



**Implementation Specifications or Requirements**

Category	Item
Software	POV Version: 7.1 and later
	Service Pack: N/A
	Windows XP SP3, Vista SP2, Win 7 SP1, Win 8: Yes
	Web Thin Client: N/A
Equipment	Panel Manufacturer: N/A
	Panel Model: N/A
	Other Hardware: N/A
	Comm. Driver: All
	Controller (e.g.: PLC) All
	Application Language: N/A
Software Demo Application	N/A

**Summary**

This Application Note describes the functioning of the DIV and ADD, as well as the MAX and MIN parameters in the Main or Standard Driver Sheets of a Communications Driver. These constants can be used for automatic conversion or scaling between a PLC register or I/O point and a POV tag value. Point of View (POV) lets you use either DIV and ADD or MAX and MIN, but not both. Knowing which combination to use and how to configure these parameters can save extra programming steps in a POV application.

**Drivers**

Drivers are one method for a POV application to communicate to PLCs Motion Controllers, Loop Controllers, RTUs and other devices. Point of View provides a large number of drivers to choose from. These drivers are installed with the POV software and new drivers as well as driver updates can be downloaded from AutomationDirect’s website at [www.automationdirect.com](http://www.automationdirect.com). The number of simultaneous drivers allowed to operate at runtime depends upon the runtime license configuration.

Drivers are configured in the Communications Workspace of the Point of View development environment. All drivers can have a Main Driver Sheet (there is only one of these) and one or more Standard Driver Sheets. The Main Driver Sheet can be used to address any register on the device being communicated to which is accessible from the communications interface, while a Standard Driver Sheet is intended to address only one class of device registers. The advantage of the Standard Driver Sheet over the Main Driver Sheet is that the Standard Driver Sheet has additional fields that can be used to control communications.

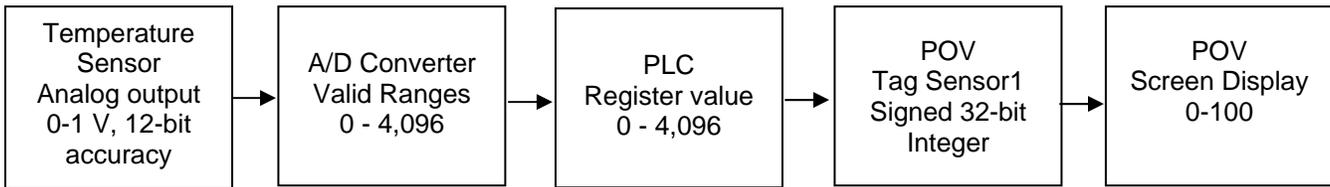
The DIV and ADD parameters are configured in a POV Main or Standard Driver worksheet, while the MAX and MIN parameters require configuration in the Driver worksheets as well as the POV Project Tags Database.

## MIN and MAX Parameters

MAX and MIN values can be used to automatically scale between a PLC register value and the corresponding POV tag value. To illustrate how scaling with the MAX and MIN parameters work, let's consider the following example:

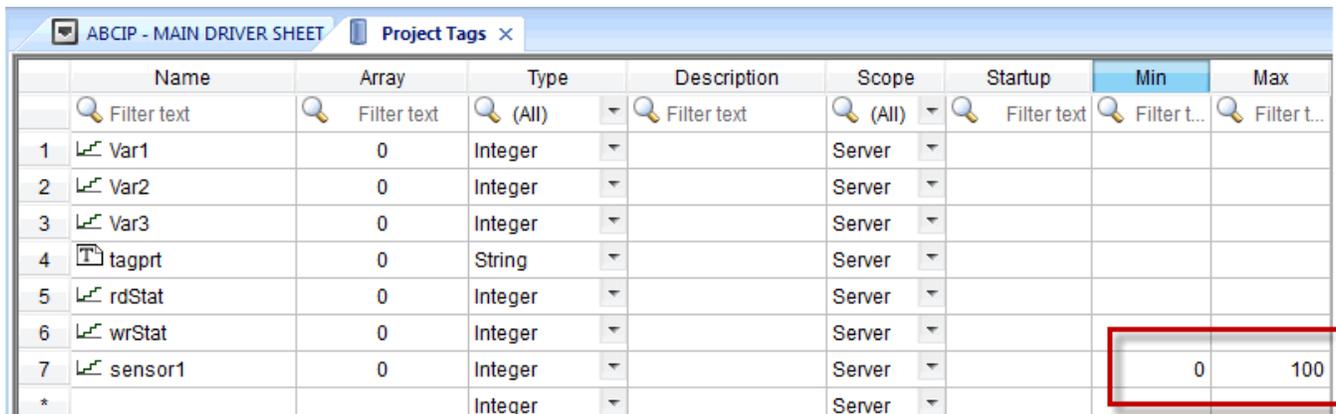
- We have a temperature sensor that has 12-bit accuracy (0 – 4096)  
The sensor has been calibrated such that a reading of 0 = 0° C. and 4096 (full scale) = 100° C.
- The temperature sensor is connected to a 12-bit A/D converter module in a PLC.
- A POV tag named Sensor1 is configured in the POV Project Tags database  
Sensor1 is configured as an Integer tag  
POV Integers are 32-bit signed values (-2,147,483,648 to 2,147,483,647)
- Sensor1 is configured in an POV Driver worksheet  
Sensor1 is associated with the PLC register that contains the digitized result of the A/D converter connected to the temperature sensor
- We want to display the temperature measured on a POV screen display in degrees Celsius.

