

Table of Contents

Welcome!	1
Main Toolbar	3
Project File Tools	4
Symbols Tools	5
ASAP2 Tools	7
Project Settings	8
Edit Tools	10
Edit Measurements	11
Edit Characteristics	13
Edit Characteristic Axes	16
Edit Axis Pts	18
Edit Conversion Methods	20
Edit Verbal Conversion Tables	22
Edit Record Layouts	24
Edit Groups	27
Edit Memory Address	28
Edit Interface Data	30
Symbol Area	31
A2L Item Area	32
Measurements Tab	33
Characteristics Tab	35
Axis Pts Tab	38
Conversion Methods Tab	40
Verbal Conversion Tables Tab	42
Record Layouts Tab	44
Groups Tab	45
A2L Item Right Click Menu	47
Messages Area	49
Contact Intrepid Control Systems, Inc.	50



Welcome to the ASAP2 Editor Help Documentation

This documentation describes the features of the ICS ASAP2 Editor software application.

Overview (refer to Figure 1)

Various map file formats generated from source code compilation define symbols in an ECU's memory. The ICS ASAP2 Editor converts map files into ASAM standard A2L files that define ECU measurements, calibrations, and diagnostic information. The A2L files are used by the ICS Vehicle Spy MEP feature to translate CCP/XCP message traffic with the ECU into user friendly displays and dialogs that aid calibration and diagnostic development.

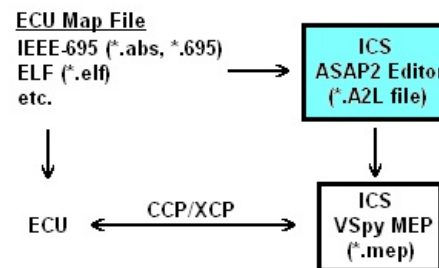


Figure 1: Overview of how the ASAP2 Editor supports Vehicle Spy and ECUs that use CCP/XCP.

General Layout and Use (refer to Figure 2)

The ASAP2 Editor consists of a [main toolbar](#) along the top of the window and three viewing areas.

A common way to use the editor is to first load an ECU map file and see its symbols in a +/- tree in the [Symbol area](#) ①. The symbols can then be added to an A2L file by dragging and dropping them onto the tabs in the [A2L item area](#) ②. The [Messages area](#) ③ will display any warnings or errors after building or generating the A2L file.

Another way to use the editor is to simply import previously created A2L files, edit their contents in the A2L item area, and generate the modified A2L file.

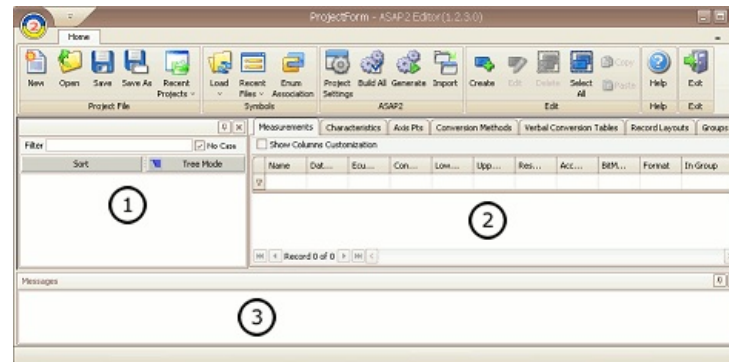


Figure 2: General layout of the ASAP2 Editor.

The Symbols and Messages areas ① & ③ can be redocked into other locations within the editor by dragging and dropping their titlebars. These areas can also be pinned to the sides of the editor to disappear as named tabs when not in use and reappear when the mouse is hovered over the tab.

Acronyms

Some abbreviations coming from specifications are used in the ASAP2 Editor and these helpfiles. Here's a short list of descriptions to help understand the acronyms being used:

- A2L - file extension on files using the ASAM MCD-2MC metalanguage.

- A2ML - another name for the ASAM MCD-2MC metalanguage.
- ASAM - Association for Standardization of Automation and Measuring Systems. (www.asam.net)
- ASAM MCD-2MC - metalanguage used in all A2L files.
- ASAP2 - from German "Arbeitskreis zur Standardisierung von Applikationssystemen". Older acronym replaced by ASAM MCD-2MC.
- CCP - CAN Calibration Protocol.
- ECU - Electronic Control Unit.
- ICS - Intrepid Control Systems. (www.intrepidcs.com)
- MCD - Measurement, Calibration, and Diagnostics.
- MEP - Memory Edit Protocol, a feature in Vehicle Spy from ICS.
- VSpy - Vehicle Spy, an MCD system from ICS.
- XCP - Universal Calibration Protocol.

Contact Information & Useful Links

[ICS Contact Information](#)

On the web:

- [Training Videos](#)
- [ASAM Standards](#)

 **ASAP2 Editor Documentation - (C) Copyright 2021 Intrepid Control Systems, Inc.**

Last Update: Wednesday, June 17, 2009



Main Toolbar

The different features of the ASAP2 Editor are accessed through the main toolbar shown in Figure 1. The toolbar is divided into six groups of tasks that can be done with the software. Click on the Toolbar Group names in Table 1 to see further details for each of them.

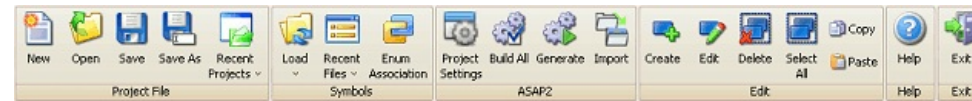


Figure 1: The main toolbar provides easy access to ASAP2 Editor's many features.

Table 1: ASAP2 Editor Toolbar Groups

Toolbar Group	Description
Project File	Create, open, or save ASAP2 Editor project (*.prj) files.
Symbols	Load symbols from an ECU map file and apply enumerated states to symbol arrays. These tools affect the +/- tree in the Symbol area of the editor.
ASAP2	Adjust A2L file properties and generate or import A2L files.
Edit	Use these tools to edit items within the A2L file .
Help	See version information and a hyperlink to the ICS website.
Exit	Exit the ASAP2 Editor application.

**Project File Tools**

The Project File group (Figure 1) in the [main toolbar](#) contains tools for the ASAP2 Editor project files (*.prj). Refer to Table 1 for a brief description of each selection.



Figure 1: The Project File toolbar group.

Table 1: Project File Tools

Project File Tool	Hotkey	Description
New	Ctrl+N	Create a blank project file.
Open	Ctrl+O	Open an existing project file.
Save	Ctrl+S	Save current setup to the currently open project file name.
Save As	Ctrl+Shift+S	Save current setup to a new project file name.
Recent Projects	n/a	Open one of the 10 most recently saved projects.



Symbols Tools

The Symbols group (Figure 1) in the [main toolbar](#) contains tools for the [Symbol area](#) of the editor. Refer to Table 1 for a brief description of each selection.

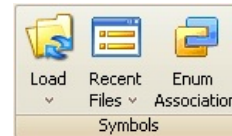


Figure 1: The Symbols toolbar group.

Table 1: SymbolsTools

Symbols Tool	Hotkey	Description
Load	n/a	Load all symbols from an ECU map file that is in one of these formats: <ul style="list-style-type: none"> • IEEE-695 (*.abs or *.695) • ELF/DWARF (*.elf) • TI COFF/DWARF (*.out) • KEIL 166 (*.m66) • OMF 166 (*.omf)
Recent Files	n/a	Load one of the 10 most recently opened ECU map files.
Enum Association	Ctrl+L	Open dialog to apply enumerated states to symbol arrays. Please read below for further details.

Elements within symbol arrays are initially displayed with generic names and index numbers like that shown in Figure 2. The Enum Association tool applies more descriptive names to the symbol array elements.

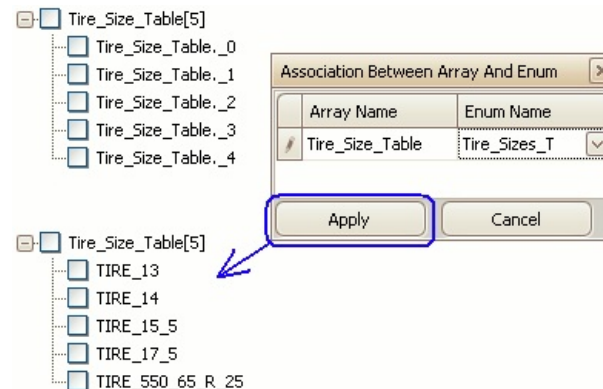


Figure 2: Apply the Enum Association tool to get descriptive names for array elements.

To Apply Enumerated States to Symbol Arrays:

1. Click the Enum Association tool button to open the dialog.
2. Drag and drop the array branch [#] from the Symbols tree onto the dialog.
3. Click in the Enum Name cell and select the desired enumeration declaration.

4. Click the Apply button.

Use the Cancel button to restore all symbol array elements back to their generic names and index numbers.

 **ASAP2 Editor Documentation - (C) Copyright 2021 Intrepid Control Systems, Inc.**

Last Update: Wednesday, June 17, 2009

**ASAP2 Tools**

The ASAP2 group (Figure 1) in the [main toolbar](#) contains tools to adjust A2L file properties and generate or import A2L files. Refer to Table 1 for a brief description of each selection.

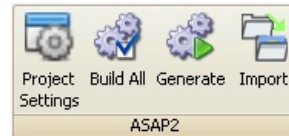


Figure 1: The ASAP2 toolbar group.

