Programmer
(Frequency Calibration)
User's Manual

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1. Programmer Structure

1.1. Programming Structure

HY11P/HY12P Series Writer can program and doing other related function through connecting with PC as Figure 1-1. Moreover, HY11P Series Writer also can be HY-IDE USB Control Board and used on Emulate, Debug and some functions for developing. Regarding to the detailed description, please refer to Hardware User Manual (http://www.hycontek.com/e-page2.html)

HY11P / HY12P Series

Writer Line

USB Line

PC

HY11P / HY12P Series Writer
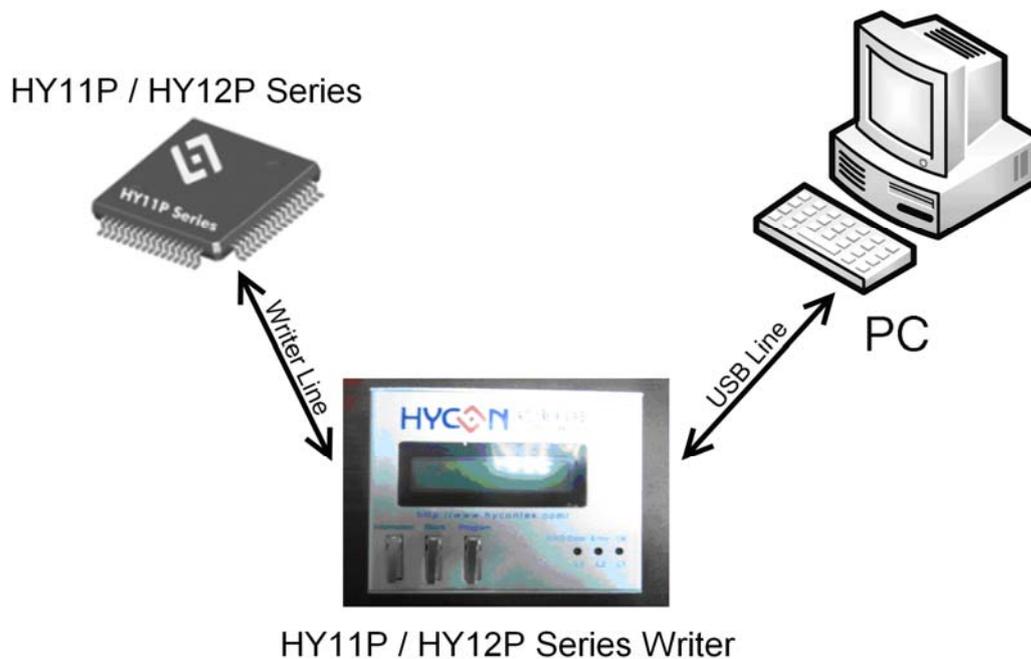
Figure 1- 1

1.2. Diagram

HY11P/HY12P Series Writer is the tool connects with PC for programming HY11P/HY12P Series products. You can program HY11P/HY12P series products by using HY11P/HY12P Series Writer as shown in Figure 1-2.
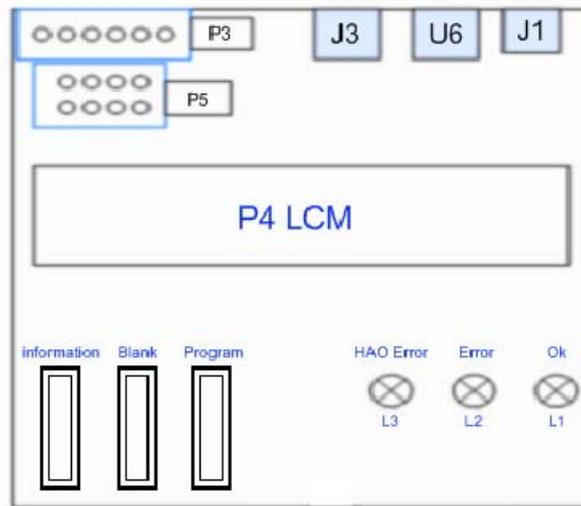
Figure 1- 2

1.3. Operation Description

The table in below gives description of every device:

Name	Function Description
J1	Adapter 9V input ⊕━◖━⊖, used when programming OTP.
U6	USB connector to PC end： Downloading programming code for HY11P/HY12P series. Downloading program for emulation and debug.
J3	Connect the control end of HY-IDE ICE Board (A09001-2).
P3	Programming control end of HY11P/HY12P series and is connected to OTP. Pins from the left to right are：VSS, VDD, SDO, SDI, SCK, VPP.
P5	Programming extension port；Please refer to Figure 1-3 for pin definition and connected circuit. Program (S1), Blank (S2), Green (L1), Red (L2).
L1	Power-on signal. Programming success signal.
L2	Blank Check Fail signal. Programming failure signal. HAO frequency calibration failure signal.
L3	Busy message signal.
S1	Program；IC programming button.
S2	Blank Check；IC blank check button.
S3	Information；Writer information check button.
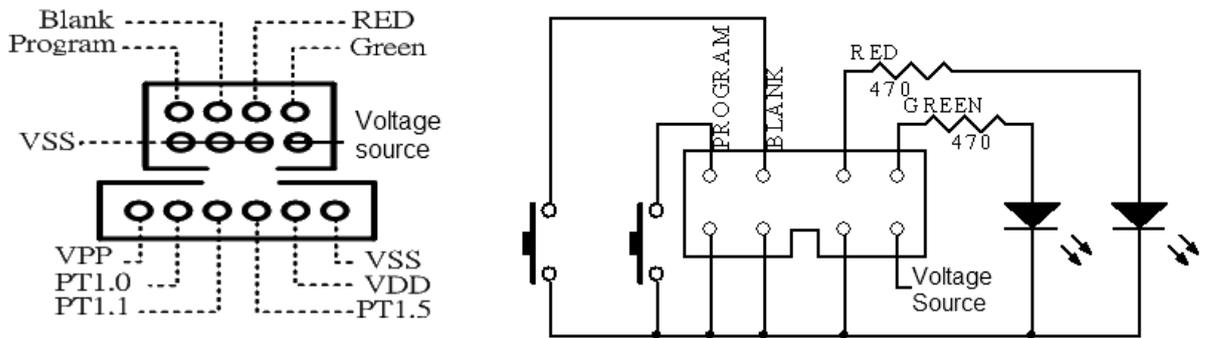
Figure 1- 3

Note: A voltage will be outputted from Voltage Source when implementing Blank & Program.

1.4. Comparison of Different Writer Version

		Description of Different Writer Version	
1	Writer model	HY10000-WK01/ HY10000-WK02	HY10000-WK05
2	Support IC model	HY11P/HY12P Series	HY11P/HY12P Series
3	Turn-on program auto check	Low	High
4	Programming time limit	support	support
5	IC frequency hardware calibration function	N/A	2MHz HAO
6	IC frequency deviation software calculation function	N/A	HAO and LPO
7	Auto key button function	Blank, Program, Verify	Program, Verify
8	LED light display L1 / L2 (/ L3)	Green/Red	Green/Red/Red
9	HYIDE software support version	Support all HYIDE version	Only support HYIDE V3.0 and later version
10	Hex code download support	Support the whole series HYIDE Hex Code 1.x version Hex Code, downloaded from HYIDE V1.6 to writer 2.x version Hex Code, downloaded from HYIDE V2.x to writer	Have to download the Hex Code into writer WK05 via HexLoader software.
11	HexLoader Software Support	The HexLoader software only supports downloading Hex file function, which applicable for writing hex code into WK01, WK02 and WK05 writers.	

※Writer version comparison will abbreviate"HY10000-", showing only WK01, WK02 and WK05.

1. Writer Model: There are three versions: WK01, WK02 and WK05.

2. IC Model Support：WK01, WK02 & WK05 can program the whole series of HY11P/HY12P IC.

3. Turn-on program auto check：WK01 & WK02 has low-tier turn-on auto check mechanism while WK05 possesses high-tier turn-on auto check mechanism as to ensure data correctness. When power on, writer will check the correctness of the code-to-be programmed by confirming its Check sum. Therefore, "Verifying… "will show up when power on. After confirmation, HYCON IDE will show up in order to assure data correction and to begin programming. If the check failed, "Verify error 6" will show up, representing the code-to-be programmed is incorrect and must be reloaded again.

4. Programming time limit：WK01, WK02 and WK05 support this function; please refer to "2.2.2 Build Options" for further description.

5. IC frequency hardware calibration function：WK01 and WK02 did not support frequency (2MHz HAO) hardware calibration function. WK05 supports 2MHz HAO frequency hardware calibration function, for related description, please refer to "2.2.4 OSC Calibration".

6. IC frequency deviation software calculation function：WK01 and WK02 did not support frequency deviation software calculation function while WK05 supported HAO frequency and LPO frequency software deviation calculation function. Further description, please refer to " 2.2.4 OSC Calibration".

7. Auto Key button function：The auto programming order of WK01 and WK02 is Blank→Program→Verify. WK05 removes Blank function, thus the auto programming order is: Program→Verify as to facilitate users implementing repeat programming operation (the purpose is to write repeatedly the same code；This move will not erase IC. If the code is different, then repeat programming will cause programming failure).

