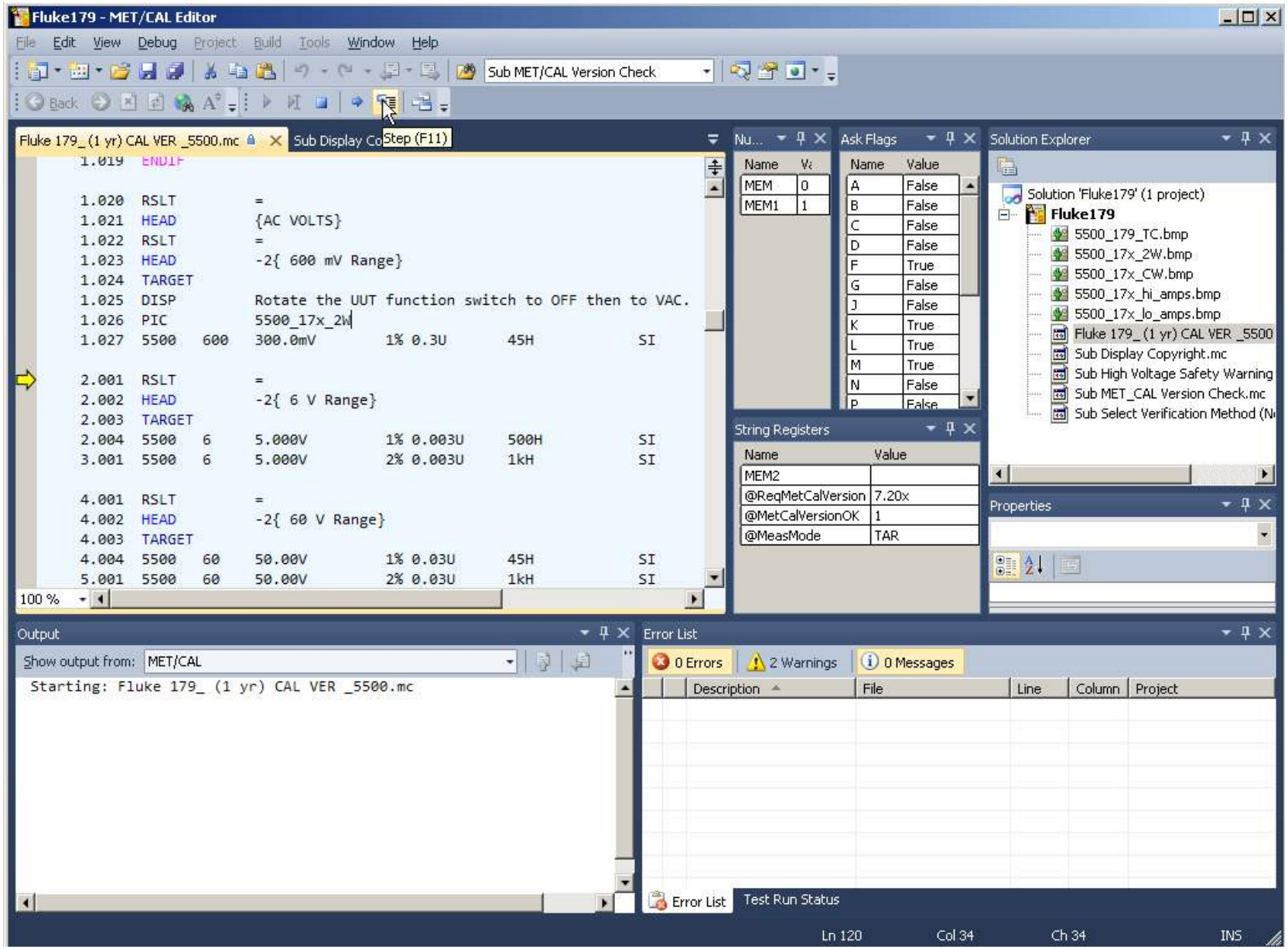
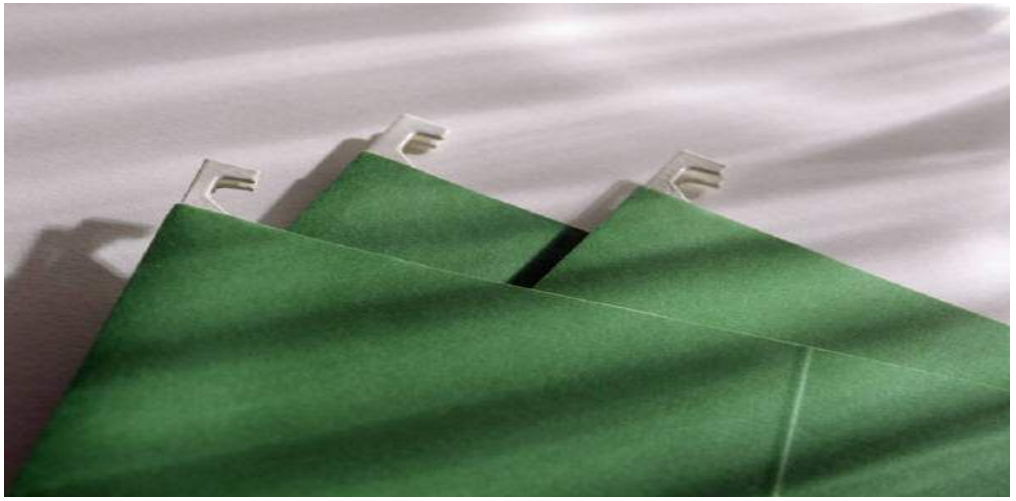
Procedure Writing – MET/CAL©
Version 11.0

FLUKE®
Calibration


Fluke179 - MET/CAL Editor
File Edit View Debug Project Build Tools Window Help
Sub MET/CAL Version Check
Back
Step (F11)
Fluke 179_ (1 yr) CAL VER _5500.mc
Sub Display Co
1.019 ENDIF
1.020 RSLT =
1.021 HEAD {AC VOLTS}
1.022 RSLT =
1.023 HEAD -2{ 600 mV Range}
1.024 TARGET
1.025 DISP Rotate the UUT function switch to OFF then to VAC.
1.026 PIC 5500_17x_2W
1.027 5500 600 300.0mV 1% 0.3U 45H SI
2.001 RSLT =
2.002 HEAD -2{ 6 V Range}
2.003 TARGET
2.004 5500 6 5.000V 1% 0.003U 500H SI
3.001 5500 6 5.000V 2% 0.003U 1kH SI
4.001 RSLT =
4.002 HEAD -2{ 60 V Range}
4.003 TARGET
4.004 5500 60 50.00V 1% 0.03U 45H SI
5.001 5500 60 50.00V 2% 0.03U 1kH SI
100 %
Nu...
Name V
MEM 0
MEM1 1
Ask Flags
Name Value
A False
B False
C False
D False
F True
G False
J False
K True
L True
M True
N False
P False
String Registers
Name Value
MEM2
@ReqMetCalVersion 7.20x
@MetCalVersionOK 1
@MeasMode TAR
Solution Explorer
Solution 'Fluke179' (1 project)
Fluke179
5500_179_TC.bmp
5500_17x_2W.bmp
5500_17x_CW.bmp
5500_17x_hi_amps.bmp
5500_17x_lo_amps.bmp
Fluke 179_ (1 yr) CAL VER _5500
Sub Display Copyright.mc
Sub High Voltage Safety Warning
Sub MET_CAL Version Check.mc
Sub Select Verification Method
Properties
Output
Show output from: MET/CAL
Starting: Fluke 179_ (1 yr) CAL VER _5500.mc
Error List
0 Errors
2 Warnings
0 Messages
Description File Line Column Project
Error List
Test Run Status
Ln 120 Col 34 Ch 34 INS

Solution -



Project -

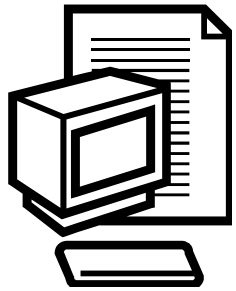
pros, pics, exes, etc

OK so what is a ***Project?***

- Procedures, subs, images, executables, and other support files make up a ***project***.
- Users will edit or create files inside ***projects*** not unlike editing or creating individual procedures in older versions of Met/Cal.
- Multiple projects can be linked to one ***solution***
- One project can be linked to multiple ***solutions.***

- More about Projects:
  - An important element in a project is its Property Page.
    - A project definition is not complete without it.
  - The Property Page is where you tell Met/Cal what file type you want to publish (save as PXE or PKM).
  - It is also where you specify a file name, package date, copyright, author, version, choose whether or not it has been validated and by whom and add comments.

- Definition: Publish
  - Publish in the MET/CAL Editor environment, means to save a file in such a way that it can be run from MET/CAL Runtime.
  - You can publish a single procedure.
  - You can publish multiple procedures



- File Types and more on Publishing
  - The editor can publish projects to PXE files
    - A PXE is a Procedure Executable
      - A PXE file cannot be changed unless you have the source Project file.
  - The editor can publish individual procedures.
    - Any individual procedure will carry the extension type of .mc while being viewed in MET/CAL Editor.
    - Regardless of whether it is part of a Project/Solution or not.

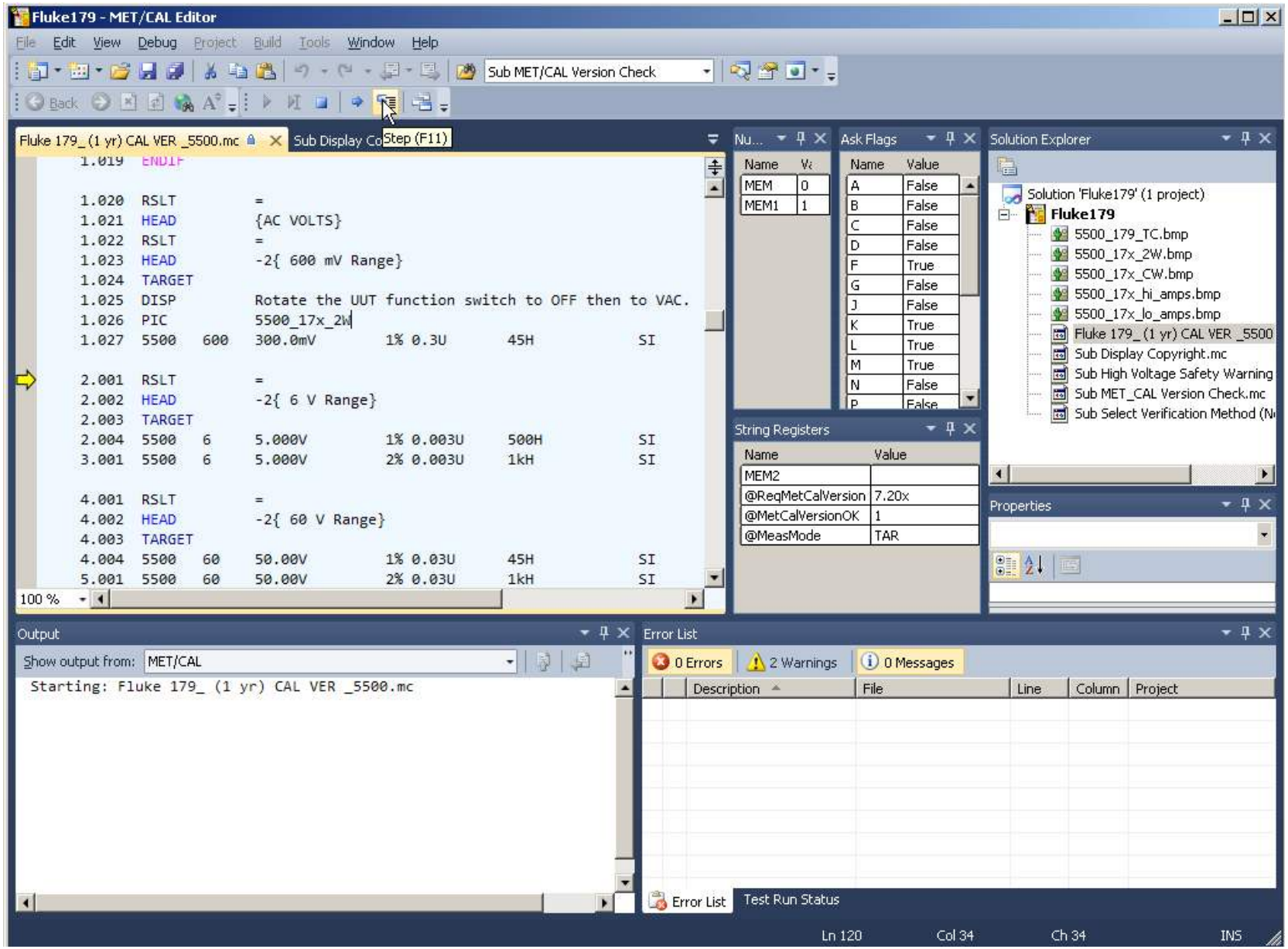
- File Types and more on Publishing
  - Individual procedures can still be published to the existing procedure directory.
    - procedures that are not part of projects/solutions* can still be edited and published as procedures).
  - Existing procedures can be published and imported into projects
  - Any pre-existing procedure that was in your directory prior to an upgrade to version 8 will fall into this category.