Table 1: ASAP2 Tools

ASAP2 Tool	Hotkey	Description
Project Settings	Ctrl+P	Open dialog to edit the A2L file properties.
Build All	Ctrl+B	Build an A2L file based upon the current project, but do NOT save results to an A2L file. Useful for quick error checking in the Messages area .
Generate	Ctrl+G	Build an A2L file based upon the current project and save results to an A2L file name of your choice. Errors in the Messages area will prevent the A2L file from being saved, but warnings will not.
Import	Ctrl+I	Import an A2L file into the current project.

**Project Settings**

The Project Settings tool contains settings to adjust A2L file properties and ASAP2 Editor default behaviors. Click this tool in the [ASAP2 group](#) of the [main toolbar](#) to open the dialog in Figure 1.

Figure 1: The Project Properties dialog is opened from the ASAP2 tool "Project Settings".

The General tab defines all of the properties and these are described in Table 1 below. The properties from "Project Name" down through "Station Address" affect both the A2L file and the ASAP2 Editor project (*.prj) file. The "Default" and "Map File" properties only affect the editor so they get stored only in the project file.

The Interface Identifier tab lets you create identifiers to be used with [Interface Data](#) for Measurements, Characteristics, and Axis Pts.

Use the OK button to close the dialog and save any changes. Use the Cancel button to close the dialog without saving any changes.

Table 1: Project Properties

Project Property	Description
Project Name	Name of the project. (no spaces allowed)
Project Description	Longer description of the project.
Module Name	Name of the ECU. (no spaces allowed)
	Byte ordering within the ECU.

Byte Order	<ul style="list-style-type: none"> • MSB_FIRST = most significant byte first • MSB_LAST = most significant byte last
Module Description	Longer description of the ECU.
Global Offset Address	Offset value (decimal) added to the base address of any map file symbols dropped into the A2L item area.
CRO	Command Receive Object - the CAN Request ID (hex) for the commands sent from the test tool to the ECU.
DTO	Data Transmission Object - the CAN Response ID (hex) for the data sent from the ECU to the test tool.
Station Address	In some cases, a secondary Station ID (hex) is also used to properly address an ECU.
Default EnumType	<p>Enumeration type applied to map file symbols dropped into the A2L item area if their type is not already defined.</p> <ul style="list-style-type: none"> • UBYTE - 1 byte unsigned integer • SBYTE - 1 byte signed integer • UWORD - 2 byte unsigned integer • SWORD - 2 byte signed integer • ULONG - 4 byte unsigned integer • SLONG - 4 byte signed integer • FLOAT32_IEEE - 32 bit floating point IEEE format • FLOAT64_IEEE - 64 bit floating point IEEE format • FLOAT32_TASKING - 32 bit floating point tasking format
Default Format	<p>Formatting applied to map file symbols dropped into the A2L item area if their format is not already defined.</p> <p>Format of this field must be: %Length.Layout</p> <ul style="list-style-type: none"> • Length = overall length • Layout = number of decimal places
Default ConversionMethod	The default conversion method applied to any map file symbols dropped into the A2L item area . The dropdown selections are defined by the Conversion Methods tab .
Associated Map File	File path to an ECU map file. If defined, the map file symbols will automatically load into the editor when the project is loaded.
Map File Type	Format of the Associated Map File. (IEEE 695, ELF, etc.)



The Edit group (Figure 1) in the [main toolbar](#) has tools for editing [A2L items](#). These tools are also available in a convenient [right click menu](#) while hovering the mouse cursor over the A2L item area. Refer to Table 1 for a brief description of each selection.



Figure 1: The Edit toolbar group.

Table 1: Edit Tools

Edit Tool	Hotkey	Description
Create	Ctrl+C	Open a dialog to create a new A2L file item . <ul style="list-style-type: none">• Measurements• Characteristics• Axis Pts• Conversion Methods• Verbal Conversion Tables• Record Layouts• Groups
Edit*	Ctrl+E	Open a dialog to edit highlighted A2L file items. The dialog layouts are the same as those used for the Create tool.
Delete*	Delete	Delete highlighted A2L file items.
Select All	Ctrl+A	Select all A2L file items on the current tab.
Copy*	Ctrl+C	Copy highlighted A2L file items to a copy buffer.
Paste	Ctrl+V	Paste A2L file items from the copy buffer to the end of the item list.

*The Edit, Delete, and Copy tools can be applied to multiple A2L items at once to help save time. Just press and hold the keyboard Shift or Control keys while left clicking on items to highlight a group of items to change. Then click on the tool to apply it to all highlighted items at once.



Create/Edit Measurements

Measurements are typically read-only values stored in an ECU.

To create or edit Measurements in an A2L file use the [Create or Edit tools](#) in the main toolbar or the [right click menu](#) while the [Measurements tab](#) is active in the A2L file area. A tabbed dialog will open similar to that shown in Figure 1.

Figure 1: The dialog for creating or editing A2L file Measurements.

The General tab defines most of the Measurement properties and these are described in Table 1 below. The [Address tab](#) defines memory addressing for the Measurement. The [Interface Data tab](#) supports unique data that a tool may need to run properly. Use the OK button to close the dialog and save any changes. Use the Cancel button to close the dialog without saving any changes.

Table 1: Measurement Properties on the General Tab

Property	Description
Name	<p>Unique identifier of the Measurement.</p> <p>Here are the main requirements for this field:</p> <ul style="list-style-type: none"> • Max overall length = 1024 characters. • Max partial string length = 128 characters. • Allowed characters: A - Z, a - z, 0 - 9, underscores, periods, and brackets []. • Must NOT contain spaces. • First character must be a letter or an underscore. • Any brackets must occur in pairs at the end of a partial string. • Any bracket pairs must surround a number or string. • Name is case sensitive. (i.e. "b" and "B" are considered unique) <p>If in doubt about valid names, please refer to the ASAM specifications.</p>
Long Identifier	Comment or description.
Display Identifier	An alternative display name that is usually much shorter than the Name property. Can be useful for devices with small display areas.

Format	<p>Display formatting applied to numerical values. If specified, this Format property overrides any formatting in the Conversion property.</p> <p>The syntax for this field is: %Length.Layout</p> <ul style="list-style-type: none"> Length = overall length Layout = number of decimal places
Bit Mask	<p>Masks out single bits of the value to be processed. 0xFF = no mask for that byte. This property defaults to no masking with the number of 0xFF's determined by the Data Type selection.</p> <p>Note: The default mask is reapplied each time the Data Type is changed.</p>
Data Type	<p>Determines the number of bytes dedicated to the value and how those bytes are interpreted. <u>This property should be chosen early</u> because it applies defaults to the Bit Mask, Lower Limit, and Upper Limit properties.</p> <ul style="list-style-type: none"> UBYTE - 1 byte unsigned integer SBYTE - 1 byte signed integer UWORD - 2 byte unsigned integer SWORD - 2 byte signed integer ULONG - 4 byte unsigned integer SLONG - 4 byte signed integer FLOAT32_IEEE - 4 byte (32 bit) floating point IEEE format FLOAT64_IEEE - 8 byte (64 bit) floating point IEEE format FLOAT32_TASKING - 4 byte (32 bit) floating point tasking format
Conversion	<p>Applies the selected Conversion Method to the value. The dropdown selections come from the Conversion Methods tab.</p>
Lower Limit	<p>Lower limit of plausible range of values. A default limit is determined mathematically by the Data Type selection.</p> <p>Note: The default limit is reapplied each time the Data Type is changed.</p>
Upper Limit	<p>Upper limit of plausible range of values. A default limit is determined mathematically by the Data Type selection.</p> <p>Note: The default limit is reapplied each time the Data Type is changed.</p>
Resolution	<p>Smallest possible change in bits. (0 to 255)</p>
Accuracy	<p>Possible variation from exact value in %.</p>



Create/Edit Characteristics

Characteristics are typically read-write calibrations stored in an ECU. The ASAP2 Editor supports these 3 types:

- Value - a single value with no axis.
- Curve - an array of values with an X axis.
- Map - a table of values with X and Y axes.

To create or edit Characteristics in an A2L file use the [Create or Edit tools](#) in the main toolbar or the [right click menu](#) while the [Characteristics tab](#) is active in the A2L file area. A tabbed dialog will open similar to that shown in Figure 1.

Figure 1: The dialog for creating or editing A2L file Characteristics

The General tab defines most of the Characteristic properties and these are described in Table 1 below. The [Address tab](#) defines memory addressing for the Characteristic. One or both of the [Axis tabs](#) will appear if the Type is a curve or map. The [Interface Data tab](#) supports unique data that a tool may need to run properly. Use the OK button to close the dialog and save any changes. Use the Cancel button to close the dialog without saving any changes.

Table 1: Characteristic Properties on the General Tab

Property	Description
Name	<p>Unique identifier of the Characteristic.</p> <p>Here are the main requirements for this field:</p> <ul style="list-style-type: none"> • Max overall length = 1024 characters. • Max partial string length = 128 characters. • Allowed characters: A - Z, a - z, 0 - 9, underscores, periods, and brackets []. • Must NOT contain spaces. • First character must be a letter or an underscore. • Any brackets must occur in pairs at the end of a partial string. • Any bracket pairs must surround a number or string.