8. LED light display：The Green/Red light of WK01 and WK02 represent OK/Error. Green(L1)/Red(L2)/Red(L3) light of WK05 represents OK/Error/Busy respectively. In process of programming, the L3 will be lighted up and when programming finished, the L3 will go out. At this moment, the L1 lighted up means programming is successful. Oppositely, the L2 lighted up means programming is failed or HAO frequency calibration failure.

9. HYIDE software version support：WK01 and WK02 support all versions of HYIDE and WK05 only supports HYIDE V3.0 and later version and HyconIDEDMM V3.0 and later version,

10. Hex Code download support：
    WK01 and WK02 support the Hex Code assembled by the whole version HYIDE. However, Hex Code of HYIDE V1.X version must be downloaded from HYIDE V1.6 to the writer and Hex Code of HYIDE V2.X version must be downloaded from HYIDE V2.X version to writer.

<div style="color:red; text-align:center;">For WK05, the Hex Code has to be downloaded via HexLoader software. .</div>

11. HexLoader Software Support：

HexLoader related function and description-HY-HexLoader Software User's Manual. The HexLoader software can download Hex code in different versions: WK01, WK02 and WK05 writers.

1.5. Attention

1. When loading the power, it is suggested to connect 9V Adapter, and then connect to USB Line; when removing the power, please disconnected USB Line first, then remove 9V Adapter.
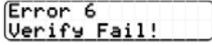
2. The message `Error 6 / Verify Fail!` will be revealed when the first time that Programmer, WK05 is power-on. Never mind it because it just means the Flash memory of Programmer is empty

3. If the function, "Programming time limit" of WK05 is executed and the programming time ran out, the message `Error 8    Prog / ram Counter = 0` will be revealed when you press the program button and the programming function will not be activated. At the same time, the information will reveal "Information 1：Program Counter Enable Left 00000000" if you press the information button.
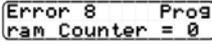
4. If the function, "Programming time limit" of WK05 is executed and the programming time ran out, the power of programmer is interrupt and then restart, the message `Error 6 / Verify Fail!` will be revealed when you press the program button. At this time, the programming function will not be activated. "Information 1：Program Counter Disable" will show up if you press the information button.
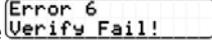
2. Programming Software Operation

2.1. Software Function

In order to ease customers to use HYCON MCU products, we developed Hycon-IDE developing environment so customers can emulate its end application on our development platform and write the program to the OTP of HY11P/HY12P series. Detailed description, please refer to user's manual of HY-IDE software (http://www.hycontek.com/page2.html).

2.2. Software Window Setup

Figure 2-1 is the program window of HyconIDE, which can be used for emulation and debug function.
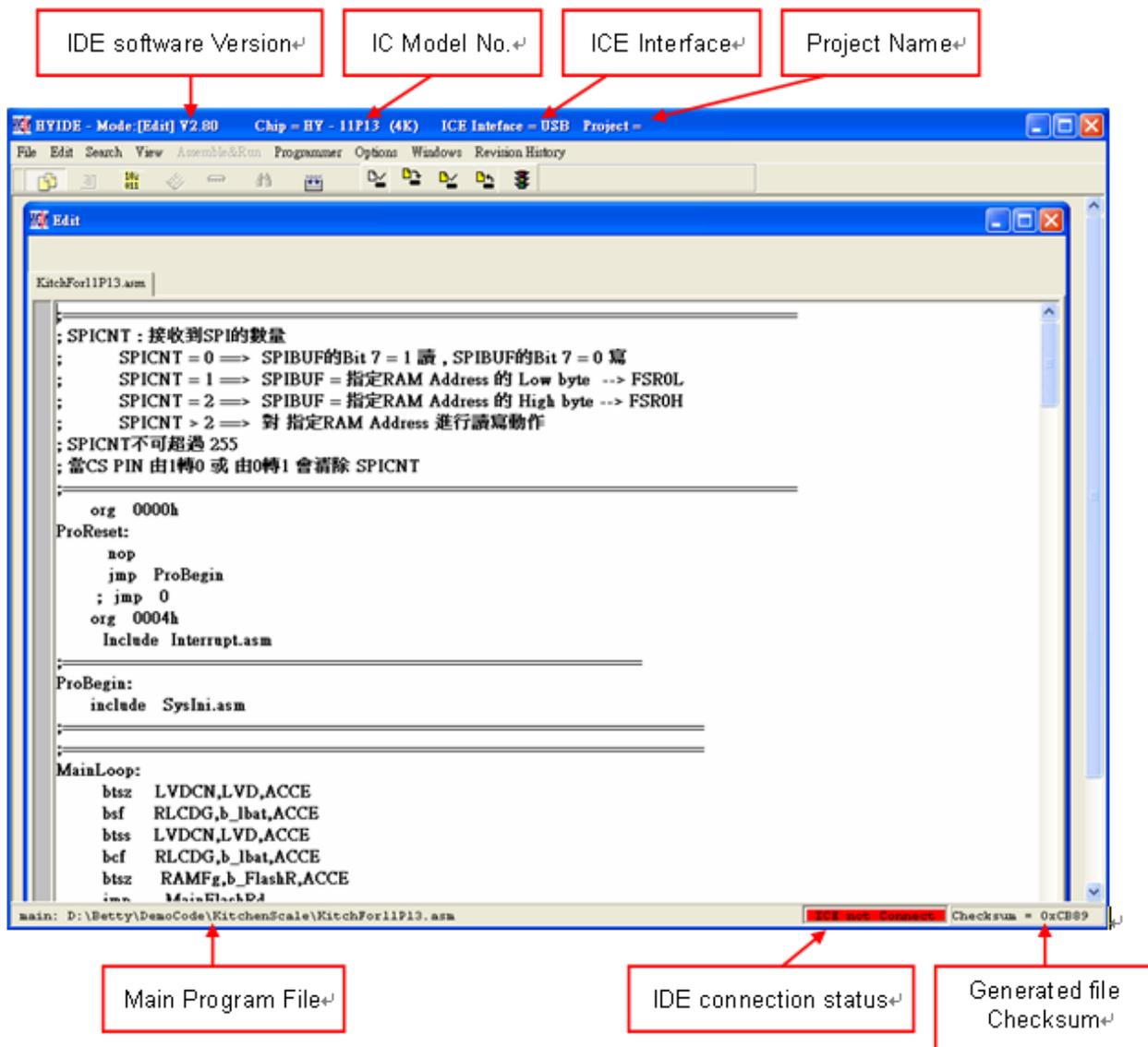
Figure 2- 1

2.2.1. Interface Setup

Click "Options", a window will appear. Click the interface setup, as shown in Figure 2-2.
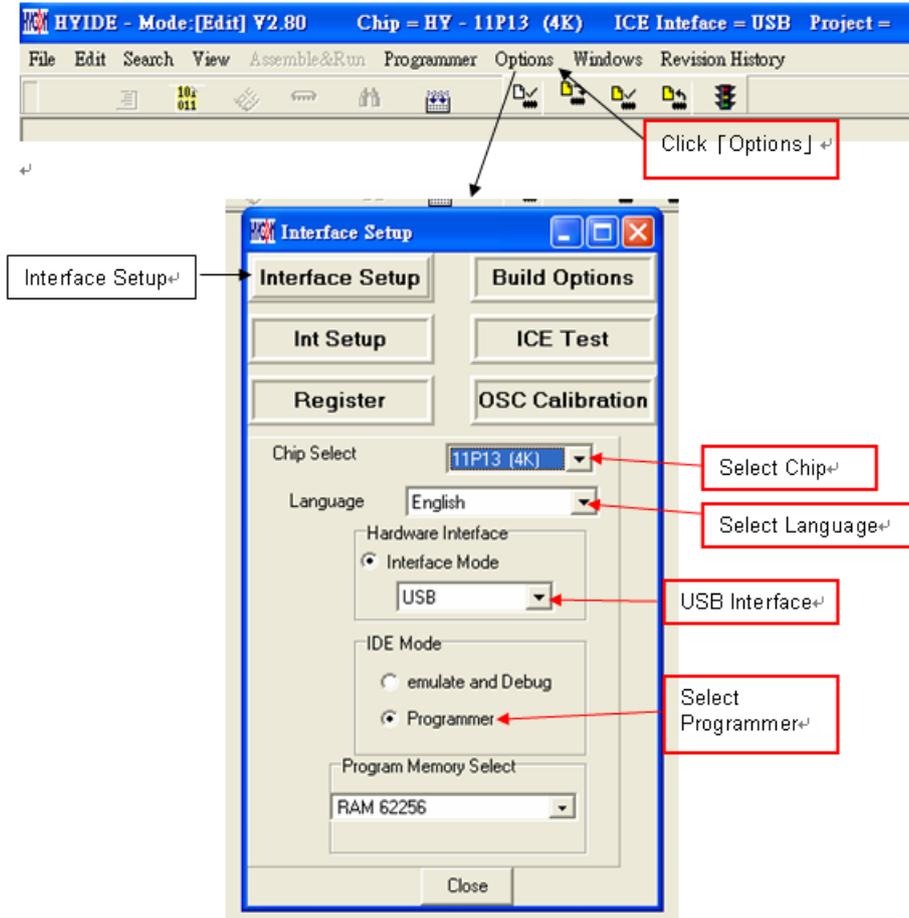
Figure 2- 2

Chip Select → Choose the specific programming IC part no. If programmed IC differs from the

selected IC, Blank Check, Program and Verify will fail.