A diagram of this process is as follows:

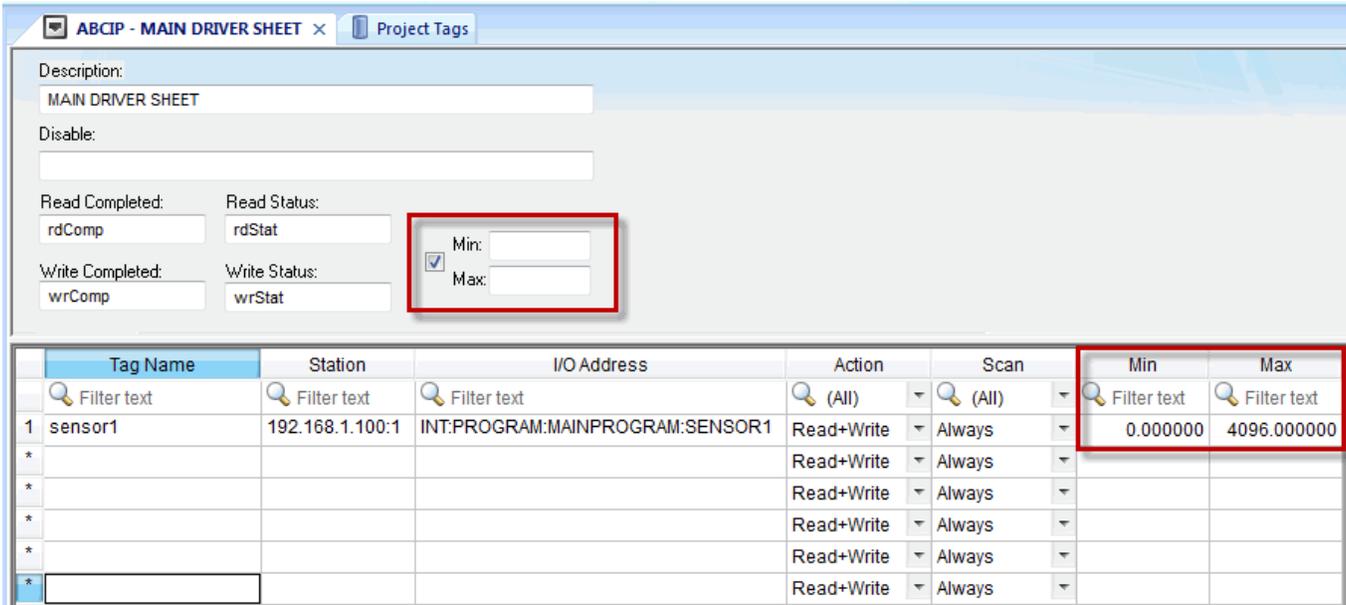


To accomplish the desired scaling effect, we need to do three things:

- Configure the MIN and MAX parameter values in the POV Project Tags database  
We will set MIN = 0 and MAX = 100
- Check the MIN/MAX checkbox in the Driver worksheet (Main Driver or Standard Driver worksheet)
- Configure the MIN and MAX parameter values in the Driver worksheet for Sensor1  
We will set MIN = 0 and MAX = 4096



