

Plunger Analysis System (PAS) API: Sample Code for Access and File Conversion Developer Guide

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Additional information

Additional free publications are available for download at www.abb.com/upstream.



[Plunger Analysis Software homepage](#)

Table 0-1: Related documentation

Documents	Document number
Plunger Analysis System (PAS) User Guide	2107720
Plunger Analysis System (PAS) API: Script-Based Access	2107724

Disclaimer

This document describes software that serves as an example of programming logic to convert PAS input files from .csv to .json format and to execute API calls to PAS functions. The software is available as an aid for customers designing their own custom client applications to access the cloud PAS API, but not as a product that is supported by ABB. ABB is not liable for the incorrect use of any part of this software. Customers are encouraged to review this document and examine the code before copying or using any of the code or library functions included in the package. ABB expects that customers carefully examine their requirements and create the solutions appropriate to their own environment. If any part of the ABB code is used or integrated into a custom solution, it is expected that customers conduct their own testing process and verify that the results meet their requirements and render accurate data. The code example is available upon request.

Safety

The code described in this document converts files created on ABB devices which are then used for plunger system analysis. The code also executes calls to the PAS API and fetches results. Analysis results based on the input data can detect faults or provide values to optimize the operation of a plunger system. Any custom or third-party function in a system that converts files should ensure conversion accuracy. Modifications and optimization of a plunger system based on analysis results may affect real-time operation or production. Test applications and analysis results before changing actual plunger system configuration to prevent service disruption or safety hazards.

1 Introduction

This guide describes sample code that converts the Plunger Analysis System (PAS) input file format from .csv to .json and sends the converted files for analysis to either Fault Detection or Optimization. The PAS APIs for both Fault Detection and Optimization require input files in .json format. Conversion is required to send request for analysis.

The sample code is included in a package which contains sample input files in .csv format. It also includes sample code to access either the fault detection or optimization APIs with an input JSON file and a certificate for authentication/authorization.

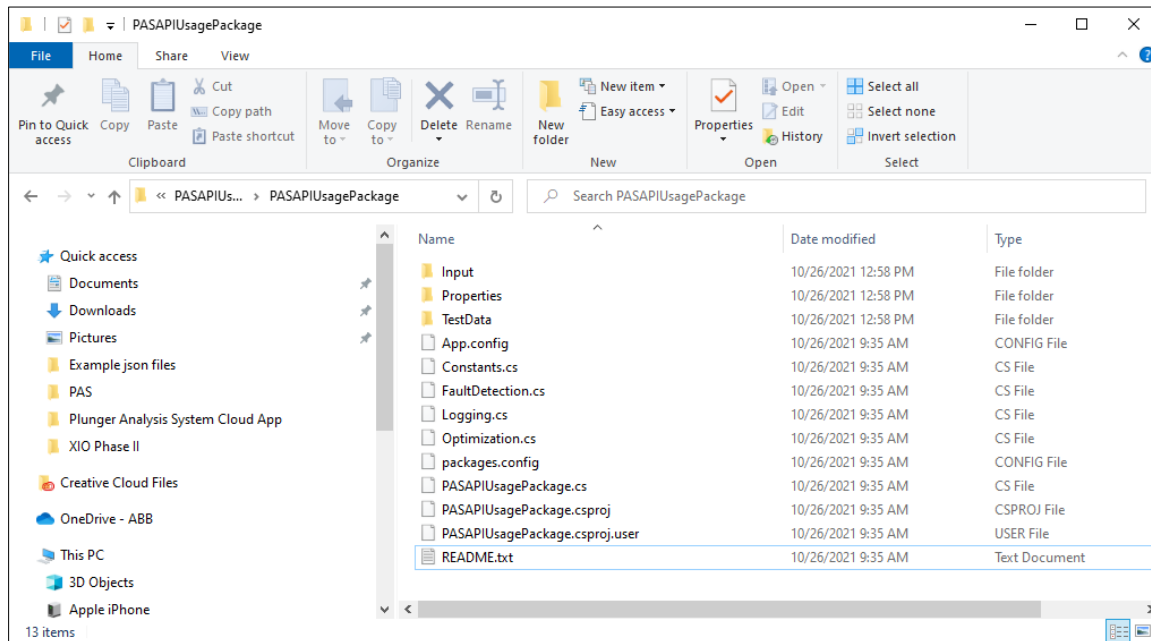
This package provides the following functions to:

- Convert input files from CSV to JSON file format
- Call the PAS Fault Detection API to analyze converted input files
- Call the PAS Optimization API to analyze converted input files

2 Package contents and file structure

Figure 2-1 shows the sample code package contents and file structure.