Language → Choose operation interface language, like Chinese or English.

Hardware Interface → USB interface or Parallel Port interface is selectable.

IDE Mode → Programmer or emulate and Debug is selectable.

Programmer: programming HY11P/HY12P series products.

Emulate and Debug: when users use it with simulator for developing.

2.2.2. Build Options

When interface setup finished, click"Build Options"to select programming configuration. As described in Figure 2-3.
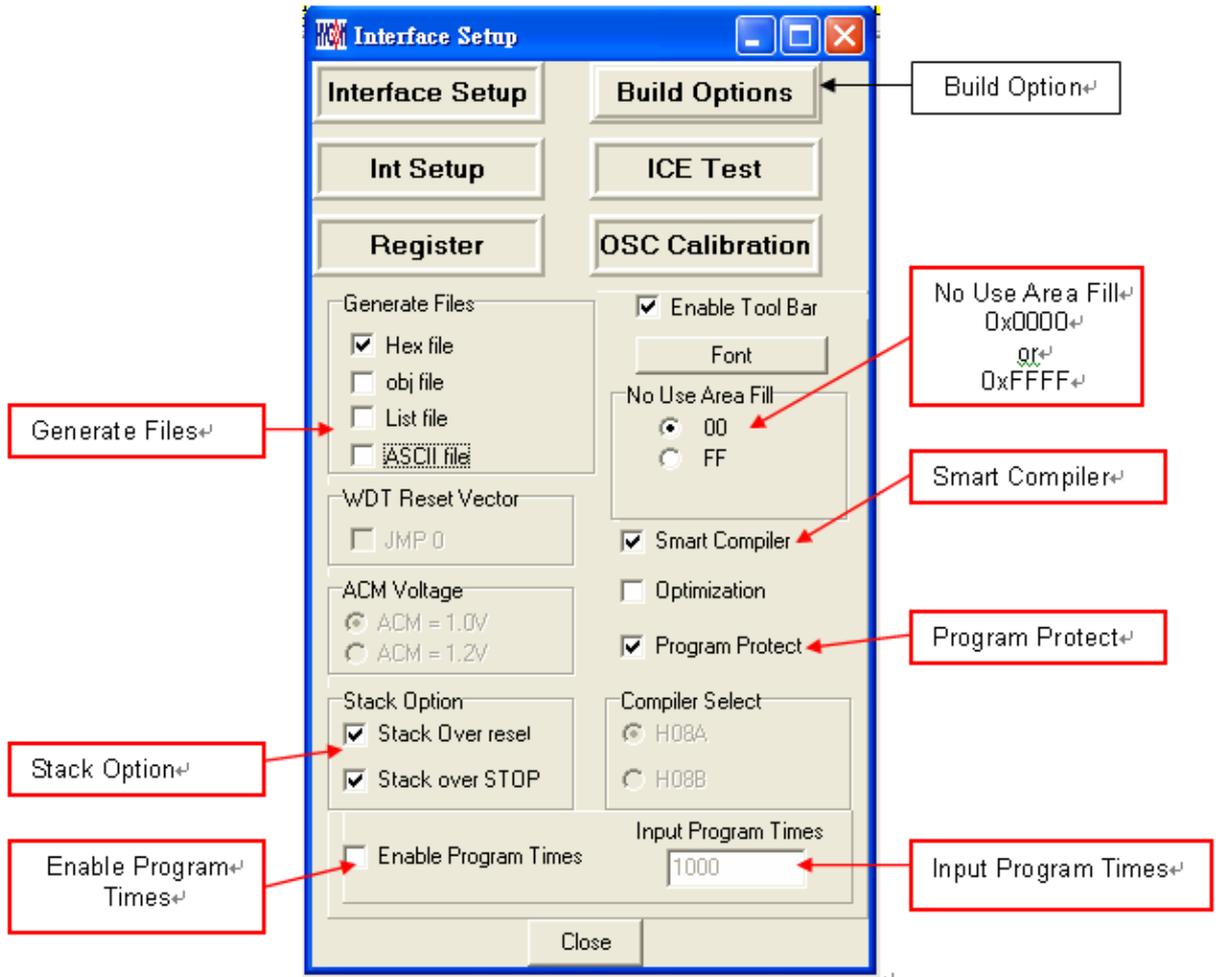
Figure 2- 3

Generate Files → Choose generated file after assembly

Stack Option → Choose whether to reset when stack overflow or stack full after OTP program operation.

No Use Area Fill → Fill up 00 or FF in unused program space after assembly.

Smart Compiler → Choose whether to simplify assembly.

Enable Program Times → Choose whether to enable Download program times.

Input Program Times → Input Download program times (Maximum: 2147483646. Minimum: 1).

2.2.3. ICE Test

After assembly finished, click "ICE Test" to test ICE operation voltage as Figure 2-4 described (Connect Adapter 9V and connect USB Line to ICE. Make sure the ICE is connected, and then click "Option" at working bar, click button "CK ALL"). After that, the VPP and VCC voltage will be started testing as Figure 2-4.

VPP voltage while programming: 5.6<VPP<6.6.

VDD voltage while programming: 2.7<VPP<3.6.
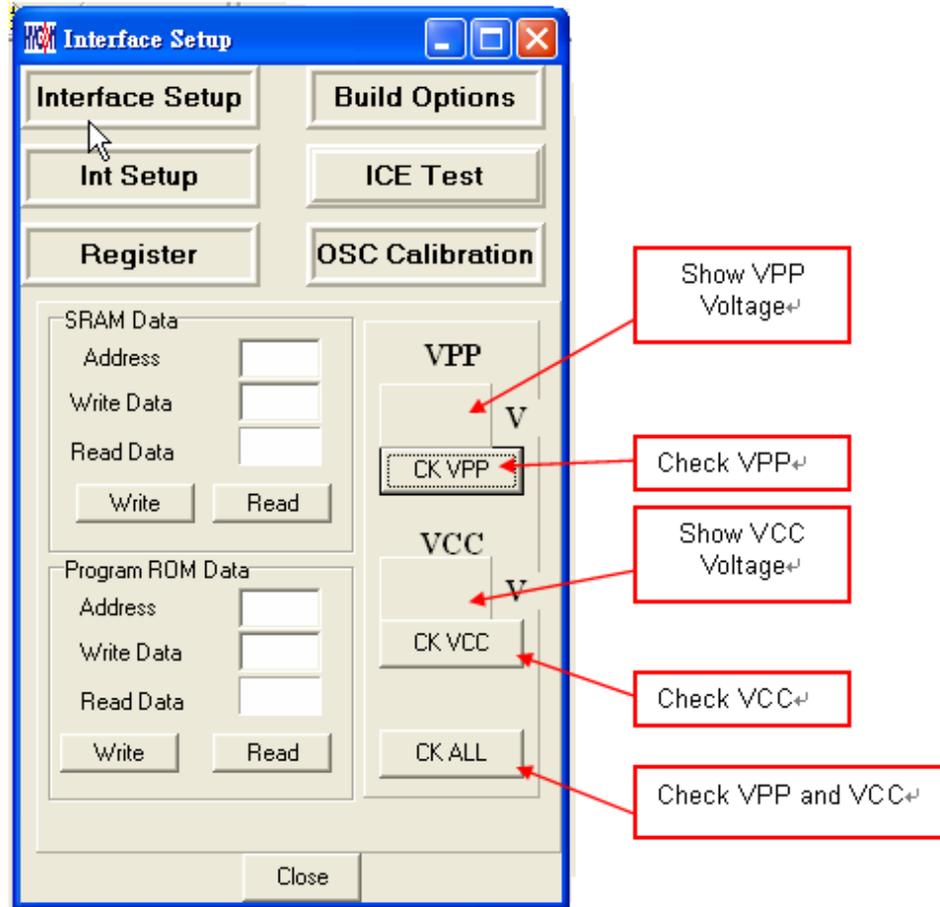
Figure 2- 4

2.2.4. OSC Calibration

OSC Calibration as Figure 2-5; Please note this function only can work on the programmer "HY10000-WK05" used the software, Hycon-IDE 3.0 above version and HyconIDEDMMV3.0 above version. If HAO/LPO Calibration programming started, the code, 0FEH/0FFH of RAM would be meaningful after powering on the IC

