972</td>
<td>10.27%</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>15,160</td>
<td>14,106</td>
<td>93.15%</td>
<td>1,058</td>
<td>8.00%</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>7,900</td>
<td>7,741</td>
<td>97.05%</td>
<td>162</td>
<td>2.05%</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>17,000</td>
<td>15,373</td>
<td>90.58%</td>
<td>1,627</td>
<td>9.42%</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>13,480</td>
<td>11,410</td>
<td>84.05%</td>
<td>2,070</td>
<td>15.45%</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>9,355</td>
<td>9,057</td>
<td>96.08%</td>
<td>298</td>
<td>3.92%</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>7,340</td>
<td>5,817</td>
<td>79.15%</td>
<td>1,723</td>
<td>22.45%</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>14,790</td>
<td>13,315</td>
<td>89.10%</td>
<td>1,484</td>
<td>9.84%</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>12,820</td>
<td>9,805</td>
<td>76.47%</td>
<td>3,017</td>
<td>25.53%</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>15,184</td>
<td>11,651</td>
<td>77.27%</td>
<td>3,533</td>
<td>23.27%</td>
<td></td>
</tr>
</tbody>
</table>
Why Confuse Bosses with Numbers?

• Why Bother Management with Data when a Picture will Do the Job?
  • The NOPRINT option in the PROC REPORT DEFINE Statement is just what we need!

314  define assembly_line / group 'Assembly Line' width=12;
315  define total_pieces / analysis NOPRINT;
316  define passed / analysis NOPRINT;
317  define passed_pct/computed NOPRINT;
318  define rejected/analysis NOPRINT;
319  define rejected_pct/computed NOPRINT;
Why Confuse Bosses with Numbers?

Traffic-Lighting Your Reports the Easy Way With PROC REPORT and ODS
Why Confuse Management with Numbers?

Assembly Line
25
26
27
28
29
30
31
32
33
34
35

One Last Example....

- Displaying a Graphics Image at the Top of Your Report
  - Not a “traffic lighting” issue, but another common question...
    - How can I put my company logo, agency seal or other image that the top of my PROC REPORT (or TABULATE, or PRINT) Output
  - Answer: ODS Style Statement
    - Let’s put the photo of the DVD duplication machine at the top of the report
One Last Example...

```sas
proc report data=traffic.quality nowindows headline headskip split="*
   style(report)=[preimage='&graphics_file\dvd_duplicator.jpg' vjust=center];
   column assembly line total pieces passed
```

Traffic-Lighting Your Reports the Easy Way
With PROC REPORT and ODS
Adding a Graphics Image at the Top of the Report

<table>
<thead>
<tr>
<th>Assembly Line</th>
<th>Total Produced</th>
<th>Pieces Accepted</th>
<th>Accepted Rate</th>
<th>Pieces Rejected</th>
<th>Rejected Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>10,053</td>
<td>9,614</td>
<td>96.16%</td>
<td>439</td>
<td>8.4%</td>
</tr>
<tr>
<td>26</td>
<td>9,801</td>
<td>8,426</td>
<td>86.38%</td>
<td>975</td>
<td>10.77%</td>
</tr>
<tr>
<td>27</td>
<td>15,186</td>
<td>14,108</td>
<td>93.15%</td>
<td>1,083</td>
<td>6.85%</td>
</tr>
<tr>
<td>28</td>
<td>7,603</td>
<td>7,414</td>
<td>97.95%</td>
<td>162</td>
<td>2.05%</td>
</tr>
<tr>
<td>29</td>
<td>17,096</td>
<td>16,373</td>
<td>95.98%</td>
<td>1,623</td>
<td>9.02%</td>
</tr>
<tr>
<td>30</td>
<td>13,889</td>
<td>11,410</td>
<td>84.59%</td>
<td>2,079</td>
<td>15.41%</td>
</tr>
<tr>
<td>31</td>
<td>9,333</td>
<td>9,057</td>
<td>92.34%</td>
<td>276</td>
<td>2.96%</td>
</tr>
<tr>
<td>32</td>
<td>7,540</td>
<td>7,817</td>
<td>77.15%</td>
<td>1,233</td>
<td>22.85%</td>
</tr>
<tr>
<td>33</td>
<td>14,769</td>
<td>13,315</td>
<td>90.16%</td>
<td>1,454</td>
<td>9.84%</td>
</tr>
</tbody>
</table>

One Last Example
Yet Another Last Example

- Example Showing Introduction of Graphics and Text Elements Before/After Report
- Plus traffic lighting
- Job Satisfaction Among Officers Assigned to Ten Detachments of the Royal Canadian Mounted Police in Alberta Province

---

Yet Another Last Example!