	<ul style="list-style-type: none"> Name is case sensitive. (i.e. "b" and "B" are considered unique) <p>If in doubt about valid names, please refer to the ASAM specifications.</p>
Long Identifier	Comment or description.
ECU Address	Memory address of the Characteristic. Data comes from the Address tab , so use that tab instead to change this data.
Display Identifier	Alternative display name that is usually shorter than the Name property. Useful for devices with small display areas.
Type	<p>The ASAP2 Editor supports these 3 types of Characteristics:</p> <ul style="list-style-type: none"> Value - a single value with no axis. Curve - an array of values with 1 axis. Map - a table of values with 2 axes.
Record Layout	Specifies the data structure. The default layout will update depending upon the Data Type field. The dropdown selections come from the Record Layouts tab . The Data Type over on the Record Layout tab must match the Data Type field on this dialog.
Conversion Method	Applies the selected Conversion Method to the value. The dropdown selections come from the Conversion Methods tab .
Format	<p>Display formatting applied to numerical values. If specified, this Format property overrides any formatting in the Conversion Method property.</p> <p>The syntax for this field is: %Length.Layout</p> <ul style="list-style-type: none"> Length = overall length Layout = number of decimal places
Data Type	<p>Determines the number of bytes dedicated to the value and how those bytes are interpreted. <u>This property should be chosen early</u> because it applies defaults to the Record Layout, Lower/Upper Limit, Extended Lower/Upper Limit, and Bitmask properties.</p> <ul style="list-style-type: none"> UBYTE - 1 byte unsigned integer SBYTE - 1 byte signed integer UWORD - 2 byte unsigned integer SWORD - 2 byte signed integer ULONG - 4 byte unsigned integer SLONG - 4 byte signed integer FLOAT32_IEEE - 4 byte (32 bit) floating point IEEE format FLOAT64_IEEE - 8 byte (64 bit) floating point IEEE format FLOAT32_TASKING - 4 byte (32 bit) floating point tasking format
Calibration Access	<p>There are 4 types of access for MCD systems or test tools:</p> <ul style="list-style-type: none"> CALIBRATION - read and write allowed. NO_CALIBRATION - read only. NOT_IN_MCD_SYSTEM - read and write not allowed, for internal ECU use only. OFFLINE_CALIBRATION - read allowed, write only allowed offline.
Lower Limit	<p>Lower limit of plausible range of values. A default limit is determined mathematically by the Data Type selection.</p> <p>Note: The default limit is reapplied each time the Data Type is changed.</p>
Upper Limit	<p>Upper limit of plausible range of values. A default limit is determined mathematically by the Data Type selection.</p> <p>Note: The default limit is reapplied each time the Data Type is changed.</p>
Extended Lower Limit	<p>Extends the lower limit of plausible values. Can be useful for generating warnings when the Lower Limit is exceeded. A default limit is determined mathematically by the Data Type selection.</p> <p>Note: The default limit is reapplied each time the Data Type is changed.</p>
Extended Upper Limit	<p>Extends the upper limit of plausible values. Can be useful for generating warnings when the Upper Limit is exceeded. A default limit is determined mathematically by the Data Type selection.</p> <p>Note: The default limit is reapplied each time the Data Type is changed.</p>
Bit Mask	<p>Masks out single bits of the value to be processed. 0xFF = no mask for that byte. This property defaults to no masking with the number of 0xFF's determined by the Data Type selection.</p> <p>Note: The default mask is reapplied each time the Data Type is changed.</p>

Max Diff

Maximum adjustment allowed to the Characteristic. Entered as an absolute value, not as a percentage.

 **ASAP2 Editor Documentation - (C) Copyright 2021 Intrepid Control Systems, Inc.**

Last Update: Tuesday, June 23, 2009



Edit Characteristic Axes

To create or edit Characteristics in an A2L file use the [Create or Edit tools](#) in the main toolbar or the [right click menu](#) while the [Characteristics tab](#) is active in the A2L file area. A tabbed dialog will open similar to that shown in Figure 1.

Figure 1: The dialog for editing a Characteristic axis.

The X-Axis tab in this dialog is available if the [Characteristic Type](#) is a curve because a curve is an array of values with 1 axis. Both the X and Y-Axis tabs are shown if the Characteristic type is a map because a map is a table of values with 2 axes. The properties on the X and Y-Axis tabs are identical and described below in Table 1.

The [General tab](#) defines the Characteristic type and most of the other properties. The [Address tab](#) defines memory addressing for the Characteristic. The [Interface Data tab](#) supports unique data that a tool may need to run properly. Use the OK button to close the dialog and save any changes. Use the Cancel button to close the dialog without saving any changes.

Table 1: Characteristic Properties on the X-Axis and Y-Axis Tabs

Property	Description
Axis Type	<p>The ASAP2 Editor supports 3 axis types:</p> <ul style="list-style-type: none"> • FIX_AXIS - These axis points are "fixed" in the sense that they can not be written by an MCD system or test tool. Axis points are calculated using the Fix Axis Calc and Fix Axis Calc Data properties. • STD_AXIS - Standard axis where the axis points are stored in the ECU and writeable by a test tool. • COM_AXIS - Common axis that can be applied to multiple curves and maps. Use the Reference Axis Point property to pick the Axis Pts.
Input Quantity	References a Measurement to be used as a working point on the axis to track along the curve or map. The dropdown selections come from the Measurements tab .
Conversion	Applies the selected Conversion Method to the axis values. The dropdown selections come from the Conversion Methods tab .
Max Axis Points	Maximum number of axis points.

Lower Limit	Lower limit of plausible range of values.
Upper Limit	Upper limit of plausible range of values.
Reference Axis Point	Selects the Axis Pts record if the Axis Type = COM_AXIS. The dropdown selections come from the Axis Pts tab .
Fix Axis Calc	<p>Selects how points are created for Axis Type = FIX_AXIS.</p> <ul style="list-style-type: none"> • FIX_AXIS_PAR - uses equation $X(i) = \text{Offset} + (i-1)*2^{\text{Shift}}$, where $i = \{1 \dots \# \text{ of axis points}\}$. • FIX_AXIS_PAR_DIST - uses equation $X(i) = \text{Offset} + (i-1)*\text{Distance}$, where $i = \{1 \dots \# \text{ of axis points}\}$. • FIX_AXIS_PAR_LIST - uses a list of values. The Conversion property is applied to achieve the actual display values.
Fix Axis Calc Data	<p>Input values for the Fix Axis Calc property.</p> <ul style="list-style-type: none"> • FIX_AXIS_PAR format is: Offset, Shift, # of axis points. Example: 0, 4, 6 creates axis points: 0, 16, 32, 48, 64, 80. • FIX_AXIS_PAR_DIST format is: Offset, Distance, # of axis points. Example: 1, 10, 5 creates axis points: 1, 11, 21, 31, 41. • FIX_AXIS_PAR_LIST format is just a list of numbers separated with commas.
Extended Lower Limit	Extends the lower limit of plausible values. Can be useful for generating warnings when the Lower Limit is exceeded.
Extended Upper Limit	Extends the upper limit of plausible values. Can be useful for generating warnings when the Upper Limit is exceeded.
Format	<p>Display formatting applied to numerical values. If specified, this Format property overrides any formatting in the Conversion property.</p> <p>The syntax for this field is: %Length.Layout</p> <ul style="list-style-type: none"> • Length = overall length • Layout = number of decimal places
Deposit	<p>Determines how axis points are stored in ECU memory:</p> <ul style="list-style-type: none"> • ABSOLUTE - value is stored as an absolute value. • DIFFERENCE - value is stored as the difference from the preceding value.
Readonly checkbox	If enabled, axis points will be read-only and can not be written.



Create/Edit Axis Pts

Axis Pts define axes that are shared across multiple Characteristic curves or maps. These axes have a [Characteristic Axis Type](#) = COM_AXIS.

To create or edit Axis Pts in an A2L file use the [Create or Edit tools](#) in the main toolbar or the [right click menu](#) while the [Axis Pts tab](#) is active in the A2L file area. A tabbed dialog will open similar to that shown in Figure 1.

Figure 1: The dialog for creating or editing A2L file Axis Pts

The General tab defines most of the Axis Pts properties and these are described in Table 1 below. The [Address tab](#) defines memory addressing for the Axis Pts. The [Interface Data tab](#) supports unique data that a tool may need to run properly. Use the OK button to close the dialog and save any changes. Use the Cancel button to close the dialog without saving any changes.

Table 1: Axis Pts Properties on the General Tab

Property	Description
Name	<p>Unique identifier of the Axis Pts.</p> <p>Here are the main requirements for this field:</p> <ul style="list-style-type: none"> • Max overall length = 1024 characters. • Max partial string length = 128 characters. • Allowed characters: A - Z, a - z, 0 - 9, underscores, periods, and brackets []. • Must NOT contain spaces. • First character must be a letter or an underscore. • Any brackets must occur in pairs at the end of a partial string. • Any bracket pairs must surround a number or string. • Name is case sensitive. (i.e. "b" and "B" are considered unique) <p>If in doubt about valid names, please refer to the ASAM specifications.</p>