The programming time will be 500msec. longer (upon LPO Software Calibration Started). HAO/LPO Calibration is not doing actual frequency calibration; only provide the difference of frequency for calculation.
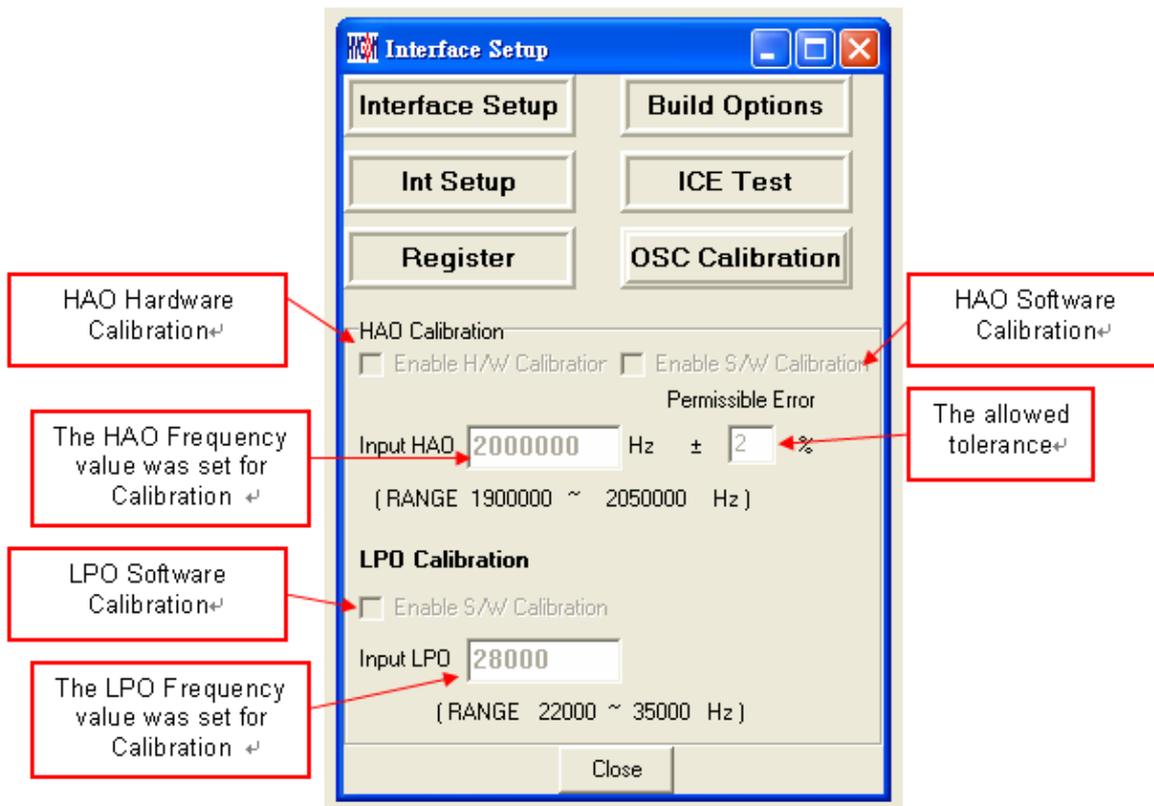
Figure 2- 5

HAO Calibration:

Name	Function
Enable H/W Calibration	Enable HAO Hardware Calibration and implement the system calibration. This function has to be confirmed once the IC model No. has been selected.
Enable S/W Calibration	Enable HAO Software Calibration. The difference value is saved in code **0FEH** of RAM.
Input HAO	Input the HAO frequency value for calibration.
Permissible	The allowed tolerance between the calibrated frequency value and the value of being calibrated.

.

LPO Calibration:

Name	Function
Enable S/W Calibration	Enable LPO Software Calibration. The difference value is saved in **0FFH** of RAM.
Input LPO	Input the frequency value of LPO to be calibrated.

Note: The function of OSC Calibration related parameters are recorded into Hex Code only can be worked with software, HYIDE V3.0 or later version.   Therefore, when the Hex Code programmed by HYIDE V3.0 or later version downloaded into writer via HexLoader software, it can be activated and the OSC Calibration selections can be revealed correctly. If the software is former than HYIDE V3.0(HYIDE V2.0~HYIDE V2.9), although the OSC Calibration function is active , the programmed Hex Code has no any data related to OSC Calibration recorded in it. For this reason, as the Hex Code is downloaded via HexLoader software, the OSC Calibration function can't be worked correctly. The original file has to be recompiled by HYIDE V3.0, the Hex Code will be included related data by then.

2.2.5. Software Calibration

HAO Software Calibration:

After Calibration, the difference value is saved in code 0FEH of RAM. This function is not doing actual frequency calibration; only writing in the difference of frequency when the IC power-on.

HAO Hardware Calibration, HAO Software Calibration can exist at the same time. Moreover, the Hardware Calibration enforced first and then proceed the Software Calibration to calculate the difference value.

The difference value of frequency defined as **4000HZ/LSB**。

The code 0FEH data format:

Bit7：0= +, 1= -；Bit6~Bit0 means frequency difference value.

01H mean the frequency difference value is +4000HZ；FFH mean the frequency difference value is -4000HZ.

Example:

The set value for HAO frequency calibration is 2000000HZ，and the actual value from IC is HAO=1920000HZ. The calculation is (1920000-2000000)/4000 = -80000/4000= -20, therefore the code 0FEH will be **1110 1100b**

Example 1:

The set value for HAO frequency calibration is 2000000HZ，and the actual value from IC is HAO=2008000HZ. The calculation is (2008000-2000000)/4000 = 8000/4000=2, therefore the code 0FEH will be **0000 0010b**

LPO Software Calibration:

After Calibration, the difference value is saved in code 0FFH of RAM. This function is not doing actual frequency calibration; only writing in the difference of frequency when the IC power-on.

The difference value of frequency defined as **64HZ/LSB**.

The code 0FFH data format:

Bit7：0= +, 1= -；Bit6~Bit0 means frequency difference value.

01H means the frequency difference value is +64HZ；FFH means the frequency difference value is -64HZ.

Example:

The set value for LPO frequency calibration is 28000HZ，and the actual value from IC is LPO=28128HZ. The calculation is (28128-28000)/64 = 128/64 = 2, therefore the code 0FFH will be **0000 0010b**

Example1:

The set value for LPO frequency calibration is 28000HZ，and the actual value from IC is LPO=27872HZ. The calculation is (27872-28000)/64 = -128/64 = -2, therefore the code 0FFH will be **1111 1110b**

2.2.6. Attention

When Interface Setup finished, please press "close" and all the set parameters will be saved. Next

time, when you open the file, it will load the record parameters automatically and the IC model No. will be displayed on the headline of window as Figure 2-6.
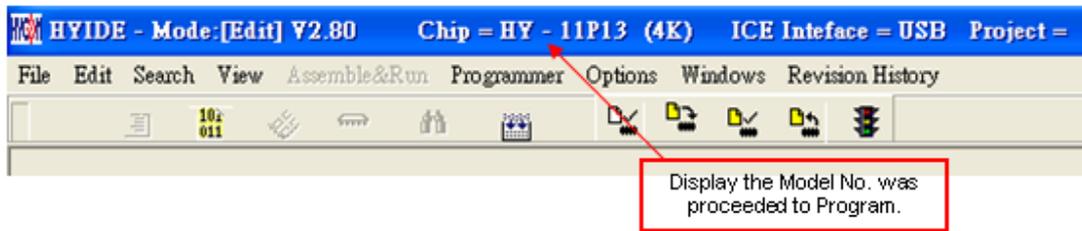
Figure 2- 6

2.3. Operation Procedures

Open Compiler main file

Open Project

Save Project

Read Programmer's Flash Memory
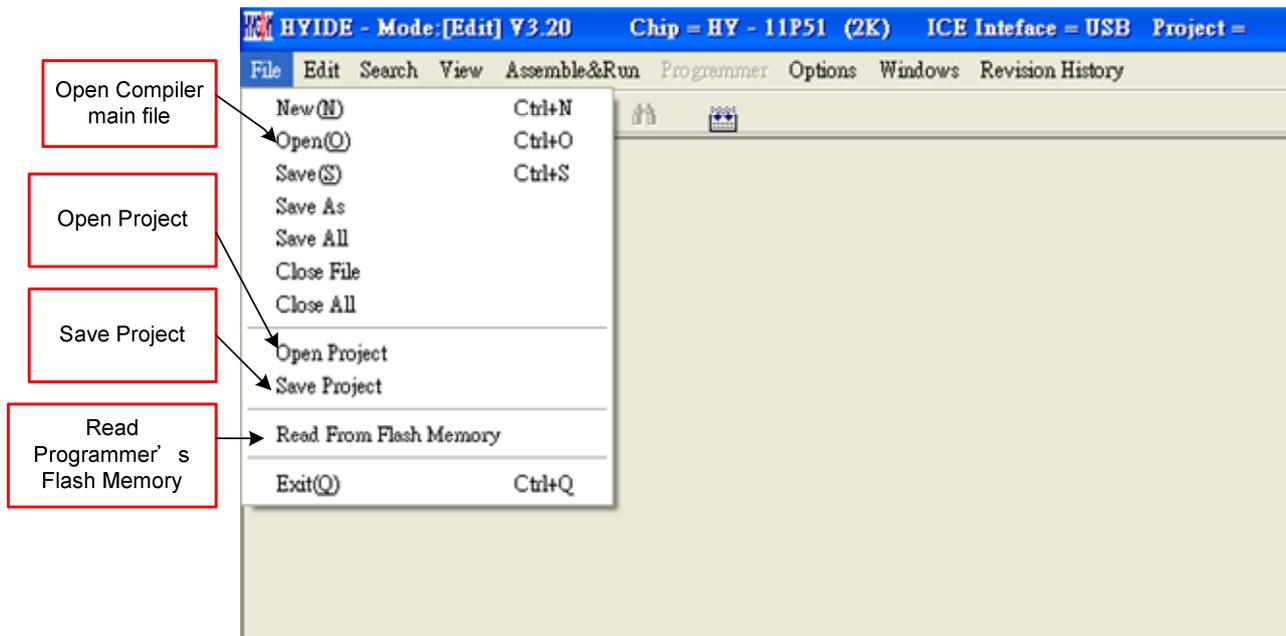
Open → Open the programmed source code main file.
Open Project → Open the saved project.
Save Project → Save the finished project.
Read the code from Flash Memory → Read the code of programmer Flash Memory.
(Attention: if the code was protective, the data will not be revealed.

