ABOV
SEMICONDUCTOR

Leader of Microcontroller Technology
Global Top Smart MCU Innovation Company

E-PGM+
E-GANG4/E-GANG6
E-PGM Serial

User Manual

Version 1.0.0
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Revision History

Date	Version	Description
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Chapter 1. Introduction

E-PGM+, E-GANG4/6 and E-PGM Serial series are universal programming equipment for the ABOV Semiconductor's MCU series, delivering superior performance and reliability. This products line has the following features:

- Deliver high programming speed for mass manufacturing
- Standalone programming and automated programming
- Support USB (2.0 full-speed) interface with Microsoft Windows
- Built-in protection circuit for the programmer and target device
- Data port inputs are protected against ESD up to 15 kV
- Support single chip programming mode via the device socket (except for E-PGM Serial)
- Support Gang programming mode via four or six device sockets
- Support in-system programming (ISP) as an on-board programmer
- Capacity of internal flash memory for target binary or hexa format data:
    - E-PGM+/E-GANG4/6: 1 Mbytes
    - E-PGM Serial: 8 Mbytes
- Support programming of both the main code and option areas

Chapter 2. Hardware
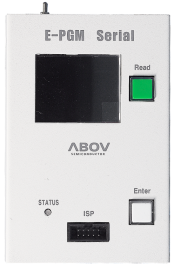
2.1 Specifications

- Product name: E-PGM+, E-GANG4/6, E-PGM Serial
- Standalone type universal programmer
- External 15 VDC Power supply
- Dimensions (W x D x H)
  - E-PGM+: 8.3 cm x 14.5 cm x 3.3 cm
  - E-GANG4: 33.5 cm x 22.5 cm x 3.5 cm
  - E-GANG6: 48.2 cm x 22.5 cm x 3.5 cm
  - E-PGM Serial: 8.3 cm x 13.3 cm x 3.3 cm
- Weight
  - E-PGM+: 0.35 kg
  - E-GANG: 2.0 kg
  - E-GANG: 2.8 kg
  - E-PGM Serial: 0.33 kg
- Input voltage
  - E-PGM+: DC adaptor 15V/1A
  - E-GANG4/6: DC adaptor 15V/2A
  - E-PGM Serial: DC adaptor 15V/1A
- Power consumption: 15W, 30W (E-GANG4, E-GANG6)
- Operating temperature: -10°C to 40°C
- Storage temperature: -30°C to 80°C

2.2 Functional comparison

E-PGM+ and E-GANG4/GANG6 have similar features, while E-PGM Serial is different from them as it is designed only for on-board programming purposes and to be noise-robust for use in mass production environments.

Table 1: Comparison between E-PGM+, E-GANG4/6, and E-PGM Serial

	E-PGM+	E-GANG4/6	E-PGM Serial
40-pin DIP socket	○	○	✕
ISP port	○	○	○
ISP port surge reinforcement	○	○	◎
Supported devices	All devices	All devices	94/95/96/97XXXX series (except for 97F1104S/1204S/1316S) All 32-bit MCUs
Buffer size	1MB	1MB	8MB
Read button	Joystick button	Joystick button	Push button
Support barcode reader (RS-232C)	○	✕	✕
Handler interface	○	○	○
Operating software	`E-PGM+.exe`	`E-PGM+.exe`	`E-PGM+.exe`

2.3   Functions

E-PGM+, E-GANG4/6 and E-PGM Serial are designed as a compact system suitable for every workspace, and are easy to use with simple and convenient features. Consumable parts such as the 40-pin DIP socket, Enter button, and joystick buttons are individually replaceable, ensuring a long service life. The functions of E-PGM+, E-GANG4/6 and E-PGM Serial are described below:

2.3.1   E-PGM+

E-PGM+ is a standalone-type universal programmer capable of programming ABOV's all microcontroller series. It consist of a main programmer unit and target device socket, and socket adaptor parts.
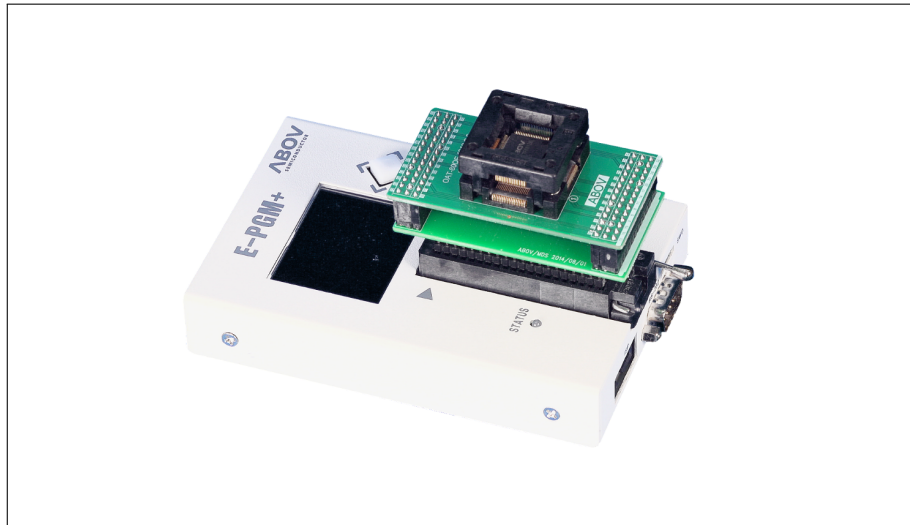
Figure 1: E-PGM+ with target socket module

Exterior features of E-PGM+

Figure 2: E-PGM+ top and side views for function description

①   10-pin IDC connector for in-system programming (ISP)

②   RS-232C serial communication port (external bar code reader interface port)

③   SWD port for firmware update and development purposes (not for use)

④   Button for programming the target device

⑤   Button for reading the target device

⑥ LCD screen for information display—device name, checksum data, and options. PASS/FAIL is shown as a result of programming, accompanied by an error description in case of failure

⑦ 40-pin DIP TEXTOOL socket for single chip programming mode

⑧ LED indicator showing the current status when writing is complete (Red: FAIL / Green: PASS)

⑨ 5-pin Molex 5264 connector for the interface with handler equipment

⑩ USB mini-B connector to a PC

⑪ Power adaptor connector for the 15V/1A external power

⑫ System power switch

2.3.2   E-GANG4/E-GANG6

E-GANG4 and E-GANG6 are standalone-type universal gang programmers capable of programming ABOV's all microcontroller series in gang mode, which enables programming multiple devices at once. E-GANG4 and E-GANG6 consist of a main programmer unit, target device socket, and socket adaptor parts. When in on-board programming mode, they can be used in connection with an external handler or manufacturing equipment without using the socket and the socket adaptor.
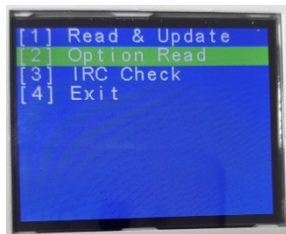

Figure 3: E-GANG4 exterior view

Figure 4: E-GANG6 exterior view

Exterior features of E-GANG6

Figure 5: E-GANG6 exterior view for function description

① 10-pin IDC connector for in-system programming (ISP)

② SWD port for firmware update and development purposes (not for use)

③ Button for programming the target device "G1" only

④ Button for reading the target device

⑤ LCD screen for information display—device name, checksum data, and options. PASS/FAIL is shown as a result of programming, accompanied by an error description in case of failure

⑥ 40-pin DIP TEXTOOL socket for gang programming mode—Gang4 has four separate sockets and Gang6 has six separate sockets

⑦ LED indicator showing the current status when writing is complete (Red: FAIL / Green: PASS)

⑧   Button for simultaneous programming of a gang of four or six devices connected

⑨   System power switch

⑩   Power adaptor connector for the 15V/2A external power

⑪   12-pin Molex 5264 connector for the interface with handler equipment

⑫   USB mini-B connector to a PC

2.3.3   E-PGM Serial

E-PGM Serial is a standalone ISP type universal programmer capable of programming ABOV's flash microcontroller series—94/95/96/97XXXX series (excluding 97F1104S/1204S/1316S) and all 32-bit microcontrollers. It does not have a TEXTOOL socket and is designed only for on-board manufacturing purposes.