**Plain Old Listing Destination Output (POLDO)**

<table>
<thead>
<tr>
<th>Obs</th>
<th>Name of Dependent Variable</th>
<th>Mean of Independent Variable</th>
<th>Degrees of Freedom</th>
<th>F-Statistic Value</th>
<th>Probability Value</th>
<th>R Squared</th>
<th>Dependent Variable Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Salary &amp; Job</td>
<td>DETACHMENT</td>
<td>0</td>
<td>2.82</td>
<td>0.042</td>
<td>0.125775</td>
<td>2.659408</td>
</tr>
<tr>
<td>2</td>
<td>Salary, Benefits &amp; Benefits</td>
<td>DETACHMENT</td>
<td>0</td>
<td>2.42</td>
<td>0.125</td>
<td>0.037140</td>
<td>2.752958</td>
</tr>
<tr>
<td>3</td>
<td>Salary, Command Office</td>
<td>DETACHMENT</td>
<td>0</td>
<td>1.42</td>
<td>0.241</td>
<td>0.051121</td>
<td>2.719127</td>
</tr>
<tr>
<td>4</td>
<td>Salary, Co-Workers</td>
<td>DETACHMENT</td>
<td>0</td>
<td>1.35</td>
<td>0.404</td>
<td>0.053364</td>
<td>2.717337</td>
</tr>
</tbody>
</table>
Yet Another Last Example

```
001 proc report滢沫_未潭股 XinXinCuiBian style="left": *" *
002 style(header)="font_weight=bold background=gray foreground=white"
003 style(heading)="font_weight=bold background=gray foreground=white"
004 style(footer)="font_weight=bold background=gray foreground=white"
005 style(report)="font_weight=bold background=gray foreground=white"
006 style(theme)="font_weight=bold background=gray foreground=white"
007 style(legend)="font_weight=bold background=gray foreground=white"
008 style(image)="font_weight=bold background=gray foreground=white"
009 style(text)="font_weight=bold background=gray foreground=white"
010 style(pagination)="font_weight=bold background=gray foreground=white"
011 style(page)="font_weight=bold background=gray foreground=white"
012 style(page)="font_weight=bold background=gray foreground=white"
013 style(page)="font_weight=bold background=gray foreground=white"
014 style(page)="font_weight=bold background=gray foreground=white"
015 style(page)="font_weight=bold background=gray foreground=white"
016 style(page)="font_weight=bold background=gray foreground=white"
017 style(page)="font_weight=bold background=gray foreground=white"
018 style(page)="font_weight=bold background=gray foreground=white"
019 style(page)="font_weight=bold background=gray foreground=white"
020 style(page)="font_weight=bold background=gray foreground=white"
021 style(page)="font_weight=bold background=gray foreground=white"
022 style(page)="font_weight=bold background=gray foreground=white"
023 style(page)="font_weight=bold background=gray foreground=white"
024 style(page)="font_weight=bold background=gray foreground=white"
025 style(page)="font_weight=bold background=gray foreground=white"
026 style(page)="font_weight=bold background=gray foreground=white"
027 style(page)="font_weight=bold background=gray foreground=white"
028 style(page)="font_weight=bold background=gray foreground=white"
029 style(page)="font_weight=bold background=gray foreground=white"
030 style(page)="font_weight=bold background=gray foreground=white"
031 style(page)="font_weight=bold background=gray foreground=white"
032 style(page)="font_weight=bold background=gray foreground=white"
033 style(page)="font_weight=bold background=gray foreground=white"
034 style(page)="font_weight=bold background=gray foreground=white"
035 style(page)="font_weight=bold background=gray foreground=white"
036 style(page)="font_weight=bold background=gray foreground=white"
037 style(page)="font_weight=bold background=gray foreground=white"
```

GWU School of Business
Decision Science 276: Exploratory and Multivariate Data Analysis
Lecture 4: Fall 2007 Semester
Introduction to Multivariate Analysis
PROC REPORT Output w/ODS & Graphics Images

Royal Canadian Mounted Police

<table>
<thead>
<tr>
<th>Dependent Variable Name</th>
<th>Variable Name 1</th>
<th>Variable Name 2</th>
<th>Variable Name 3</th>
<th>R-Square</th>
<th>Prob of Type I Error</th>
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</thead>
<tbody>
<tr>
<td>Salary w/Job</td>
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<td>9</td>
<td>3.65</td>
<td>0.11704</td>
<td>2.05 0.0423</td>
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<tr>
<td>Salary w/Salary &amp; Benefits</td>
<td>detachment</td>
<td>9</td>
<td>3.66</td>
<td>0.0077</td>
<td>0.92 0.5131</td>
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<tr>
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<td>detachment</td>
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<td>3.52</td>
<td>0.4074</td>
<td>4.42 0.00094</td>
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<tr>
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<td>detachment</td>
<td>9</td>
<td>4.20</td>
<td>0.0003</td>
<td>0.99 0.4541</td>
</tr>
</tbody>
</table>

Gendarmerie Royale du Canada
Summary and Conclusions

- Traffic-Lighting can do a lot to increase the value of your SAS-generated reports.
- Easy to implement in PROC REPORT
  - Also available in PROCs PRINT and TABULATE
- Also available by using PROC TEMPLATE to create a Table Template

Thanks for inviting me to GASUG

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