Display Identifier	An alternative display name that is usually much shorter than the Name property. Can be useful for devices with small display areas.
Long Identifier	Comment or description.
Input Quantity	References a Measurement to be used as a working point on the axis to track along the curve or map. The dropdown selections come from the Measurements tab .
Record Layout	Specifies the data structure. The default layout will update depending upon the Data Type field. The dropdown selections come from the Record Layouts tab . The Data Type over on the Record Layout tab must match the Data Type field on this dialog.
Conversion Method	Applies the selected Conversion Method to the value. The dropdown selections come from the Conversion Methods tab .
Format	Display formatting applied to numerical values. If specified, this Format property overrides any formatting in the Conversion Method property. The syntax for this field is: %Length.Layout <ul style="list-style-type: none"> Length = overall length Layout = number of decimal places
Data Type	Determines the number of bytes dedicated to the value and how those bytes are interpreted. <u>This property should be chosen early</u> because it applies defaults to the Lower/Upper Limit and Extended Lower/Upper Limit properties. <ul style="list-style-type: none"> UBYTE - 1 byte unsigned integer SBYTE - 1 byte signed integer UWORD - 2 byte unsigned integer SWORD - 2 byte signed integer ULONG - 4 byte unsigned integer SLONG - 4 byte signed integer FLOAT32_IEEE - 4 byte (32 bit) floating point IEEE format FLOAT64_IEEE - 8 byte (64 bit) floating point IEEE format FLOAT32_TASKING - 4 byte (32 bit) floating point tasking format
Calibration Access	There are 4 types of access for MCD systems or test tools: <ul style="list-style-type: none"> CALIBRATION - read and write allowed. NO_CALIBRATION - read only. NOT_IN_MCD_SYSTEM - read and write not allowed, for internal ECU use only. OFFLINE_CALIBRATION - read allowed, write only allowed offline.
Lower Limit	Lower limit of plausible range of values. A default limit is determined mathematically by the Data Type selection. Note: The default limit is reapplied each time the Data Type is changed.
Upper Limit	Upper limit of plausible range of values. A default limit is determined mathematically by the Data Type selection. Note: The default limit is reapplied each time the Data Type is changed.
Extended Lower Limit	Extends the lower limit of plausible values. Can be useful for generating warnings when the Lower Limit is exceeded. A default limit is determined mathematically by the Data Type selection. Note: The default limit is reapplied each time the Data Type is changed.
Extended Upper Limit	Extends the upper limit of plausible values. Can be useful for generating warnings when the Upper Limit is exceeded. A default limit is determined mathematically by the Data Type selection. Note: The default limit is reapplied each time the Data Type is changed.
Max Diff	Maximum adjustment allowed to an axis point. Entered as an absolute value, not as a percentage.
Max Axis Points	Maximum number of axis points.



Create/Edit Conversion Methods

Conversion Methods are formulas and tables applied to [Measurements](#), [Characteristics](#), and [Axis Pts](#). They are declared with the keyword COMPU_METHOD within the A2L file.

To create or edit Conversion Methods in an A2L file use the Create or Edit tools from the [Edit group](#) in the [main toolbar](#) while the [Conversion Methods tab](#) is active in the A2L file area. A dialog will open similar to that shown in Figure 1.

Create New Conversion Method

General

Name:

Long Identifier:

Conversion Type:

TAB_INTPT

Conversion table:

Formula:

Coefficient 'a':

0

Coefficient 'b':

0

Coefficient 'c':

0

Coefficient 'd':

0

Coefficient 'e':

0

Coefficient 'f':

0

Format:

%0.6

Units:

OK

Cancel

Figure 1: The dialog for creating or editing A2L file Conversion Methods.

Refer to Table 1 below for a brief description of each property. Use the OK button to close the dialog and save any changes. Use the Cancel button to close the dialog without saving any changes.

Table 1: Conversion Method Properties

Property	Description
Name	<div>Unique identifier of the Conversion Method.</div> <div>Here are the main requirements for this field:</div> <ul style="list-style-type: none">• Max overall length = 1024 characters.• Max partial string length = 128 characters.• Allowed characters: A - Z, a - z, 0 - 9, underscores, periods, and brackets [].• Must NOT contain spaces.• First character must be a letter or an underscore.• Any brackets must occur in pairs at the end of a partial string.• Any bracket pairs must surround a number or string.• Name is case sensitive. (i.e. "b" and "B" are considered unique) <div>If in doubt about valid names, please refer to the ASAM specifications.</div>
Long Identifier	Comment or description.
	The ASAP2 Editor supports 5 types of conversions:

Conversion Type	<ul style="list-style-type: none"> • TAB_INTTP - table with interpolation. • TAB_NOINTP - table without interpolation. • TAB_VERB - verbal conversion table. • RAT_FUNC - fractional rational function $f(x)=(axx + bx + c)/(dxx + ex + f)$, where coefficients 'a' through 'f' are specified properties. • FORM - formula as specified in the Formula property.
Conversion Table	Table used for the TAB_x conversion types. Dropdown selections come from the Verbal Conversion Tables tab .
Formula	<p>Formula specified as a function of x.</p> <p>Multiple references use syntax X1, X2, X3, etc where X1 references the first input, X2 the second, etc. If there is only one reference in the formula then X can be used instead of X1.</p>
Coefficients 'a' through 'f'	<p>Coefficient values for the Conversion Type = RAT_FUNC.</p> <p>$f(x)=(axx + bx + c)/(dxx + ex + f)$</p>
Format	<p>Display formatting applied to numerical values. This Format will be overridden by any Format properties specific to Measurements, Characteristics, and Axis Pts.</p> <p>The syntax for this field is: %Length.Layout</p> <ul style="list-style-type: none"> • Length = overall length • Layout = number of decimal places
Units	A physical unit label like Volts, RPM, kph, etc.



Create/Edit Verbal Conversion Tables

Verbal Conversion Tables are equivalent to enumerated or state encoded decimal lookup tables. These tables take integer value inputs and apply text description outputs to them. For example, 0 = Off, 1 = On, etc.


To create or edit Verbal Conversion Tables in an A2L file use the Create or Edit tools from the [Edit group](#) in the [main toolbar](#) while the [Verbal Conversion Tables tab](#) is active in the A2L file area. A dialog will open similar to that shown in Figure 1.

Figure 1: The dialog for creating or editing A2L file Verbal Conversion Tables

Refer to Table 1 below for a brief description of each property. Use the OK button to close the dialog and save any changes. Use the Cancel button to close the dialog without saving any changes.

Table 1: Verbal Conversion Table Properties

Property	Description
Name	<p>Unique identifier of the Verbal Conversion Table.</p> <p>Here are the main requirements for this field:</p> <ul style="list-style-type: none"> • Max overall length = 1024 characters. • Max partial string length = 128 characters. • Allowed characters: A - Z, a - z, 0 - 9, underscores, periods, and brackets []. • Must NOT contain spaces. • First character must be a letter or an underscore. • Any brackets must occur in pairs at the end of a partial string. • Any bracket pairs must surround a number or string. • Name is case sensitive. (i.e. "b" and "B" are considered unique) <p>If in doubt about valid names, please refer to the ASAM specifications.</p>
Long Identifier	Comment or description.
Inputs	Each cell in this column is allowed a single integer value input. (i.e. 0, 1, etc.) Multiple rows with the same input value are not allowed.
Outputs	Each cell in this column assigns a text description label to its Input. (i.e. Off, On, etc.)

Default Value	Default text display for undeclared Inputs.
 ASAP2 Editor Documentation - (C) Copyright 2021 Intrepid Control Systems, Inc.	

Last Update: Saturday, June 20, 2009



Create/Edit Record Layouts

Record Layouts specify data structures in the ECU memory.

To create or edit Record Layouts in an A2L file use the Create or Edit tools from the [Edit group](#) in the [main toolbar](#) while the [Record Layouts tab](#) is active in the A2L file area. A dialog will open similar to that shown in Figure 1.

Figure 1: The dialog for creating or editing A2L file Record Layouts.

Refer to Table 1 below for a brief description of each property. Use the OK button to close the dialog and save any changes. Use the Cancel button to close the dialog without saving any changes.

Table 1: Record Layout Properties

Property	Description
Name	<p>Unique identifier of the Record Layout.</p> <p>Here are the main requirements for this field:</p> <ul style="list-style-type: none"> • Max overall length = 1024 characters. • Max partial string length = 128 characters. • Allowed characters: A - Z, a - z, 0 - 9, underscores, periods, and brackets []. • Must NOT contain spaces. • First character must be a letter or an underscore. • Any brackets must occur in pairs at the end of a partial string. • Any bracket pairs must surround a number or string. • Name is case sensitive. (i.e. "b" and "B" are considered unique) <p>If in doubt about valid names, please refer to the ASAM specifications.</p>
Description	Comment or description.
FNC_VALUES	If enabled, the Record Layout uses enabled properties to define how values are deposited in ECU memory.
Position	Start position of values in the record. If the Index Mode uses one of the Alternate options the position determines the ordering of values and axis points.

Data Type	<p>Number of bytes dedicated to each value and how those bytes are interpreted.</p> <ul style="list-style-type: none"> • UBYTE - 1 byte unsigned integer • SBYTE - 1 byte signed integer • UWORD - 2 byte unsigned integer • SWORD - 2 byte signed integer • ULONG - 4 byte unsigned integer • SLONG - 4 byte signed integer • FLOAT32_IEEE - 4 byte (32 bit) floating point IEEE format • FLOAT64_IEEE - 8 byte (64 bit) floating point IEEE format
Index Mode	<p>Determines how the values of curves (arrays) or maps (tables) are stored in ECU memory. For example consider these 2 curves, a map, and an X-Axis:</p> <pre> a1 a2 a3 == Example of curve a. b1 b2 b3 == Example of curve b with common X-axis. Y1 a11 a12 a13 == Example of map a with Y-Axis points. Y2 a21 a22 a23 X1 X2 X3 == X-Axis points common to examples above. </pre> <ul style="list-style-type: none"> • COLUMN_DIR - store values by column. Applying this mode gives: Curve 'a' (a1, a2, a3) Map 'a' (a11, a21, a12, a22, a13, a23) • ROW_DIR - store values by row. Applying this mode gives: Curve 'a' (a1, a2, a3) Map 'a' (a11, a12, a13, a21, a22, a23) • ALTERNATE_WITH_X - store by alternating between column values and X-axis point. Applying this mode gives: Curve 'a' (a1, X1, a2, X2, a3, X3) Map 'a' (a11, a21, X1, a12, a22, X2, a13, a23, X3) • ALTERNATE_WITH_Y - store by alternating between row values and Y-axis point. Applying this mode gives: Curve 'a' (not applicable) Map 'a' (a11, a12, a13, Y1, a21, a22, a23, Y2) • ALTERNATE_CURVES - used for multiple curves with a common axis. Store by alternating between column values from each curve and the common X-axis point. Applying this mode gives: Curves 'a' and 'b' (a1, b1, X1, a2, b2, X2, a3, b3, X3) Map (not allowed)
Address Type	<p>There are 4 types of memory addressing:</p> <ul style="list-style-type: none"> • PBYTE - memory location has a 1 byte pointer to the value. • PWORD - memory location has a 2 byte pointer to the value. • PLONG - memory location has a 4 byte pointer to the value. • DIRECT - memory location has the first value and remaining values follow with incrementing address.
AXIS_PTS_X	If enabled, the Record Layout defines how X-axis points are deposited in ECU memory.
Position	Same description as above for the FNC_VALUES Position.
Data Type	Same description as above for the FNC_VALUES Data Type.
Index Order	<p>Determines the axis point sequence in the memory.</p> <ul style="list-style-type: none"> • INDEX_INCR - increasing index with increasing address. • INDEX_DECR - decreasing index with increasing address.
Address Type	Same description as above for the FNC_VALUES Address Type.