Name	Array	Type	Description	Scope	Startup	Min	Max
Filter text	Filter text	(All)	Filter text	(All)	Filter text	Filter t...	Filter t...
1 Var1	0	Integer		Server			
2 Var2	0	Integer		Server			
3 Var3	0	Integer		Server			
4 tagprt	0	String		Server			
5 rdStat	0	Integer		Server			
6 wrStat	0	Integer		Server			
7 sensor1	0	Integer		Server		0	100
*		Integer		Server			



Tag Name	Station	I/O Address	Action	Scan	Min	Max
1 sensor1	192.168.1.100:1	INT:PROGRAM:MAINPROGRAM:SENSOR1	Read+Write	Always	0.000000	4096.000000
*			Read+Write	Always		
*			Read+Write	Always		
*			Read+Write	Always		
*			Read+Write	Always		
*			Read+Write	Always		

Note that the Driver Worksheet has two areas to define MIN and MAX parameter values; in the header and in the body of the Driver worksheet. If the MIN and MAX parameter values in the Header are defined, then these values will be used for all Tags in the Driver Worksheet **unless** the MIN and MAX parameter values for a specific tag are set to 0 (MIN=0 and MAX=0). If MIN and MAX are set to 0, then no scaling will be done. If the MIN and MAX parameter values in the Header are left blank (as in the above example), then the only scaling that will be done is with tags that have the MIN and MAX parameter values defined (i.e. non-blank).

Note that you cannot use both the MIN and MAX parameters as well as the DIV and ADD parameters. If the MIN and MAX checkbox in the Driver worksheet Header is checked, you have MIN and MAX parameters. If it is unchecked, then you have DIV and ADD parameters.

### DIV and ADD Parameters

Both the Main Driver Sheet and the Standard Driver Sheets have fields titled DIV and ADD if the MIN and MAX checkbox in the Driver worksheet Header is unchecked. These are values used for automatic scaling between a POV tag and a PLC register or I/O point. This scaling is provided as a convenience to the developer, so that device register values do not have to be scaled by the PLC, or by the Point of View developer using a Math Worksheet or VBScript. These DIV and ADD values can be different for every device register.

The DIV and ADD fields work as follows:

#### When Reading from the Device Register

$$\text{POV Tag value} = (\text{Device Register}) / \text{DIV} + \text{ADD}$$

#### When Writing to the Device Register

$$\text{Device Register} = (\text{POV Tag Value} - \text{ADD}) * \text{DIV}$$



As an example, let's assume we have a sensor that reads temperature measurements in degrees Celsius. A reading of 0 is zero Celsius and a reading of 100 is one-hundred degrees Celsius. The conversion formula between Celsius and Fahrenheit is:

### Celsius to Fahrenheit

Rewriting the Celsius to Fahrenheit conversion formula,  $F = C * 1.8 + 32$ . But note that when reading from the Device Register (as you would do when you are reading an analog sensor value), POV divides the Device Register by the value contained in the DIV field. So if we want to multiply by the Device Register value by 1.8, we must put the inverse ( $1/1.8 = 0.555556$ ) in the DIV field. Following the division, the ADD value is added to the equation, completing the conversion from Celsius to Fahrenheit.

Tag Name	Station	I/O Address	Action	Scan	Div	Add
1 sensor1	192.168.1.100	%AI:60	Read+Write	Always	0.555556	32.000000
*			Read+Write	Always		
*			Read+Write	Always		
*			Read+Write	Always		
*			Read+Write	Always		
*			Read+Write	Always		

But what if you had a sensor that output a value that corresponded to Fahrenheit and you wanted to automatically convert the Fahrenheit sensor reading to Celsius? According the formula, you must first subtract 32 from F and then multiply by 5/9. The sequence of the POV operations is wrong! A little algebraic manipulation fixes this. Rewriting the equation:

$$C = (F-32) * 5/9$$

$$C = F * 5/9 - 32 * 5/9$$

$$C = F / 1.8 - 17.777778$$

With this rewriting on the formula, DIV would be 1.8 and ADD would be -17.777778.

Another (more realistic) use of the ADD & DIV values is to compensate for analog sensors that have a bias voltage at zero input level.



## IMPORTANT NOTES ABOUT DIV and ADD

- Don't use the DIV and ADD fields for a POV Tag if the Tag has its MIN or Max values set in the Project Tag database.
- If the POV Tag (for a Read) or the Device Register (for a Write) is not type Real, rounding will occur.