Note: The "Download file to Flash Memory" function has been cancelled. HYIDE has no function which supports Hex Code downloading.

2.3.1. Open/Save Project

"Save Project" will save all setting included program, the choice of toolbar selection and so on to *.prj file. Oppositely, "Open Project" can read back the file with all the setting.
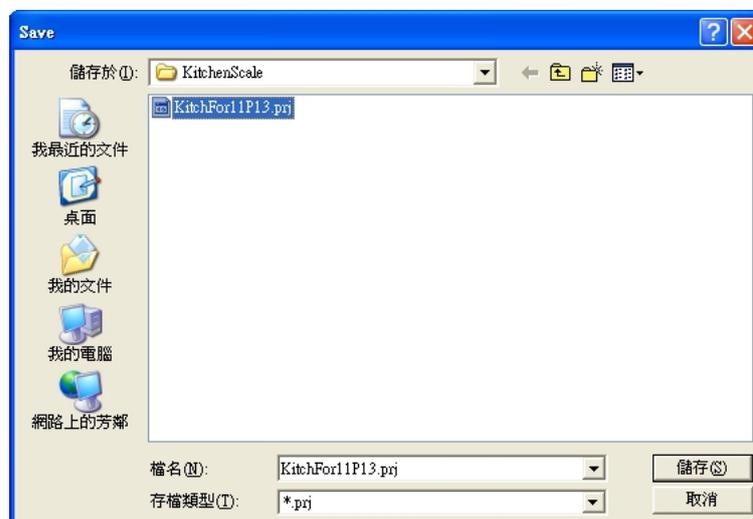
2.3.2. Open File and Assembly
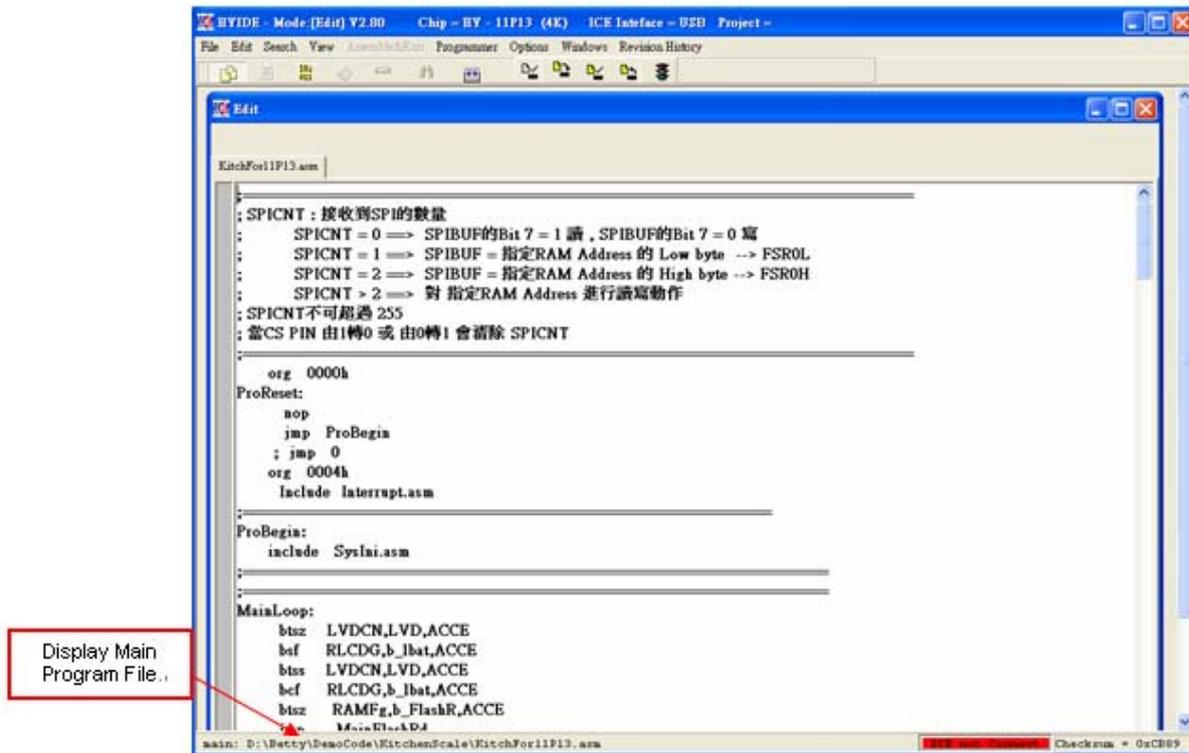
Figure 2- 7

Open source code main file and it will be displayed as the assembly file. If the displayed name differs from main file, points the mouse to the specific file and presses mouse right key. Set this file as the assembly main file as shown in Figure 2-8.

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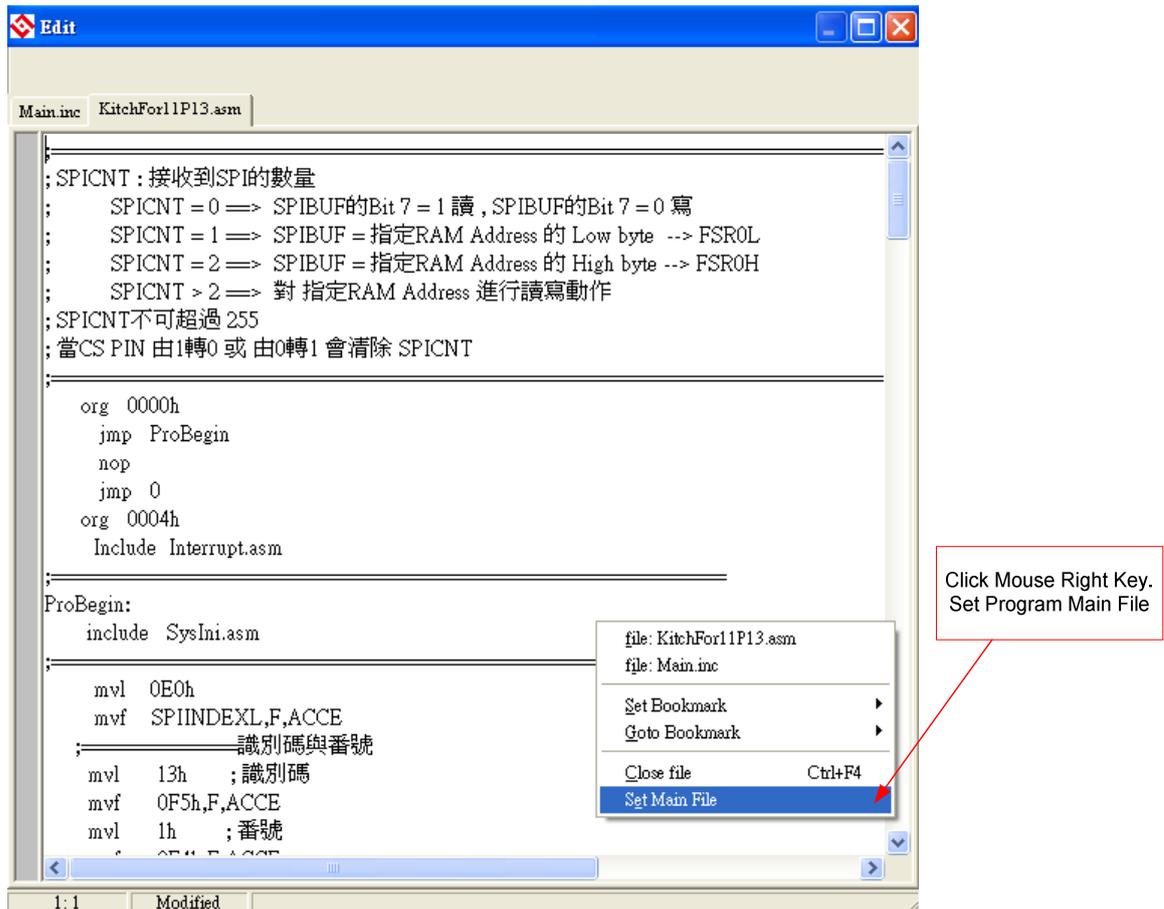
Figure 2- 8

Assembles Source Code and download the file to programmer or IDE Flash Memory, as Figure 2-9 illustrated.