- File Extensions Glossary
  - .mc
    - Text Source code for a procedure
      - If you are editing a procedure file in MET/CAL Editor – you are editing it in a text formatted file that carries an extension of “mc”.
      - This “.mc” file is THE source code for the procedure.
  - .mcproj
    - MET/CAL Project
  - .mcsln -
    - MET/CAL Solution

- How do I start – to create a project?
  - From MET/CAL Editor, Click “File” and “New” “Project from an existing Procedure”
  - Lets use the procedure we just edited.
  - Select a procedure you want to work on by clicking “find”.
  - Highlight “MET/CAL Project” under “Installed Templates”
  - Type a name in the “Name” field at the bottom of the screen.
  - Note that the Solution Explorer now has the project you names and the procedure file selected right below – again with the extension .mc

- Creating a Project/Solution
  - Repeat the editing steps.
  - Publish the procedure.
  - If you choose you can publish the Project now
    - Either in addition to the procedure – or instead of
  - If you have more than one procedure file in a project, publishing the project will publish all of the files in a batch at one time.
  - Or if you have multiple files in multiple Projects in a single Solution – you can just publish the Solution.

- Starting completely from scratch?
  - Select “File” “New”, “Procedure File”.
  - Type in a name.
  - Write your procedure, compiling and publishing as you go, or as you need.
  - Then follow the steps in earlier slides to publish it as part of a Project and ultimately a Solution and we are back where we started.
  - There are a couple of ways to accomplish this task.
    - This is the way that will feel most like the older MET/CAL Editor method.

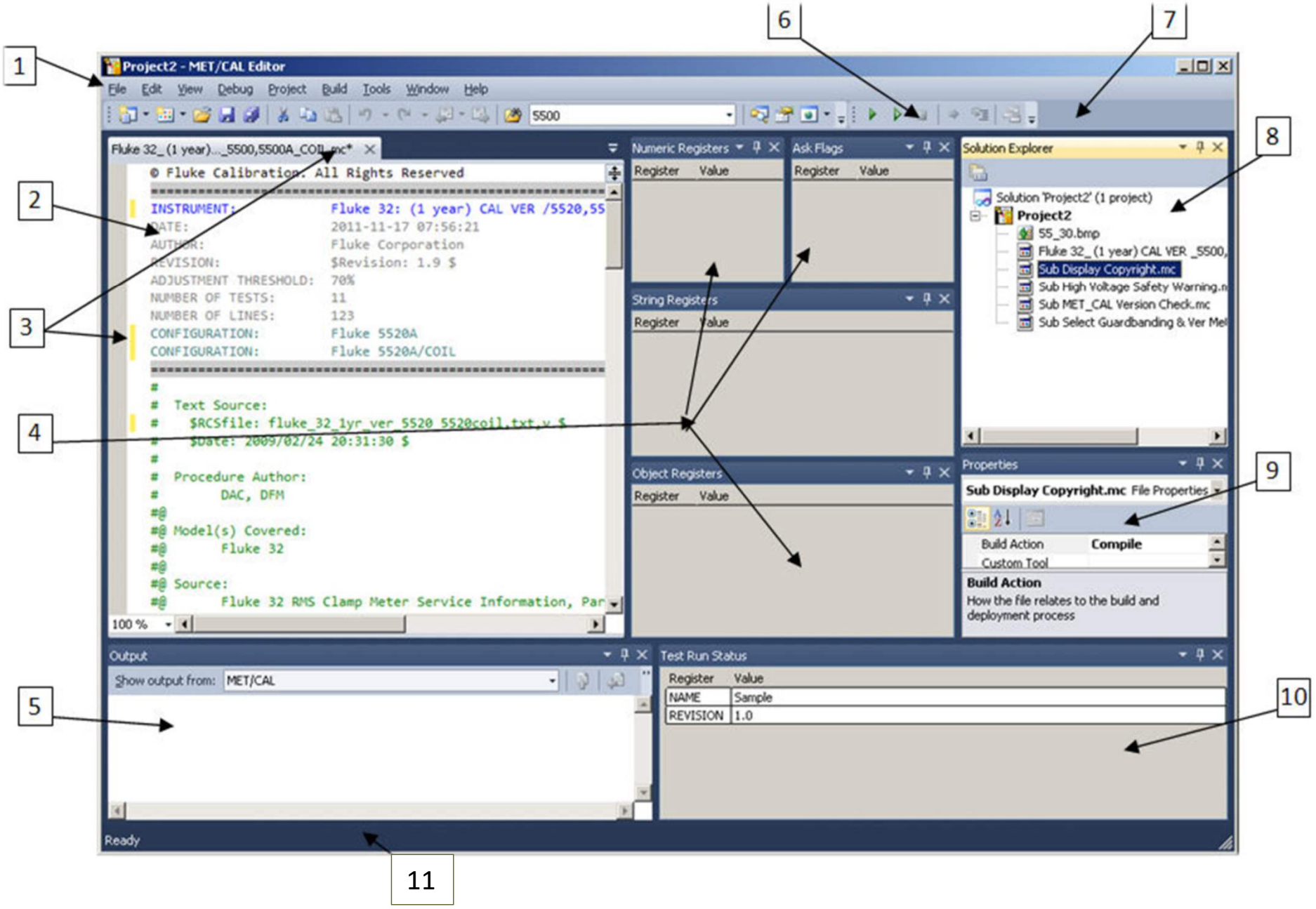

Fluke179 - MET/CAL Editor
File Edit View Debug Project Build Tools Window Help
Sub MET/CAL Version Check
Back
Step (F11)
Fluke 179_ (1 yr) CAL VER _5500.mc
Sub Display Co
1.019 ENDIF
1.020 RSLT =
1.021 HEAD {AC VOLTS}
1.022 RSLT =
1.023 HEAD -2{ 600 mV Range}
1.024 TARGET
1.025 DISP Rotate the UUT function switch to OFF then to VAC.
1.026 PIC 5500_17x_2W
1.027 5500 600 300.0mV 1% 0.3U 45H SI
2.001 RSLT =
2.002 HEAD -2{ 6 V Range}
2.003 TARGET
2.004 5500 6 5.000V 1% 0.003U 500H SI
3.001 5500 6 5.000V 2% 0.003U 1kH SI
4.001 RSLT =
4.002 HEAD -2{ 60 V Range}
4.003 TARGET
4.004 5500 60 50.00V 1% 0.03U 45H SI
5.001 5500 60 50.00V 2% 0.03U 1kH SI
100 %
Nu...
Name V
MEM 0
MEM1 1
Ask Flags
Name Value
A False
B False
C False
D False
F True
G False
J False
K True
L True
M True
N False
P False
String Registers
Name Value
MEM2
@ReqMetCalVersion 7.20x
@MetCalVersionOK 1
@MeasMode TAR
Solution Explorer
Solution 'Fluke179' (1 project)
Fluke179
5500_179_TC.bmp
5500_17x_2W.bmp
5500_17x_CW.bmp
5500_17x_hi_amps.bmp
5500_17x_lo_amps.bmp
Fluke 179_ (1 yr) CAL VER _5500
Sub Display Copyright.mc
Sub High Voltage Safety Warning
Sub MET_CAL Version Check.mc
Sub Select Verification Method
Properties
Output
Show output from: MET/CAL
Starting: Fluke 179_ (1 yr) CAL VER _5500.mc
Error List
0 Errors
2 Warnings
0 Messages
Description File Line Column Project
Error List
Test Run Status
Ln 120 Col 34 Ch 34 INS

MET/CAL Procedure Editor

The MET/CAL Editor is a development tool for creating, editing and maintaining MET/CAL procedures.

Version 8.0 of the MET/CAL Editor is all new and incorporates many features requested in earlier versions of MET/CAL.

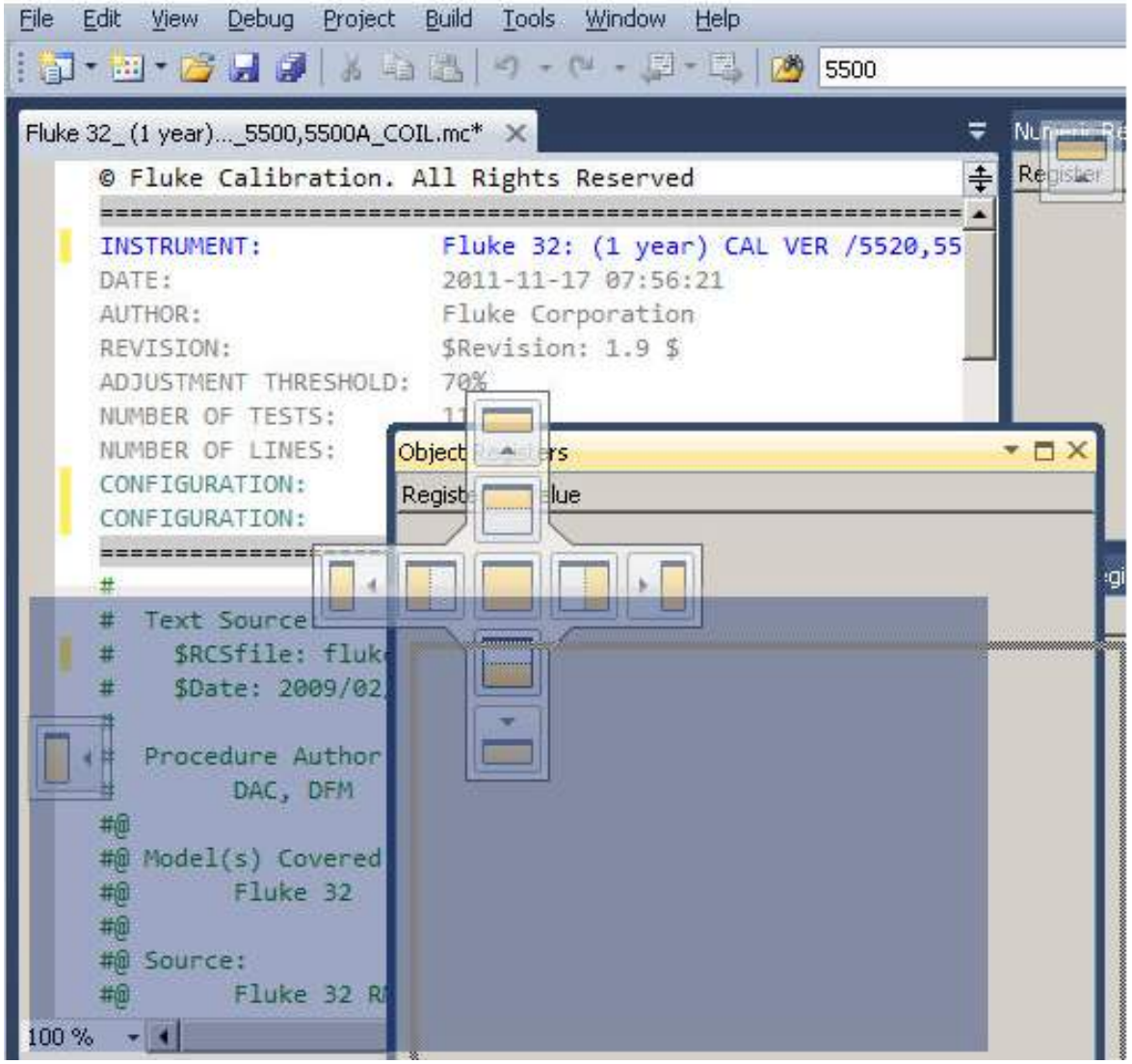
The editor is built around the Microsoft Visual Studio Isolated Shell which is at the center of all development using Microsoft tools (C#, C++, VB.NET, etc).