Last Update: Sunday, June 28, 2009

**Create/Edit Groups**

Use Groups in an A2L file to help organize [Measurements](#) and [Characteristics](#) into logical categories.

To create or edit Groups use the tools from the [Edit group](#) in the [main toolbar](#) or the [right click menu](#) while the [Groups tab](#) is active in the A2L file area. A dialog will open similar to Figure 1.

Figure 1: The dialog for creating or editing A2L file Groups.

The Group Name must follow the same rules that apply to all other A2L item names. Enable the Root checkbox to force the Group to be at the root, or base level, of a branch. Use the Description field to describe the group or enter a comment.

Add items to the Group by dragging them from the [Measurements tab](#) or [Characteristics tab](#) and dropping them onto the corresponding tab on the edit Group dialog. Add Subgroups within the Group by dragging them from the Groups tab and dropping them onto the Subgroup tab. Only Groups with their Root flag disabled can be used as a Subgroup.

Use the Apply button to close the dialog and save any changes. Use the Cancel button to close the dialog without saving any changes.



Edit Memory Address

[Measurements](#), [Characteristics](#) and [Axis Pts](#) have memory addresses pointing to their location within an ECU. The memory address can be changed by using the Address tab found in the edit dialogs for each of those A2L item types. The Address tab will appear similar to Figure 1.

The screenshot shows the 'Characteristic Properties' dialog box with the 'Address' tab selected. The 'A2L address' field contains '0x00000000'. Below it, there are three input fields: 'Global offset address(dec)' with '0', 'Base address in map file' with '0x00000000', and 'Individual offset address(dec)' with '0'. To the left of these is the 'Associated variable' label. Below the offset fields is the 'Associated name' field with up and down arrows. At the bottom left is a 'Manual flag' checkbox which is unchecked. To its right is the 'Update type' dropdown menu set to 'FULL_UPDATE'. 'OK' and 'Cancel' buttons are at the bottom right.

Figure 1: Example of the dialog for editing a memory address

The Address tab properties are described in Table 1 below. Use the OK button to close the dialog and save any changes. Use the Cancel button to close the dialog without saving any changes.

Table 1: Address Tab Properties

Property	Description
A2L Address	Absolute memory address of the A2L item within the ECU. Format is 4 bytes hexadecimal. If the Manual Flag is enabled then this value can be entered directly. If the Manual Flag is disabled then this value is calculated as Global Offset + Base Address + Individual Offset.
Global Offset Address	Offset value (decimal) added to the Base Address of all map file symbols dropped into the A2L item area. The Project Settings dialog is the only place to change this value.
Base Address in Map File	Memory address from a map file symbol dropped into the A2L item area. Format is 4 bytes hexadecimal.
Individual Offset Address	Offset value (decimal) added to the Base and Global Offset addresses. This value can be changed only if the Manual Flag is disabled.
Associated Name	Name from a map file symbol dropped into the A2L item area.
Manual Flag	Toggles how the A2L Address in this dialog is created. Enable it to manually update the A2L Address directly. Disable it to let the A2L address be calculated as Global Offset + Base Address + Individual Offset.
Update Type	Applies only to Measurements and Characteristics.

**Edit Interface Data**

MCD systems, test tools, and other interfaces may require unique data to function properly. This interface data can describe things such as database commands, device driver information, or setup details for serial communications. Interface Data is declared with the keyword IF_DATA within the A2L file.

The ASAP2 Editor supports interface data for [Measurements](#), [Characteristics](#), and [Axis Pts](#). The data can be changed by using the Interface Data tab found in the edit dialogs for each of those A2L item types. The Interface Data tab will appear similar to Figure 1.

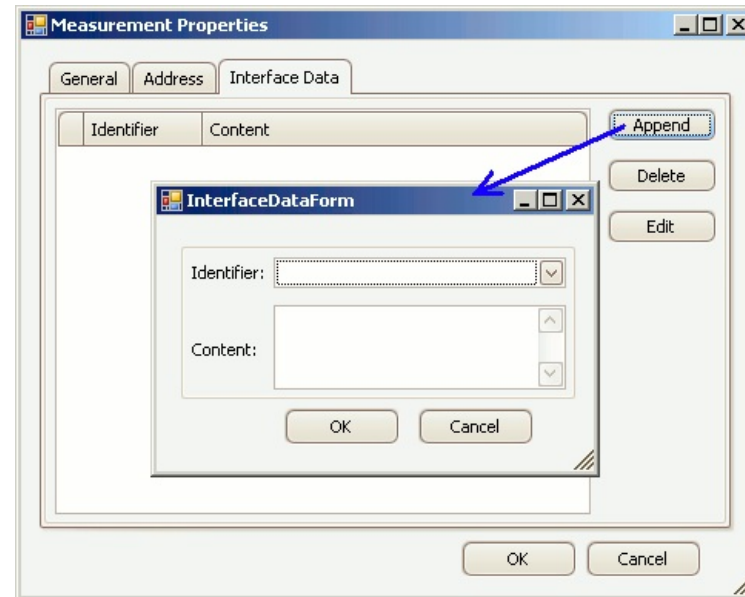


Figure 1: Example of the Interface Data tab and its edit dialog.


Interface data must be linked to an Identifier created on the Interface Identifier tab on the [Project Settings](#) dialog. After an Identifier is created, come back to the Interface Data tab and click the Append button. An edit dialog will open to let you select an Identifier and enter interface data in the Content area. All interface data in the Content area must use the same ASAM MCD-2MC metalanguage that is used in the A2L file.

Use the OK buttons to close the dialog and save any changes. Use the Cancel buttons to close the dialog without saving any changes.



Symbol Tree

Symbols are defined in ECU memory map files created by source code compilers. These symbols are the main input to the ASAP2 Editor for making A2L files for applications like Vehicle Spy.

To get all symbols from an ECU map file click the Load button found in the [Symbols group](#) on the [main toolbar](#). When the file is loaded the symbols are displayed as a +/- tree in a docked window on the left side of the ASAP2 Editor. This window can be redocked into other locations within the editor by dragging and dropping its titlebar. The window can also be pinned  to the sides of the editor to disappear as a named tab when not in use and reappear when the mouse is hovered over the tab.

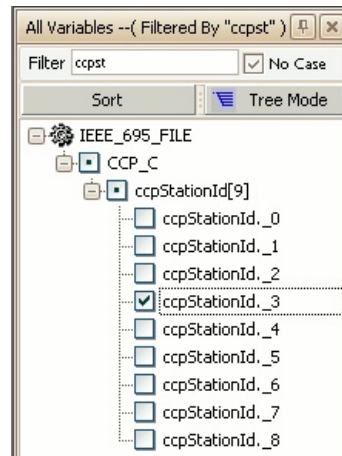


Figure 1: Symbols in Tree Mode.

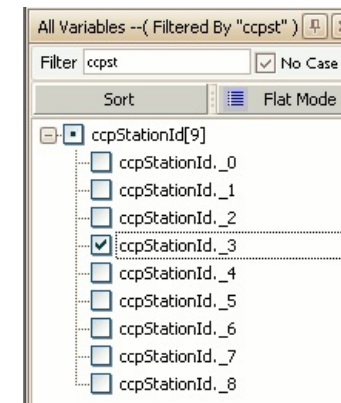


Figure 2: Symbols in Flat Mode.

The symbol tree starts in **Tree Mode** (Figure 1) which means the root shows the ECU map file name and the main branches are the module names from the source code. Click the +/- buttons in the tree to see the symbols in each of modules. Click the Tree Mode button to toggle to **Flat Mode** (Figure 2) which displays the symbols without the ECU map file name or module names.

Use the **Filter** entry to quickly find symbols. Just type what you are looking for, tap the Enter key, and the tree is filtered to only show symbol names containing what you typed. The **No Case** checkbox determines if the Filter is case sensitive. The filter does not apply to the map file or module names seen in Tree Mode.

Click the **Sort** button to sort the tree alphabetically A-Z, Z-A, or use the original sorting from the loaded map file.

The symbol tree in Figures 1 and 2 shows an array and its elements. Arrays are denoted with brackets [] around a number at the end of their name. The number is the number of elements within that array. Each array element is denoted with the array name they belong to followed by an index number. The element names can be replaced with more descriptive names by using the Enum Association tool in the [Symbols group](#) on the [main toolbar](#).

To add a symbol to an A2L file, click on it then drag and drop it onto a valid tab in the [A2L file area](#). Symbols can not be dropped onto the Conversion Methods, Record Layouts, or Groups tabs. Multiple symbols can be added at once to help save time. Just press and hold the keyboard Shift or Control keys while left clicking to create a group of highlighted symbols. Then drag and drop the entire group onto the desired tab.