Figure 2- 9
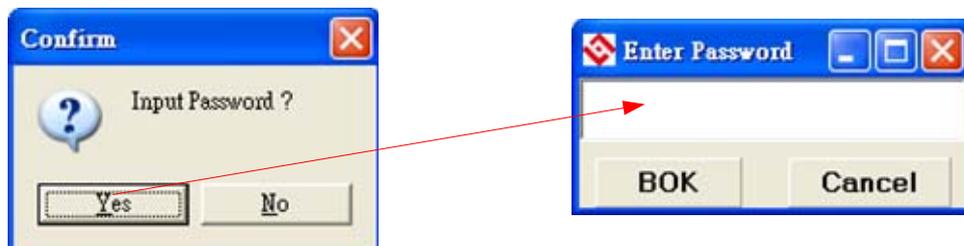
Figure 2- 10
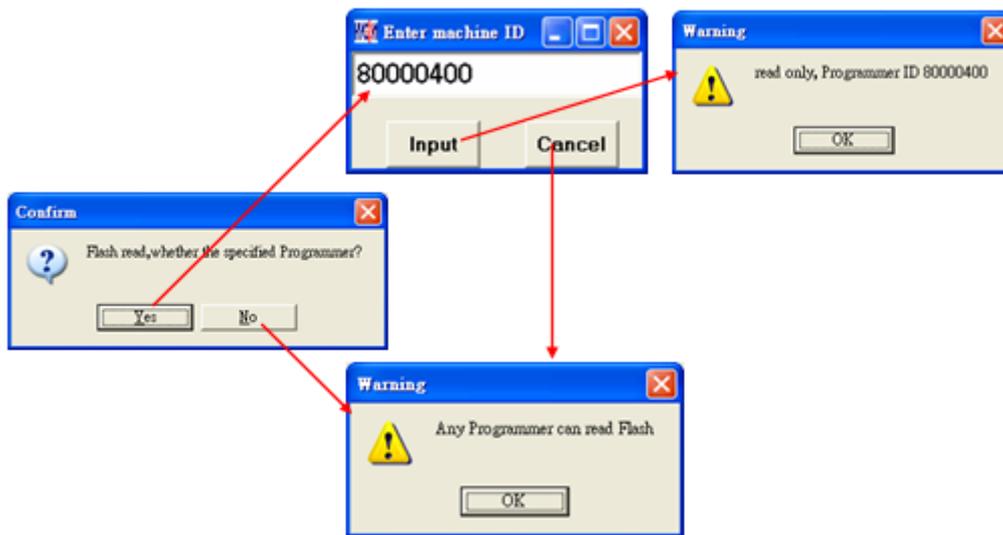
Figure 2- 11

Figure 2- 12

1. When using USB interface, the assembly finished program code will be loaded into programmer or Flash Memory of IDE for mass production programming.

2. Before downloading code to programmer Flash Memory, system may require to enter into password. This function enables users to monitor the code from PC to programmer Flash Memory. Please note that password can only include 6 digits (ASCII Code). In order to protect the code that users developed, the password must be entered before downloading the code into programmer. If the password entering step is cancelled during downloading procedure, it means that the code will not be allowable to be read from programmer. (as Figure 2-11)

   After you entered the password, you will need to confirm if you would like to assign the specific programmer. If you choose yes, only use the assigned programmer can read the code from Flash Memory. Oppositely, if you choose No, you can read the code by all programmers. (as Figure 2-11)

   Note: once you set the password, it will be the operating password of the programmer. This password has to be entered before you read the code. Please memorize your password to ensure the code can be read in the future.

   In addition, every time a new code is downloaded; the programmer will ask you to enter a new password afresh.

3. If there is enabled program times in the assembly option, information column will display the

programming times as shown in Figure 2-12.

4. After assembling completed, Hex filename and Checksum will be displayed in underneath section, as Figure 2-13 illustrated.

Download To Programmer's Flash Memory

Display OTP Connection Status

Display Program Checksum

E:\CYPRESS\IDELCM\TestDemo\TestDemoboard.hex   Body on board   Checksum = 0xD0C0

Figure 2- 13

2.3.3. Download Hex File to Programmer or IDE Flash Memory

For HY11P series, this function has not been supported on Hycon-IDE 3.0 hereafter. If users would like to download Hex File, please download by software, HY-HexLoader and following the Users' Guide to do it.

Note: For HY12P series, this function has not been supported on HyconIDEDMM V3.0. To download Hex File, users must use compiler source code method to the writer.

2.3.4. Read the Code from Flash Memory

The function of "Read from Flash Memory" helps users to ascertain whether the code of programmer Flash Memory is the same with Download Code. The Password entered must in accordance with the Download Password, so the data will be revealed, as Figure 2-15 shown.

If the Flash Memory has assigned a certain Programmer, only the assigned Programmer can use the mentioned way to read the code from Flash Memory.
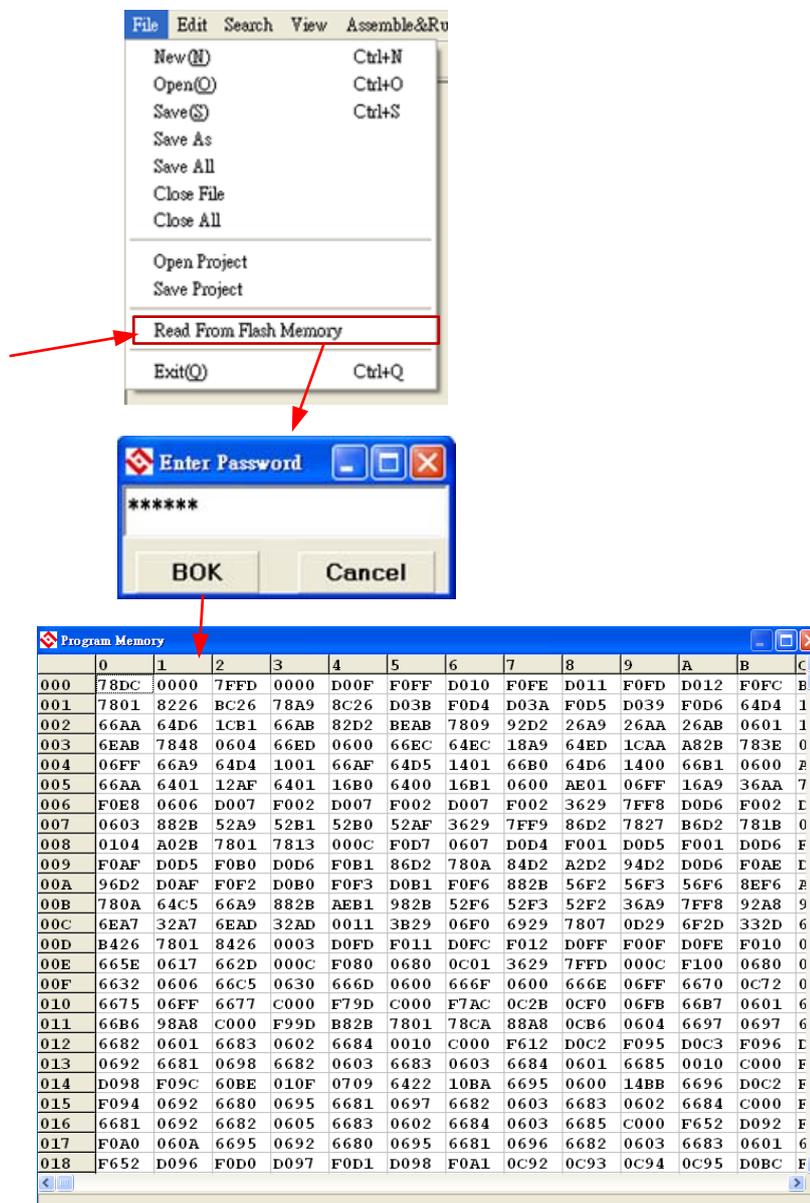
Figure 2- 14

3. PC Online Programming
3.1. PC Online OTP Programming
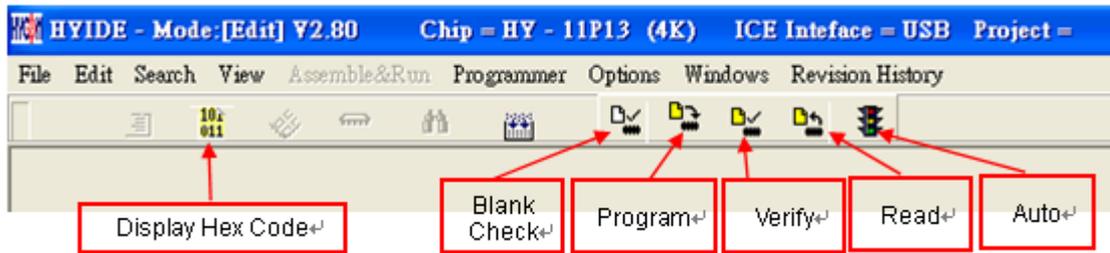
Figure 3- 1
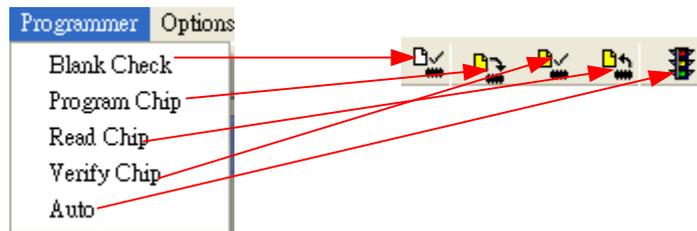
Figure 3- 2

Blank Check, Programming, Verify and Read Commands can be implemented when the programmed file being successfully loaded into programmer or IDE Flash Memory. On the contrary those commands will not be activated if the download failed.

Figure 3- 3

Figure 3- 4

Figure 3- 5

Make sure the selected programming IC part number is the same with the OTP part number in the topic window as Figure 2-6 described. When programmer executes Blank Check, Programming and Verify commands, Program will check whether the IC part number and OTP programming part number are identical. If the part number is different, the data will not be written into OTP and an error message will be displayed in information column as Figure 3-3 described.

