Application Note

PRODUCT NAME

Fieldbus system

EX600 CIP Safe

Model / Series / Product Number

EX600-BEN1

EX600-FVC1

SMC Corporation

EX600-BEN/FVC1 Application Note v1.0 Created By:
UTC, SMC Corporation of America

1 Table of Contents

This application note was created by the SMC Corporation of America, United States Technical Center. For technical support, please provide a description of the application along with error/fault codes, indicator status, connected modules and any other applicable information to eaeg.us@smc.com.

2 Overview

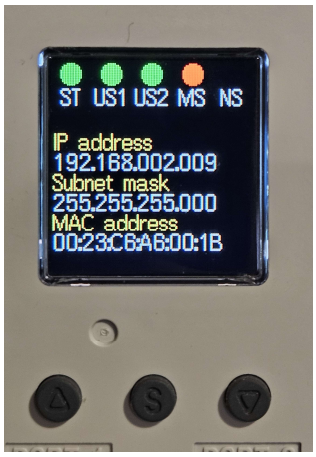
This training manual covers information and techniques to commission an SMC EX600-BEN1 with a EX600-FVC1 installed on it. The following equipment was utilized for creating this guide:

- Rockwell Studio 5000 Major Revision 37
- Allen Bradley 1769-L30ERMS
- 1x EX600-DYPB
- 1x EX600-DXPB
- 1x EX600-LAB1
  - Operation Manual
- 1x EX600-BEN1
  - Operation Manual
- 1x EX600-FVC1
  - Operation Manual
- Valve manifold with 2x valves
- EIP Molex Tool
  - Download

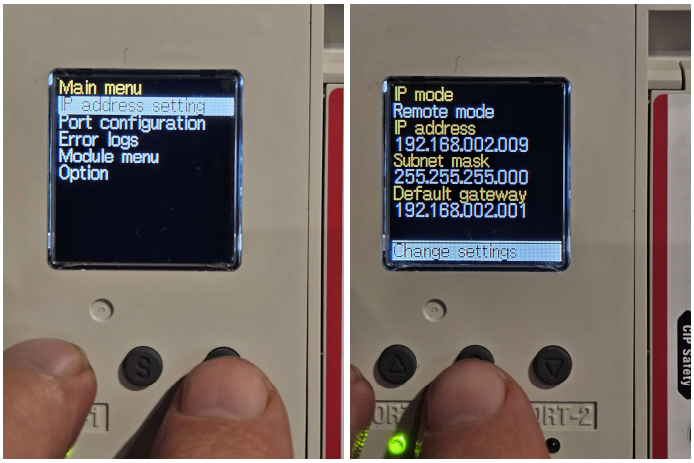
Please refer to Doc. No: DOC1114013 (EX600-FVC1 Operation Manual) for all safety related information.

3 Basic Commissioning Walkthrough

1. Unbox and assemble all equipment. Make sure the EX* unit is powered up and has the Ethernet cable installed. Your unit should look like the unit pictured below.
2. Assign the IP address. For this guide we will be assigning the IP address from the BEN1 unit using the 3 small buttons on the face. Below is the default screen:



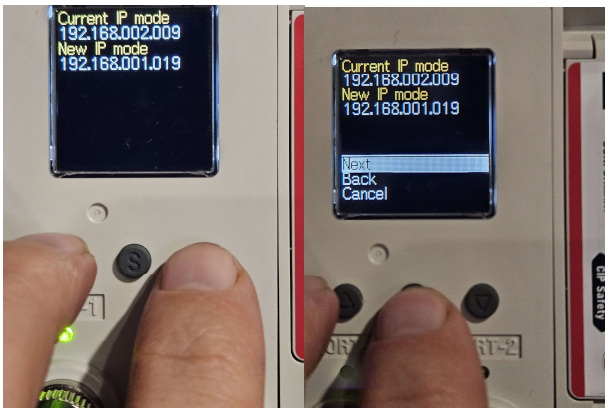
2.1. Press and hold both up and down buttons at the same time until the menu changes.
2.2. Select ‘IP address setting’ by navigating with the up and down buttons and select with the middle "S" button. Then select ‘Change settings’.



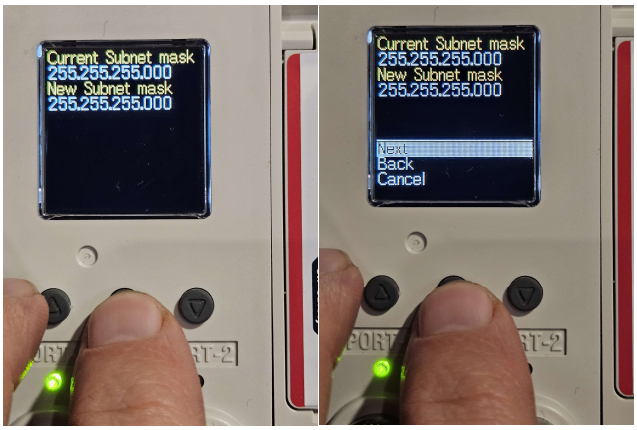
2.3. Enter the password. Default is "0000".

2.4. For the purposes of this guide, select ‘Hardware mode’, then select ‘Next’.

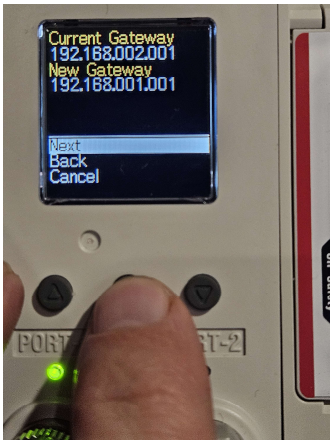
2.5. Using the up, down and set buttons, set the IP address of the unit then select "Next".



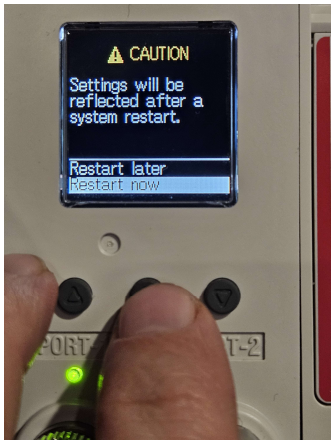
2.6. Using the up, down and set buttons, set the Subnet mask of the unit then select “Next”.