Figure 2-1: Sample code package contents and file structure



The Input directory contains sample input files for Optimization and Fault Detection. These input files can be converted and used for the calls to the PAS APIs. Sample files for fault detection and optimization are stored in their respective folder:

- ..\PASAPIUsagePackage\Input\FaultDetection
- ..\PASAPIUsagePackage\Input\Optimization

The input file name for fault detection files is: Input_FaultDetection. The input file name for optimization files is: Input_Optimization. Sample input files provided in the package may include both formats: csv and json. Only the csv files are used for the conversion function.

The README.txt file describes the system requirements and run environment required to create the executable sample code from the files provided (FaultDetection.cs, Optimization.cs, PASAPIUsagePackage.cs, Constants.cs). Open the README file and review the requirements. Installation of additional utilities to build the sample code is required. You must build the sample code before file conversion or API calls. Follow the steps described in the README file. The remainder of this document assumes you have successfully built the executable code.

3 Create required file folders

Before running the code, manually create the following folders (see paths):

- Certificate: \PASAPIUsagePackage\Certificate
- Output for fault detection: ..\PASAPIUsagePackage\Output\FaultDetection
- Output for optimization: ..\PASAPIUsagePackage\Output\Optimization



IMPORTANT NOTE: The code assumes that valid certificates are available for access to the cloud PAS APIs. The sample code binds the certificate to the API calls. If the certificate is incorrect or invalid, the call is rejected, and analysis is not performed. Generate a self-signed certificate and copy it in the certificate directory. Certificate generation and management is the responsibility of the customer.

To have certificate ready:

1. Obtain CA-signed certificate for your client application.
2. Share the CA-signed certificate with ABB DevOps group. ABB registers the certificate with the PAS application endpoint.

3. Name the certificate: **PASAPICertificate.cer** and place it under the Certificate folder (..\PASAPIUsagePackage\Certificate).

5 Run the code

This procedure assumes you have generated the code binary. Refer to the README.txt file for instructions.

To run the code from the command line:

1. Start the command prompt.
2. Go to the package folder: ..\PASAPIUsagePackage.
3. At the command prompt, run the **PASAPIUsagePackage.exe**.
4. Verify options menu displays ([Figure 5-1](#)).
5. Proceed to the next sections to convert files or run API calls to request PAS analyses.

Figure 5-1: Available functions when PAS API sample code is executed

```
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.
C:\PASAPIUsagePackage>PASAPIUsagePackage.exe

Enter 1 to Convert CSV files to JSON files
Enter 2 to call PAS FaultDetection API
Enter 3 to call PAS Optimization API
: -
```

6 Convert CSV files to JSON files

Use PASAPIUsagePackage option number 1 for file conversion. Note that this option converts all the csv files in the input optimization and fault detection folders.

At the options menu:

1. Type **1**, then press **Enter**.
2. Wait for processing.
3. Verify successful conversion ([Figure 6-1](#)). Note that the converted files or output files are stored in their respective folders:
 - ..\PASAPIUsagePackage\Output\FaultDetection
 - ..\PASAPIUsagePackage\Output\Optimization

Figure 6-1: Successful CSV file conversion

```
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.
C:\PASAPIUsagePackage>PASAPIUsagePackage.exe

Enter 1 to Convert CSV files to JSON files
Enter 2 to call PAS FaultDetection API
Enter 3 to call PAS Optimization API
: 1
Processing Fault Detection CSV Files...
*****
Successfully processed faultdetection csv files, output available at C:\PASAPIUsagePackage\Output\FaultDetection\
*****

Processing Optimization CSV Files...
*****
Successfully processed optimization csv files, output available at C:\PASAPIUsagePackage\Output\Optimization\
*****
C:\PASAPIUsagePackage>_
```

7 Call PAS Fault Detection API

This procedure assumes that a certificate for API call authentication is available in the certificate folder (see sections [3 Create required file folders](#) and [4 Obtain or generate valid certificates](#)).