If users intend to find out whether the part number is correct before programming, point the cursor to "IC Connection Status Display" and click the mouse left key. If the selected IC is correct, a message will show up as Figure 3-4. If it is incorrect, the message will be displayed as Figure 3-5. If "Enable Program Times" has been marked up, the spare program times will display in the message column as Figure 3-6 illustrated.

Figure 3- 6

3.2. Blank Check

The icon of Blank check is , The internal code of Blank ICs that have yet been programmed is 0xFFFF. The purpose of checking the IC is to make sure the OTP address content is 0xFFFF. If the IC selection is correct and the content is empty, a message will appear as Figure 3-7.

Figure 3- 7

If the IC selection is incorrect or the content is not empty, a message will show up as Figure 3-8 described.

Figure 3- 8

3.3. Program

The icon of Program is [icon]. The purpose of programming is to write Compiler accomplished program into IC OTP. When programming is completed and the IC is assembled as finished goods, programmer can operate the program as users commanded.

Program the downloaded or assembly finished Hex file (displayed at the bottom of the column) in the selected IC and verify the correctness of the programming content (please refer to Chapter 2.3.2 or 2.3.3 for programming procedures).

If the selected IC is correct and the programming succeeds, message will appear at the information column as Figure 3-9 illustrated. If "Enable Program Times" is ticked up, the enable program times will minus 1 and the program times left will be revealed in the message column.
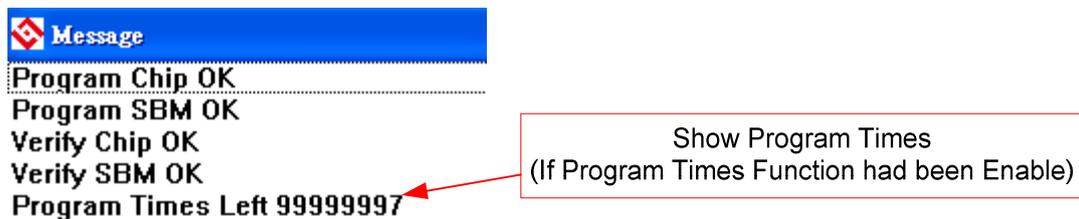
Figure 3- 9

If the IC selection is incorrect or the programming fails, a message will show up as Figure 3-10.

Figure 3- 10

3.4. Verify

The icon of Verify is . The purpose to verify programming IC is to compare if the program written into IC OTP equals to the program downloaded to programmer or IDE Flash Memory.

Verify programming IC content consistency with the downloaded or assembled Hex file (displayed at the bottom of the column). If the IC is protected by program, this verification is ineffective or the comparison failed.

If IC selection and program verification is success, a message will appear as Figure 3-11.

Figure 3- 11

If IC selection is incorrect or the program verification miscarries, a message will pop up as Figure 3-12.

Figure 3- 12

3.5. Read

The icon of Read is [icon]. The purpose to read the IC is to verify the consistency of OTP

Checksum and programmed Hex file. To read IC content, the procedures are illustrated as Figure 3-13.

Its content will reveal at "Display Code" window.

If the IC is protected by program, this function is ineffective or the comparison failed.
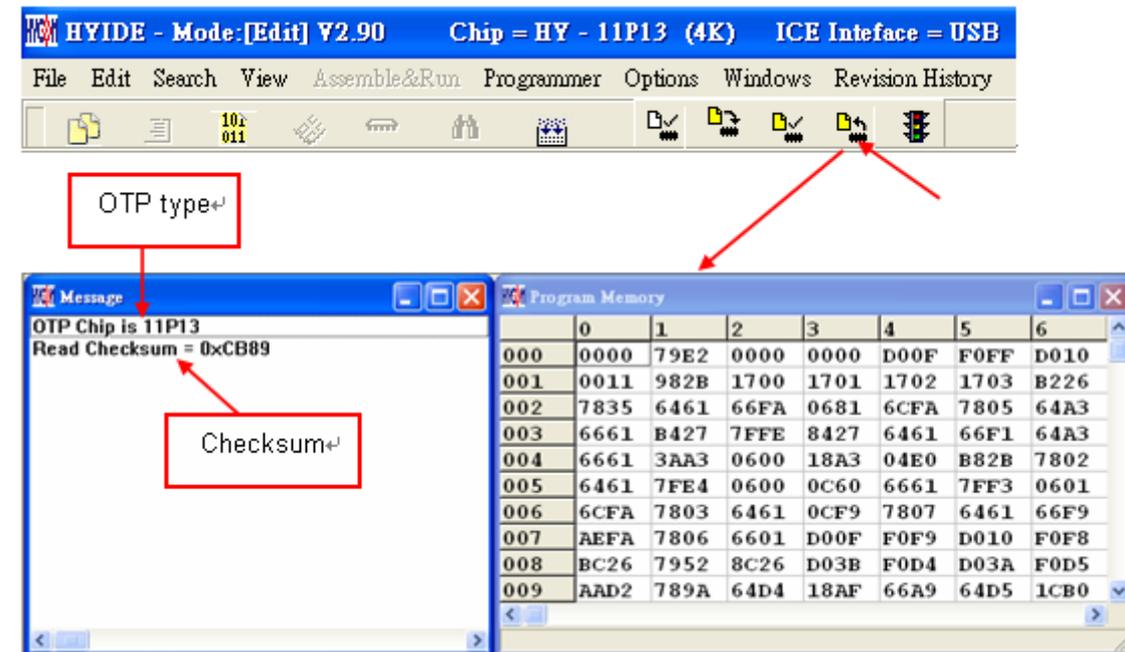
Figure 3- 13

3.6. Auto

The icon of Auto is ⬚ . Auto integrates Blank Check, Program and Verify function. If user selects Auto, it will first check whether the IC is blank, then to program and verify.

After the execution succeeded, a message will be displayed as Figure 3-14 displayed. If the option, "Enable Program Times" is ticked up, the program permitted times will reduce 1 and the program times left will be shown in the message column.


```
Message
Chip Blank OK
SBM Blank OK
Program Chip OK
Program SBM OK
Verify Chip OK
Verify SBM OK
Program Times Left 99999997
```
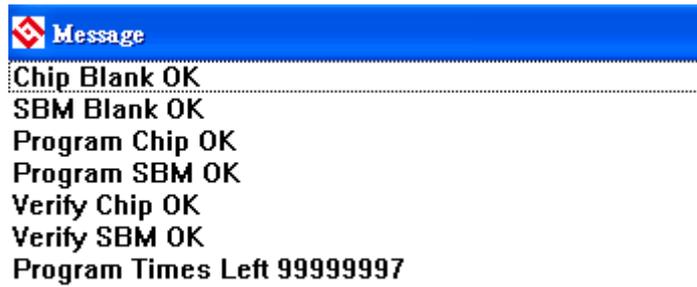
Figure 3- 14

If any function fails, the whole process will stop and display an error message in the message column.

4. PC Offline Programming
4.1. Program Description

As the development process evolves to mass-production, the programmer can be used alone when programming on the production line. It is not necessary to connect the programmer to the PC.

*Attention: When use programmer, please make sure the 9V Adapter has been connected before USB line was plugged in PC. Please don't put in or pull out 9V Adapter when programmer connected with PC or the PC may crash.
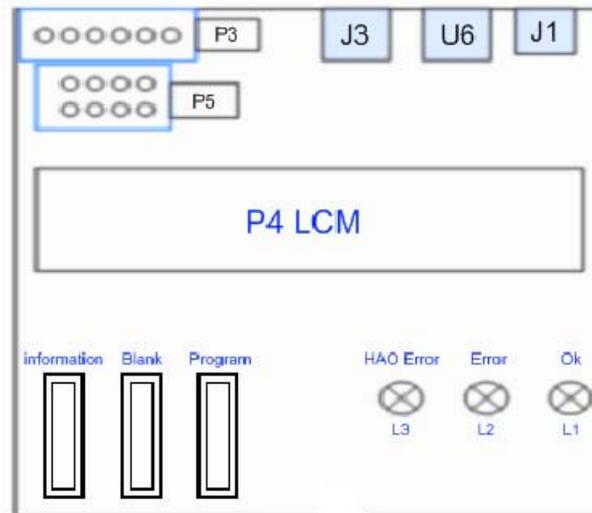
Figure 3- 15

(For the description of device, please refer to chapter 1.2)

L1 → Success message signal, green LED.

L2 → Failure message signal, red LED

Blank Check failed message signal, red LED.

HAO Frequency Calibration error message signal, red LED.

L3 → Busy message signal, red LED.

S1 → Programming button (Program→Verify), for offline program operation.

S2 → Blank Check button, for offline operation.

To implement offline operation, Hex file must be firstly downloaded to programmer Flash Memory. The procedure can refer to chapter 2.3.2 or chapter 2.3.3.

To implement offline operation, press S2 button can check if the IC is blank and the L1 Green LED should be lighted up. We suggest S2 button should be pressed first for checking if the IC is blank before you press S1 to proceed programming to ensure the programming will be success.

S1 Button is programming button. Its procedures are: Blank Check → Program → Verify and the L3 (Busy) message light should be lighted up. If "Program Protection" of "Assemble Option" is picked up before downloading data to Flash Memory, program protection will be executed after Verify completed. If "Program Protection" is not picked up, it will stop after Verify accomplished, L3 (Busy)

message light will go out and L1 Green LED will be lighted up.