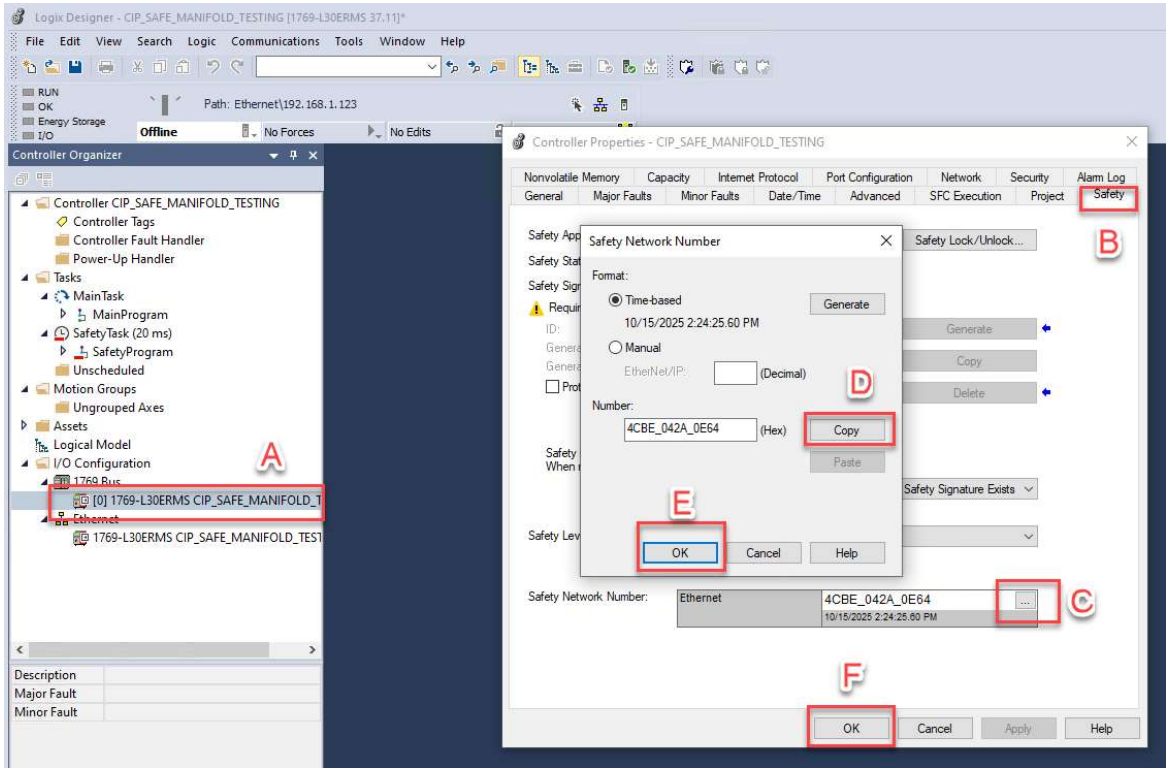
2.7. OPTIONAL: Using the up, down and set buttons, set the Gateway of the unit then select “Next”.



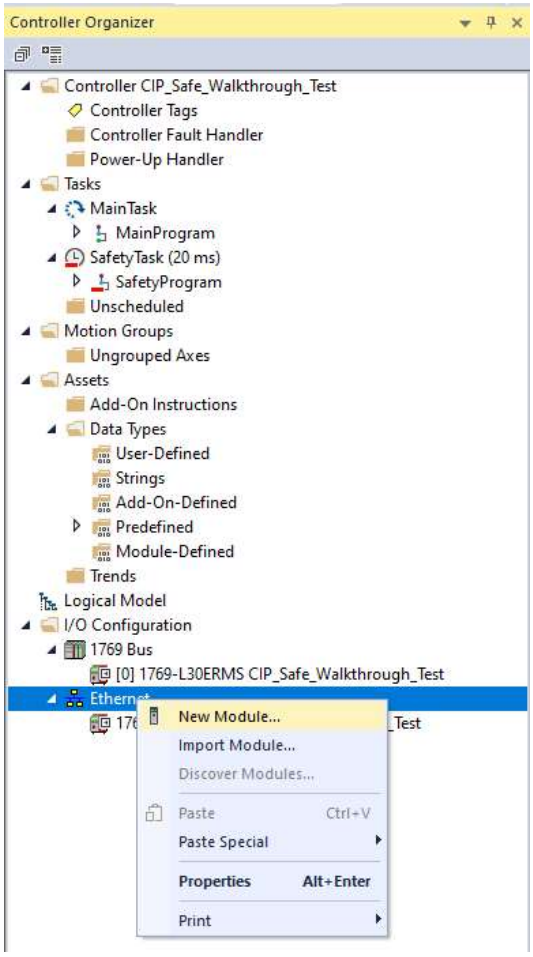
2.8. Select ‘Restart now’. After restart complete, power cycle the unit. Confirm settings.



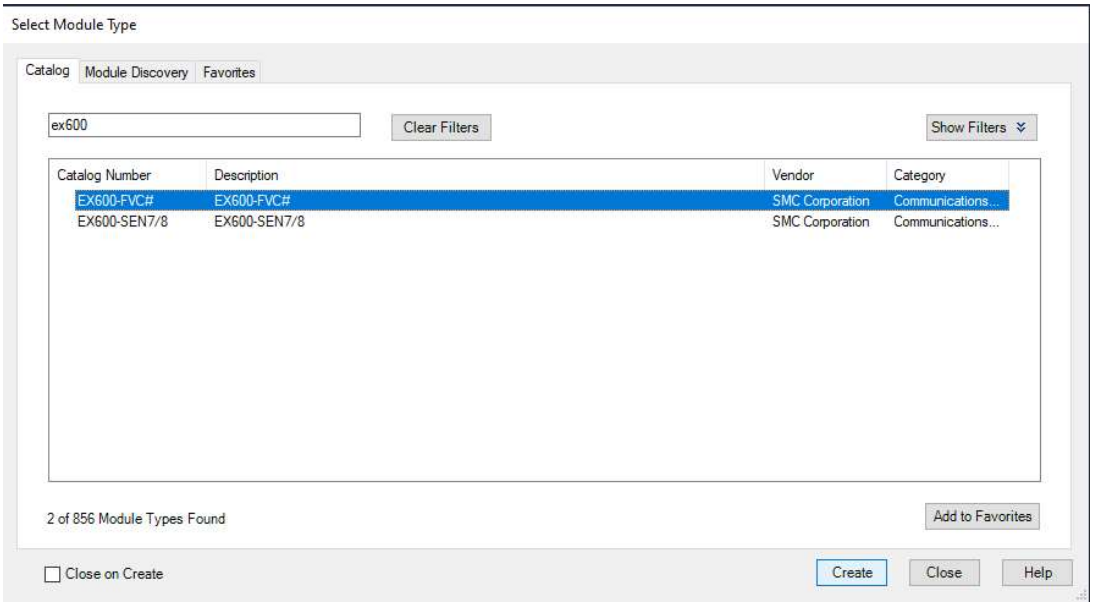
3. Install/register the EDS file.
   3.1. This information can be found in the EX600-BEN* Operation Manual (Doc. No. DOC1121211)
4. Create the module in Studio 5000.
   4.1. Copy the Safety Network Number (SNN) from the Controller Properties.
      4.1.1. (A) Right click >>> ‘properties’
      4.1.2. (B) Safety tab
      4.1.3. (C) Select the ‘…’ ellipse
      4.1.4. (D) Copy
      4.1.5. (E) OK
      4.1.6. (F) OK