1
2
3
4
5
6
7
8
9
10
11
Project2 - MET/CAL Editor
File Edit View Debug Project Build Tools Window Help
5500
Fluke 32_(1 year)..._5500,5500A_COIL.mc*
© Fluke Calibration. All Rights Reserved
INSTRUMENT: Fluke 32: (1 year) CAL VER /5520,55
DATE: 2011-11-17 07:56:21
AUTHOR: Fluke Corporation
REVISION: $Revision: 1.9 $
ADJUSTMENT THRESHOLD: 70%
NUMBER OF TESTS: 11
NUMBER OF LINES: 123
CONFIGURATION: Fluke 5520A
CONFIGURATION: Fluke 5520A/COIL
Text Source:
$RCSfile: fluke_32_1yr_ver_5520_5520coil.txt,v $
$Date: 2009/02/24 20:31:30 $
Procedure Author:
DAC, DFM
#@ Model(s) Covered:
#@ Fluke 32
#@ Source:
#@ Fluke 32 RMS Clamp Meter Service Information, Par
100 %
Numeric Registers
Register Value
Ask Flags
Register Value
String Registers
Register Value
Object Registers
Register Value
Solution Explorer
Solution 'Project2' (1 project)
Project2
55_30.bmp
Fluke 32_(1 year) CAL VER _5500,
Sub Display Copyright.mc
Sub High Voltage Safety Warning.n
Sub MET_CAL Version Check.mc
Sub Select Guardbanding & Ver Mel
Properties
Sub Display Copyright.mc File Properties
Build Action Compile
Custom Tool
Build Action
How the file relates to the build and deployment process
Output
Show output from: MET/CAL
Test Run Status
Register Value
NAME Sample
REVISION 1.0
Ready

Customizing the Editor Display

1. The editor has a very flexible environment that provides features to customize it's look and feel.
2. Each window within the editor can be docked to other windows side by side, top and bottom or as a tab.
3. Individual windows can also be configured to float outside the window of the editor itself.
4. The screen layout of the editor persists between uses of the program.
5. After the display is customized, it will remain the same for all subsequent runs of the editor.