When Programming finished, please press S2 to check if the IC is blank. At this moment, the L2 Red LED should be lighted up means the programming is success (because the data has been programmed into IC, so Blank Check is failed.)

If any failure or error happened during execution procedures, L2 Red LED will be lightened up. On the contrary, L1 Green LED will be lighted up if success.

4.2. Program Times Restriction

The menu of "Assemble Option" in interface setup has an option of "Enable Program Times" as described Figure 2-4. This option restricts the permitted program times of download program.

This is a safety mechanism that restrains the permitted program times, preventing it from over-programming on the production line.

After ticking up "Enable Program Times", key in the program times in the column below "Input Program Times" (maximum is 99999999, minimum is 1). This argument will be written into EEPROM of the programmer after the compiler programmed file is downloaded to Flash Memory. Afterwards, the enabled program times will reduce 1 each time when programming completed. If the value reduced to 0, the programming action may not be executed. At this time, an error signal (Red LED) will be lighted up but Blank Check still operates normally.

5. Information Button
5.1. Information Button

➢ Press Information button(S3), displaying HYCON IDE message.

```
Information 0 :
```
Wait for 1 second →
```
Welcome To Use
Hycon IDE
```

➢ Press Information button again, displaying Program Counter Times message.

1. If Program Counter Times is enabled.

```
Information 1 :
```
Wait for 1 second →
```
Program Counter
Enable
```

Wait for 2 seconds ↓

```
Program Counter
Left 99999998
```

Program times left
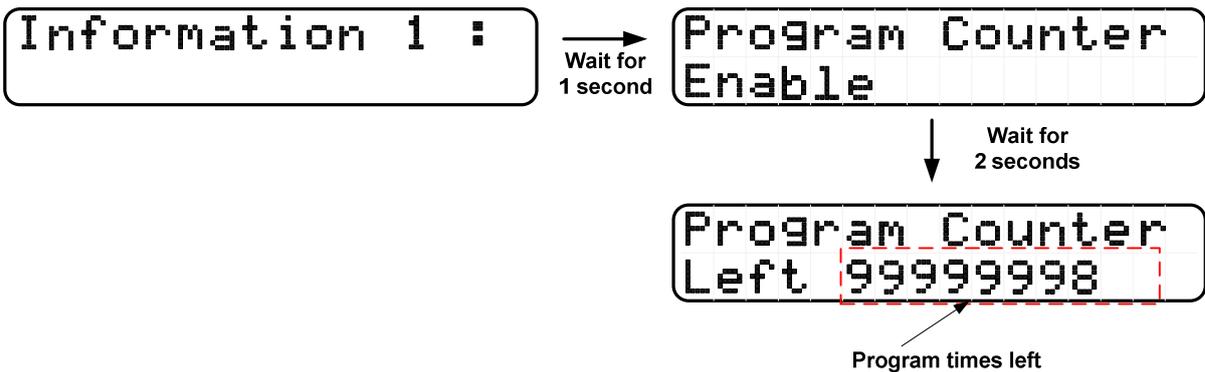
2. If Program Counter Times is disabled.

```
Information 1 :
```
Wait for 1 second →
```
Program Counter
Disable
```

➢ Press Information button again, displaying VDD and VPP voltage.

Display programmer's current VDD and VPP voltage

```
Information 2 :
```
Wait for 1 second →
```
VDD = 03.00V
VPP = 06.00V
```
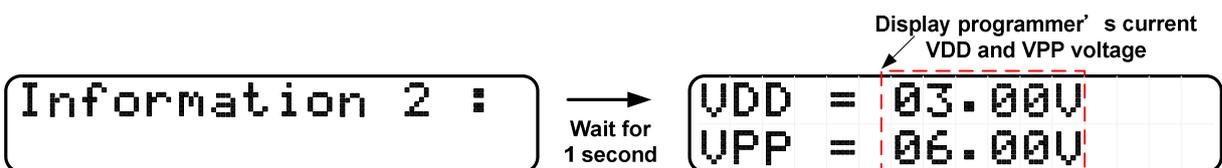
➢ Press Information button again, OTP ID and Flash stored ID.

```
Information 3 :
```
Wait for 1 second →
```
OTP ID =  0043
Flash ID = 0043
```

➢ Press Information button again, displaying error message.

1. If there is no error message.

```
Information 4 :
```
Wait for 1 second →
```
PASS       Che
cksum = 0x45ACh
```

Saved in Flash Memory Checksum
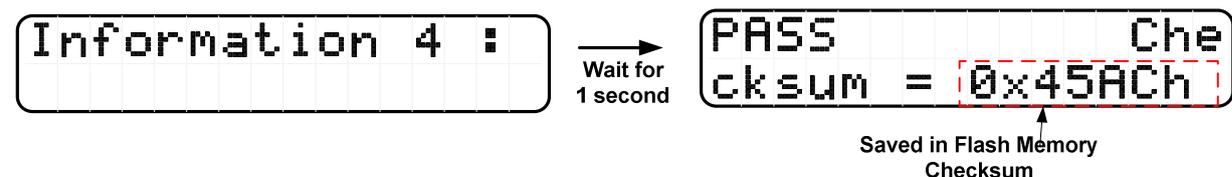
If there is any Frequency Calibration function is active.

```
Information    4:
```
→ **Wait for 1 second**
```
HHAO=xxxxKHZ  Che
Cksum= 0x45AC
```

Display the message by the time the hardware/software Frequency Calibration finished and the Checksum of Flash Memory
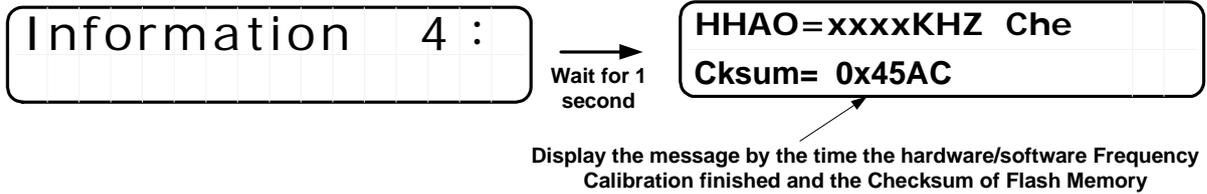
2. If there is error message.

```
Information 4 :
```
→ **Wait for 1 second**
```
Error 4
Blank Fail!
```

Display current error message
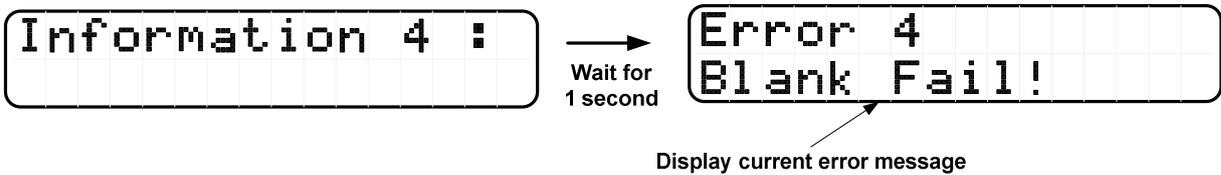
➢ Information 4-6 will display the message by the time Frequency Calibration finished. If the whole calibration is completed. The message will be displayed as follows:

```
Information    4:
```
→ **Wait for 1 second**
```
HHAO=xxxxKHZ  Che
Cksum=  0x45AC
```

Display the message by the time the hardware/software Frequency Calibration finished and the Checksum of Flash Memory

```
Information    5:
```
→ **Wait for 1 second**
```
SHAO=xxxxKHZ  Che
Cksum=  0x45AC
```

Display the message by the time the hardware/software Frequency Calibration finished and the Checksum of Flash Memory

```
Information    6:
```
→ **Wait for 1 second**
```
SLPO=xxxxKHZ  Che
Cksum=  0x45AC
```

Display the message by the time the hardware/software Frequency Calibration finished and the Checksum of Flash Memory

➢ Information 7-9 will display the configured calibrated message. The message will be displayed as follows when fully activated:

```
Information  7:
```
→ **Wait for 1 second** →
```
Cal.H-HAO= 2000
KHZ
```

Display the message which is the current value was set for Frequency Calibration

```
Information  8:
```
→ **Wait for 1 second** →
```
Cal.S-HAO= 2000
KHZ
```

Display the message which is the current value was set for Frequency Calibration

```
Information  9:
```
→ **Wait for 1 second** →
```
Cal.S-LPO= 28.00
KHZ
```

Display the message which is the current value was set for Frequency Calibration

5.2. Error Message

> VDD Error

```
Error 1
VDD = 2.12V
```

> VPP Error

```
Error 2
VPP = 4.92V
```

> OTP ID Error

```
Error 3
Chip ID ERROR
```

> Blank Fail

```
Error 4
Blank Fail!
```

> Program Fail

```
Error 5
Program Fail!
```

> Verify Fail

```
Error 6
Verify Fail!
```

> Protect Fail

```
Error 7
Protect Fail!
```

> Program Counter left zero

```
Error 8      Prog
ram Counter = 0
```

6. Revision History

Major differences are stated thereinafter:

Version	Page	Revision Summary
V03	All	First edition
V04	7	Add notice of Programmer, WK04
V06	5-7,12-13,16, 21	Revise related information of Programmer, WK05
	32-33	Add Frequency Calibration related description
V07	All	Add HY12P Series related operation description.