4.2. In the I/O Configuration folder, right-click ‘Ethernet’, and select ‘New Module’.



4.3. Search for EX600-FVC#, highlight, click Create.

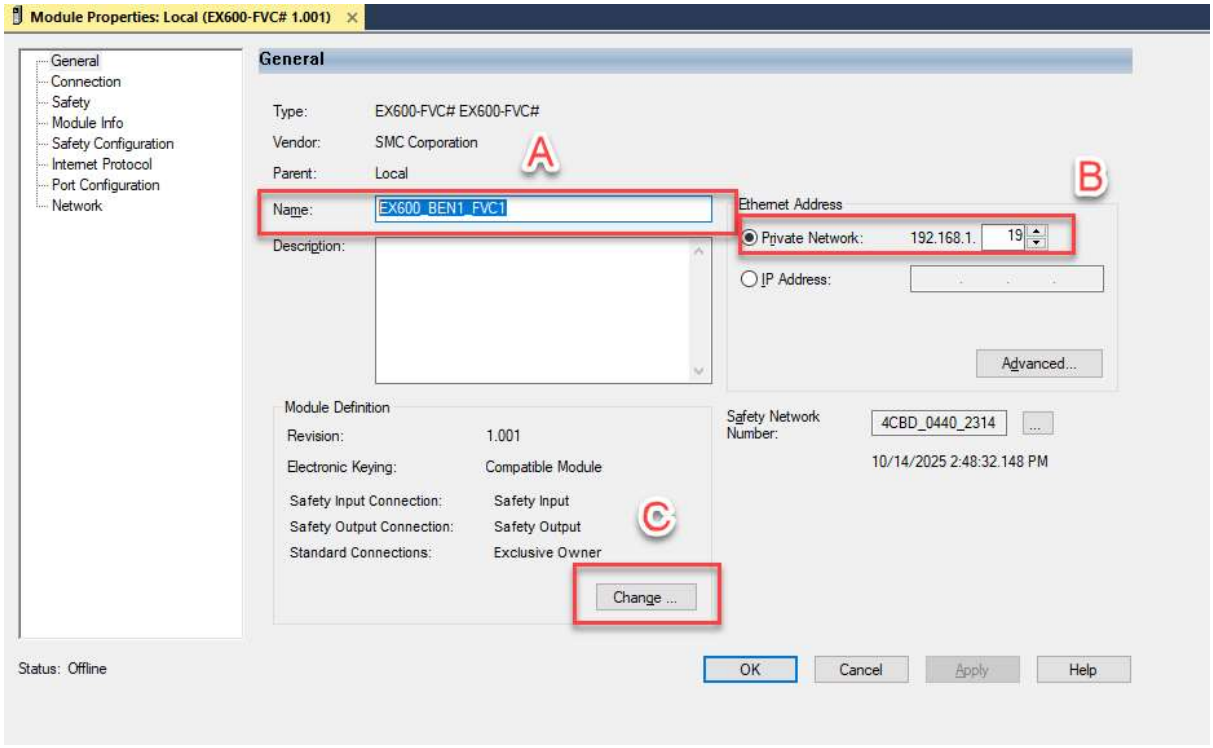


4.4. The New Module screen will appear. Please configure the following settings.

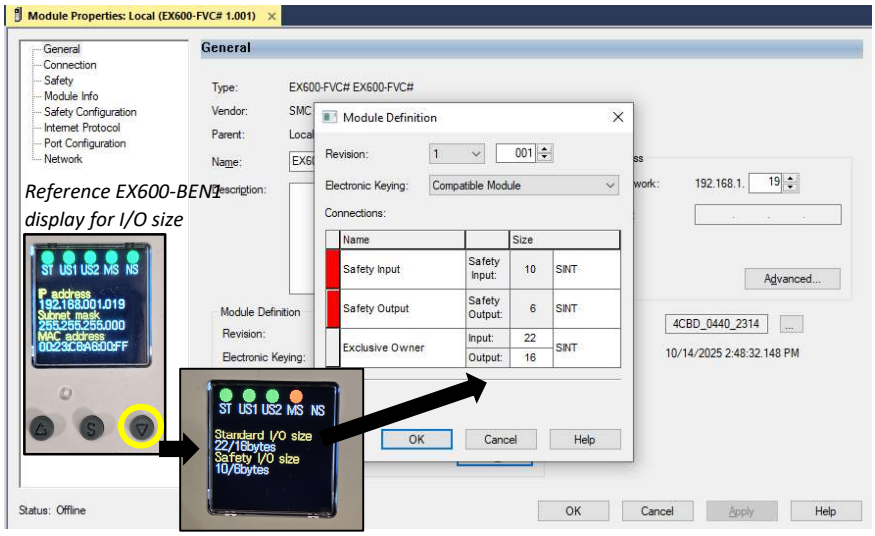
4.4.1. (A) Name: Any manifold name (e.g., EX600_BEN1_FVC1)

4.4.2. (B) IP Address: The IP address set for the fieldbus module (e.g., 192.168.1.19)

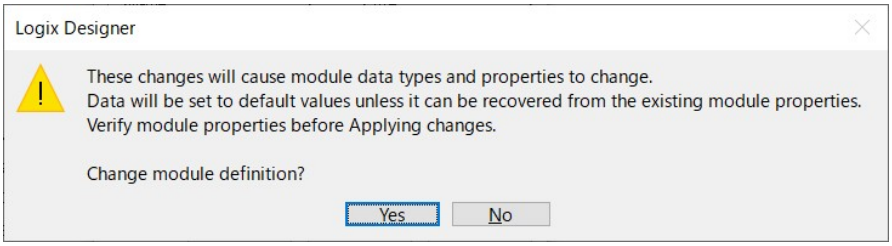
4.4.3. (C) Module Definition: Click the Change button. (This example is based on the IO that is attached (See top of section)). The SI module will also tell the process data size by pushing on the Down arrow 1 time.