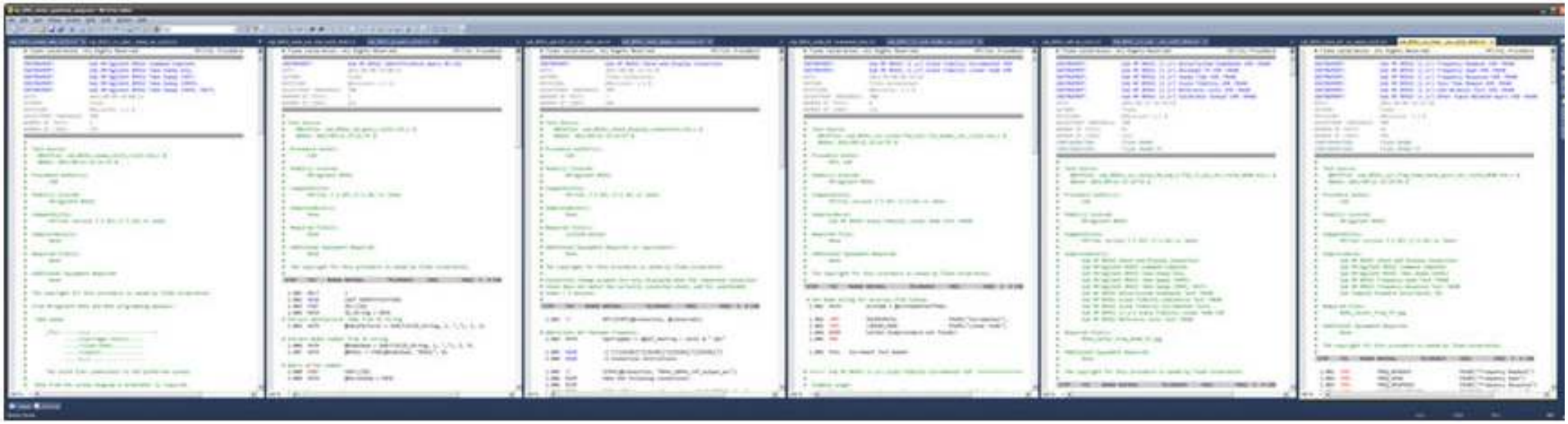
Docking Windows



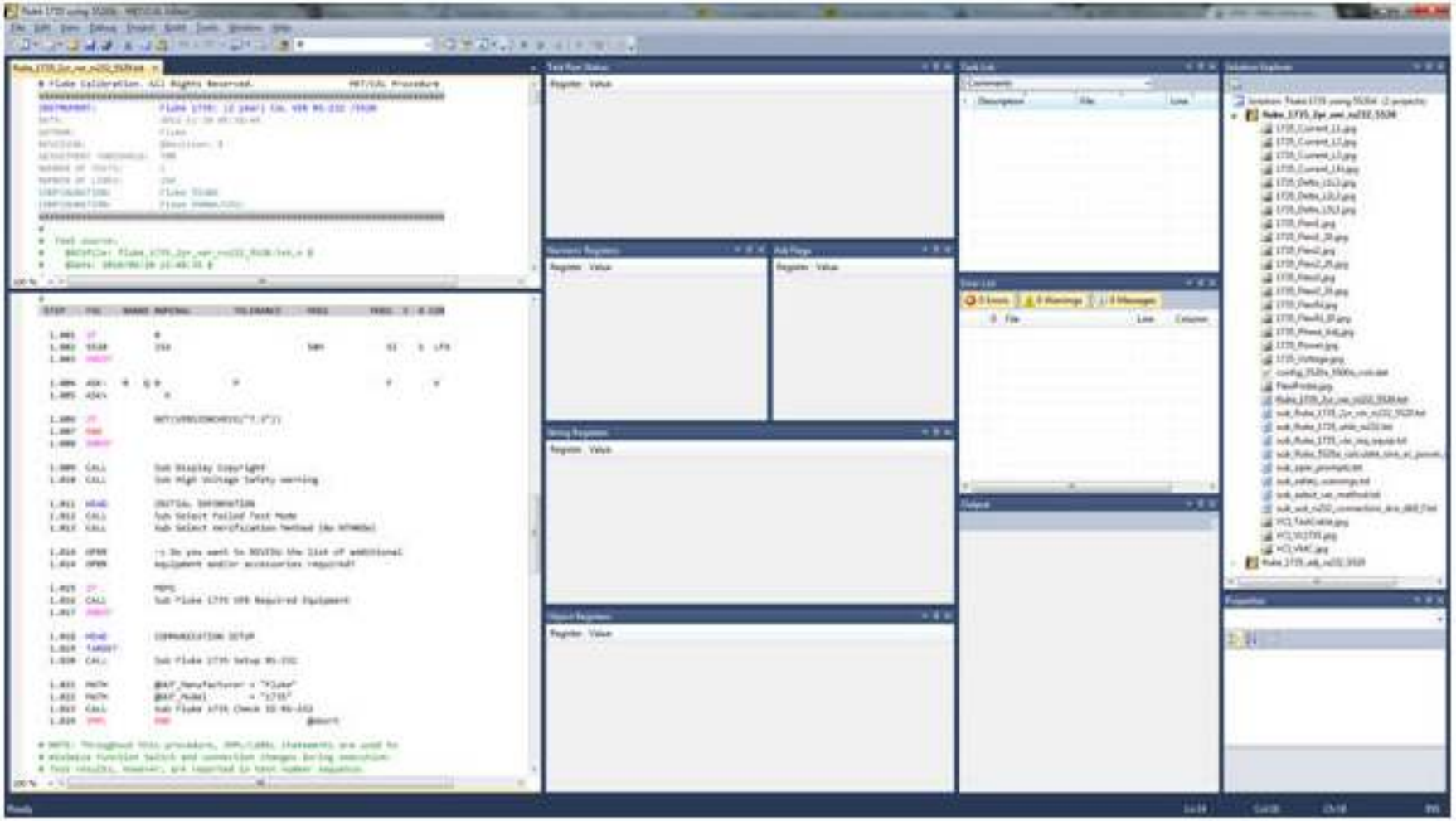
Different Window Configurations

The Editor is configurable for many different display configurations

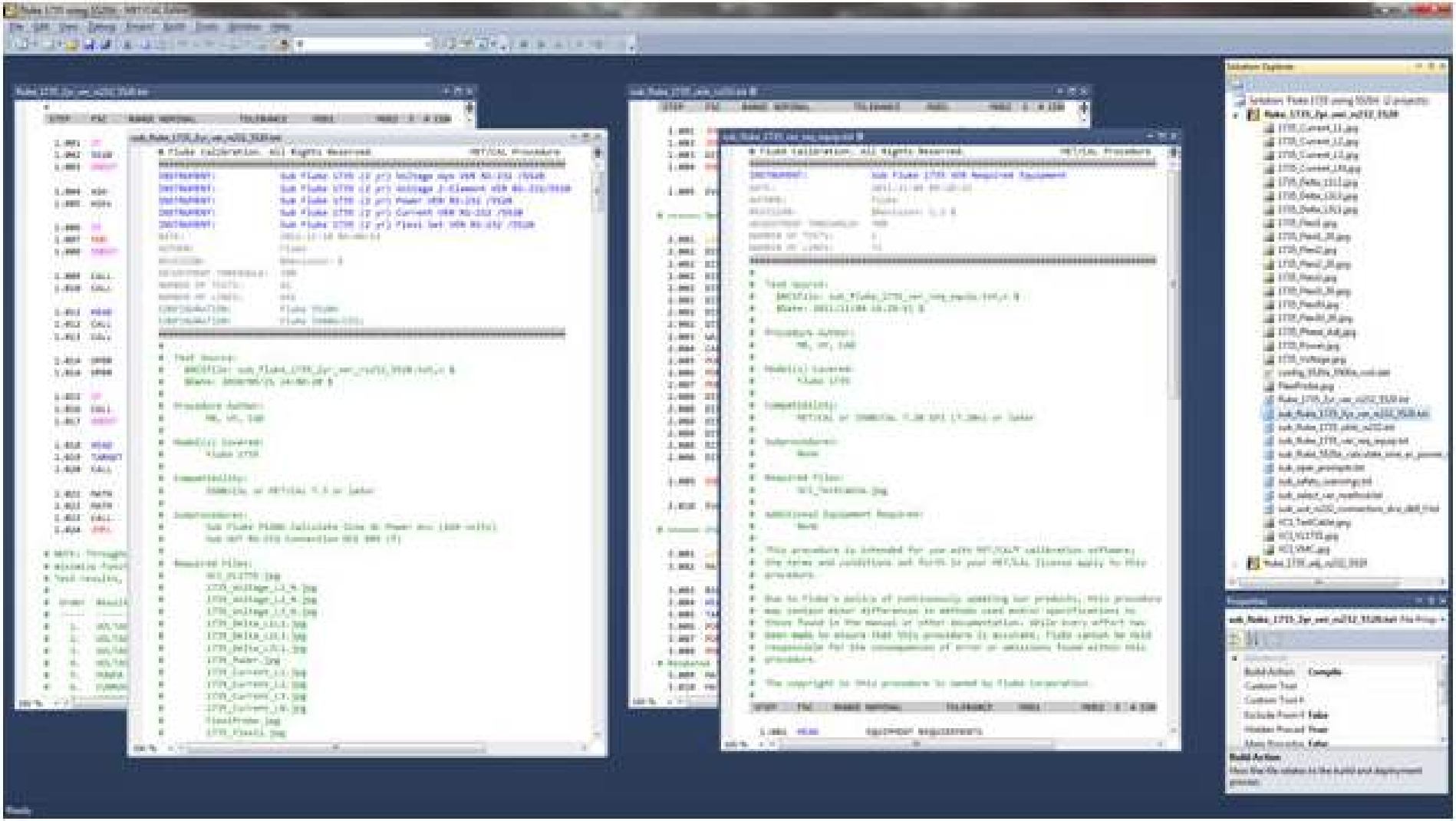
Two Monitors – Multiple Procedures



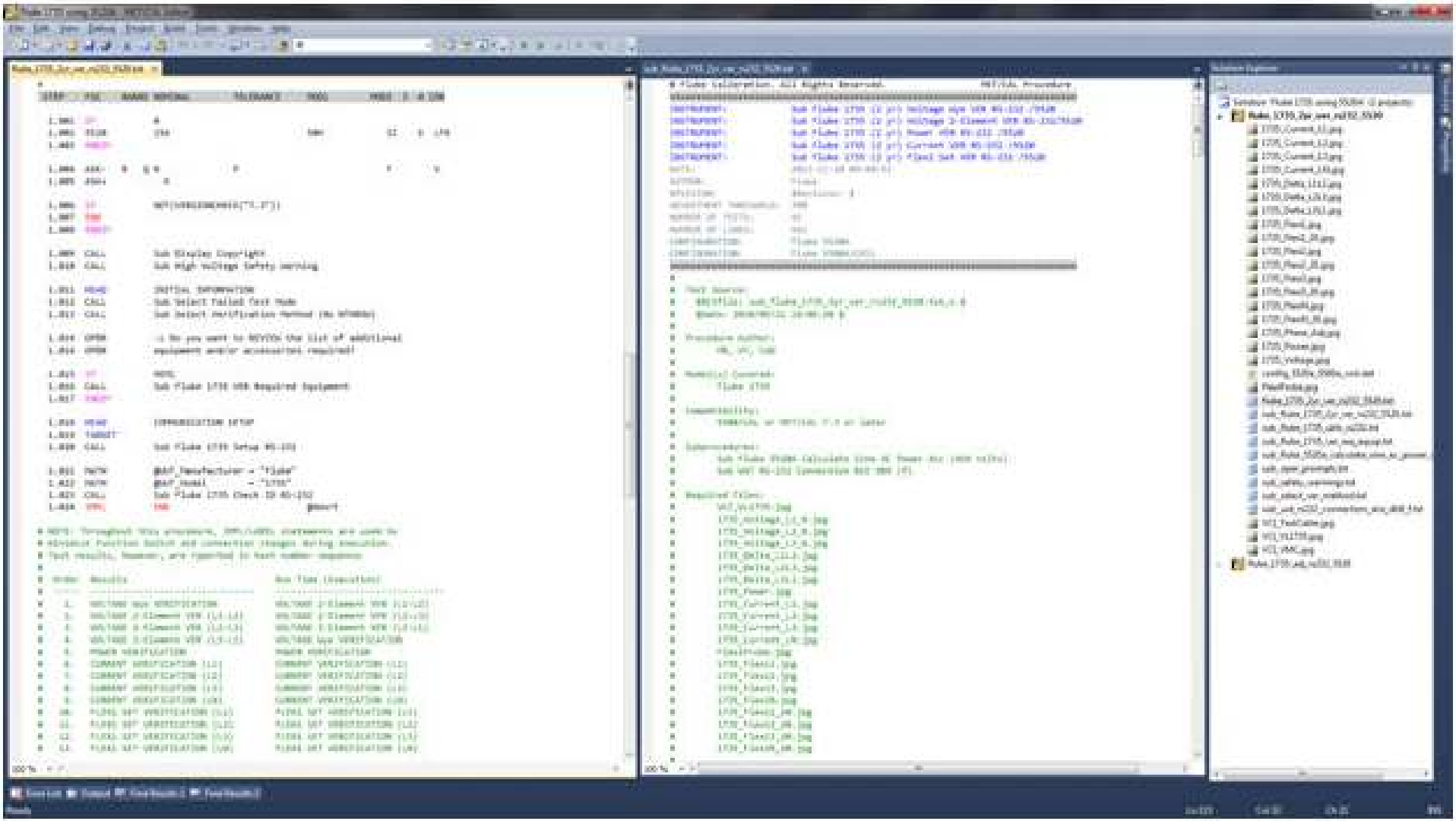
Single Monitor – Split Procedure plus Other Views



Single Monitor – Floating Windows



Single Monitor – Minimized Tool Views



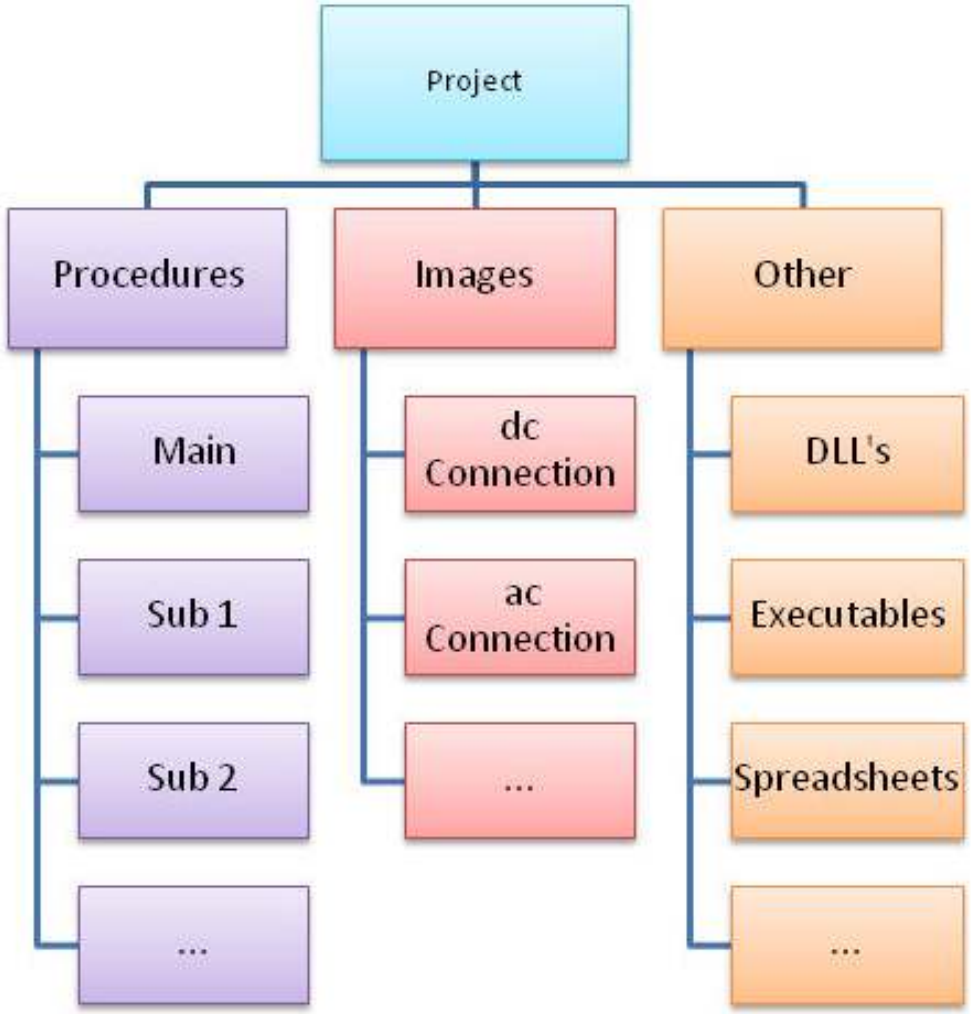
What is a MET/CAL Procedure?

1. MET/CAL operation is centered around procedures.
2. They are used by the MET/CAL Runtime program to perform a calibration.
3. Created, edited and maintained by the MET/CAL Editor
4. A MET/CAL procedure is a file containing MET/CAL commands called Function Select Codes or FSC's.
5. Procedures are written for specific instruments and follow the manufactures' written calibration procedure

Projects and Solutions

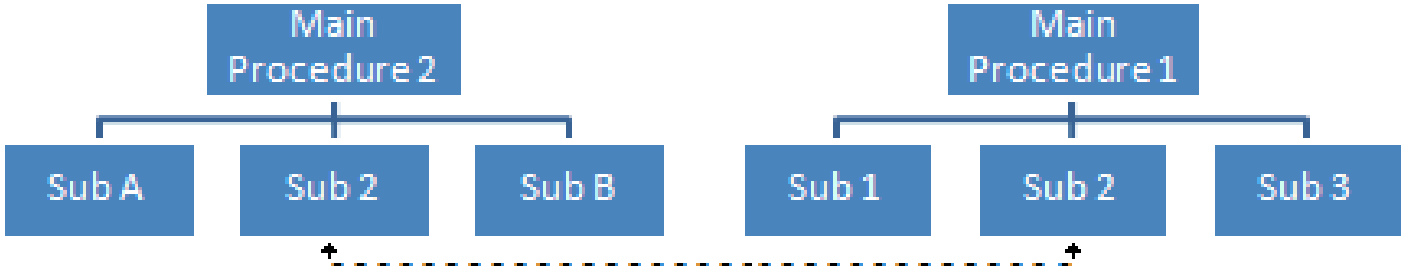
1. Version 8.0 introduces a new capability called Projects.
2. All of the components that make up a Project are saved to a single file called a Procedure Executable.
3. The file is easily distributed to other workstations or other labs.
4. The file cannot be altered and the contents cannot be viewed.
5. The project keeps all of the project's building blocks together within the project.
6. Without a project, it is up to the procedure author to ensure that all dependent files are located in the folders specified by the metcal.ini file.

What is a MET/CAL project?