To the left of each symbol name is a status box. A checkmark means the symbol is being used in the A2L file. A dot means the module or array has a symbol in it being used in the A2L file.



A2L Item Area

Use the A2L item area in the ASAP2 Editor for viewing and editing items in an A2L file. A2L files are used by MCD systems and test tools like Vehicle Spy to translate ECU serial data into user friendly displays and dialogs to help with calibration and diagnostic development.

Before using the A2L item area it is recommended to verify the [Project Settings](#) in the [ASAP2 group](#) on the [main toolbar](#). The ASAP2 group also has tools for error checking, generating, and importing A2L files.

The A2L item area contains tabs for different categories of items as shown in Figure 1. Click the hyperlinks above Figure 1 to find more information for each tab.

[Measurements](#)
[Characteristics](#)
[Axis Pts](#)
[Conversion Methods](#)
[Verbal Conversion Tables](#)
[Record Layouts](#)
[Groups](#)

Measurements

Characteristics

Axis Pts

Conversion Methods

Verbal Conversion Tables

Record Layouts

Groups

☐ Show Columns Customization

Name	Data Type	EcuAddress	Conversion	LowerLimit	Upp...	Res...	Acc...			I...
ground										
GROUND...	UWORD	12345678	DEFAULT_CM	0	65535	0	0	N

Figure 1: Use the tabs in the A2L item area to view and edit items in A2L files.

Table Features Shared Across All Tabs

Every tab in the A2L item area shares useful features for working with their tables.

Columns can be rearranged by dragging and dropping their headers within the table. Columns can also be added and removed. First, enable the **Show Columns Customization** checkbox to open a Hidden Columns window. Next, drag and drop columns between the table and the Hidden Columns window areas. Any columns dropped in the Hidden Columns window will be hidden after that window is closed.

Columns can be filtered in two ways. First, text can be typed in the cells of the first row in the table marked with a funnel icon to find items containing that text. Second, if the mouse cursor hovers over a column header a **funnel button** will appear in the corner of the cell. Click the funnel button to open a list of predefined filters ready for selection.

Columns can be sorted A-Z and Z-A by clicking the column header.

A convenient [right click menu](#) is available if the mouse is right clicked while the cursor is hovering over the table area.

Item colors in the table indicate various conditions:

- Black - item is ok
- Gray - item does not exist in the ECU map file loaded in the [symbol tree](#).
- Orange - item has some other warning or error condition. Use the [Build All](#) tool on the main toolbar to quickly see the condition in the [Messages area](#).



Measurements Tab

Measurements are typically read-only values stored in an ECU.

The Measurements tab has a table to display all A2L file Measurement items and their properties. Each row (below the 1st filtering row) defines a Measurement and each column is a property. The default column configuration is shown in Figure 1.


Measurements	Characteristics	Axis Pts	Conversion Methods	Verbal Conversion Tables	Record Layouts	Groups					
<input type="checkbox"/> Show Columns Customization											
	Name	Data Type	EcuAddress	Conversion	LowerLimit	UpperLimit	Resolution	Accuracy	BitMask	Format	In Group
											

Figure 1: The Measurements tab in the A2L file item area.

Columns in the table can be filtered, reorganized, added, and hidden. These [table features](#) are common across all tabs in this area.

To add items to the table you can:

- Drag/drop [symbols](#) from an ECU map file.
- Use the [Create](#) tool or [right click menu](#) selection.
- [Import](#) an existing A2L file.

To edit items already in the table with the [Edit Measurement](#) dialog you can:

- Double click on a cell in the table.
- Use the [Edit](#) tool or [right click menu](#) selection.

Refer to Table 1 below for a description of each column on the Measurements tab.

Table 1: Column Descriptions for the Measurements Tab

Default Columns	Description
Name	<p>Unique identifier of the Measurement.</p> <p>Here are the main requirements for this field:</p> <ul style="list-style-type: none"> • Max overall length = 1024 characters. • Max partial string length = 128 characters. • Allowed characters: A - Z, a - z, 0 - 9, underscores, periods, and brackets []. • Must NOT contain spaces. • First character must be a letter or an underscore. • Any brackets must occur in pairs at the end of a partial string. • Any bracket pairs must surround a number or string. • Name is case sensitive. (i.e. "b" and "B" are considered unique) <p>If in doubt about valid names, please refer to the ASAM specifications.</p>
Data Type	<p>Determines the number of bytes dedicated to the value and how those bytes are interpreted. This property should be chosen early because it applies defaults to the Bit Mask, Lower Limit, and Upper Limit properties.</p> <ul style="list-style-type: none"> • UBYTE - 1 byte unsigned integer • SBYTE - 1 byte signed integer • UWORD - 2 byte unsigned integer • SWORD - 2 byte signed integer • ULONG - 4 byte unsigned integer • SLONG - 4 byte signed integer • FLOAT32_IEEE - 4 byte (32 bit) floating point IEEE format • FLOAT64_IEEE - 8 byte (64 bit) floating point IEEE format • FLOAT32_TASKING - 4 byte (32 bit) floating point tasking format

ECUAddress	Memory Address of the Measurement in the ECU.
Conversion	Applies the selected Conversion Method to the value. The dropdown selections come from the Conversion Methods tab .
LowerLimit	Lower limit of plausible range of values. A default limit is determined mathematically by the Data Type selection. Note: The default limit is reapplied each time the Data Type is changed.
UpperLimit	Upper limit of plausible range of values. A default limit is determined mathematically by the Data Type selection. Note: The default limit is reapplied each time the Data Type is changed.
Resolution	Smallest possible change in bits. (0 to 255)
Accuracy	Possible variation from exact value in %.
BitMask	Masks out single bits of the value to be processed. 0xFF = no mask for that byte. This property defaults to no masking with the number of 0xFF's determined by the Data Type selection. Note: The default mask is reapplied each time the Data Type is changed.
Format	Display formatting applied to numerical values. If specified, this Format property overrides any formatting in the Conversion property. The syntax for this field is: %Length.Layout <ul style="list-style-type: none"> Length = overall length Layout = number of decimal places
In Group	The Group this item is in.
Hidden Columns	Description
DisplayIdentifier	An alternative display name that is usually much shorter than the Name property. Can be useful for devices with small display areas.
KeyName	Name from a map file symbol dropped into the A2L item area.
LongIdentifier	Comment or description.
Manual Flag	Manual flag setting from the Address tab on the Measurement's edit dialog.



Characteristics Tab

Characteristics are typically read-write calibrations stored in an ECU. The ASAP2 Editor supports these 3 types:

- Value - a single value with no axis.
- Curve - an array of values with an X axis.
- Map - a table of values with X and Y axes.

The Characteristics tab has a table to display all A2L file Characteristic items and their properties. Each row (below the 1st filtering row) defines a Characteristic and each column is a property. The default column configuration is shown in Figure 1.


Measurements	Characteristics	Axis Pts	Conversion Methods	Verbal Conversion Tables	Record Layouts	Groups						
<input type="checkbox"/> Show Columns Customization												
	Name	Type	Address	Deposit	Conversion	LowerLimit	UpperLimit	BitMask	MaxDiff	Format	In Group	Data Type
												

Figure 1: The Characteristics tab in the A2L file item area.

Columns in the table can be filtered, reorganized, added, and hidden. These [table features](#) are common across all tabs in this area.

To add items to the table you can:

- Drag/drop [symbols](#) from an ECU map file.
- Use the [Create](#) tool or [right click menu](#) selection.
- [Import](#) an existing A2L file.

To edit items already in the table with the [Edit Characteristic](#) dialog you can:

- Double click on a cell in the table.
- Use the [Edit](#) tool or [right click menu](#) selection.

Refer to Table 1 below for a description of each column on the Characteristics tab.

Table 1: Column Descriptions for the Characteristics Tab

Default Columns	Description
Name	<p>Unique Identifier of the Characteristic.</p> <p>Here are the main requirements for this field:</p> <ul style="list-style-type: none"> • Max overall length = 1024 characters. • Max partial string length = 128 characters. • Allowed characters: A - Z, a - z, 0 - 9, underscores, periods, and brackets []. • Must NOT contain spaces. • First character must be a letter or an underscore. • Any brackets must occur in pairs at the end of a partial string. • Any bracket pairs must surround a number or string. • Name is case sensitive. (i.e. "b" and "B" are considered unique) <p>If in doubt about valid names, please refer to the ASAM specifications.</p>
Type	<p>The ASAP2 Editor supports these 3 types of Characteristics:</p> <ul style="list-style-type: none"> • Value - a single value with no axis. • Curve - an array of values with 1 axis. • Map - a table of values with 2 axes.
Address	Memory Address of the Characteristic.
Deposit	Specifies the data structure. The default layout will update depending upon the Data Type field. The dropdown selections come from the Record Layouts tab . The Data Type over on the Record Layout tab must match the Data Type field on this dialog.