4.5. Module Definition: Click (C) ‘Change …’ to display the Module Definition dialog. Set the standard input and output data sizes for Input and Output according to the manifold configuration and click OK. Safety I/O is fixed at 10/6 bytes.

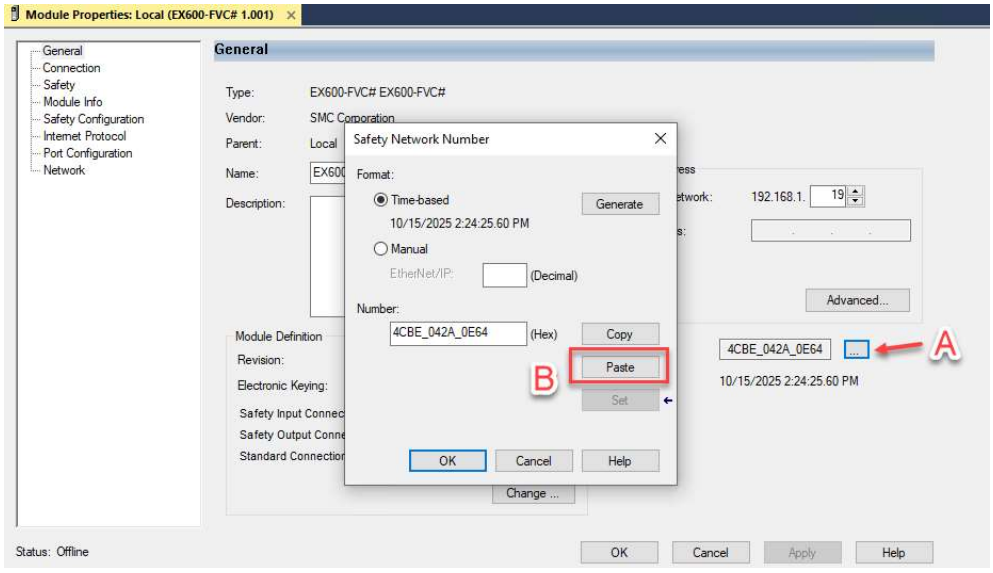


4.6. The following warning will appear, click YES.



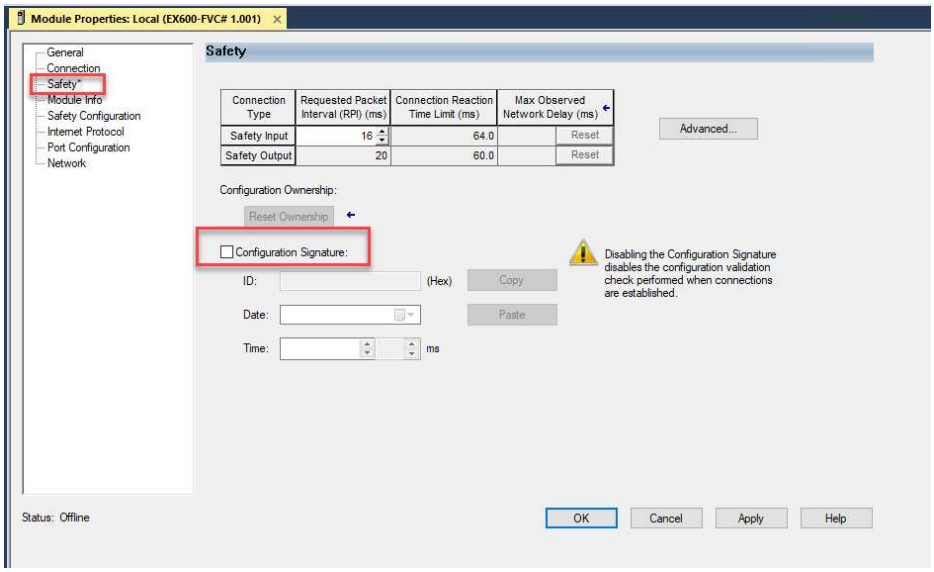
4.7. Click on the SNN (A) "…" ellipse and click (B) ‘Paste’ then OK.

4.7.1.*NOTE* Notice how "SET" is greyed out. That is OK for now. Will come back and set that in the next steps.



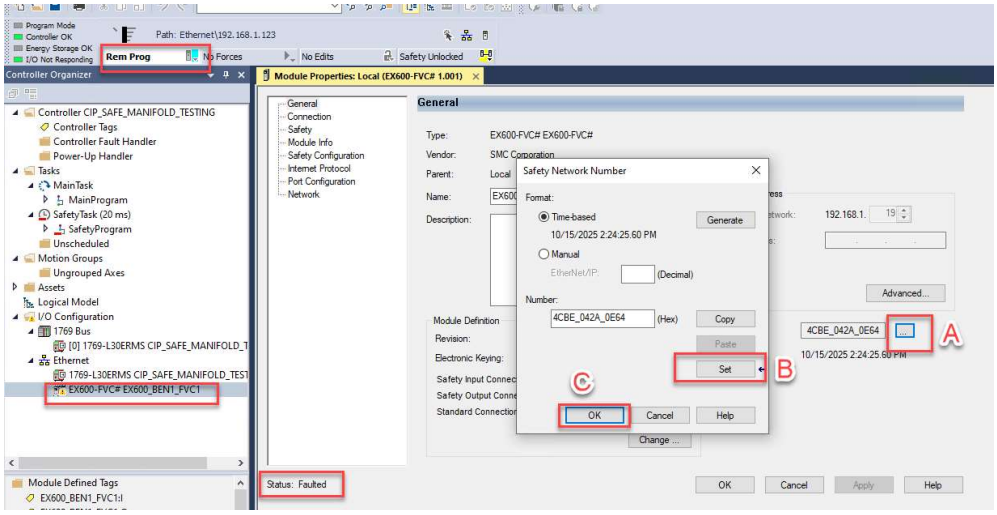
4.8. Select ‘Safety’ tab and de-select "Configuration Signature".

4.8.1.*NOTE* Will come back and reselect it in the next steps.