Figure 6: E-PGM serial exterior view

Exterior features of E-PGM Serial

Figure 7: E-PGM Serial top and side views for function description

① 10-pin IDC connector for in-system programming (ISP)

② SWD port for firmware update and development purposes (not for use)

③ Button for programming the target device

④ Button for reading the target device

⑤ LCD screen for information display—device name, checksum data, and options. PASS/FAIL is shown as a result of programming, accompanied by an error description in case of failure

⑥ LED indicator showing the current status when writing is complete (Red: FAIL / Green: PASS)

⑦ 5-pin Molex 5264 connector for the interface with handler equipment

⑧ USB mini-B connector to a PC

⑨ Power adaptor connector for the 15V/1A external power

⑩ System power switch

2.4   40-pin DIP TEXTOOL socket pin configuration

E-PGM+ and E-GANG4/6 (not E-PGM Serial) use specific sockets to program one or a gang of devices. The user should place the appropriate socket and adapter on the 40-pin DIP TEXTOOL socket before conducting programming. ABOV Semiconductor provides all sockets and adaptors compatible with E-PGM+ and E-GANG4/6. Please refer to the Socket and Adaptor Selection Guide for your target device.

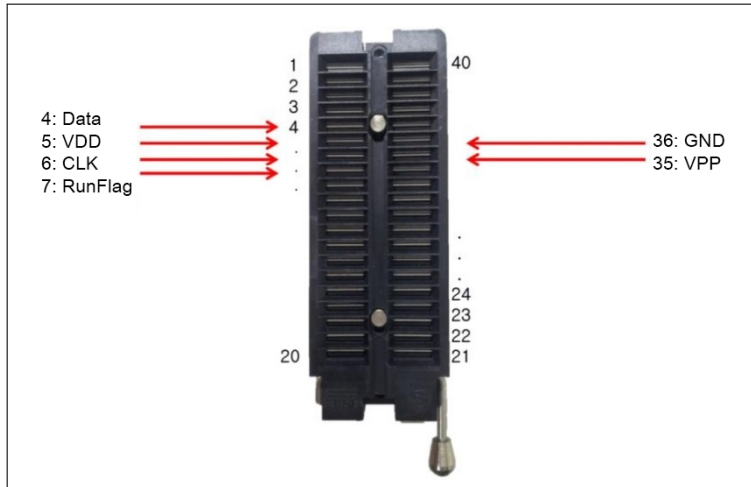The following figure and table show the signal assignment of the 40-pin DIP TEXTOOL socket.

Figure 8: 40-pin DIP TEXTOOL socket and programming pin assignment

Table 2: Pin name and assignment

Pin no.	40-pin DIP socket	ISP connector
VDD	5	2
GND	36	4
CLOCK	6	6
DATA	4	8
VPP/Reset	35	10
RunFlag/Boot	7	5

2.5   10-pin connector pin configuration

A 10-pin IDC type connector is required for on-board programming with E-PGM+, E-GANG4/6 and E-PGM Serial. The target board and 10-pin connector must be connected correctly for programming. An improper connection will pop up the `Device-ID Fail` message on the LCD screen.
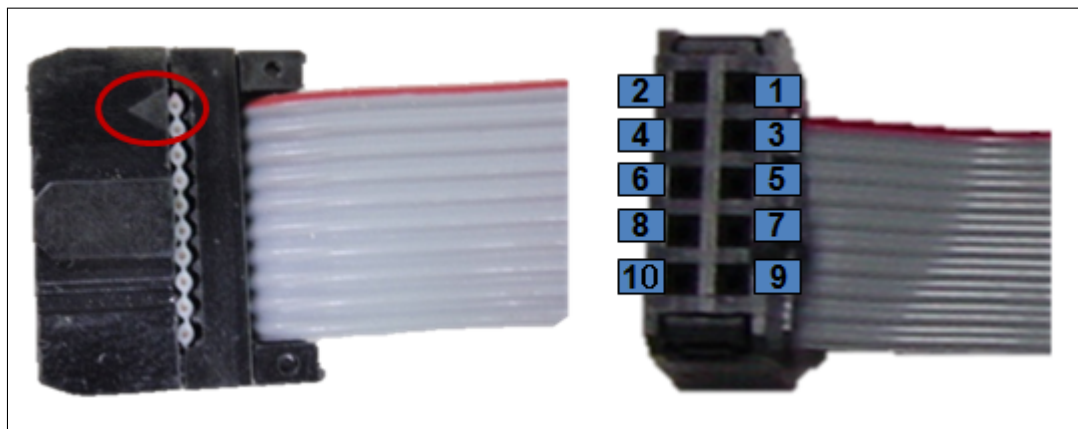
Figure 9: 10-pin IDC connector pin assignment

Table 3: 10-pin IDC connector pin configuration for each device group

Pin no.	Supported signals	AC33M6128/8128, AC33M3064/4064	MC80F7708 UART ISP	32-bit SWD
1	MCU UART-RX	MCU UART-RX	MCU UART-RX	N/A
2	VDD	VDD	VDD	VDD
3	MCU UART-TX	MCU UART-TX	MCU UART-TX	N/A
4	GND	GND	GND	GND
5	Run Flag or Boot Pin or ACK	Boot Pin	ACK	N/A
6	Clock	N/A	N/A	SWD-CLK
7	GND	N/A	N/A	N/A
8	Data	N/A	N/A	SWD-DATA
9	N/A	N/A	N/A	N/A
10	VPP or Reset Pin	RESET	VPP	RESET

Chapter 3. Software

3.1 Software releases

The software and firmware of E-PGM+, E-GANG4/6 and E-PGM Serial can be downloaded from ABOV Semiconductor's website. The firmware of individual devices is developed and fully tested by ABOV Semiconductor, and only certified versions are uploaded to the website.

Additional software updates are provided through a special version development process upon request by customers. For more information about special version development, please get in touch with our sales representatives.

E-PGM+, E-GANG4/GANG6 and E-PGM Serial share the same software program. Once one of these programmers is connected, the software program identifies the programmer model and enumerates the number of gangs (sockets) available.

3.2 Software installation

To install the software, perform the following steps:

1. Visit the ABOV Semiconductor's website at www.abov.co.kr > **Development Tools** > **Rom Writer** > **E-PGM+/E-GANG**.

2. Under **Downloads**, download `E-PGM+ USB Driver for 32/64 bit OS` and `E- PGM+ Software`. E-GANG4/6 and E-PGM Serial operate on the same driver and software.

Downloads

Title	File Name	Type	Language	Version	Issue Date	Size	Down
E-PGM+ USB Driver for 32/64 - bit OS	epgm_driver_install_Ver1.7.zip	🖳	English	1.7	2017-04-25	1001.28KB	⬇
E-PGM+ Software	E-PGM+_V1.034.00 (190319).zip	🖳	English	V1.034.00 (190319)	2019-03-19	10.26MB	⬇

3. Proceed without connecting the programming equipment (E-PGM+, E-GANG4/6, or E-PGM Serial) to the PC.

4. Unzip `Epgm_driver_install_Ver_x.x.zip`, and open the created folder.

5. Run `USB_driver_install.exe`.
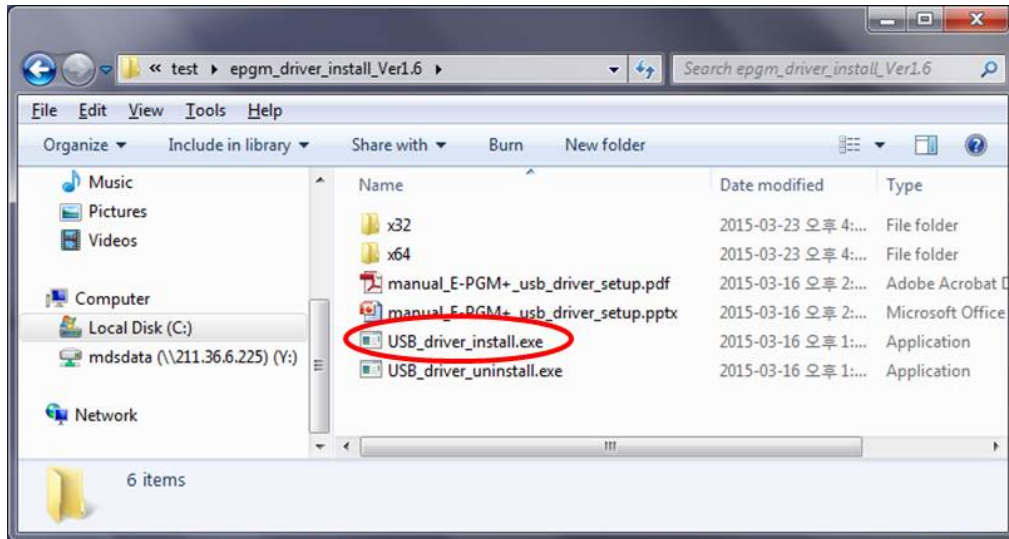

6. Click **Install** if the dialog below pops up:

7. After running the `exe` file, the window below should appear if successful. The installation takes one to three minutes depending on your PC environment.
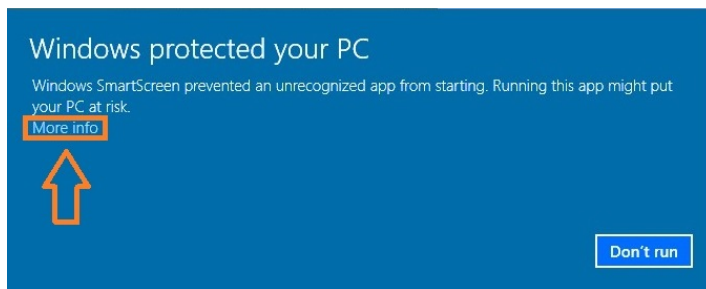

- • Driver installation is complete when "completed successfully" appears at the bottom of the CMD window.