Conversion	Applies the selected Conversion Method to the value. The dropdown selections come from the Conversion Methods tab .
LowerLimit	Lower limit of plausible range of values. A default limit is determined mathematically by the Data Type selection. Note: The default limit is reapplied each time the Data Type is changed.
UpperLimit	Upper limit of plausible range of values. A default limit is determined mathematically by the Data Type selection. Note: The default limit is reapplied each time the Data Type is changed.
BitMask	Masks out single bits of the value to be processed. 0xFF = no mask for that byte. This property defaults to no masking with the number of 0xFF's determined by the Data Type selection. Note: The default mask is reapplied each time the Data Type is changed.
MaxDiff	Maximum adjustment allowed to the Characteristic. Entered as an absolute value, not as a percentage.
Format	Display formatting applied to numerical values. If specified, this Format property overrides any formatting in the Conversion Method property. The syntax for this field is: %Length.Layout <ul style="list-style-type: none"> Length = overall length Layout = number of decimal places
In Group	The Group this item is in.
Data Type	Determines the number of bytes dedicated to the value and how those bytes are interpreted. <u>This property should be chosen early</u> because it applies defaults to the Bit Mask, Lower/Upper Limit, and Extended Lower/Upper Limit properties. <ul style="list-style-type: none"> UBYTE - 1 byte unsigned integer SBYTE - 1 byte signed integer UWORD - 2 byte unsigned integer SWORD - 2 byte signed integer ULONG - 4 byte unsigned integer SLONG - 4 byte signed integer FLOAT32_IEEE - 4 byte (32 bit) floating point IEEE format FLOAT64_IEEE - 8 byte (64 bit) floating point IEEE format FLOAT32_TASKING - 4 byte (32 bit) floating point tasking format
Hidden Columns	Description
CalibrationAccess	There are 4 types of access for MCD systems (test tools): <ul style="list-style-type: none"> CALIBRATION - read and write allowed. NO_CALIBRATION - read only. NOT_IN_MCD_SYSTEM - read and write not allowed, for internal ECU use only. OFFLINE_CALIBRATION - read allowed, write only allowed offline.
DisplayIdentifier	An alternative display name that is usually much shorter than the Name property. Can be useful for devices with small display areas.
Extended Lower Limit	Extends the lower limit of plausible values. Can be useful for generating warnings when the Lower Limit is exceeded. A default limit is determined mathematically by the Data Type selection. Note: The default limit is reapplied each time the Data Type is changed.
Extended Upper Limit	Extends the upper limit of plausible values. Can be useful for generating warnings when the Upper Limit is exceeded. A default limit is determined mathematically by the Data Type selection. Note: The default limit is reapplied each time the Data Type is changed.
KeyName	Name from a map file symbol dropped into the A2L item area.
LongIdentifier	Comment or description.
Manual Flag	Manual flag setting from the Address tab on the Characteristic's edit dialog.



Axis Pts Tab

Axis Pts define axes that are shared across multiple Characteristic curves or maps. These axes have a [CharacteristicAxis Type](#) = COM_AXIS.

The Axis Pts tab has a table to display all A2L file AxisPt items and their properties. Each row (below the 1st filtering row) defines an Axis and each column is a property. The default column configuration is shown in Figure 1.


Measurements	Characteristics	Axis Pts	Conversion Methods	Verbal Conversion Tables	Record Layouts	Groups				
<input type="checkbox"/> Show Columns Customization										
	Name	InputQuantity	Address	Deposit	Conversion	MaxAxisPoints	LowerLimit	UpperLimit	MaxDiff	Format
										

Figure 1: The Axis Pts tab in the A2L file item area.

Columns in the table can be filtered, reorganized, added, and hidden. These [table features](#) are common across all tabs in this area.

To add items to the table you can:

- Drag/drop [symbols](#) from an ECU map file.
- Use the [Create](#) tool or [right click menu](#) selection.
- [Import](#) an existing A2L file.

To edit items already in the table with the [Edit Axis Pts](#) dialog you can:

- Double click on a cell in the table.
- Use the [Edit](#) tool or [right click menu](#) selection.

Refer to Table 1 below for a description of each column on the Axis Pts tab.

Table 1: Column Descriptions for the Axis Pts Tab

Default Columns	Description
Name	<p>Unique identifier of the Axis Pts.</p> <p>Here are the main requirements for this field:</p> <ul style="list-style-type: none"> • Max overall length = 1024 characters. • Max partial string length = 128 characters. • Allowed characters: A - Z, a - z, 0 - 9, underscores, periods, and brackets []. • Must NOT contain spaces. • First character must be a letter or an underscore. • Any brackets must occur in pairs at the end of a partial string. • Any bracket pairs must surround a number or string. • Name is case sensitive. (i.e. "b" and "B" are considered unique) <p>If in doubt about valid names, please refer to the ASAM specifications.</p>
InputQuantity	References a Measurement to be used as a working point on the axis to track along the curve or map. The dropdown selections come from the Measurements tab .
Address	Memory Address of the Axis Pts in the ECU.
Deposit	Specifies the data structure. The default layout will update depending upon the Data Type field. The dropdown selections come from the Record Layouts tab . The Data Type over on the Record Layout tab must match the Data Type field on this dialog.
Conversion	Applies the selected Conversion Method to the value. The dropdown selections come from the Conversion Methods tab .
MaxAxisPoints	Maximum number of axis points.
	Lower limit of plausible range of values. A default limit is determined mathematically by the Data Type selection.

LowerLimit	Note: The default limit is reapplied each time the Data Type is changed.
UpperLimit	Upper limit of plausible range of values. A default limit is determined mathematically by the Data Type selection. Note: The default limit is reapplied each time the Data Type is changed.
MaxDiff	Maximum adjustment allowed to an axis point. Entered as an absolute value, not as a percentage.
Format	Display formatting applied to numerical values. If specified, this Format property overrides any formatting in the Conversion Method property. The syntax for this field is: %Length.Layout <ul style="list-style-type: none"> Length = overall length Layout = number of decimal places
Hidden Columns	Description
CalibrationAccess	There are 4 types of access for MCD systems or test tools: <ul style="list-style-type: none"> CALIBRATION - read and write allowed. NO_CALIBRATION - read only. NOT_IN_MCD_SYSTEM - read and write not allowed, for internal ECU use only. OFFLINE_CALIBRATION - read allowed, write only allowed offline.
DataType	Determines the number of bytes dedicated to the value and how those bytes are interpreted. <u>This property should be chosen early</u> because it applies defaults to the Lower/Upper Limit and Extended Lower/Upper Limit properties. <ul style="list-style-type: none"> UBYTE - 1 byte unsigned integer SBYTE - 1 byte signed integer UWORD - 2 byte unsigned integer SWORD - 2 byte signed integer ULONG - 4 byte unsigned integer SLONG - 4 byte signed integer FLOAT32_IEEE - 4 byte (32 bit) floating point IEEE format FLOAT64_IEEE - 8 byte (64 bit) floating point IEEE format FLOAT32_TASKING - 4 byte (32 bit) floating point tasking format
DisplayIdentifier	An alternative display name that is usually much shorter than the Name property. Can be useful for devices with small display areas.
ExtendedLowerLimit	Extends the lower limit of plausible values. Can be useful for generating warnings when the Lower Limit is exceeded. A default limit is determined mathematically by the Data Type selection. Note: The default limit is reapplied each time the Data Type is changed.
ExtendedUpperLimit	Extends the upper limit of plausible values. Can be useful for generating warnings when the Upper Limit is exceeded. A default limit is determined mathematically by the Data Type selection. Note: The default limit is reapplied each time the Data Type is changed.
KeyName	Name from a map file symbol dropped into the A2L item area.
LongIdentifier	Comment or description.
Manual Flag	Manual flag setting from the Address tab on the Axis Pts' edit dialog.



Conversion Methods Tab

Conversion Methods are formulas and tables applied to [Measurements](#), [Characteristics](#), and [Axis Pts](#). They are declared with the keyword COMPU_METHOD within the A2L file.

The Conversion Methods tab has a table to display all A2L file Conversion Method items and their properties. Each row (below the 1st filtering row) defines a Conversion Method and each column is a property. The default column configuration is shown in Figure 1.

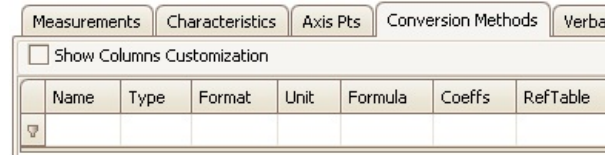


Figure 1: The Conversion Methods tab in the A2L file item area.

Columns in the table can be filtered, reorganized, added, and hidden. These [table features](#) are common across all tabs in this area.

To add items to the table you can:

- Use the [Create](#) tool or [right click menu](#) selection.
- [Import](#) an existing A2L file.

To edit items already in the table with the [Edit Conversion Methods](#) dialog you can:

- Double click on a cell in the table.
- Use the [Edit](#) tool or [right click menu](#) selection.

Refer to Table 1 below for a description of each column on the Conversion Methods tab.

Table 1: Column Descriptions for the Conversion Methods Tab

Default Columns	Description
Name	<p>Unique identifier of the Conversion Method.</p> <p>Here are the main requirements for this field:</p> <ul style="list-style-type: none"> • Max overall length = 1024 characters. • Max partial string length = 128 characters. • Allowed characters: A - Z, a - z, 0 - 9, underscores, periods, and brackets []. • Must NOT contain spaces. • First character must be a letter or an underscore. • Any brackets must occur in pairs at the end of a partial string. • Any bracket pairs must surround a number or string. • Name is case sensitive. (i.e. "b" and "B" are considered unique) <p>If in doubt about valid names, please refer to the ASAM specifications.</p>
Type	<p>The ASAP2 Editor supports 5 types of conversions:</p> <ul style="list-style-type: none"> • TAB_INTP - table with interpolation. • TAB_NOINTP - table without interpolation. • TAB_VERB - verbal conversion table. • RAT_FUNC - fractional rational function $f(x) = (axx + bx + c)/(dxx + ex + f)$, where coefficients 'a' through 'f' are specified properties. • FORM - formula as specified in the Formula property.
	Display formatting applied to numerical values. This Format will be overridden by any Format properties specific to Measurements , Characteristics , and Axis Pts .