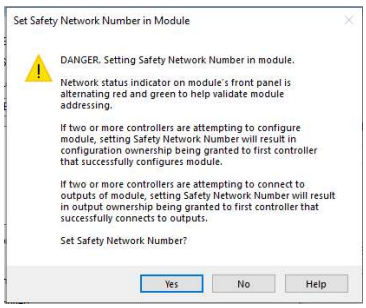


4.9. Download to the PLC and go into "Program mode". The SMC module is faulted because it has not been set yet.

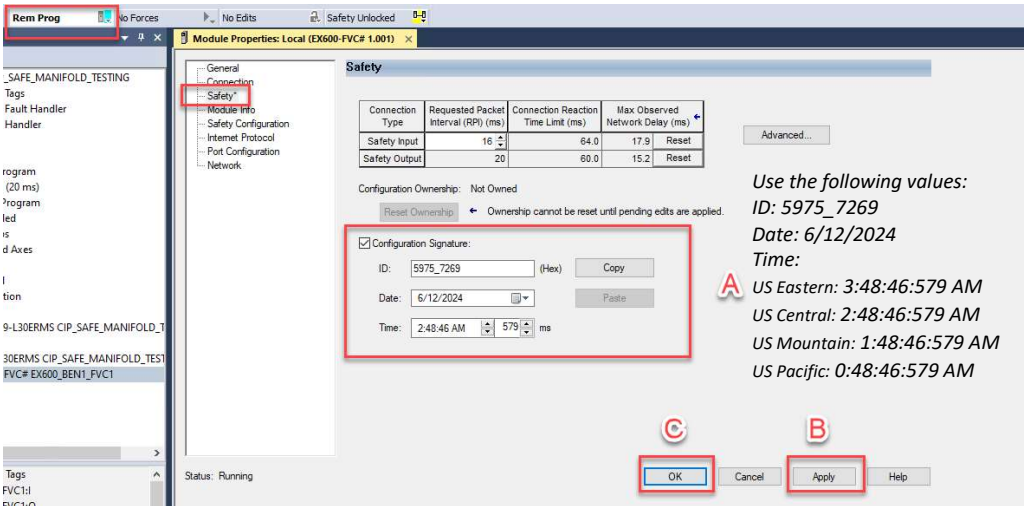
4.9.1. The EX600-FVC# Module Properties click (A) the SNN ‘…’, (B) ‘Set’, (C) ‘OK’.



4.9.2. A Warning will pop up. Select Yes and OK. At this point your IO should NOT be faulted.



4.10. In safety tab, check (A) "Configuration signature". Enter the information as in the picture below for ID and Date. This guide was written in CDT (GMT -5). Time should be converted from 16:48:46:579 (JST) to the daylight time of your time zone, not the standard time.