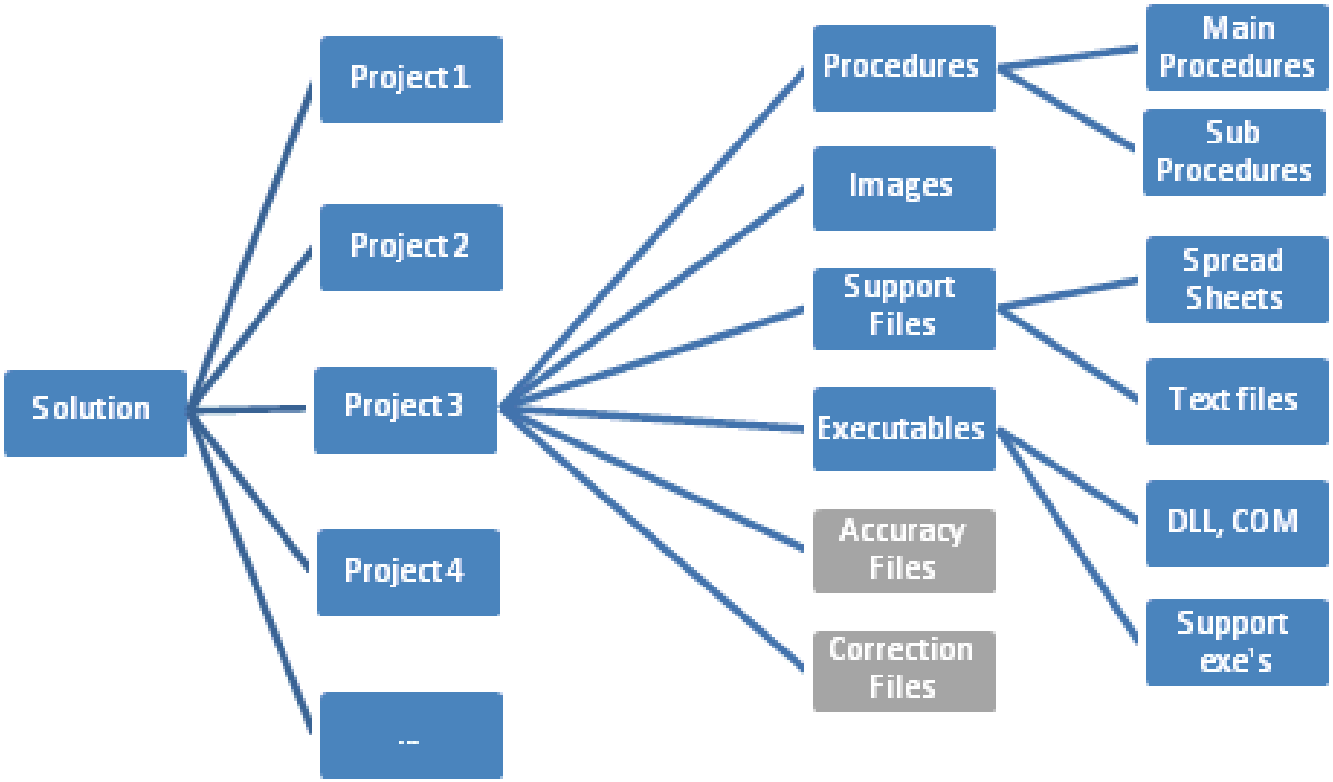
The MET/CAL project

Managing sub-procedures



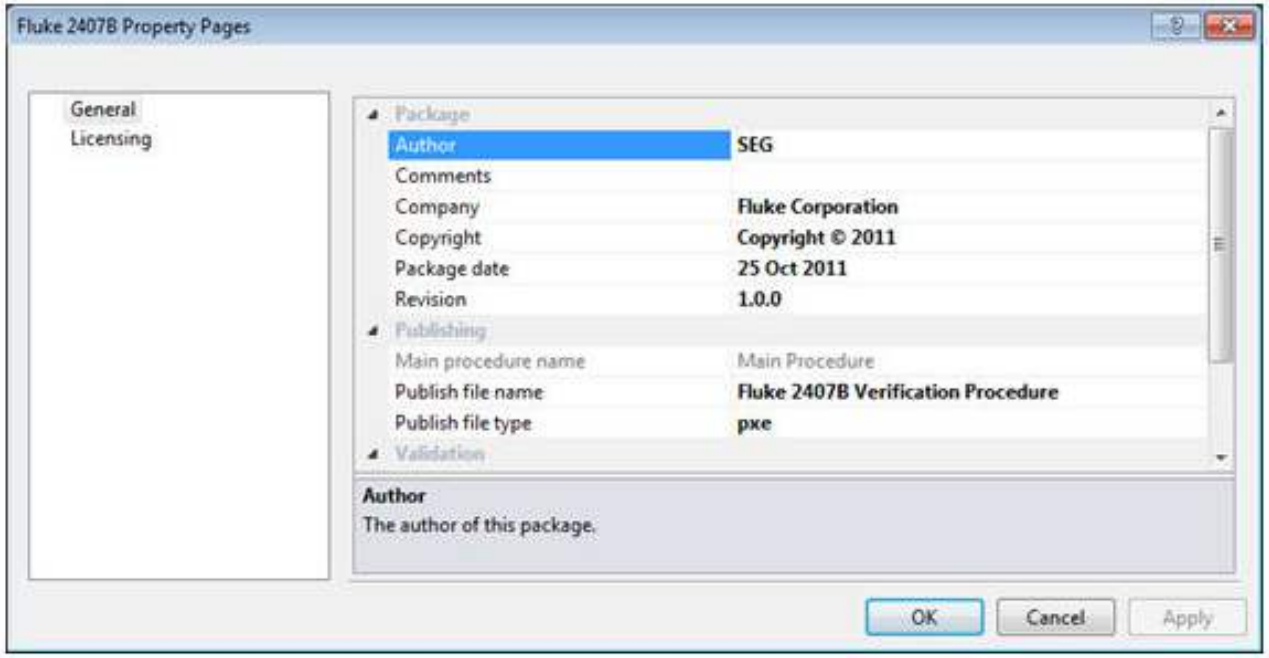
In previous versions of MET/CAL, sub-procedures were often shared among several procedures. This sometimes created problems.

Solutions


Solution
Project 1
Project 2
Project 3
Project 4
...
Procedures
Images
Support Files
Executables
Accuracy Files
Correction Files
Main Procedures
Sub Procedures
Spread Sheets
Text files
DLL, COM
Support exe's

Project Properties

1. All Projects have properties
2. The menu is named based on the active project selected
3. Project properties are provided to associate information with all files in the project



Properties Fields Explained

Field	Definition
General	
Author	Enter the name of the person or group responsible for creating the procedure.
Comments	Text used to describe the overall purpose of the procedure or any special actions that should be taken when using the procedure.
Company	Name of the company that owns the procedure
Copyright	The copyright date of the procedure package.
Package Date	The date stamp of the procedure. When importing procedures, this is the date field of the main procedure. The field must be manually updated by the user.
Revision	The version of the procedure package. Use the version for tracking and control purposes
Main Procedure Name	The name of the main procedure file. Each procedure package can have only 1 main procedure. The main procedure file is selected by using the file properties dialog for the actively selected file in a procedure project.
Publish File Name	The default file name of the procedure package.
Publish File type	The package type: • PXE- Procedure Executable file. PXEs can be directly executed by MET/CAL • PKM- Procedure Package file. Used for distribution of procedure source. A PKM cannot be run by MET/CAL. The files must be imported into the editor and republished for use by the Run Time. This is a legacy option provided for compatibility with prior versions of MET/CAL. Distribution of procedure source is simplified by the Source zip file added to the \bin directory of a project during the Build process.

Properties Fields Explained, continued

Validated	True/False field to indicate if a procedure has been validated. Use the option to flag to PXE users when a procedure is acceptable to execute.
Validated by	The person(s) or group that verified the procedure.
Validation comment	Use the field to indicate the type or level of validation. "Z540.3, ISO17025" for example. There are no limits or specific requirements for the comment.
Validation date	The date that the package was validated. This date does not have to correspond
Licensing	
License GUID	The Globally Unique Identifier for the procedure executable. This item is used with a license file to create a proprietary PXE. Licensed PXEs cannot be used without the appropriate license file. The license file mechanism is proprietary and is not publicly available in this release of MET/CAL.
Licensed by	The name of the organization that is providing the license.
Licensed procedure	True/False to indicate if the procedure is licensed or not.
Licensed to	The name of the organization that is authorized to use the PXE.

Building and Publishing

Procedures Without Projects

1. Procedures developed outside of projects do not support the build operation.
2. These procedures are edited, debugged then published.
3. Any procedure opened with the File, Open Procedure option is opened outside of a project.
4. However, files in a procedure project can also be published as individual compiled procedure files.
5. Only procedures that compile can be published.

1. Open an existing procedure using the File, Open Procedure menu choice, or create a new procedure with CTRL+N or File, New Procedure.
2. Add text to the instrument line, and edit the procedure content.
3. Press F9 to Compile Check the procedure. This process ensures that all procedure content is valid and that the procedure can be compiled.
4. Test Run the procedure by using F5. Use the Debug Toolbar or short-cuts to control the debug process.
5. Repeat steps 2-4 until the procedure meets expectations.
6. Publish the procedure using the Build, Publish Procedure(s) or Build, Publish Procedure(s) To option to add the procedure to the compiled procedure directory.
7. Use the Procedure Selector to hide procedures that should not be accessible by the Run Time.
8. Use the MET/CAL Run Time, Calibrate menu to launch the published procedure.

Building Procedure Projects

The Build and Publish process does the following:

Verifies that all procedures in the project compile without errors. Warnings do not prevent a compiling. Reference the Output window to view build process errors. The Status bar also updates with general progress information.

Scans each procedure and verifies procedures referenced in CALL statements are in the project. Even files market as Exclude from Build in the file properties must be in the project however they will not be added to the final PXE.

Scans each procedure and verifies that each image referenced by a PIC statement is in the project. If a variable is used to reference the image, the file cannot be verified. In this case, it is up to the user to ensure that the picture is included in the project or is in the active pic directory defined by the metcal.ini file.

Building Procedure Projects, continued

Scans each procedure for DOS statements and ensures that the application called by the statement is in the project. Similar to pictures, if a variable is used the program cannot be verified at build time. It is up to the user to ensure that the file is included in the project or is in the User_Prog_Dir or the User_CWD defined by the metcal.ini file.

All files in the project that are compressed and added to a zip file that is named the same as the Package File Name defined in the Project Properties dialog. The file is copied to the \Bin directory relative to the active procedure project file.

The zip file contains all relevant source files necessary to rebuild the Procedure Project. Use this file to transfer source to another user if it is necessary to rebuild the project on a system that does not have access to the original project files.

Regardless of the Package Type selection in the Project Properties, a PXE file is also created in the \Bin project sub directory. All debugging is performed by using the PXE file in this folder.

Building Procedure Projects, continued

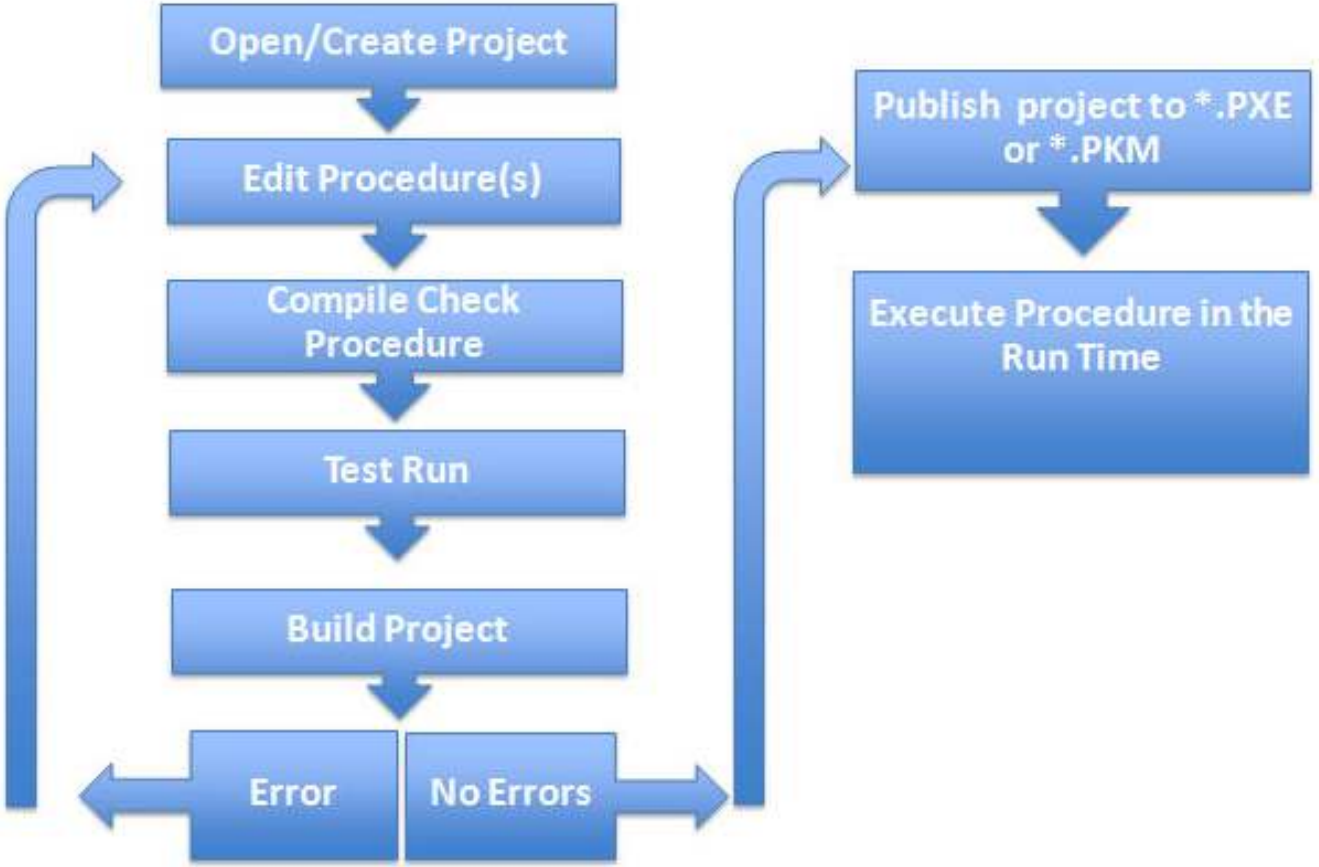
If the Build operation was initiated by Start Debugging, the actively selected procedure will execute starting at the first line of code. Debug from Cursor will always begin at the current cursor point of the active procedure.

When the Package Type selection in the Project Properties dialog is PKM and building was initiated by a Publish operation, a PKM file is also created in the \Bin directory.

When the Build, Publish Package option is used, the PKM or PXE file is copied to the target location selected by the user when the option was first pressed. Note publishing a package is effectively a file copy operation to move the package from the \Bin directory to the Run Time working directory. The default folder is the current compiled procedure directory.

For archival purposes, it is good practice to backup the project Zip file with the PXE after publishing. This is a user specific operation that is not handled by the procedure editor.

A flow chart of the Build/Publish sequence for procedures in a project



File Types supported by MET/CAL Version 8.0

File Extension	Purpose
.MCSLN	MET/CAL Editor Solution file which organizes projects, project items and solution items. Solution files are stored in the project directory or a specific solution directory. The location is determined by the New Project dialog.
.SUO	Visual Studio Solution User Options file which is a structure storage or compound file stored in binary format solution layout (hidden file type). When a source control program is used or when sharing a procedure project, exclude this file as it is specific to the user authoring the procedure and it does not contain details related to the function of the procedure.
.MCPROJ	MET/CAL Editor Project file which organizes project items.
.PRO	Old style MET/CAL procedure file.
.MC	MET/CAL procedure file stored in UTF-8 format. The file is plain text and can be opened in any text editor.
.CACHE	File used to make it faster to load .PRO files. These files should not be modified by the user and are hidden by default.
.PKM	Packed procedure file. The file contains one or more procedures and support files. A *.PKM file can be created by altering the Publish Type property in the **Project Properties** dialog. A *.PKM file can be imported into a project by using the **File, New Project from Existing *.pkm file** option.
.PXE	MET/CAL procedure executable; cannot be edited; produced when a Project is published; source Project is required to change a .PXE file.
.MCZ	MET/SUPPORT CD procedure file. The extension is associated with an extraction program that unpacks the procedure and support files into the active metcal.ini file paths.