8. Connect the programming equipment (E-PGM+, E-GANG4/6, or E-PGM Serial) to the PC, and turn on the power. The device driver of the connected programmer will be automatically recognized and appear in Device Manager.
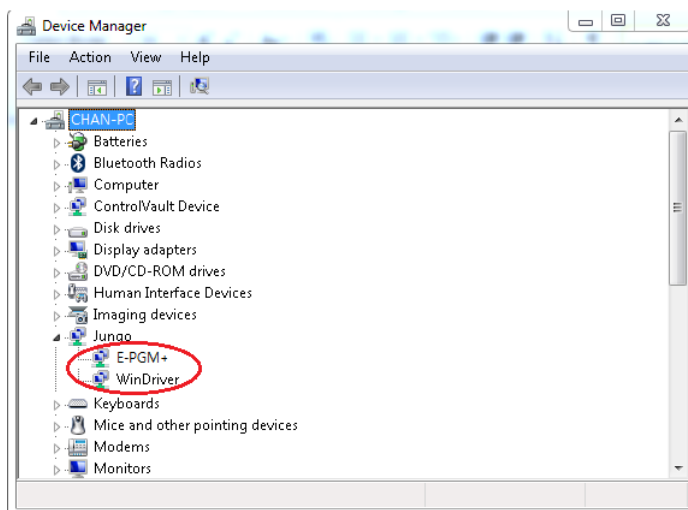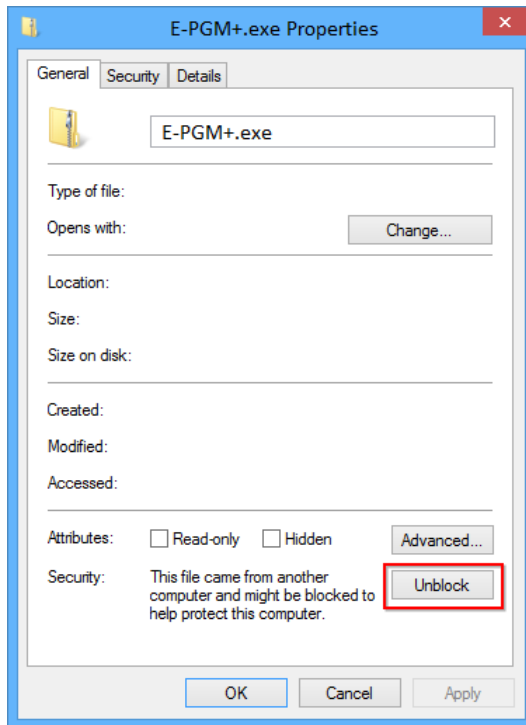
9. Unzip the `E-PGM+ Software` package downloaded in Step 2. In the created folder, double-click the executable (`E-PGM+.exe`) to run the program.

📁 Firmware	2019-03-20 오후...	파일 폴더	
📁 USB_driver_Ver1.7	2019-03-20 오후...	파일 폴더	
📄 E_PGM.txt	2019-03-19 오전...	텍스트 문서	20KB
E-PGM+.exe	2019-03-19 오전...	응용 프로그램	2,251KB
📕 E-PGM+_History_V1.034.00(190319).pdf	2019-03-19 오전...	Adobe Acrobat D...	123KB
📕 E-PGM+_manual_Ver1.91.pdf	2018-02-20 오전...	Adobe Acrobat D...	2,209KB

Note: If the `exe` file cannot be executed with the following message popping up,

Windows protected your PC

Windows SmartScreen prevented an unrecognized app from starting. Running this app might put your PC at risk.

More info

Don't run

Right-click the file for the context menu, select **Properties**, and click **Unblock** under **Security**. Then, try running again.

E-PGM+.exe Properties

General | Security | Details

E-PGM+.exe

Type of file:
Opens with: Change...

Location:
Size:
Size on disk:

Created:
Modified:
Accessed:

Attributes: ☐ Read-only   ☐ Hidden   Advanced...

Security: This file came from another computer and might be blocked to help protect this computer.   Unblock

OK   Cancel   Apply

3.3 Software UI descriptions

Below are descriptions of the software functions:
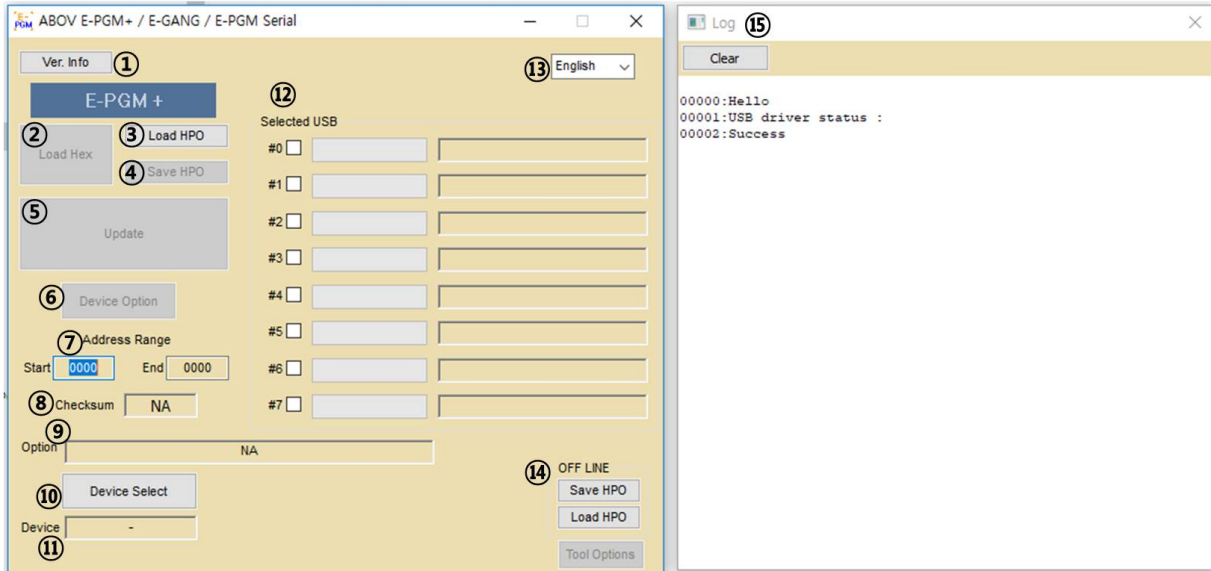
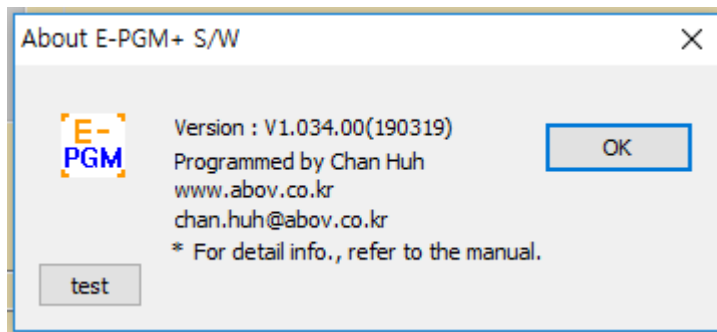① The **Ver. Info** button displays the software version. When the button is pressed, a dialog box will pop up to show the software version, date of finalization, and developer's e-mail address.