To execute an API call for Fault Detection:

1. Type **2**, then press **Enter**. The package will read the input file and certificate from the following directories respectively:
 - ..\PASAPIUsagePackage\Input\FaultDetection\Input_FaultDetection.json
 - ..\PASAPIUsagePackage\Certificate\ <Certificate File>
2. Wait for processing.

3. Verify that the API call completes successfully ([Figure 7-1](#)). Note that the output JSON file will be generated at the following location:
 .\PASAPIUsagePackage\Output\FaultDetection\

Figure 7-1: Fault detection API call (certificate required)

```
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.
C:\PASAPIUsagePackage>PASAPIUsagePackage.exe

Enter 1 to Convert CSV files to JSON files
Enter 2 to call PAS FaultDetection API
Enter 3 to call PAS Optimization API
: 2
Start Processing : PAS FaultDetection API Call
*****
End Processing : PAS FaultDetection API Call
API Output file is available at C:\PASAPIUsagePackage\Output\FaultDetection\Output_FaultDetection2021-10-27_12-39-27-647.json
*****
C:\PASAPIUsagePackage>_
```

8 Call PAS Optimization API

This procedure assumes that a certificate for API call authentication is available in the certificate folder (see sections [3 Create required file folders](#) and [4 Obtain or generate valid certificates](#)).

To execute an API call for Optimization:

1. Type **3** then press **Enter**. The package will read the input file and certificate from the following directories respectively:
 - ..\PASAPIUsagePackage\Input\Optimization\Input_Optimization.json
 - ..\PASAPIUsagePackage\Certificate\ <Certificate File>
2. Wait for processing.
3. Verify that the API call completes successfully ([Figure 8-1](#)). Note that the output JSON file will be generated at the following location:

Figure 8-1: Optimization API call (certificate required)

```
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.
C:\PASAPIUsagePackage>PASAPIUsagePackage.exe

Enter 1 to Convert CSV files to JSON files
Enter 2 to call PAS FaultDetection API
Enter 3 to call PAS Optimization API
: 3
Start Processing : PAS Optimization API Call
*****
End Processing : PAS Optimization API Call
API Output file is available at C:\PASAPIUsagePackage\Output\Optimization\Output_Optimization2021-10-27_12-40-49-567.json
*****
C:\PASAPIUsagePackage>_
```

9 Notes

- The certificate is specific to each client application. Developers must plan to generate or obtain multiple certificates if developing multiple clients for PAS API access. Each certificate must be shared with the ABB DevOps group, to ensure it is registered on the cloud. Access requests or API calls with non-registered, expired, or invalid certificates will be denied.
- For a given client, the same certificate can be used to access both Fault Detection and Optimization APIs.
- The sample code processes only the sample input trend files included in the package. It is not designed to process other input files from other use cases. The code is for demo purposes only. Customers are responsible to consider the use cases that meet their requirements.
- The package has basic validations in place e.g.: If folders that should be created by the user are not created or available, errors display onscreen (command line):
 - If the Certificate folder is not created the following error displays: "Certificate directory is missing. Please create Certificate directory and copy certificate in it".
 - If the user has not placed the certificate file in the Certificate directory the following error displays: "..\PASAPIUsagePackage\Certificate\PASAPICertificate not found. Certificate file name must be PASAPICertificate".

ABB Inc.

Measurement & Analytics

Quotes: US-IAMA.inquiry@us.abb.com

Orders: US-IAMA.order@us.abb.com

Training: US-IAMA.training@us.abb.com

Support: upstream.support@us.abb.com

+1 800 442 3097 (opt. 2)

Additional free publications are available for download at:

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Main Office - Bartlesville

7051 Industrial Blvd
Bartlesville, OK 74006
Ph: +1 918 338 4888

Kansas Office - Liberal

2705 Centennial Blvd
Liberal, KS 67901
Ph: +1 620 626 4350

Texas Office - Houston

3700 W. Sam Houston
Parkway S., Suite 600
Houston, TX 77042
Ph: +1 713 587 8000

Texas Office - Odessa

8007 East Business 20
Odessa, TX 79765
Ph: +1 432 272 1173

Texas Office - Pleasanton

150 Eagle Ford Road
Pleasanton, TX 78064
Ph: +1 830 569 8062



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