UTF-8 ??

MET/CAL 8.0 stores procedures files using UTF-8 format.

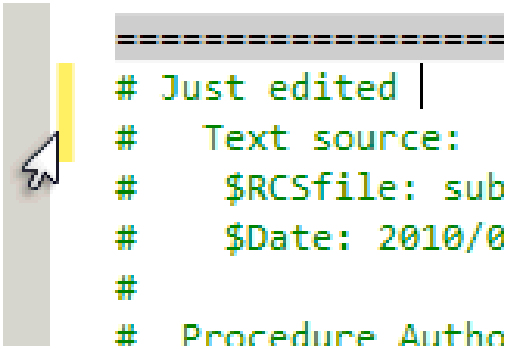
UTF-8 is a Unicode format that supports universal transport of characters created on operating systems with different code pages.

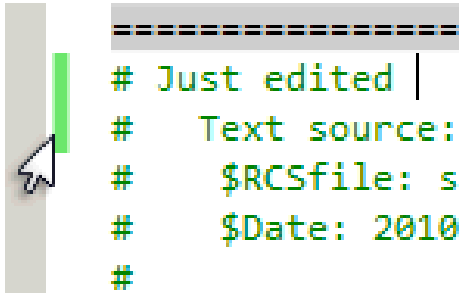
See Unicode Character Encoding in the MET/CAL User's Guide for more information.

Files That Have Changed

Files that have changed include an asterisk after the file name on the file's edit dialog

File changes are indicated by a yellow highlight next to the file text. After the file is saved, the highlight changes to green.





Printing a Procedure

The File, Print menu opens a dialog box that lets you print the current procedure. To print the procedure to a PDF, install a PDF printer and select it as the print device in the print dialog.

To print a procedure, proceed as follows:

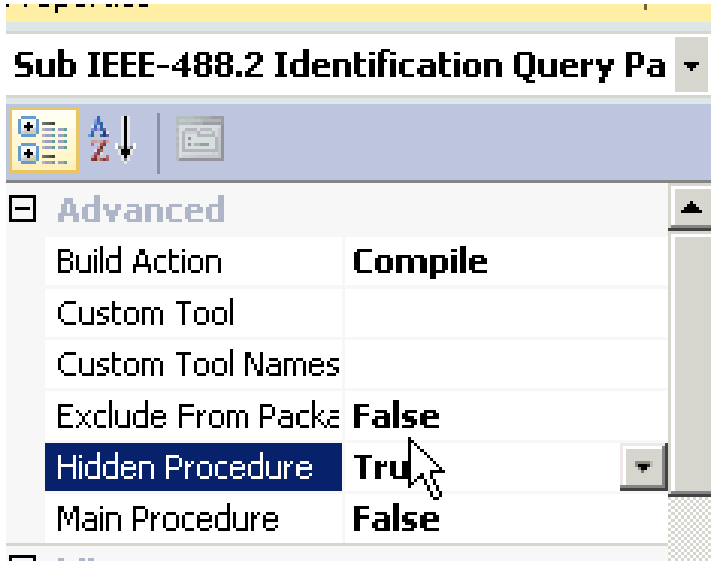
1. Open the procedure you want to print.
2. From the File menu, select **Print**.

A Print dialog box appears.

3. Choose the options you want and select **OK** to print the active procedure

Hiding a Procedure

The Procedure Selector has features to hide and unhide procedures in the active Compiled Procedure directory



In a procedure project use the file properties dialog and choose True as the Hide Procedure option.

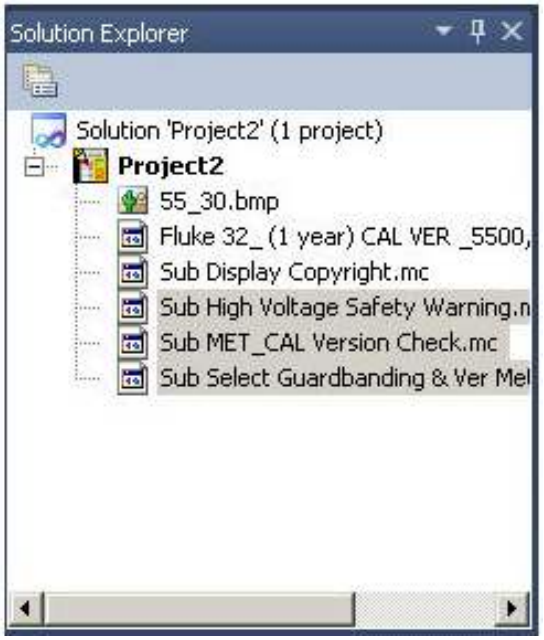
Compile Checking a Procedure

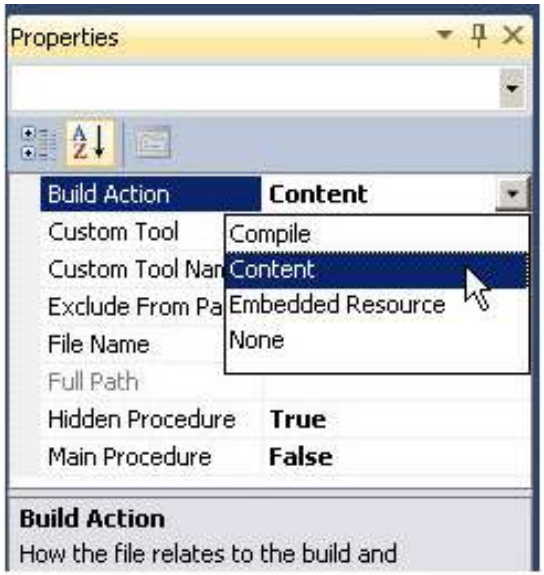
The **Debug, Compile Check Procedure** (F9) checks the contents of the active procedure and reports errors in the Error window and warnings in the Warning window. The compile check does not check dependencies outside of the procedure file itself. Errors must be corrected before you can run the procedure. If no errors are present, the procedure is formatted and fields are lined up under the correct columns.

T.U.R. Checking - Procedure lines that contains an instrument evaluation FSC, the Test Uncertainty Ratio (T.U.R.) is calculated in most cases.

Automatic Line Check is operating as long as the Editor is not operating in Text Mode. The same checking as described above is performed on every procedure line as you enter it. When you press [ENTER], the line check is triggered. If no errors are found, the line is formatted, and the cursor is placed on the next line ready for the next procedure statement.

To enable debugging without resolving all issues in procedures, select all affected procedures in the Solution Explorer (CTRL+Click to multi-select), press F4 to display the file properties and choose Content as the Build Action property. This selection prevents the build process from attempting to compile the selected procedures. Make sure to change the build action back to Compile before publishing the procedure.





Debug from Cursor

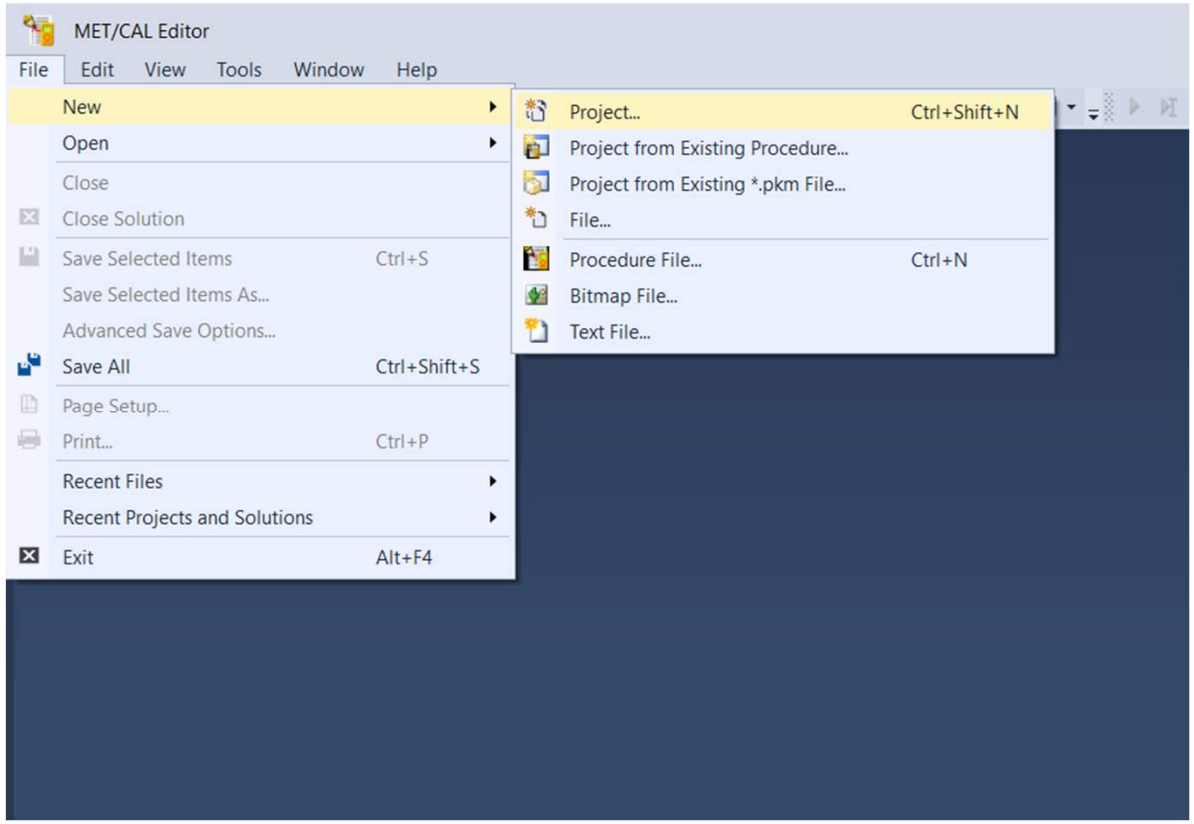
Runs procedure from the line where the cursor is currently positioned.

When the procedure is completed or terminated, the values of certain parameters are remembered, so that the next time you execute the procedure, it is not necessary to repeat the test steps that establish those values.
The system remembers the following parameters:

- ASK flags, created using the ASK- and ASK+ FSCs.
- Memory variables MEM, MEM1, MEM2, and M1 through M255
- Values created with Instrument Setup FSCs (For example, MMFC, MCAL, and 606 FSCs).
- MESS message buffers, created with the MESS FSC.
- DRAW parameters, created with the DRAW FSC.
- SET settings table, created with SET FSCs.