② The **Load** button is used to select a hex file to write to the device. Before selecting a hex file, it is recommended to check the checksum of the file. Make sure that it matches the checksum value displayed in the GUI after the file is loaded. The **Load** button will be activated only after selecting a device. When the button is pressed, the **Select Hex File Type** option dialog is displayed. By default, the software displays the hex format suited for the device. Make sure everything is correct, then click **OK** to proceed.
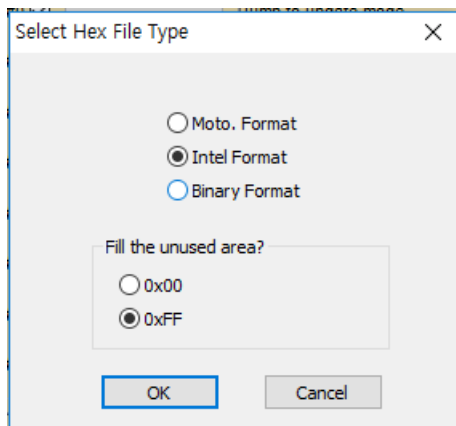
③ The **Load HPO** button is used to load an already existing HPO file. An HPO file is an improved version of a hex file that includes information on option values. Once an HPO file is created, the name of the device is stored together with option values. As such, there is no need to select a device when loading the HPO file.

④ The **Save HPO** button stores the device configuration, hex file, and option values in the form of an HPO file. You can automatically retrieve your settings without having to select a hex file, options, and device under Load HPO.

⑤ The **Update** button is used to update the tool with the finalized settings. Pressing this button updates the tool with the hex file and option values. The progress bar displays the progress. The status is shown next to the progress bar as **OK** or **Fail** upon completion.
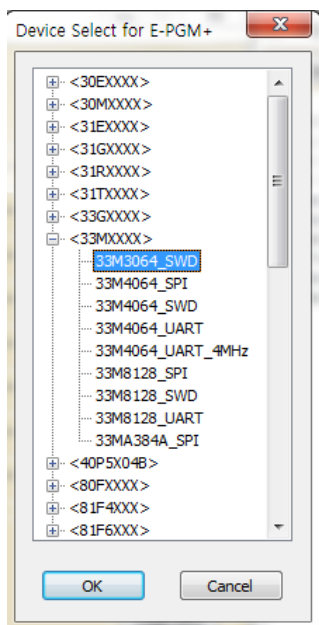

E-PGM+ E-GANG

⑥ The **Option Selection** button is used to check or modify option values of the device. When this button is pressed, the option dialog box of the device pops up. In the option dialog box, you can enter new option values or modify existing values.

⑦ **Address Range** provides the start and end addresses of the ROM when a device is selected. These values are fixed, and cannot be modified by the user.

⑧ This area displays the checksum. When a hex file is loaded using the **Load** button, the checksum is calculated for data in the hex file to check for errors that may have occurred in the loading process. Checksum is an important element that must be checked in the programming process.

⑨ The **Option** section shows the hexadecimal value of a selected option. Option values must also be checked in the programming process.

⑩ The **Device Select** button is the first button to press after starting programming. When the button is pressed, the list of device categories is displayed. Click **+** or **-** to see the specific devices under each category, and select the desired device.

⑪ If you have successfully selected a device using the **Device Select** button, the name of the device is displayed in text form.

⑫ When E-PGM+, E-GANG4/6, or E-PGM Serial is connected, the #0 checkbox in the **Selected USB** area is automatically ticked. For E-GANG4, the #1, #2, #3, and #4 checkboxes are ticked. For E-GANG6, #1, #2, #3, #4, #5, and #6 checkboxes are ticked. The progress is shown in the progress bar next to each activated checkbox.
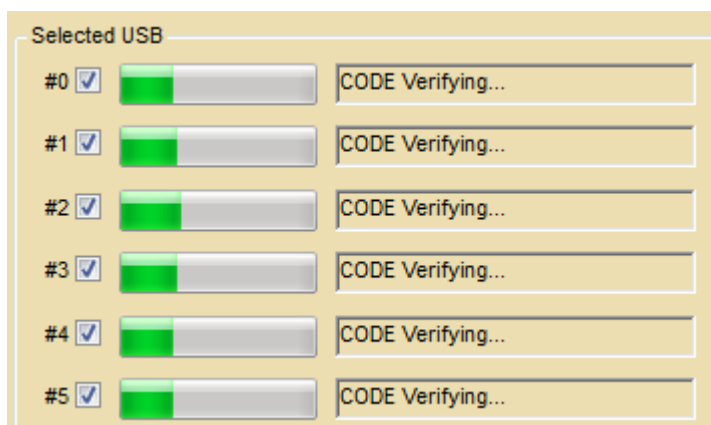

⑬ This button allows you to select a language. The supported languages in `E-PGM+.exe` are English and Chinese. Choose the desired language.

⑭ The **OFF LINE** section is used to save and load the HPO file without connecting a programming equipment. Under the **OFF LINE** section the user can create a HPO file for a programming project or verifying the options and content of a HPO project in advance. Once the **Save HPO** button is clicked, the **Load Hex** button will be activated.

Then, proceed in the following order:

1. click **Load Hex** to load a target hexafile.

2. click **Device Option** to select options.

3. click **Save HPO**.