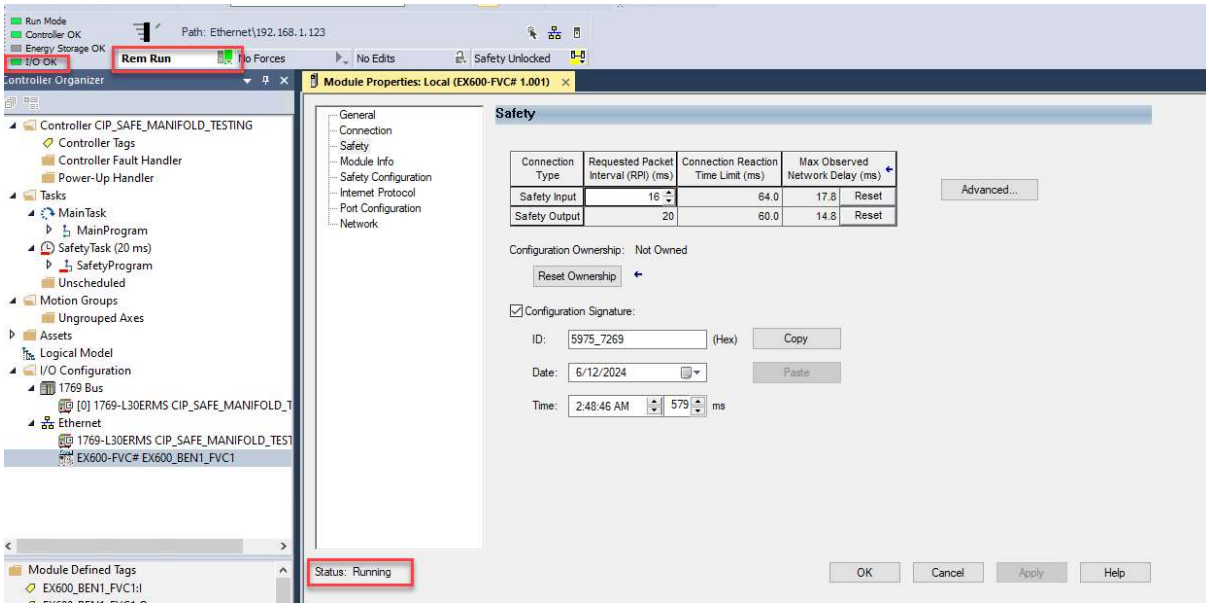


4.10.1. Connection parameters set per EX600-FVC1 Operation Manual (Doc. No: DOC1114013)

4.10.2. Download and enter RUN mode. There should NOT be errors. Setup is now complete.

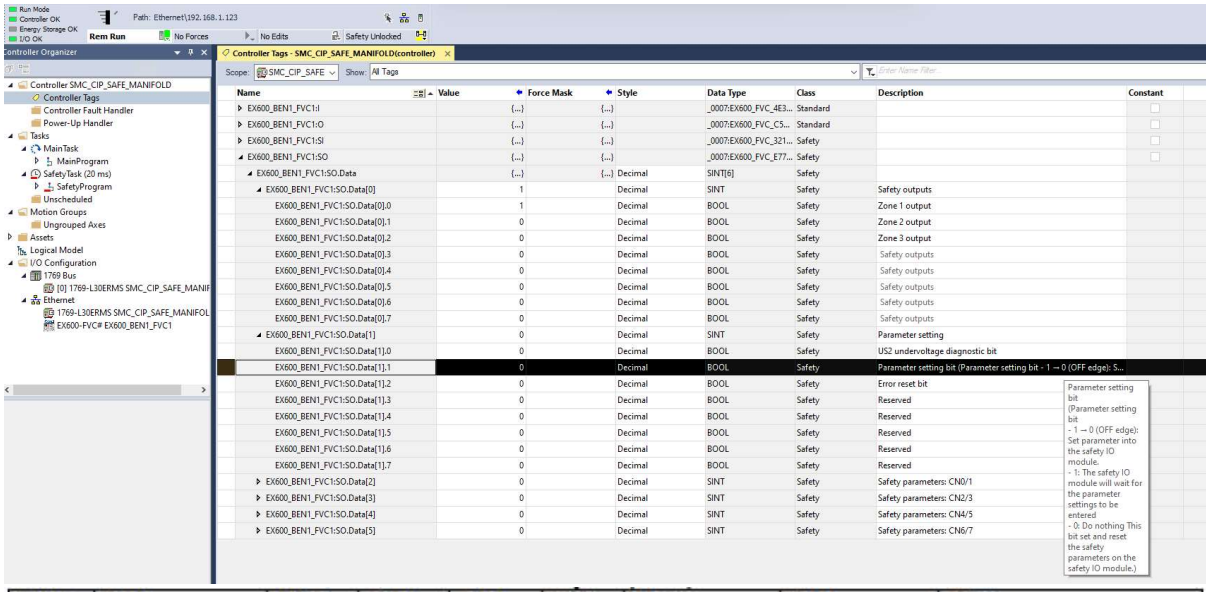
Table 4.2-1 Connection parameters

Items	Specification
Vendor	7
Product type	12
Product code	271
Product revision	1.001
Data format	SINT
Input size and assembly Instance	See Table 4.2-2
Output size and assembly Instance	See Table 4.2-2
CIP safety connection	Type2
SCCRC	ID: 59757269
SCTS	Date: 2024/06/12 Time: 7:48:46, 579ms (UTC)



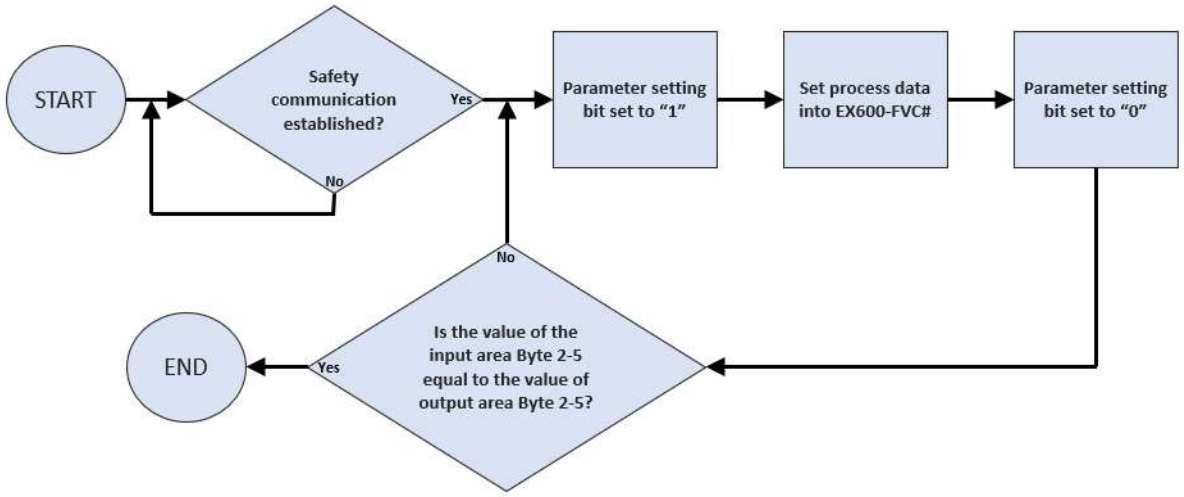
4 Channel Parameterization

1. Module function test
   1.1. While in Run mode, in the Controller Organizer, open the ‘Controller Tags’.
   1.2. Navigate to Safe Out Byte 1, Bit 1 (*ModuleName*:SO.Data[1].1). The IO is waiting for a falling edge of this ‘parameter setting’ bit to enable the safety card parameters. Until that happens, FDI and FDO will be flashing green on the front of the unit. Once .SO.Data[1].1 is set from 1 to 0, FDI and FDO will turn solid Green and outputs can be toggled.



Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	Reserved					Z3	Z2	Z1
1	Reserved					Error Reset	Parameter setting	US2 undervoltage diagnostic

2. Input ports will remain disabled until channels are parameterized. Consult EX600-FVC1/2 Operation Manual, section 4.4 for detailed information.



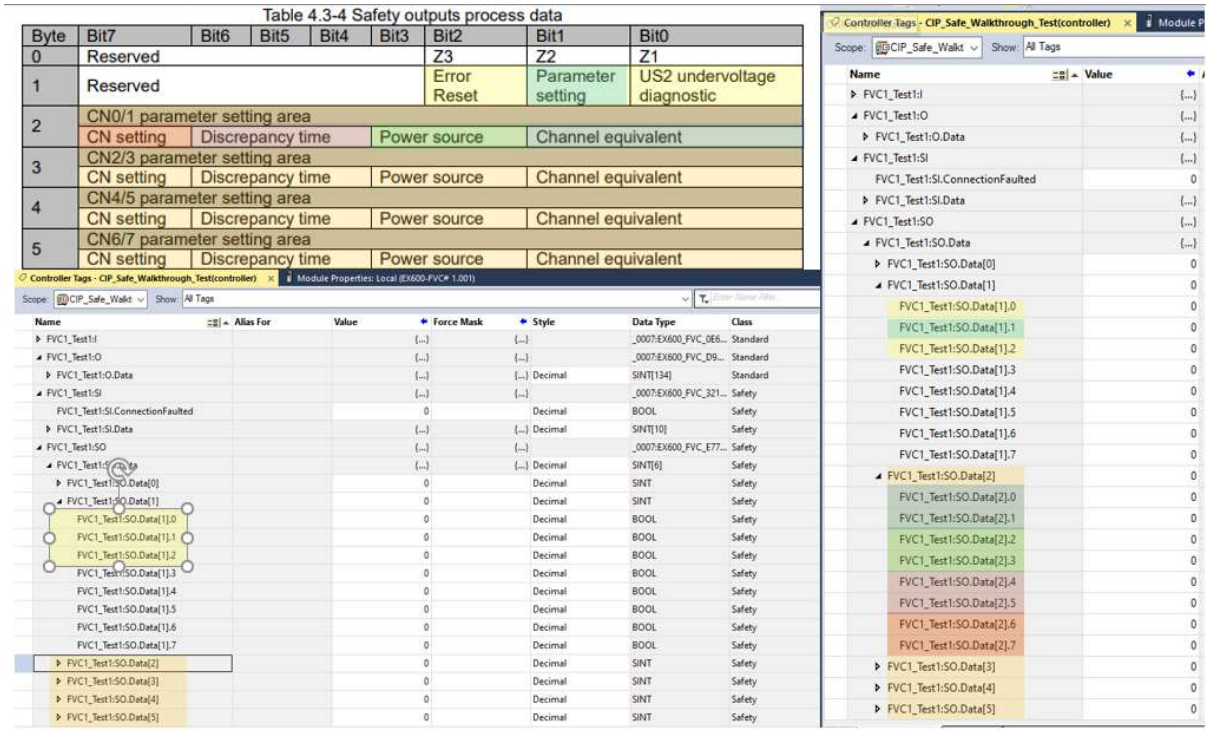
3. To enable and save input channel parameters, you must follow the above flow chart.
   3.1. Change the 'parameter setting' bit to "1". *Before setting safety parameters, all wiring and installation should be complete. The module may detect diagnostics if wiring does not match the system architecture set by the parameter setting. When the "Parameter setting bit" is set to "1", the module shifts to the safe state immediately. When operating this bit, please use it with care and be aware of your environment.*
   3.2. Follow Table 4.3-3 from the EX600-FVC1/2 Operation Manual.