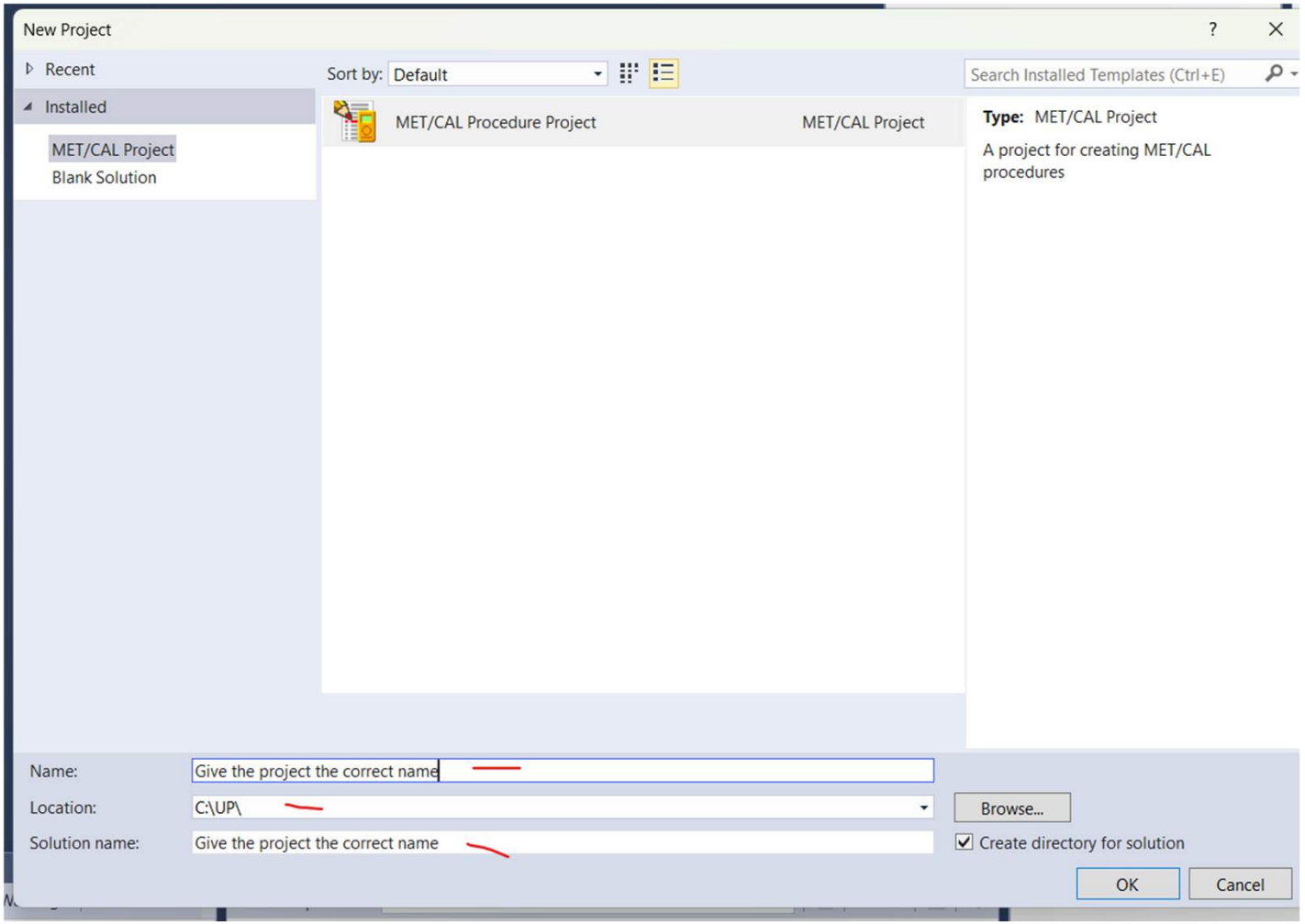
MET/CAL Editor has many ways to copy and create new procedure.

From beginning.

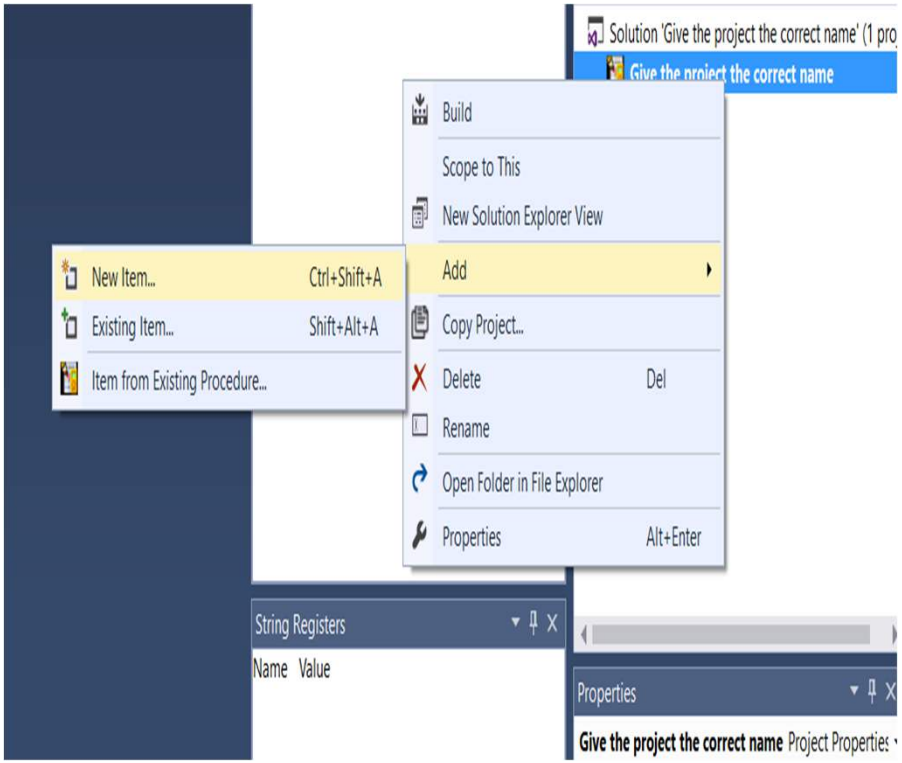


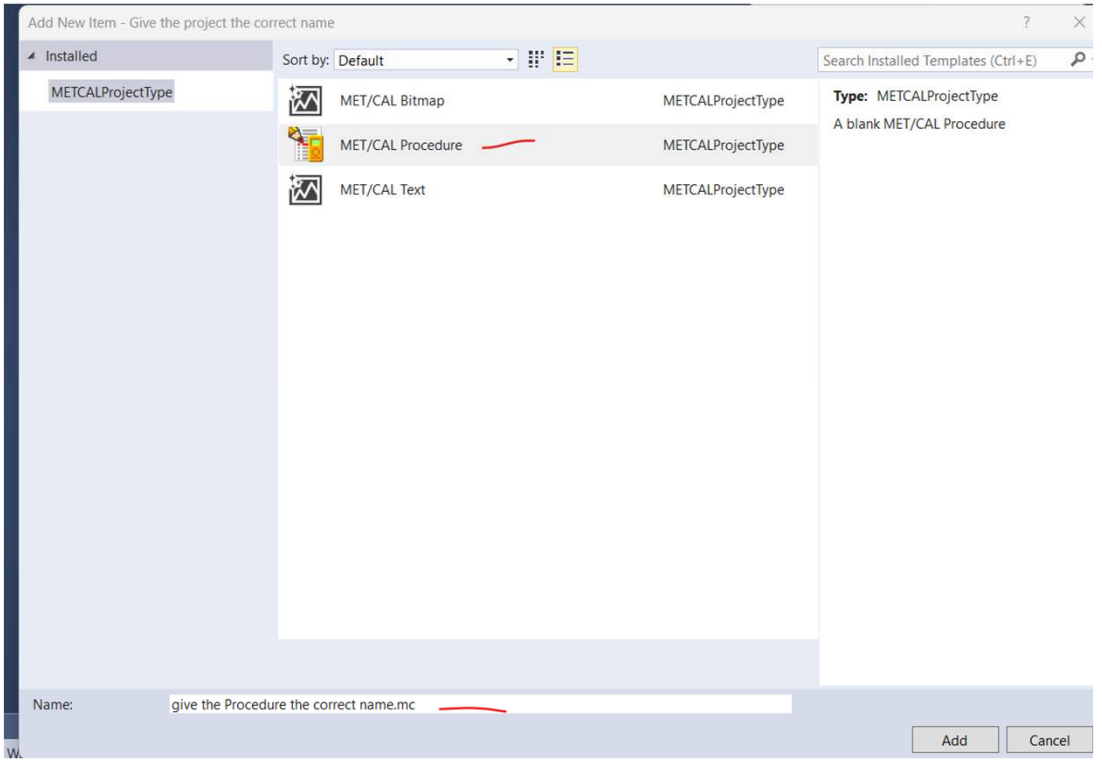
MET/CAL Editor has many ways to copy and create new procedure.

From beginning.



MET/CAL Editor has many ways to copy and create new procedure.





Now you can create your Procedure what is another part of the training

```
1  Caltech TST server                                          MET/CAL Procedure
2  ================================================================================
3  INSTRUMENT:             Now create your proc
4  DATE:                   2025-01-01
5  AUTHOR:                 Mats Svensson
6  REVISION:               1.00
7  ADJUSTMENT THRESHOLD:   70%
8  NUMBER OF TESTS:        1
9  NUMBER OF LINES:        14
10 ================================================================================
11  STEP    FSC    RANGE NOMINAL        TOLERANCE     MOD1        MOD2  3  4 CON
12
13   1.001  ASK+           K
14   1.002  DISP         hi is all good
15
```

Add 6 sub proc named:

- Sub1 Gen
- Sub2 Gen
- Sub3 Gen

- Sub1 set
- Sub2 set
- Sub3 set

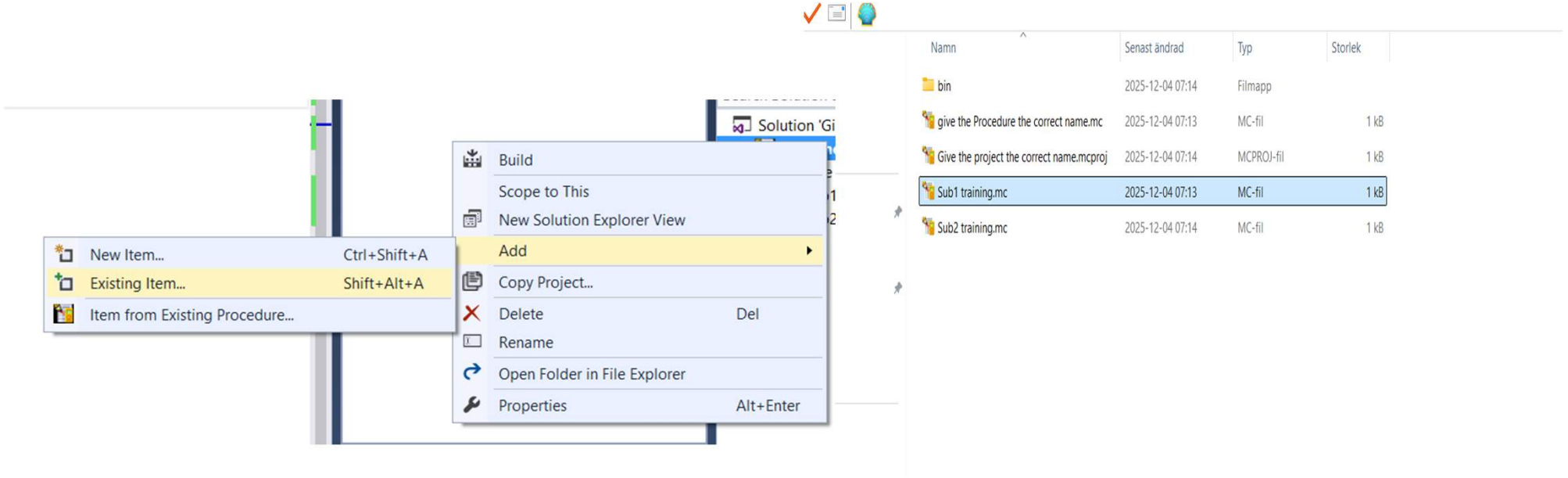
Compile the project.