Normally in offline mode, the **Save HPO** button indicated in the red circle is disabled. For your reference, the following figure shows the dialog box in the off-line state.
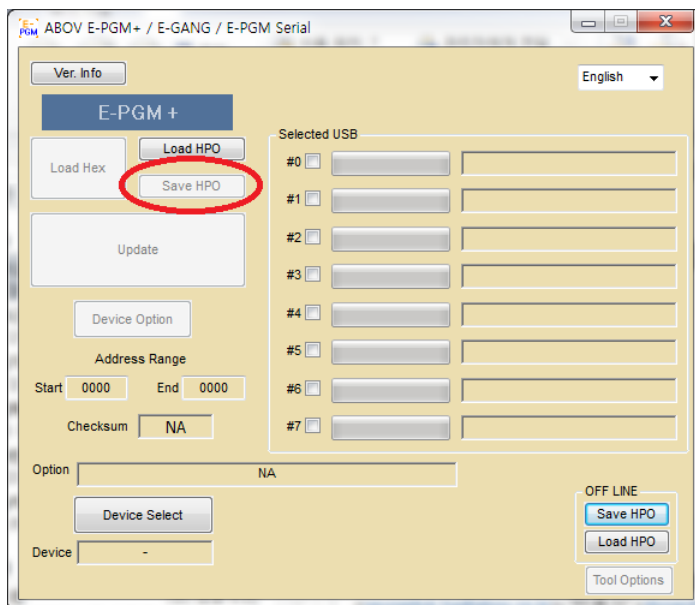
⑮ The **Log** dialog shows the progress and results in real time. You can check the problems and solutions that occurred before progress recording.
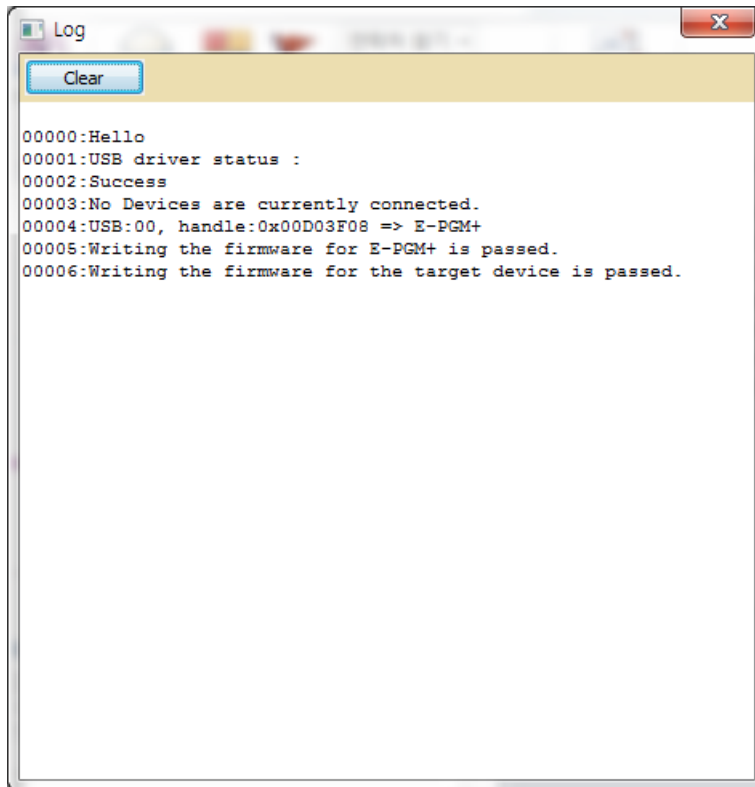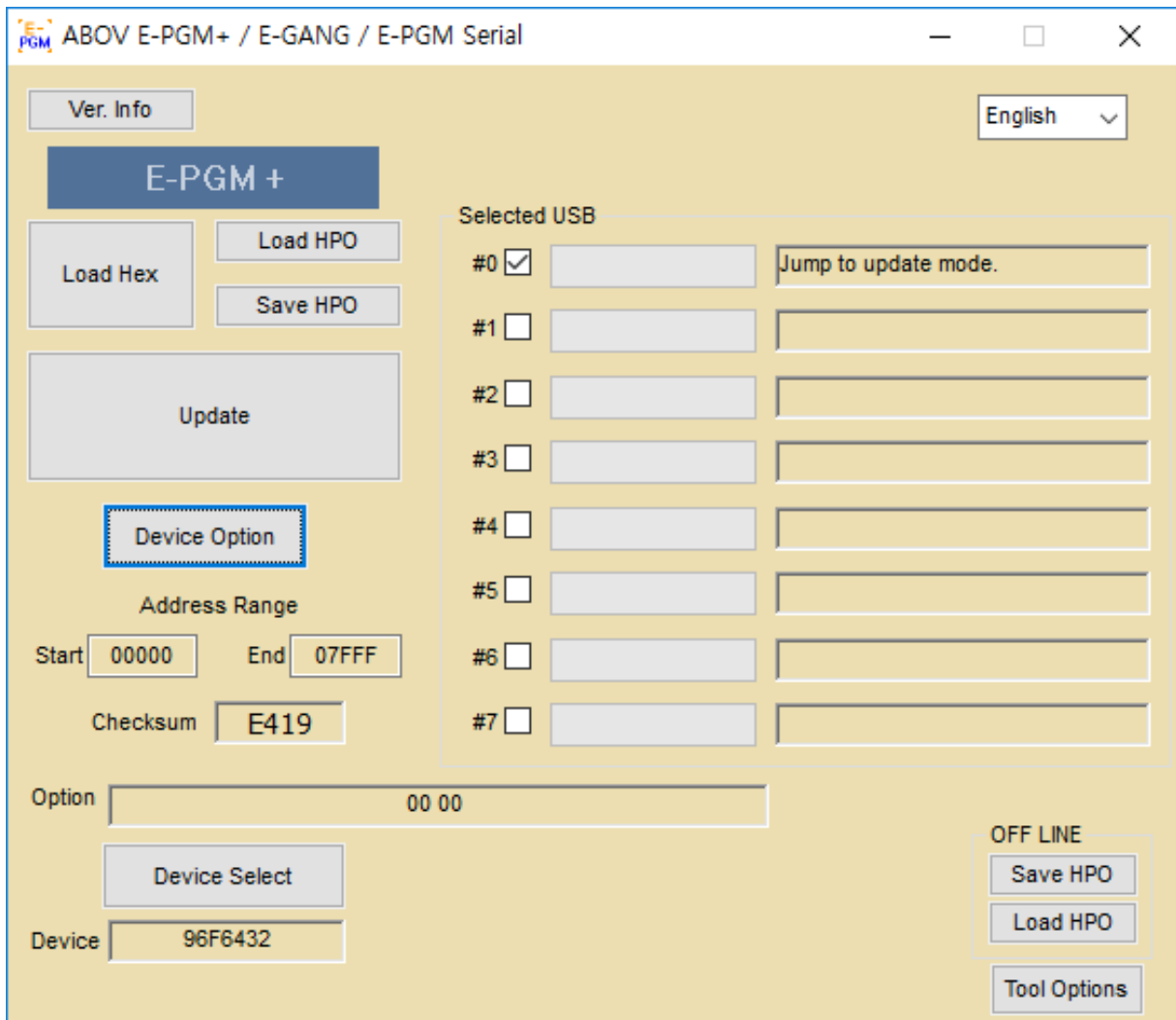

3.4 Device selection

The E-PGM+ software program is used jointly by E-GANG4, E-GANG6 and E-PGM Serial. The number of ports is automatically displayed in the dialog box when any of the programmers is connected (E-PGM+ and E-PGM Serial: 1 port, E-GANG4: 4 ports, E-GANG6: 6 ports).

Prepare for programming by selecting a device:

1. Click **Device** to select a device.

2. Click **Load** to select a hex file for IC programming.

3. The dialog box for selecting the option of the hex file pops up. Refer to the device's manual, and select the appropriate options according to application characteristics.

4. Click **Update** to update the connected programming equipment (E-PGM+, E-GANG4/6, E-PGM Serial) with the hex file and option values. This updates the tool with the active device firmware and hex file. **Update Tool** updates the tool only, and is not to write to the device. Writing to the device does not begin until you press the **Enter** button of E-PGM+, E-GANG4/6 or E-PGM Serial.

3.5   Programming error messages

Errors may occur during programming. The causes of errors cannot be presented in detail due to the limited space of the LCD screen. Instead, a brief error message appears, and the details of each error are given below.

Error messages	Error details and causes
No device-ID Read-ID = 0xxxxx	Wrong device is selected, or VDD/GND or signals are not connected. Wrong device is selected.
Power Check Vdd : xx or Vpp : xx	Incorrect VDD/VPP voltage was supplied; During on-board programming, the voltage level on the target board dropped too much due to high current consumption; or During on-board programming, the target board is short-circuit.
Trim Chk. Failed	No device-specific data is found; or During on-board programming, a device reset occurred.
Erase failed	Erase failed.
Verify Fail Addr : xxxxxx Data : xx => xx	Verification failed. For example, Addr : 1234 Data : 56 => 78 Failed address is 1234 Normal case: Read value is 56 Fail case: Read value is 78
Fail:Ext. Power On Remove Ext. Power	During on-board programming, the target board is supplied with external power. Remove the external power.

3.6   Troubleshooting

3.6.1   Error message: "The program can't start because WDAPI1010.dll is missing from your computer. Try reinstalling the program to fix this problem."
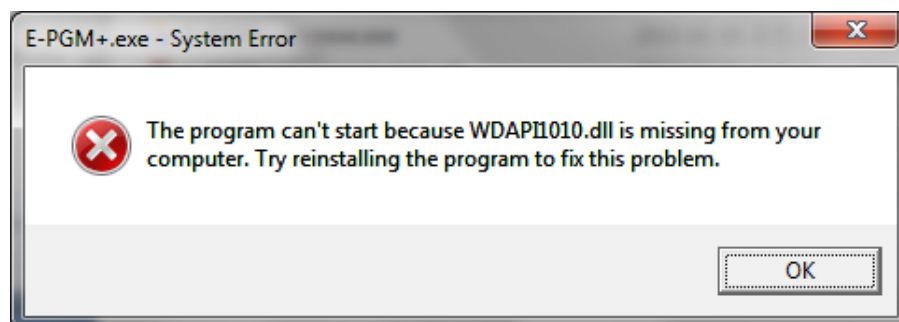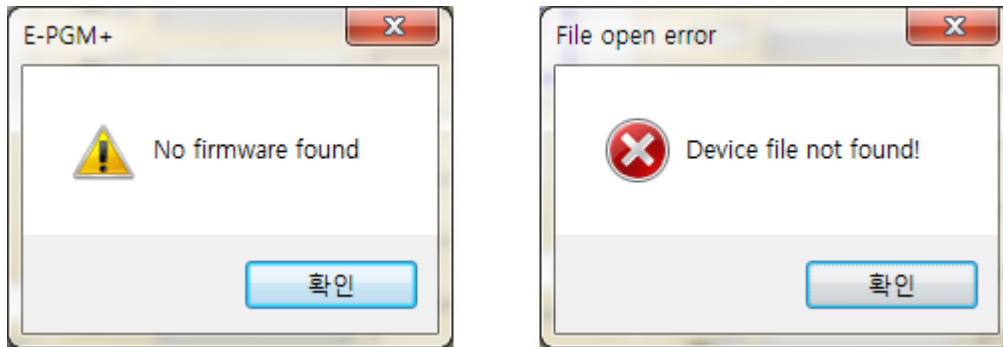

Cause

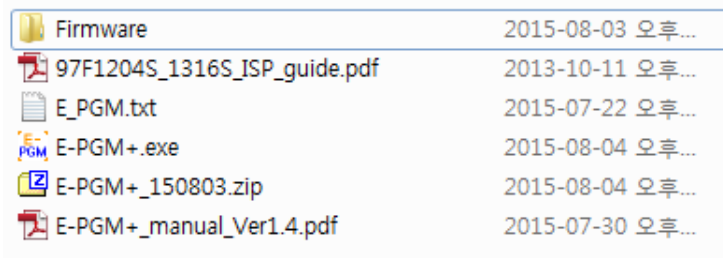WDAPI1010.DLL is not found in the C:\Windows folder.

