Paper for Consideration by the S-100 TSM

Machine Readability of Display Plane Ordering

Submitted by:	NIWC Atlantic
Executive Summary:	Identifies issues with determining the drawing order of display planes
Related Documents:	S-100 Part 9
Related Projects:	Development of S-100 and S-1XX product specifications

1 Introduction / Background

S-100 provides a portrayal framework defining capabilities for use by products. The framework ensures product presentation, use, and implementation in a standard, consistent manner.

This paper recommends an enhancement to the S-100 portrayal model that enables applications to algorithmically determine the stacking order of display planes described within a portrayal catalogue. These changes support machine readability.

2 Display Plane Ordering

The 9-13.3.18 *DisplayPlane* class describes the schema for display planes enumerated within a portrayal catalogue. The class is an extension of 9-13.3.2 *CatalogItem*, but provides no new fields. Two attributes are used to describe each display plane: a unique identifier (used as a reference during catalogue entry lookups), and language independent text (used to describe the purpose of the display plane). The language independent text supports human readability, but not machine readability. In other words, a human can determine the display plane ordering from the descriptions, a machine cannot.

This poses two challenges for applications:

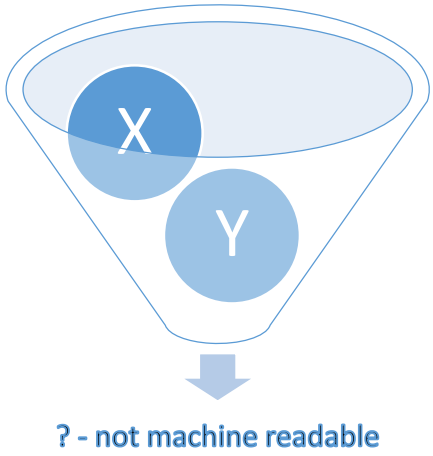
- How to determine whether a given display plane is above or below another display plane
- How to determine whether a given display plane is above RADAR or below RADAR

While the application could prompt the user to set the ordering during portrayal catalogue installation, we view this as undesirable. Instead, we propose changes to the portrayal catalogue model in support of machine readability.

2.1 Display Plane Relative Ordering

In order to render the portrayal an application must sort drawing instructions by display plane. The display plane is indicated using a string attribute of the drawing instruction, which provides a reference to a display plane in the portrayal catalogue. After sorting, the application has *N* bins of drawing instructions, where *N* is the number of display planes defined within the portrayal catalogue. Each bin is associated with a single display plane.

In order to render the instructions in the correct order the application must sort the bins into their final draw order. There is currently no algorithm to determine this ordering; the only attribute available is the description of the display plane. For example, the portrayal catalogue may describe display planes “X” and “Y”, but it provides no information to algorithmically determine a relative drawing order.



Providing clarification may be sufficient to resolve this issue, e.g.:

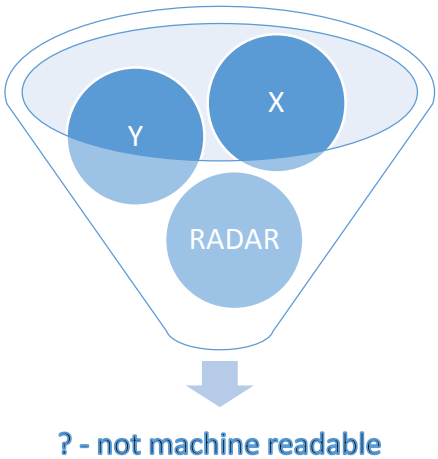
> *The portrayal catalogue specifies display planes in order of increasing priority. The first display plane in the catalogue should appear underneath all others, the last display plane should appear atop all others.*

However, the issue presented in the next section cannot be resolved via clarification. We therefore recommend adding the information needed to unambiguously determine the stacking order of display planes provided in the portrayal catalogue. This information is presented in section 2.3 Recommended Changes to the Portrayal Catalogue Model.

2.2 Display Plane Ordering Relative to RADAR

In addition to ordering the display planes relative to one another, applications which display RADAR information must determine how the RADAR display plane should be inserted into those specified in the portrayal catalogue. To do this, the application must determine whether each display plane is above or below RADAR. Currently there is no information provided to make this determination.

Using the previous example, the application only knows it has two display planes: “X” and “Y”. It now must add a display plane for RADAR to the sort:



2.3 Recommended Changes to the Portrayal Catalogue Model

There are many different ways the two sorting issues presented could be resolved; however, note that 2b-4.2.22 *S100_PR_DisplayPlane* already contains an *Order* attribute for each display plane:

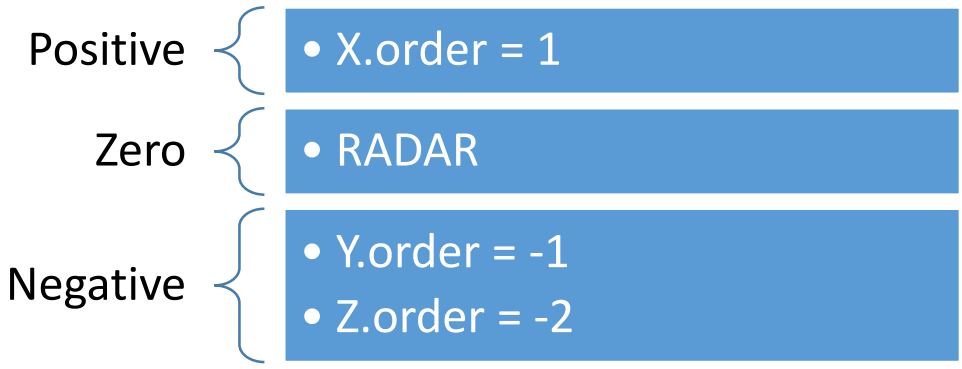
Role	Name	Description	Mult	Data Type

Class	S100_PR_DisplayPlane	The specific content for a display plane definition as a register item of type 'displayPlane'	-	S100_PR_RegisterItem
Attribute	Order	Used to sort the drawing order of display planes	1	Integer

We recommend using this attribute within the portrayal catalogue to specify the stacking order. The attribute will have a unique value for each display plane enumerated within a portrayal catalogue. The attribute will never have a value of zero, which will be reserved for an application provided RADAR display plane.

Values less than zero indicate below RADAR, values greater than zero indicate above RADAR. A sort on the attribute will order all display planes correctly – e.g. lower values are lower in the stack, higher values are higher in the stack.

For example, given display planes "X", "Y", and "Z" assigning attribute values of X.order = 1, Y.order = -1, Z.order = -2 produces a draw order after sorting of:



Adding the enabling attribute in 9-13.3.18 *DisplayPlane*:

Role	Name	Description	Mult	Data Type
Class	DisplayPlane	A display plane name and definition	-	-
Subtype of	CatalogItem	See CatalogItem	-	-
Attribute	order	Used to sort the drawing order of display planes. Display planes with larger values are drawn above those with lower values. Positive : Above RADAR Zero : Reserved for RADAR Negative: Below RADAR	1	integer

This change resolves the issues presented and supports full machine readability for display planes provided within a portrayal catalogue.

3 Action Required

The group is invited to:

a. Note the issues presented

b. Provide feedback on the issues presented

c. Advise on recommended way forward for presentation to S-100WG