LOOK IN TO THE FOLDER

LOOK IN TO THE FOLDER

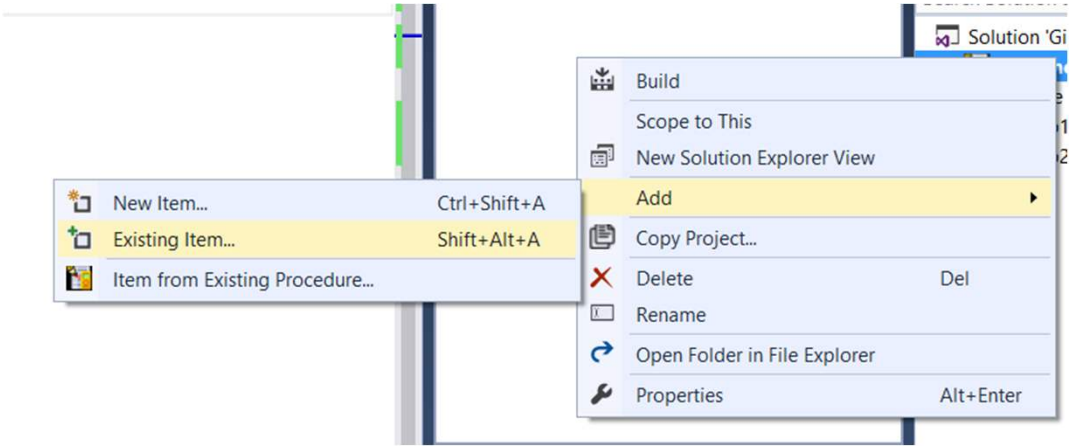
Repeat the step before

- Create a project from step 1
- Create a proc from the step before
- Go to Windows Explorer and copy the sub procedure
- Past it in to the New project
- Add it in MET/CAL under Existing Item



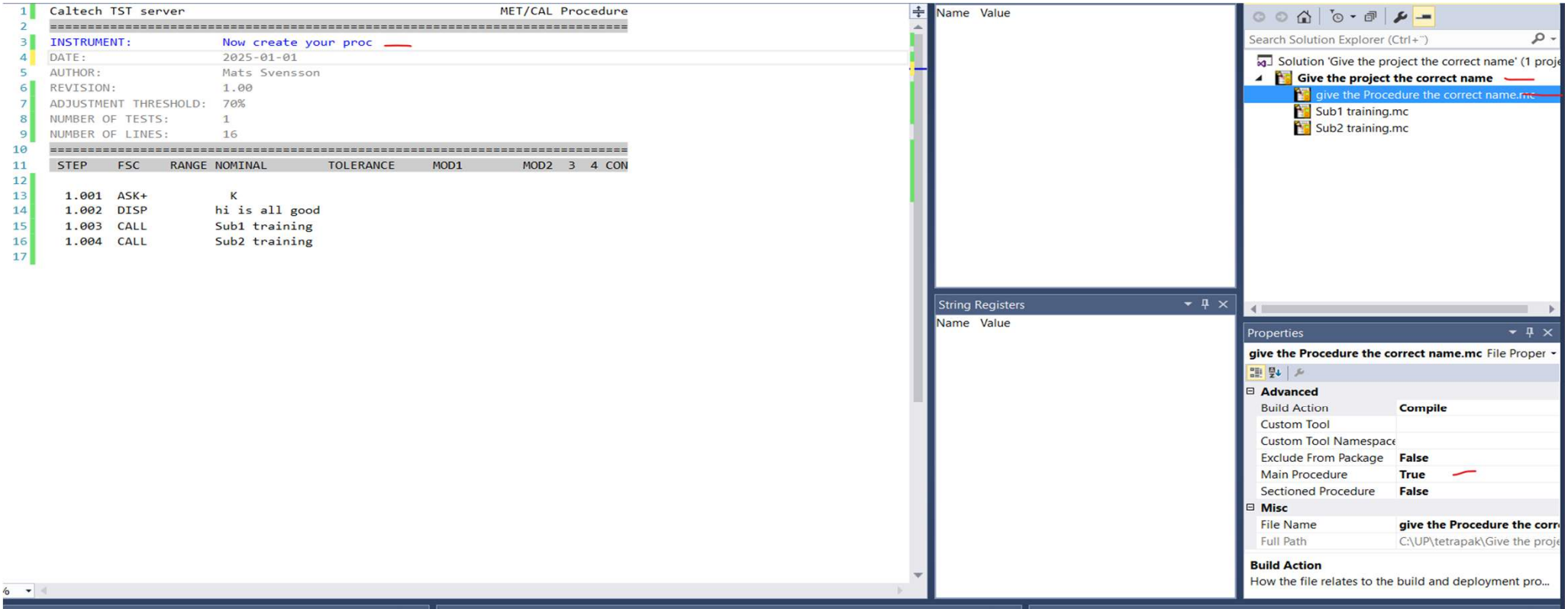
If you also like to copy the Main proc you need to Rename it and set it as MAIN PROCEDURE
You can rename it before you add it into the project or in MET/CAL

Also rename the Instrument text in the Main proc and rename the project “PXE” File

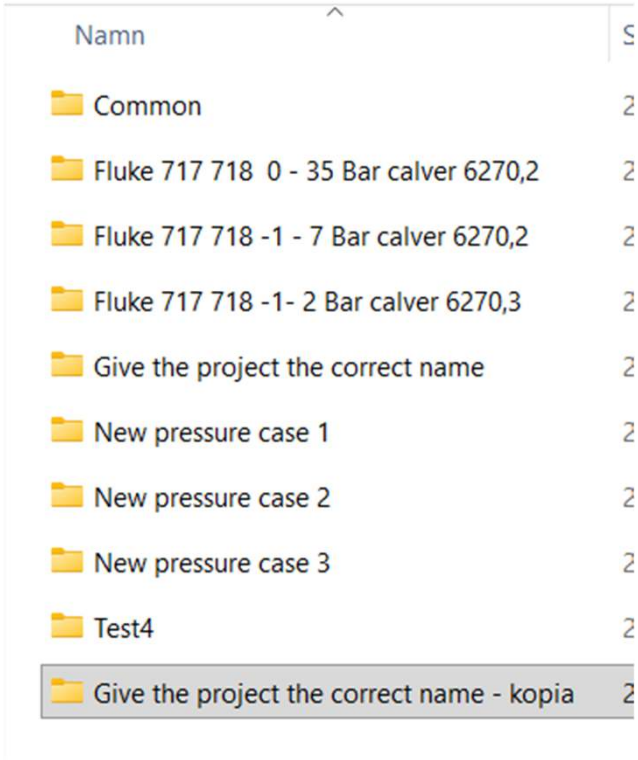


If you also like to copy the Main proc you need to Rename it and set it as MAIN PROCEDURE
You can rename it before you add it into the project or in MET/CAL

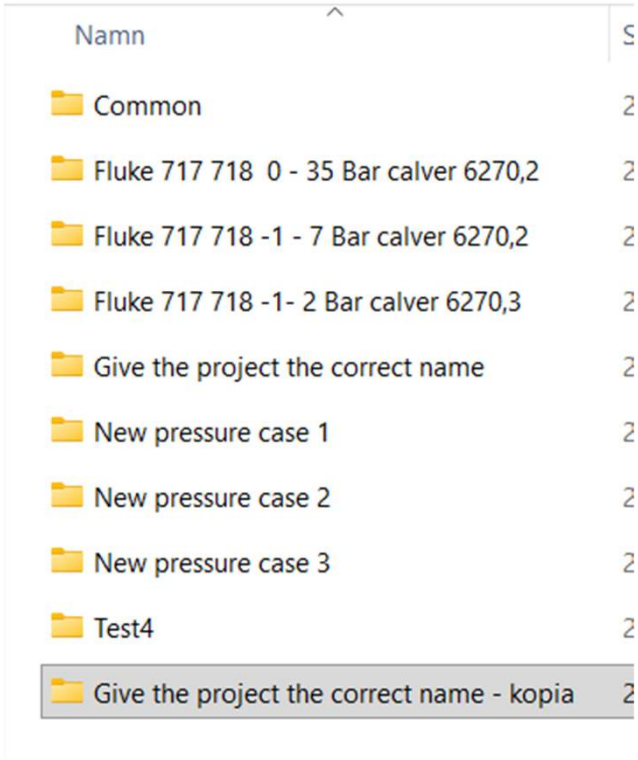
Also rename the Instrument text in the Main proc and rename the project “PXE” File



Copy the complete project to a new catalog and rename it



Copy the complete project to a new catalog and rename all

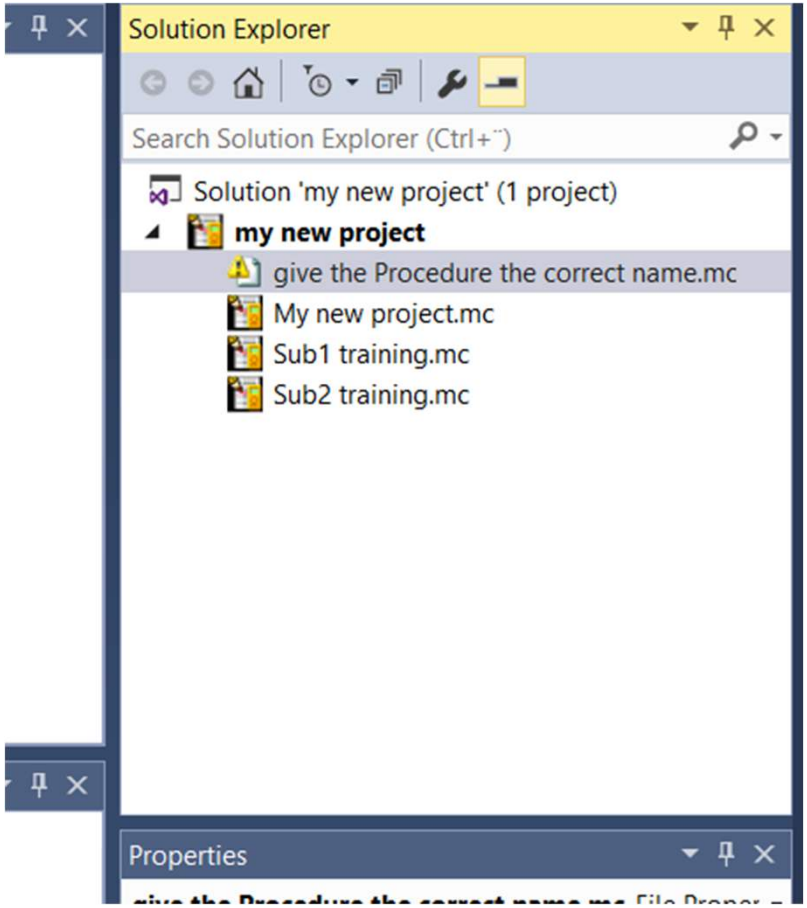


Now you need to delete the old main proc and add the new one if you renamed it in explorer

Or

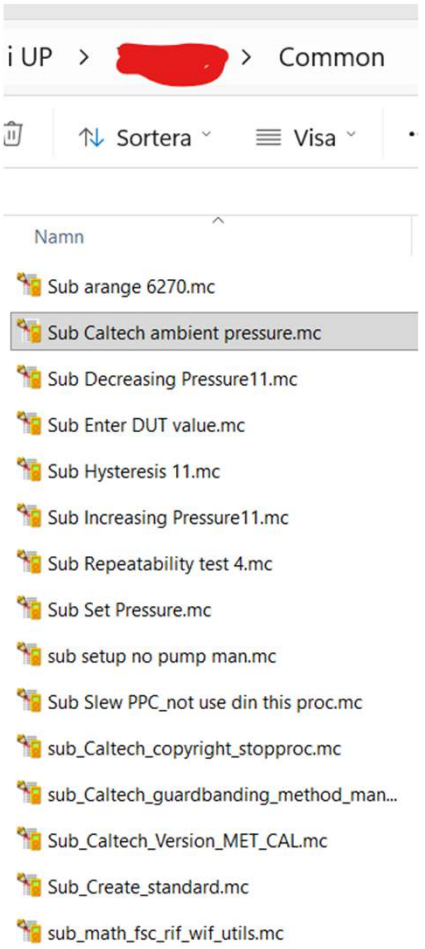
Rename it in MET/CAL what I prefer

Ranme the PXE



Work with Command folders

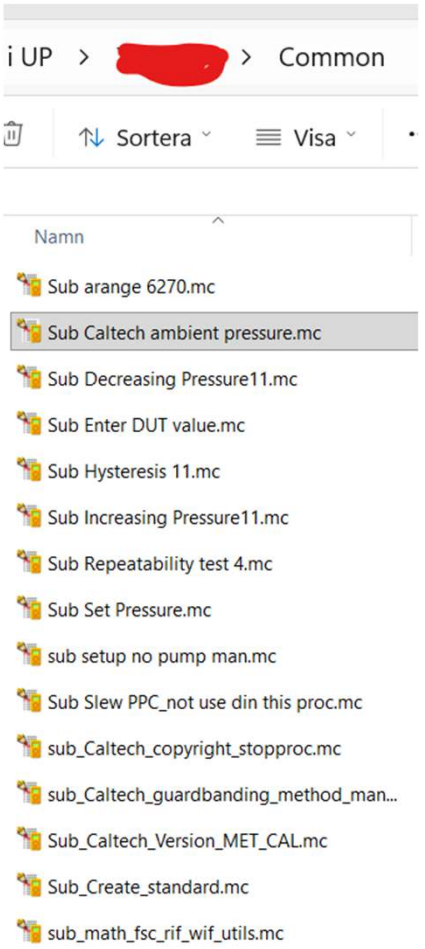
- Create 2 folders
- Named Sub General1
- Named Sub Set1
- Rename the PXE



Work with Command folders

- Past all sub you have create to folder Sub General1

- Rename the PXE



Work with Command folders

- Past only general subs to the catalog Sub General1
- Past only “Set sub” to Sub1 Set1
- Named Sub General1
- Named Sub Set1
- Rename the PXE