Solution

If you have set up the device driver, the missing file can be copied into the `C:\Windows` folder.

3.6.2   Error message: "No firmware found" or "Device file not found!"
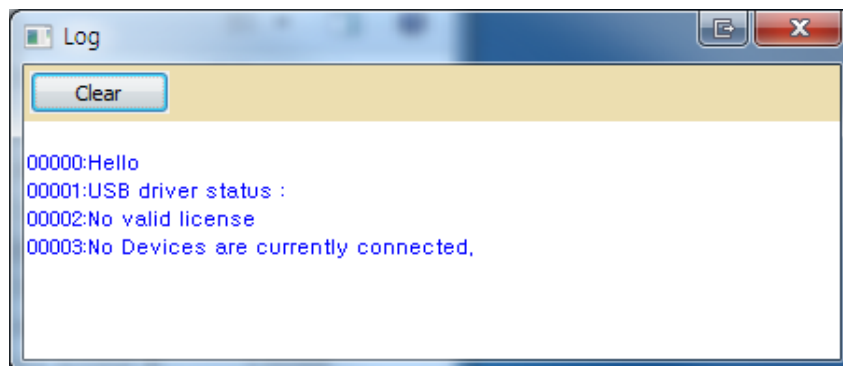

Cause

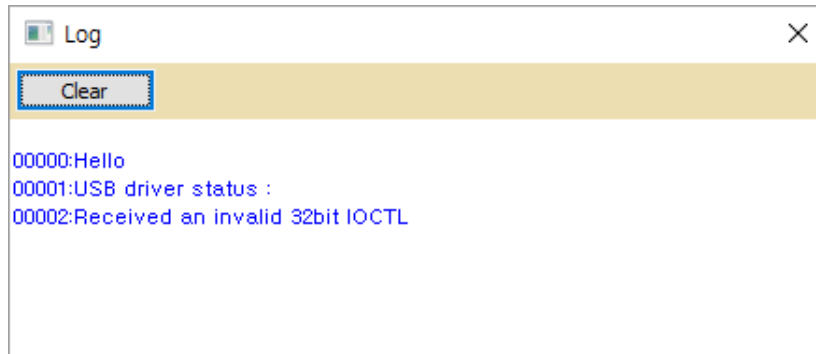The `firmware` folder and `E-PGM.txt` file are not located in the same folder.

Solution

If you want to execute this on the desktop, you need to use a desktop shortcut.

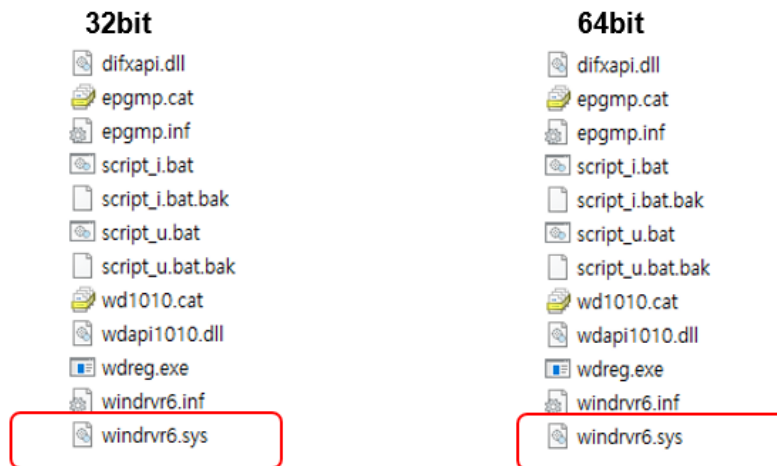### 3.6.3   Error message: "No valid license" or "Received an invalid 32bit LOCTL"

```
■ Log                                          ×
┌─────────────┐
│    Clear    │
└─────────────┘

00000:Hello
00001:USB driver status :
00002:Received an invalid 32bit IOCTL
```

Cause

The existing `windrvr6.sys` file is invalid.

Solution

1. Disconnect the USB line.

2. Run `USB_driver_unistall.exe` (Version 1.7).

3. Delete `C:\Windows\System32\drivers\windrvr6.sys`.

4. Copy `windrvr6.sys` from the driver installation files to the following path:

   • 64bit: Copy `x64\windrvr6.sys` to `C:\Windows\System32\drivers\`
   • 32bit: Copy `x32\windrvr6.sys` to `C:\Windows\System32\drivers\`

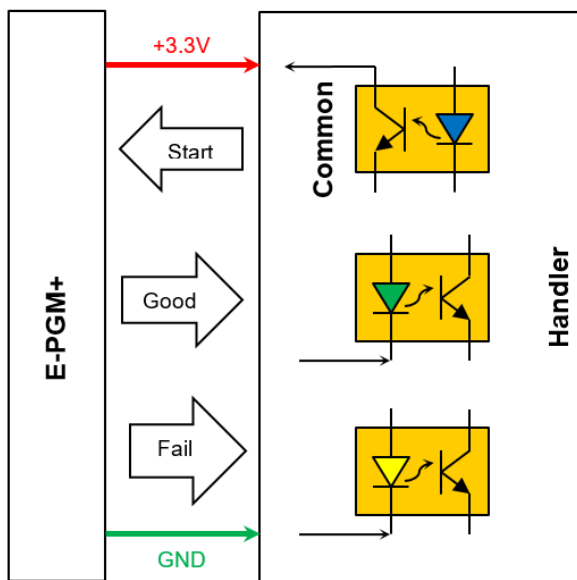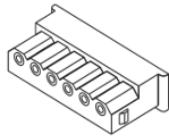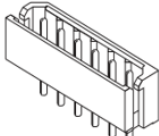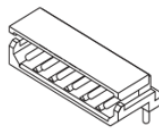| **32bit**	**64bit**
difxapi.dll	difxapi.dll
epgmp.cat	epgmp.cat
epgmp.inf	epgmp.inf
script_i.bat	script_i.bat
script_i.bat.bak	script_i.bat.bak
script_u.bat	script_u.bat
script_u.bat.bak	script_u.bat.bak
wd1010.cat	wd1010.cat
wdapi1010.dll	wdapi1010.dll
wdreg.exe	wdreg.exe
windrvr6.inf	windrvr6.inf
windrvr6.sys	windrvr6.sys