Format	The syntax for this field is: %Length.Layout <ul style="list-style-type: none">• Length = overall length• Layout = number of decimal places
Unit	A physical unit label like Volts, RPM, kph, etc.
Formula	Formula specified as a function of x. Multiple references use syntax X1, X2, X3, etc where X1 references the first input, X2 the second, etc. If there is only one reference in the formula then X can be used instead of X1.
Coeffs	Coefficient values for the Conversion Type = RAT_FUNC. $f(x)=(axx + bx + c)/(dxx + ex + f)$
RefTable	Table used for the TAB_x conversion types. Dropdown selections come from the Verbal Conversion Tables tab .
Hidden Columns	Description
LongIdentifier	Comment or description.



Verbal Conversion Tables Tab

Verbal Conversion Tables are equivalent to enumerated or state encoded decimal lookup tables. These tables take integer value inputs and apply text description outputs to them. For example, 0 = Off, 1 = On, etc.

The Verbal Conversion Tables tab has a table to display all A2L file Verbal Conversion Tables and their properties. Each row (below the 1st filtering row) defines a Verbal Conversion Table and each column is a property. The default column configuration is shown in Figure 1.



Figure 1: The Verbal Conversion Tables tab in the A2L file item area.

Columns in the table can be filtered, reorganized, added, and hidden. These [table features](#) are common across all tabs in this area.

To add items to the table you can:

- Drag/drop [symbols](#) from an ECU map file.
- Use the [Create](#) tool or [right click menu](#) selection.
- [Import](#) an existing A2L file.

To edit items already in the table with the [Edit Verbal Conversion Tables](#) dialog you can:

- Double click on a cell in the table.
- Use the [Edit](#) tool or [right click menu](#) selection.

Refer to Table 1 below for a description of each column on the Verbal Conversion Tables tab.

Table 1: Column Descriptions for the Verbal Conversion Tables Tab

Default Columns	Description
Name	<p>Unique identifier of the Verbal Conversion Table.</p> <p>Here are the main requirements for this field:</p> <ul style="list-style-type: none"> • Max overall length = 1024 characters. • Max partial string length = 128 characters. • Allowed characters: A - Z, a - z, 0 - 9, underscores, periods, and brackets []. • Must NOT contain spaces. • First character must be a letter or an underscore. • Any brackets must occur in pairs at the end of a partial string. • Any bracket pairs must surround a number or string. • Name is case sensitive. (i.e. "b" and "B" are considered unique) <p>If in doubt about valid names, please refer to the ASAM specifications.</p>
EnumType	Mislabeled column that works like KeyName which is the name from a map file symbol dropped into the A2L item area.
NumberValuePairs	Total number of defined Input/Output pairs.
DefaultValue	Default text display for undeclared Inputs.
TableValues	List of each defined Input/Output pair.
Hidden Columns	Description

LongIdentifier	Comment or description.
----------------	-------------------------

 **ASAP2 Editor Documentation - (C) Copyright 2021 Intrepid Control Systems, Inc.**

Last Update: Sunday, June 21, 2009

**Record Layouts Tab**

Record Layouts specify data structures in the ECU memory.

The Record Layouts tab (Figure 1) has a table to display all A2L file Record Layouts. Each row (below the 1st filtering row) defines a Record Layout.

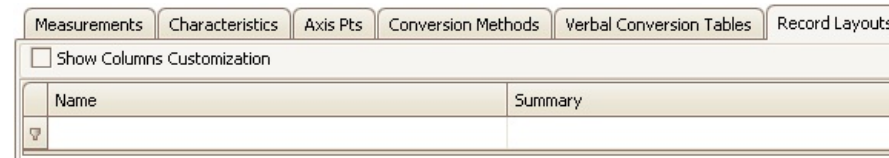


Figure 1: The Record Layouts tab in the A2L file item area.

Columns in the table can be filtered, reorganized, added, and hidden. These [table features](#) are common across all tabs in this area.

To add items to the table you can:

- Use the [Create](#) tool or [right click menu](#) selection.
- [Import](#) an existing A2L file.

To edit items already in the table with the [Edit Record Layouts](#) dialog you can:

- Double click on a cell in the table.
- Use the [Edit](#) tool or [right click menu](#) selection.



Groups Tab

Use Groups in an A2L file to help organize [Measurements](#) and [Characteristics](#) into logical categories.

The Groupstab has a table to display all A2L file Groups and their properties. Each row (below the 1st filtering row) defines a Group and each column is a property. The default column configuration is shown in Figure 1.

Measurements	Characteristics	Axis Pts	Conversion Methods	Verbal Conversion Tables	Record Layouts	Groups
<input type="checkbox"/> Show Columns Customization						
Name	Root	Reference Measurements	Reference Characteristics	Sub group	LongIdentifier	In Group

Figure 1: The Groupstab in the A2L file item area.

Columns in the table can be filtered, reorganized, added, and hidden. These [table features](#) are common across all tabs in this area.

To add items to the table you can:

- Use the [Create](#) tool or [right click menu](#) selection.
- [Import](#) an existing A2L file.

To edit items already in the table with the [Edit Groups](#) dialog you can:

- Double click on a cell in the table.
- Use the [Edit](#) tool or [right click menu](#) selection.

Refer to Table 1 below for a description of each column on the Groups tab.

Table 1: Column Descriptions for the Groups Tab

Default Columns	Description
Name	<p>Unique identifier of the Group.</p> <p>Here are the main requirements for this field:</p> <ul style="list-style-type: none"> • Max overall length = 1024 characters. • Max partial string length = 128 characters. • Allowed characters: A - Z, a - z, 0 - 9, underscores, periods, and brackets []. • Must NOT contain spaces. • First character must be a letter or an underscore. • Any brackets must occur in pairs at the end of a partial string. • Any bracket pairs must surround a number or string. • Name is case sensitive. (i.e. "b" and "B" are considered unique) <p>If in doubt about valid names, please refer to the ASAM specifications.</p>
Root	Yes/No flag showing if this Group is at the Root level.
Reference Measurements	List of Measurements currently in this Group.
Reference Characteristics	List of Characteristics currently in this Group.
Sub Group	List of Subgroups that belong to this group.
LongIdentifier	Comment or description.
In Group	Yes/No flag showing if this Group is in another group.

 **ASAP2 Editor Documentation - (C) Copyright 2021 Intrepid Control Systems, Inc.**

Last Update: Sunday, June 21, 2009



A2L Item Right Click Menu

Editing tools are available in a right click menu while hovering the mouse cursor over the [A2L item area](#). Many of these tools can also be found in the [Edit group](#) of the [main toolbar](#). Refer to Table 1 below for a brief description of each selection.

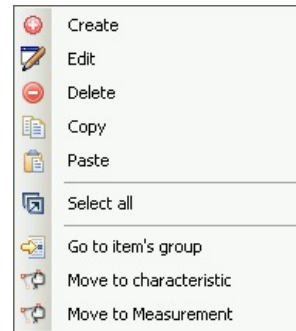



Figure 1: The right click menu while hovering over the A2L item area.

Table 1: A2L Item Right Click Menu Selections

Menu Selection	Description
Create	Open a dialog to create a new A2L file item. <ul style="list-style-type: none"> • Measurements • Characteristics • Axis Pts • Conversion Methods • Verbal Conversion Tables • Record Layouts • Groups
Edit*	Open a dialog to edit highlighted A2L file items. The dialog layouts are the same as those used for the Create selection.
Delete*	Delete highlighted A2L file items.
Copy*	Copy highlighted A2L file items to a copy buffer.
Paste	Paste A2L file items from the copy buffer to the end of the item list.
Select All	Select all A2L file items on the current tab.
Go to Item's Group	Go to the Groups tab and open the edit Group dialog for the group the item is currently in.
Move to Characteristic*	Move highlighted A2L file items to the Characteristics tab .
Move to Measurement*	Move highlighted A2L file items to the Measurements tab .

*These menu selections can be applied to multiple A2L items at once to help save time. Just press and hold the keyboard Shift or Control keys while left clicking on items to highlight a group of items to change. Then right click and make a menu selection to apply it to all highlighted items at once.

**Messages Area**

The Messages area in the ASAP2 Editor displays any warnings or errors detected during the creation of an A2L file. This area is displayed in a docked window on the bottom of the ASAP2 Editor. The Messages window can be redocked into other locations within the editor by dragging and dropping its titlebar. The window can also be pinned  to the sides of the editor to disappear as a named tab when not in use and reappear when the mouse is hovered over the tab.

Using the **Build All** or **Generate** tools from the [ASAP2 group](#) on the [main toolbar](#) will update the Messages area. Errors, warnings, and a build summary will appear similar to that shown in Figure 1.

Any errors in the Messages area will prevent the A2L file from being saved, but warnings will not.

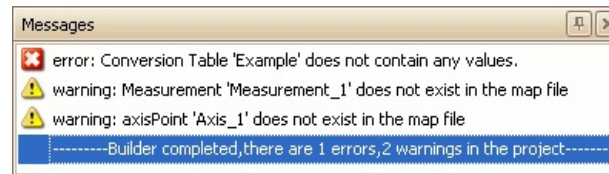


Figure 1: Example of the Messages area in the ASAP2 Editor.



Contact Information



Intrepid Control Systems, Inc.
1850 Research Drive
Troy, MI 48083 USA
(ph) 586.731.7950
(fax) 586.731.2274
(email) ICSContactUs@intrepidcs.com
(website) www.intrepidcs.com

 **ASAP2 Editor Documentation - (C) Copyright 2021 Intrepid Control Systems, Inc.**

Last Update: Monday, December 30, 2019