Table 4.4-3 Detail of Byte2-5

Bit1		Bit0	Channel equivalent
0		0	Reserved
0		1	1oo1
1		0	1oo2 non-equivalent
1		1	1oo2 equivalent
Bit3		Bit2	Power source
0		0	Reserved
0		1	INx & INx+1 power source UTx with clock pulse (x = 1-4)
1		0	INx power source: UTx with clock pulse (x = 1-4) INx+1 power source: UT5 with clock pulse
1		1	INx & INx+1 power source: each power sources, without clock pulse
Bit6	Bit5	Bit4	Discrepancy time
0	0	0	Reserved
0	0	1	16ms
0	1	0	50ms
0	1	1	100ms
1	0	0	500ms
1	0	1	1s
1	1	0	No limit
1	1	1	Reserved
Bit7			CN setting
0			Disable
1			Enable

Table 4.3-4 Safety outputs process data

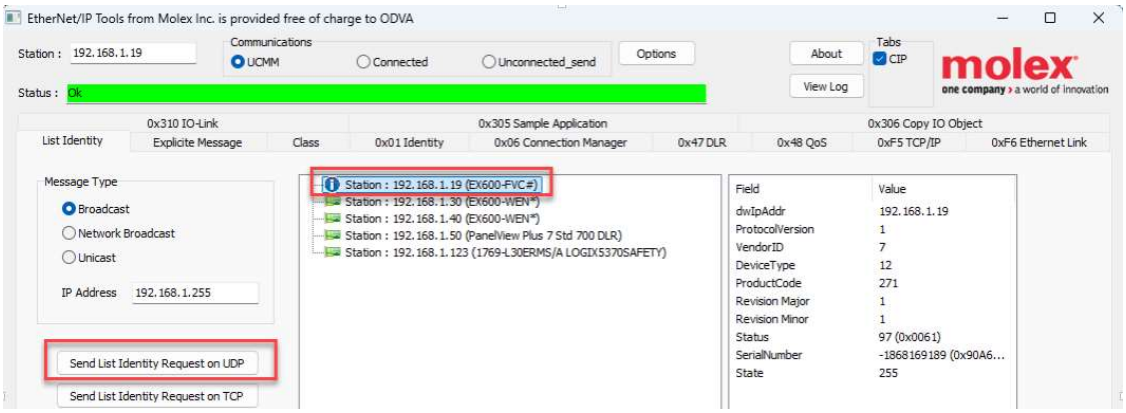
Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	Reserved					Z3	Z2	Z1
1	Reserved					Error Reset	Parameter setting	US2 undervoltage diagnostic
2	CN0/1 parameter setting area							
	CN setting	Discrepancy time			Power source		Channel equivalent	
3	CN2/3 parameter setting area							
	CN setting	Discrepancy time			Power source		Channel equivalent	
4	CN4/5 parameter setting area							
	CN setting	Discrepancy time			Power source		Channel equivalent	
5	CN6/7 parameter setting area							
	CN setting	Discrepancy time			Power source		Channel equivalent	



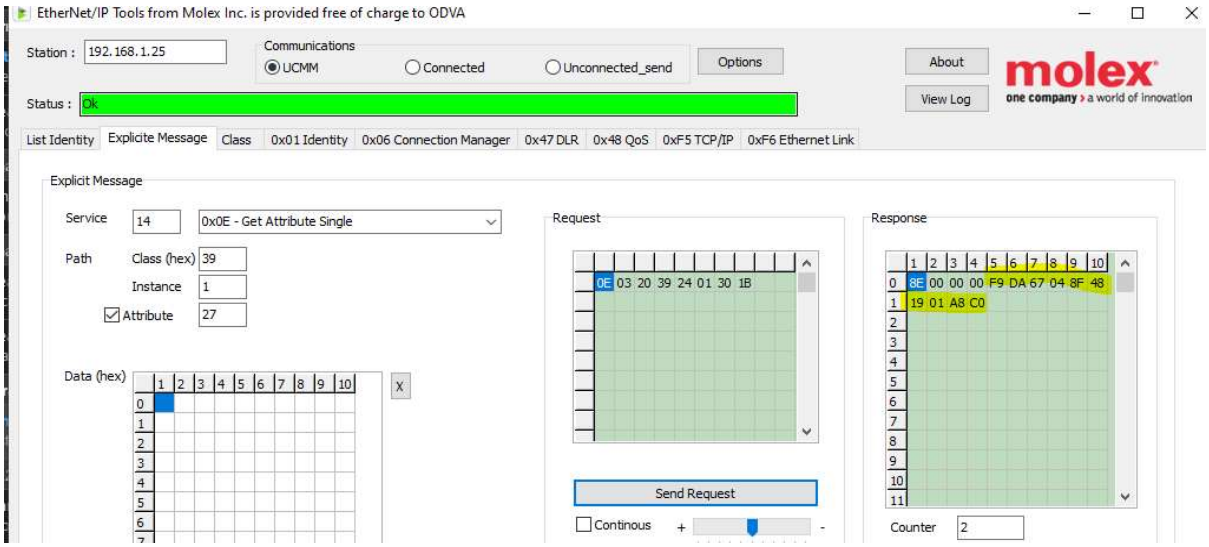
   3.3. Once channel parameters are configured change the 'Parameter setting' bit back to "0".
   3.4. Confirm safety input bytes 2-5 match safety output bytes 2-5.

5 Safety Reset

1. Once a SNN is assigned to the EX600-BEN1, if the PLC is changed, a safety reset is required.
   1.1. To reset the EX600-FVC1 module to its factory default settings, the Molex Ethernet/IP Tool is required. This tool can be downloaded from the official website.
   1.2. https://www.molex.com/en-us/products/industrial-solutions/industrial-communication-solutions/industrial-sdk#contact
2. Launch the program and select "EX600-FVC" from the list under the Identity tab. Enter the Ethernet/IP address in the field located to the right of the station number in the upper-left corner of the interface.



3. EX600-FVC1 TUNE ID: This section outlines the process for retrieving the current Tune ID from the EX600-FVC module. The Tune ID will be recorded and later included—along with the password—in the command string used to perform the factory reset. Tune ID is 10 bytes.
   3.1. Navigate to the Explicit Message tab within the program. Set the service type to Get Attribute Single (Service Code: 14). Configure the following parameters: Class = 39, Instance = 1, and enable the Attribute checkbox with a value of 27. Click Send Request to proceed. If successful, the status will display "OK." The response will begin with 8E 00 00 00, followed by a series of hexadecimal values. These values represent the Tune ID, as illustrated in the example below.

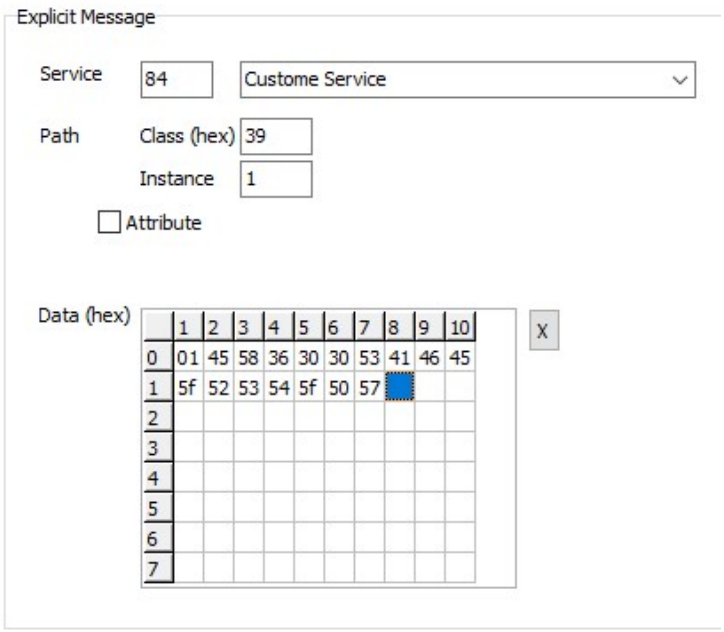


4. EX600-FVC1 PASSWORD: The password is 16 bytes in length and is defined as EX600SAFE_RST_PW. To transmit the password using the Molex Ethernet/IP Tool, it must first be converted from ASCII text to hexadecimal format. The following hexadecimal values represent the password to be sent.

Hex Value: **45 58 36 30 30 53 41 46 45 5F 52 53 54 5F 50 57**

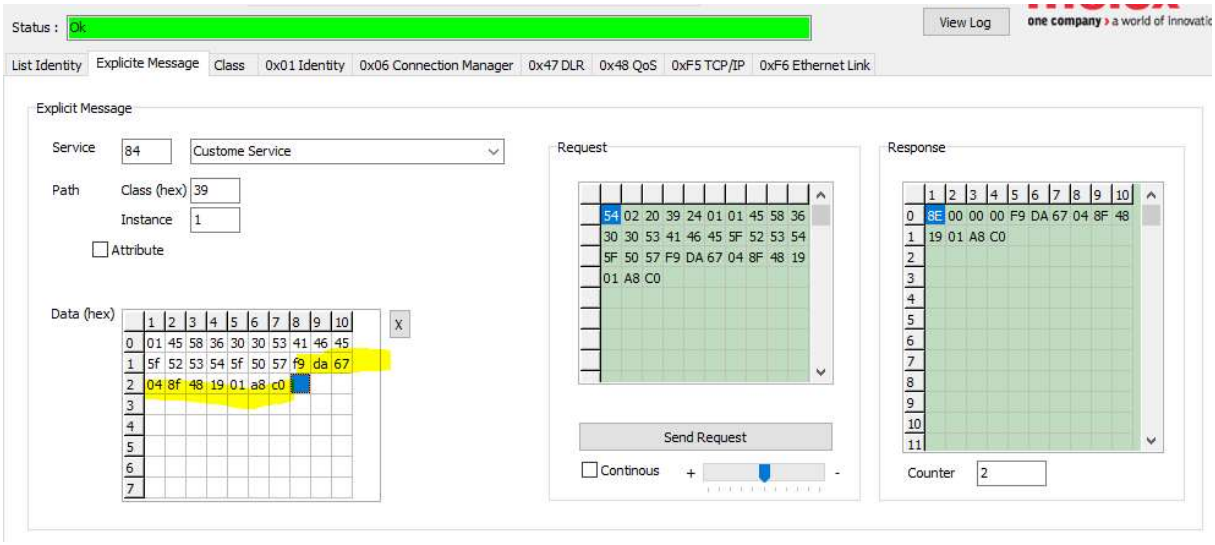
```
EX600SAFE_RST_PW
= 'E' → 69 → 45
= 'X' → 88 → 58
= '6' → 54 → 36
= '0' → 48 → 30
= '0' → 48 → 30
= 'S' → 83 → 53
= 'A' → 65 → 41
= 'F' → 70 → 46
= 'E' → 69 → 45
= '_' → 95 → 5F
= 'R' → 82 → 52
= 'S' → 83 → 53
= 'T' → 84 → 54
= '_' → 95 → 5F
= 'P' → 80 → 50
= 'W' → 87 → 57

= 45 58 36 30 30 53 41 46 45 5F 52 53 54 5F 50 57
```

5. SENDING THE RESET COMMAND: To issue the reset command, set the service type to Custom Service and enter a value of 84. The class remains set to 39, and the instance should be set to 1. No attribute is required for this operation.
   5.1. With the Tune ID and password obtained, these two elements must now be combined into a single command string for transmission to the EX600-FVC. Below is the command starting with 01, followed by the password in hexadecimal format.



	1	2	3	4	5	6	7	8	9	10
0	01	45	58	36	30	30	53	41	46	45
1	5f	52	53	54	5f	50	57			
2										
3										
4										
5										
6										
7										

5.2. The final step is to append the Tune ID immediately after the password in the command string. Use the Tune ID values retrieved earlier and include them in the appropriate sequence. The example below illustrates the complete setup.



5.3. Click Send Request. Upon a successful response, verify the response with D4 00 00 00. On the EX600-FVC module, confirm that the IP address, Subnet Mask, and Gateway have been cleared (set to default). The module is now successfully reset and ready for commissioning with a new controller.

5.3.1. The EX600-BEN1 may require a direct PC connection, otherwise an error could occur.