5. Run `USB_driver_install.exe` (Version 1.7).

6. Connect the USB line.

Chapter 4. Connection to handler

The E-PGM+, E-GANG4/6 and E-PGM Serial is designed to maximize the efficiency of device programming when connected with a handler—an automated mass-production machine. The connected handler receives the **Enter** button signal and communication signals (DSDA, DSCL) required for device programming from the programming equipment (E-PGM+, E-GANG4/6 and E-PGM Serial). This ensures signals from a single unit of E-PGM+, E-GANG4/6, or E-PGM Serial are delivered to multiple devices configured in parallel on the handler and thus all those devices are programmed simultaneously. The hardware description for handler connection is provided below:
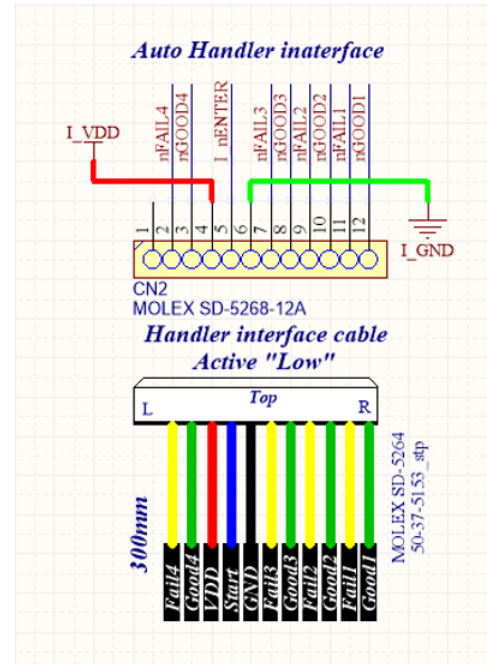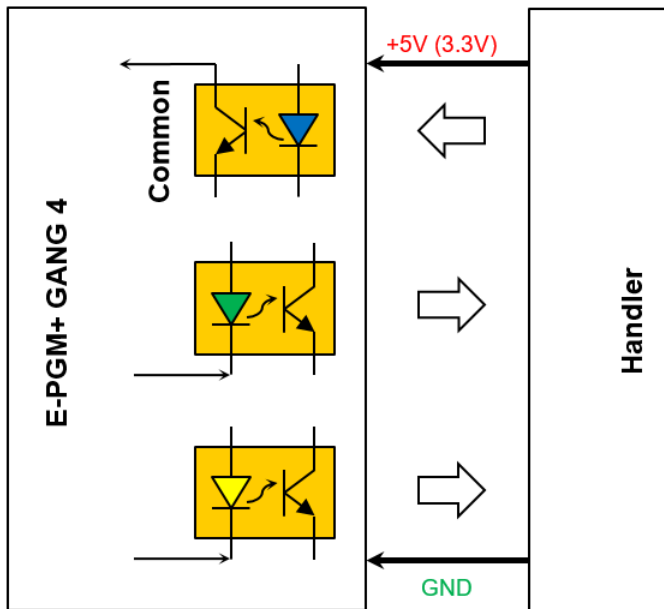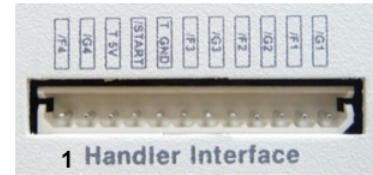
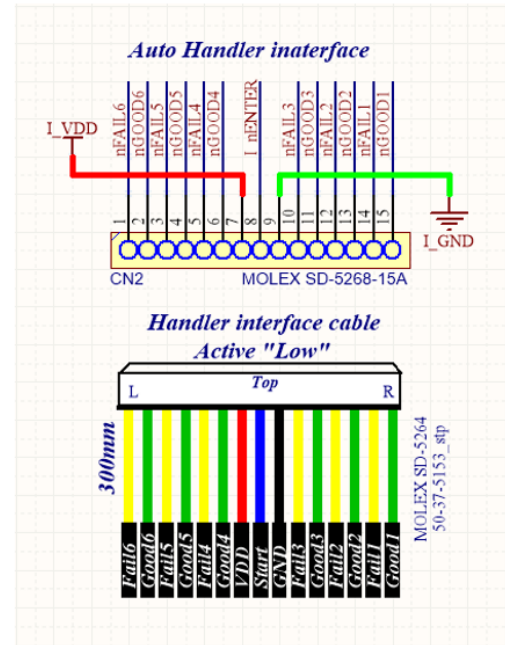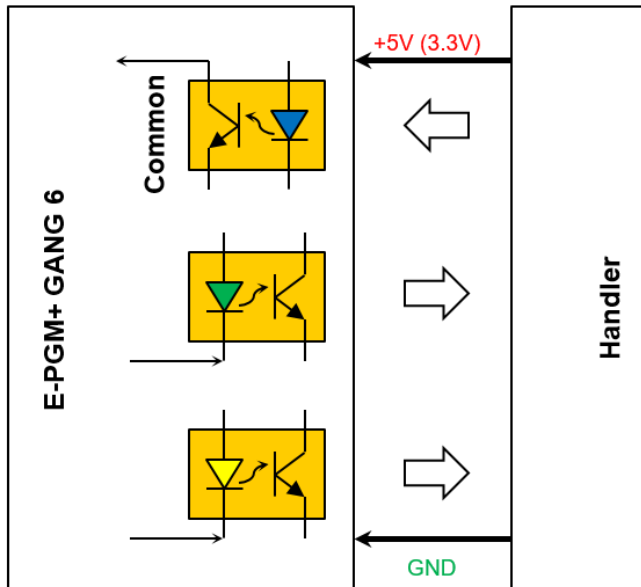## 4.1 E-PGM+ handler connections

- 3.3V Power output
- Output > Good/Fail indicator signal (active "L")
- Input > Start key (active "L")

4.2   E-GANG4 handler connections

- Internal isolator
- Handler 5V (3.3V) power used
- Output > Good/fail indicator signal (active: "L")
- Input > Start key (active: "L")

4.3 E-GANG6 handler connections

Handler Interface

- Internal isolator
- Handler 5V (3.3V) power used
- Output > Good/fail indicator signal (active: "L")
- Input > Start key (active: "L")

Chapter 5. Connecting multiple E-PGM+ units

As an alternative to using a handler, you can connect multiple E-PGM+ units between their Start and Gnd pins, respectively, as shown below. With this configuration, your button inputs on any single programmer are delivered to all the connected units. Thus, "multi-write" is supported without a handler. This function is also available in E-PGM Serial.
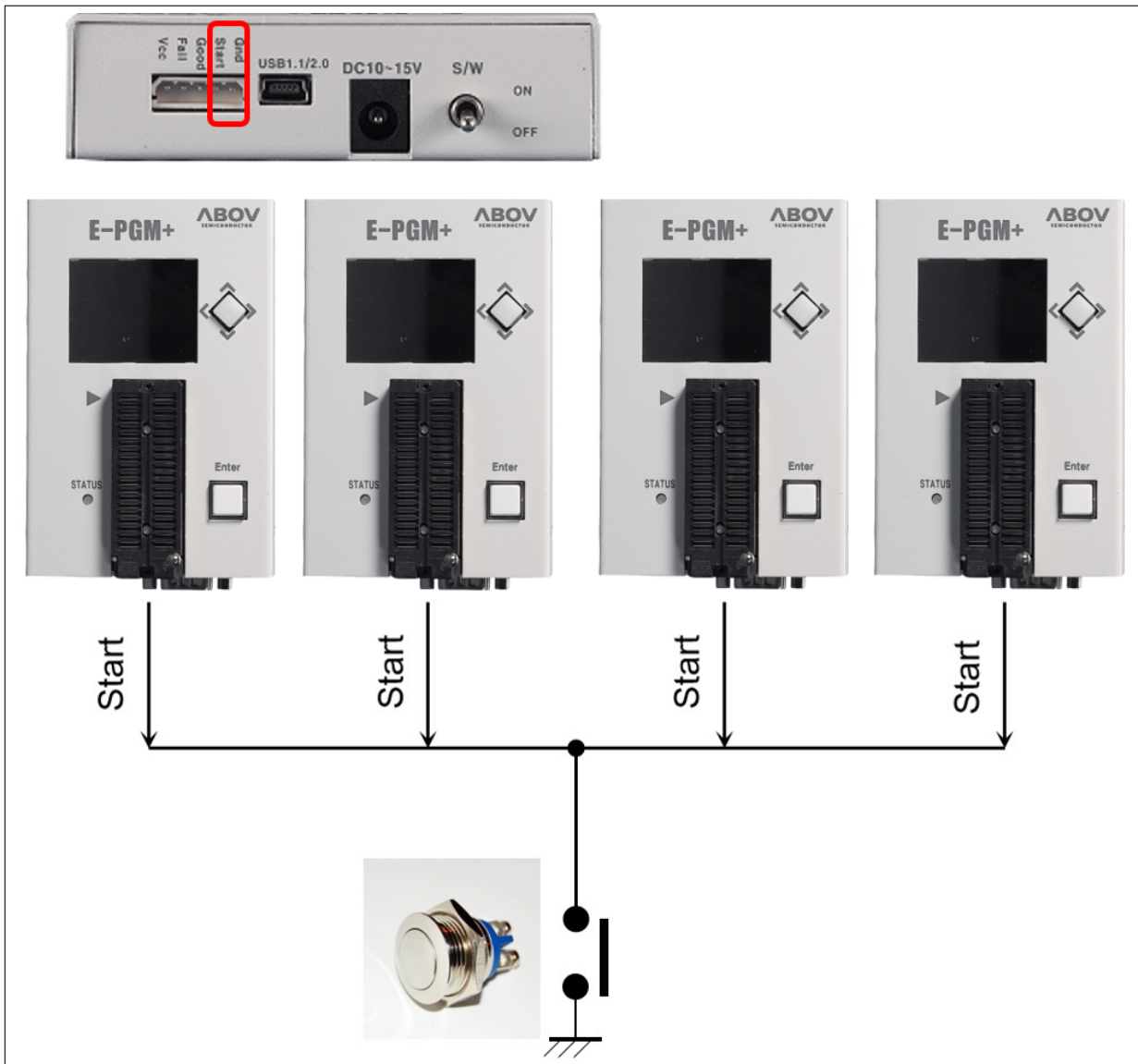

Figure 10: An example connection of multiple E-PGM+ units

Chapter 6. For MC97F1104S/1204S/1316S only

MC97F1104S, MC97F1204S, and MC97F1316S require a higher Vpp of 17V when programmed, and so you need to set the SW3 switch in the Step-up position to ensure a maximum Vpp level of 19V.

When programming any other devices, on the other hand, you must set the switch is in the Ext position to limit the maximum Vpp level to 15V. If SW3 is set in the Step-up position, the OP-AMP can be damaged when the Vdd and ground are shorted during on-board programming.
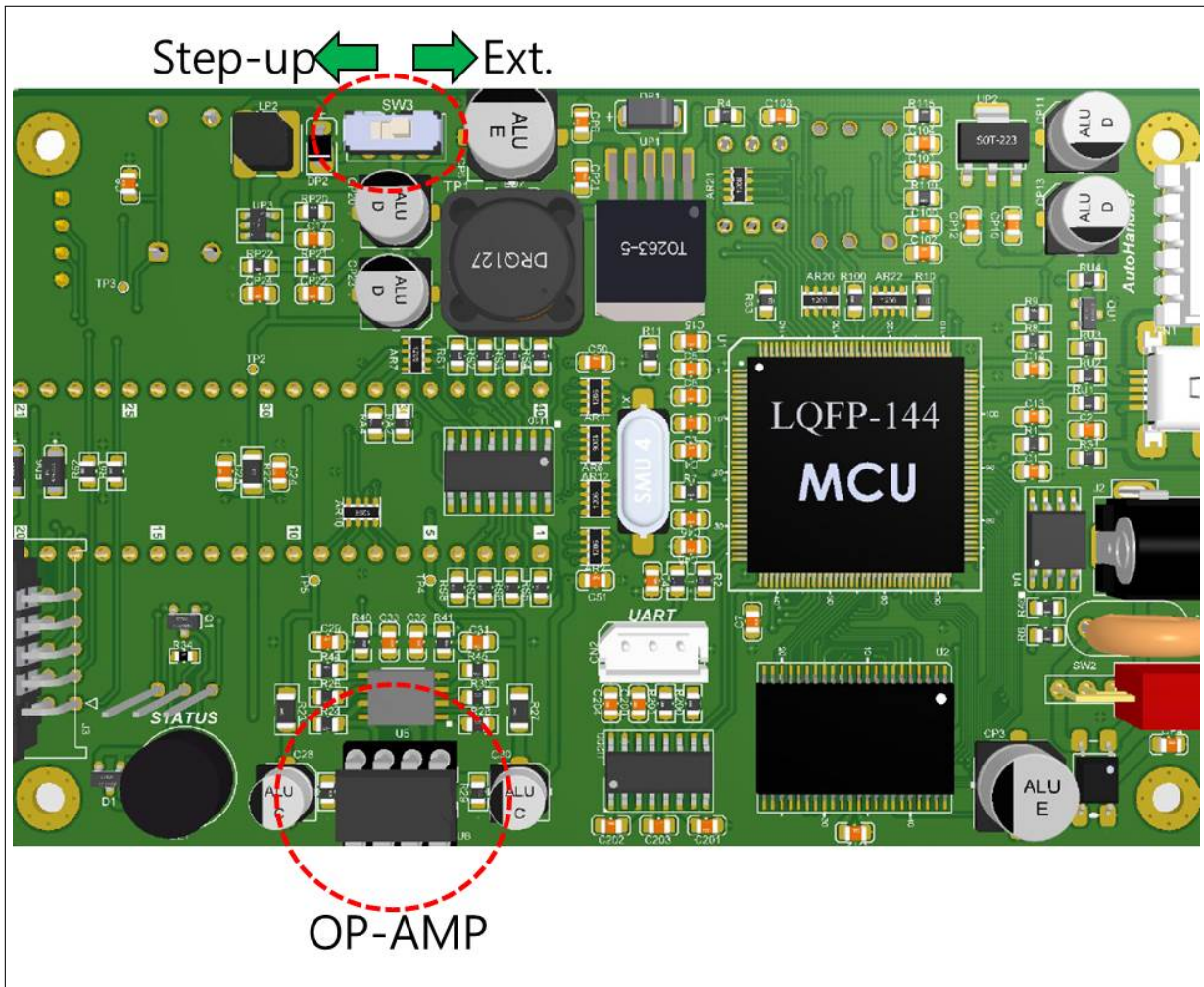

Figure 11: Internal step-up power selection

With the SW3 switch in Step-up, the PBC is so configured that the Vdd of the OP-AMP is connected with the DC/DC step-up output (19 V); with SW3 in Ext, the Vdd of the OP-AMP is connected to the external power adapter (15 V).
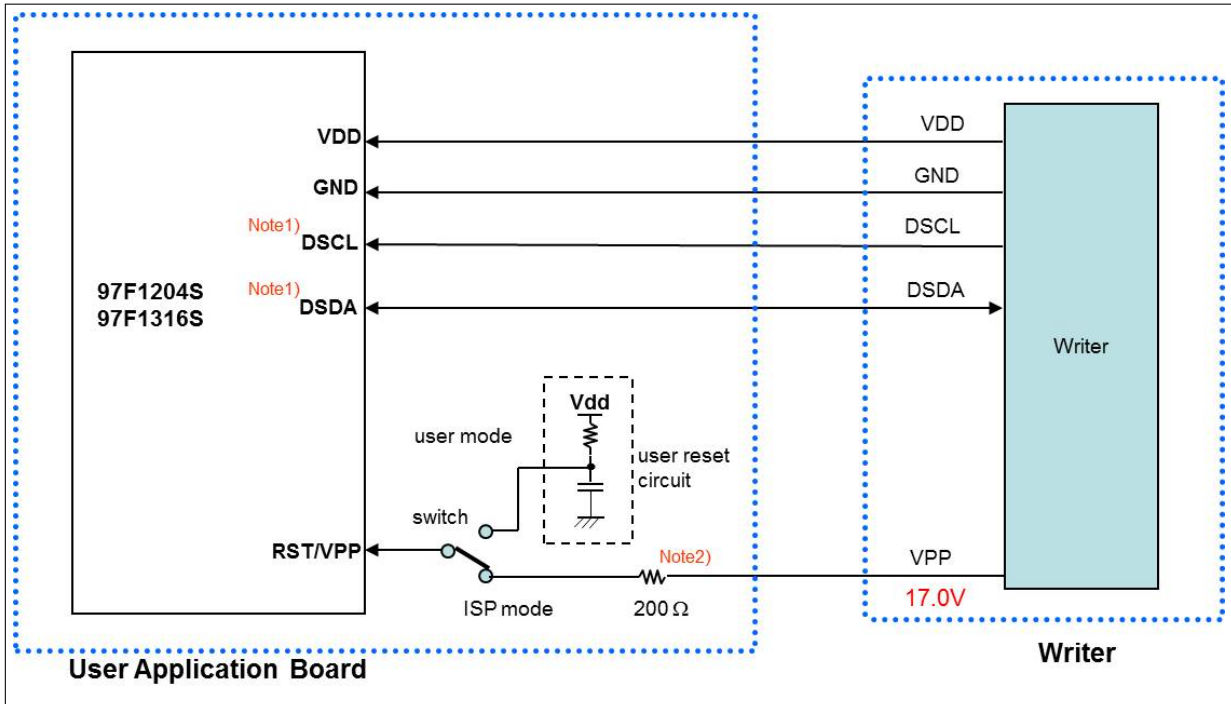
Figure 12: Insertion of a 200 ohm resistor in VPP line

Note:

1. If other signals affect the communication in ISP mode, disconnect them from pins (DSDA/DSCL) using the jumper or switch.

2. A 200 Ω resistor must be installed at the target board. Without it, the MCU could be damaged because of a high voltage (17.0 V). If you want to remove it, you need to insert it in the Vpp line of the ISP cable as illustrated below: