3. Recipe

3.1. Recipe

Recipe is composed of a block of similiar systematic data. Because of the similarity, user can edit them as a group of receipe for sending conveniently. By using this way, user can send data efficiently and exactly. Recipe is not applicable on all models; please refer to Appendix A. - Table of the ADP 6.0 Features and HMI Models for the complete details.

The following coating equipment is used to spray paint on different parts. The paint colors are limited to white, red, blue, dark and mixed color (1 = spray, 0 = no spray). One can use recipe to present and save the data with more simplification and convenience.

Coating Equipment

Color	White	Red	Blue	Black	Time
Top	1	0	0	0	3
Button	0	1	0	0	2
Left	0	1	1	0	1
Right	0	0	0	1	1

This recipe data has five variables: White, Red, Blue, Dark and Time.

1st Recipe Part: Top, White, 3 min. ,

2nd Recipe Part: Button, Red, 2 min.,

3rd Recipe Part: Left, Purple, 1 min.,

4th Recipe Part: Right, Black, 1 min.,

A variable represents a word, the recipe size is 5 and the Number of recipe is 4.

3.2. Recipe Operation Steps

This section will illustrate the operation and application of recipe. Section 3.1 Coating Equipment will be took as example.

1. First, a user needs to define **Recipe Register**. Select [Application]/ [Workstation Setup], and enter the PLC address, [Recipe size] and [Number of recipes] on the [Miscellaneous] tab. In this example, [Data size] = 5, [Number of recipes] = 4. See Figure 186.

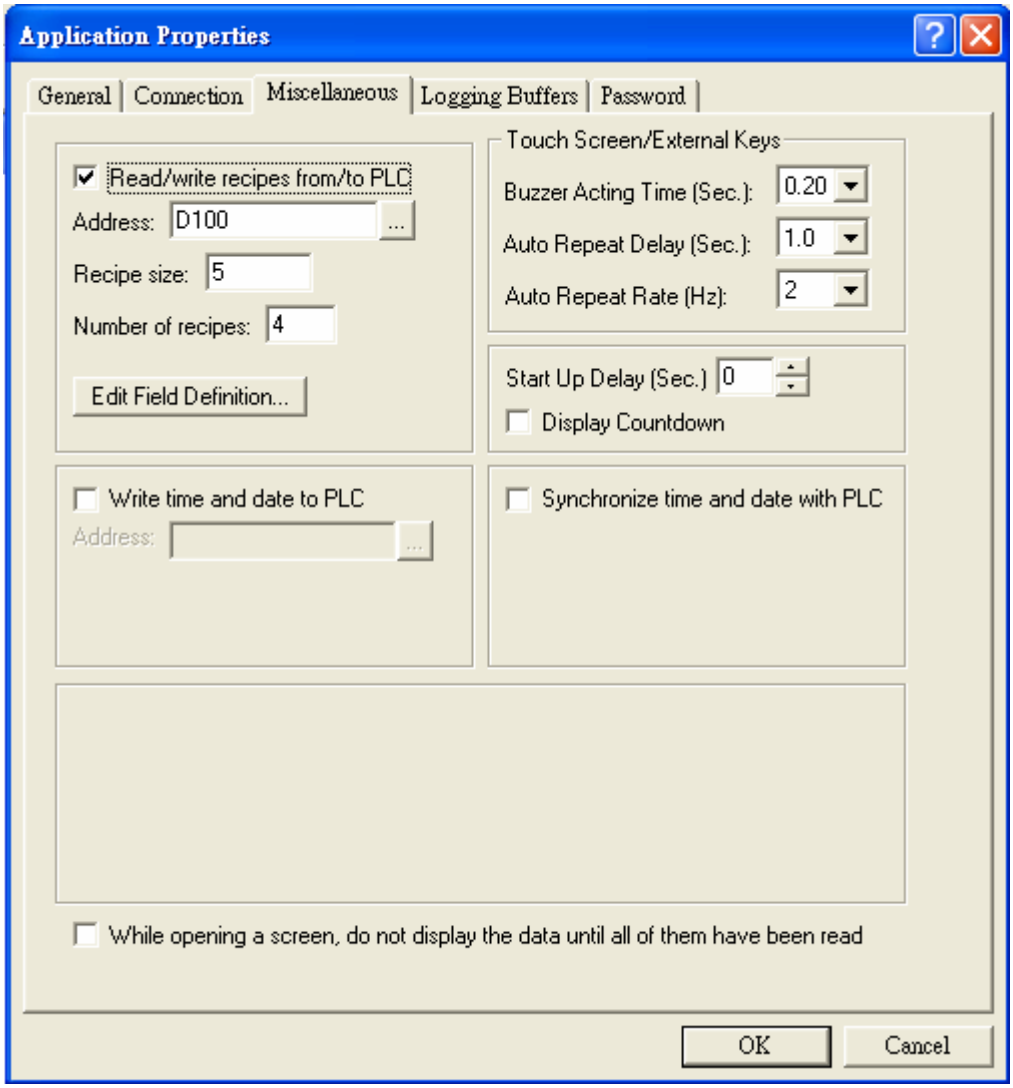

Figure 186. Setup [Recipe size] and [Number of recipes]

According to the above parameters setup, the starting address of PLC Recipe Register is D100, size is 5Words. The starting address of PWS Current Recipe is RCPW0, size is 5Words. The starting address of PWS RAM is RCPW5, size is 5*4Words.

If the Recipe Write Flag is ON, the HMI will write Current Recipe from PWS RCPW0~RCPW4 to PLC D100~D104. If the Recipe Read Flag is ON, the HMI write recipe from PLC D100~D104 to PWS RCPW0~RCPW4. If user wants the HMI to read/write the recipe data from/to the PLC, one needs to define RNR (Dn+5).

For the instructions of HMI recipe registers, please refer to the Section 4.3. Recipe Register.

2. Then, a user can edit its application and save as *.V6F. See Figure 187. In the example, [Numeric Entry] object is used to display the coating equipment data on HMI.

   RCPW5~RCPW9 represents 1st Top recipe data
   RCPW10~RCPW14 represents 2nd Button recipe data
   RCPW15~RCPW19 represents 3rd Left recipe data
   RCPW20~RCPW24 represents 4th Right recipe data

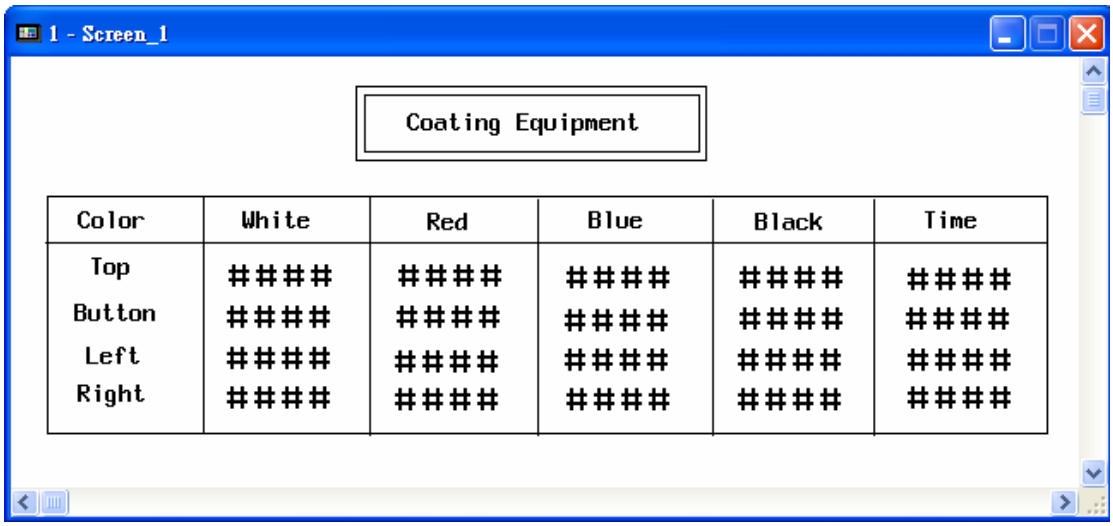

Figure 187. The Screen of Coating Equipment

3. Download the ADP file to HMI. First, select [Download Application] on HMI, then select [Application]/ [Download Firmware and Application] in ADP. The dialog box will be appeared as below in ADP. See Figure 188.

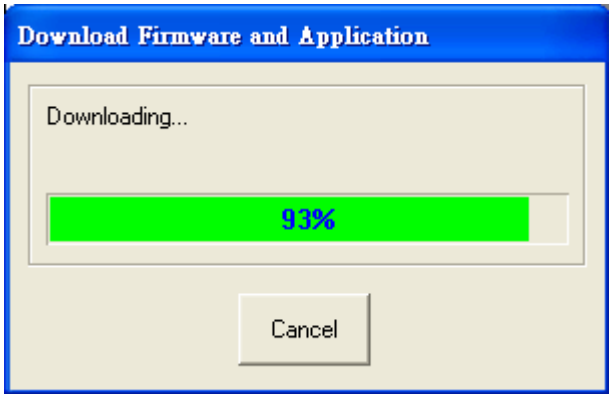

Figure 188. Download Firmware and Application

4. Then upload the recipe from HMI to ADP. Select [Upload Recipes] on HMI, then select [File]/[Upload Recipes] in ADP.

The recipe will be uploaded to ADP and saved as *.RCP. See Figure 189.

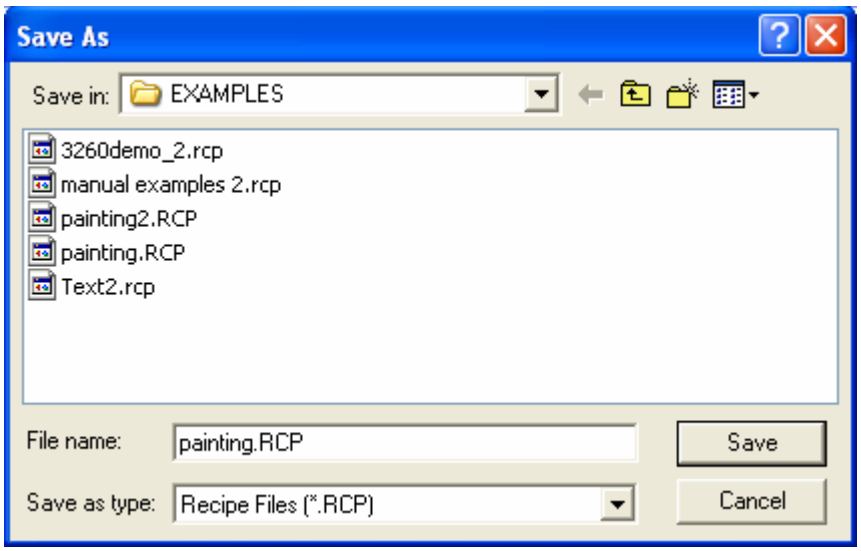

Figure 189. Save the Upload Recipe

5. After the above steps have completed, the recipe file can be open to edit. Select [Tool]/ [View/Edit], the ADP receipe edit dialog box should be appeared as Figure 190. Select [File]/ [Open] and select the desired recipe file (ex. “painting.RCP”). Note: Recipe files “*.RCP” must be uploaded and saved in HMI first, the recipe size and number of recipes can not be modified

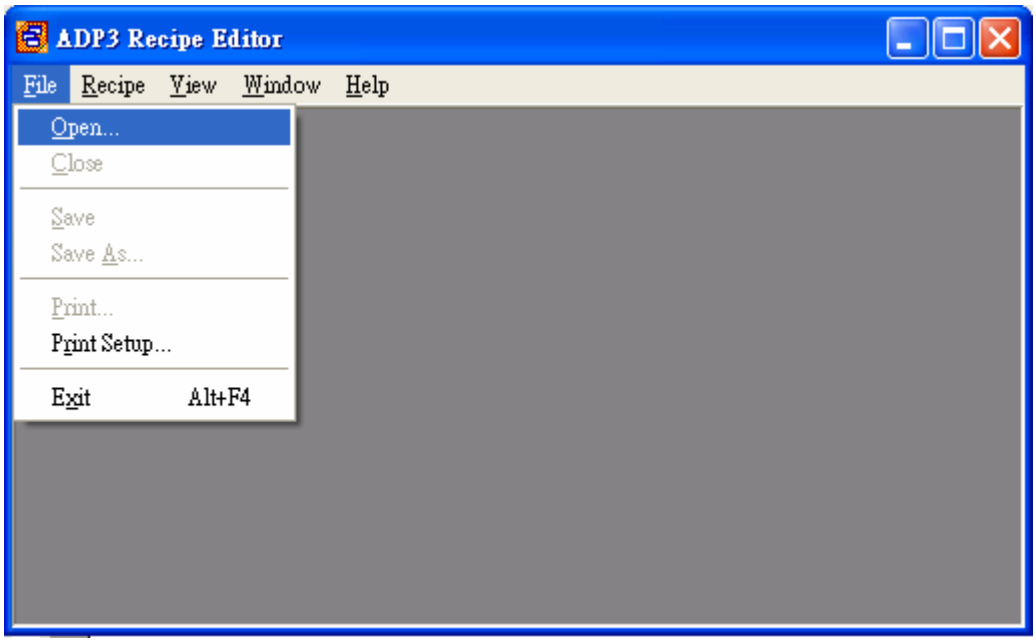

Figure 190. The ADP Recipe Editor Dialog Box

6. Select [Recipe]/[Open] to edit the recipe, enter the recipe number to open. See Figure 191. The examples of coating equipment are [Recipe Number] =1~4.

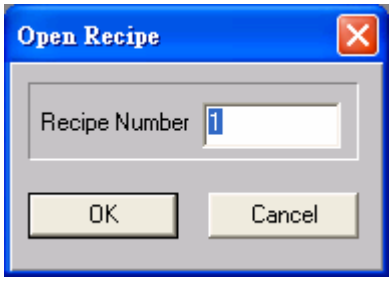

Figure 191. Specify Recipe Number

7. Its dialog box should be appeared on the screen. See Figure 192. A user can edit the data in the dialog box. Note that the count of editable data is data size. After edit, select [File]/[Save] to save the data. For example, Recipe #1 is (1,0,0,0,3), Recipe #2 is (0,1,0,0,2)…etc.

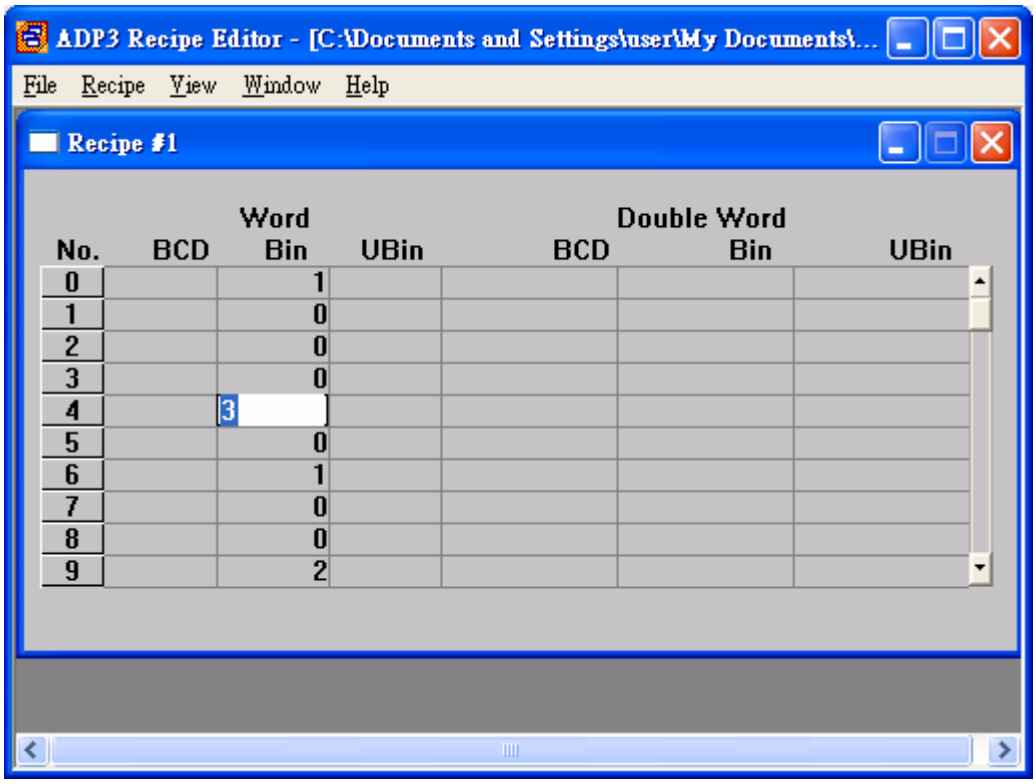

Figure 192. Edit the Recipe Data

8. Select [Download Recipes] on HMI, then select [File]/ [Download Recipes] to download the recipe file. See Figure 193.Figure 193

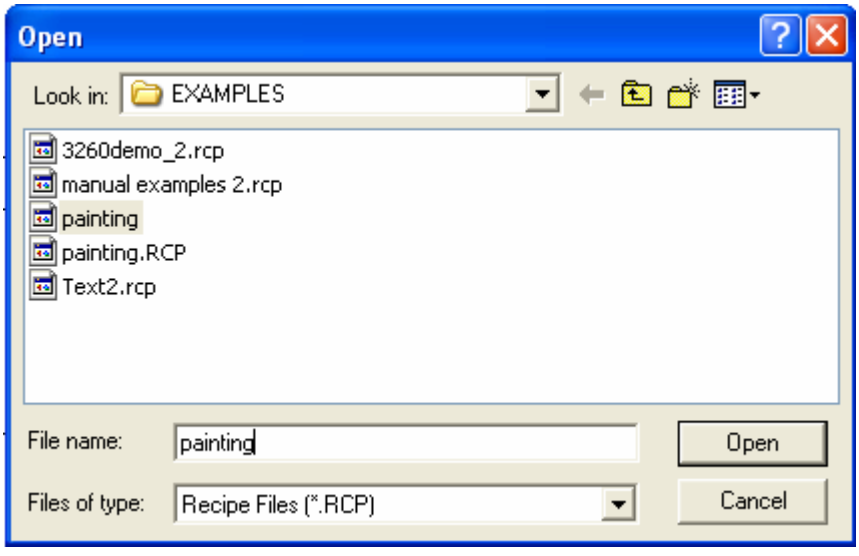

Figure 193. Open Download Recipe

9. Finally, select [Run] on HMI. The HMI will display the recipe filled with data as the screen displayed in ADP. The illustration of coating equipment includes painting methods and time. See Figure 194.

Coating Equipment

Color	White	Red	Blue	Black	Time
Top	1	0	0	0	3
Button	0	1	0	0	2
Left	0	1	1	0	1
Right	0	0	0	1	1

Figure 194. The Recipe Data on HMI

3.3. PLC Controls HMI Recipe

After the recipe is completed, a user can assign PLC to control the recipe through the communication between PLC and HMI. The PLC can read/write the recipe from/in HMI. This section will introduce the PLC setup and corresponding execution related to HMI. For the introduction of communication between PLC and HMI, please refer to Ch 4 Control and Status Block for the complete details.

The main steps to read recipe from PLC to HMI:

1. Set up continuous blocks, one is control block; the other is status block. Select [Application]/[Workstation Setup] in ADP, enter the PLC address and its size in [Control Block] and [Status Block] on the [General] tab. The minimize size is 6 Words for recipe in [Control Block].

2. Take coating equipment as example, the control block of PLC FX Series is D0-D5, size is 6; the status block is D10-D15. See Figure 195. For the properties which are not explained in this section, please refer to the Section 4.1. [Control Block] and the Section 4.2. [Status Block].

   (**Recipe Register** is defined the same as the Section 3.2. Recipe Operation Steps, the starting address is D100; Size is 5.

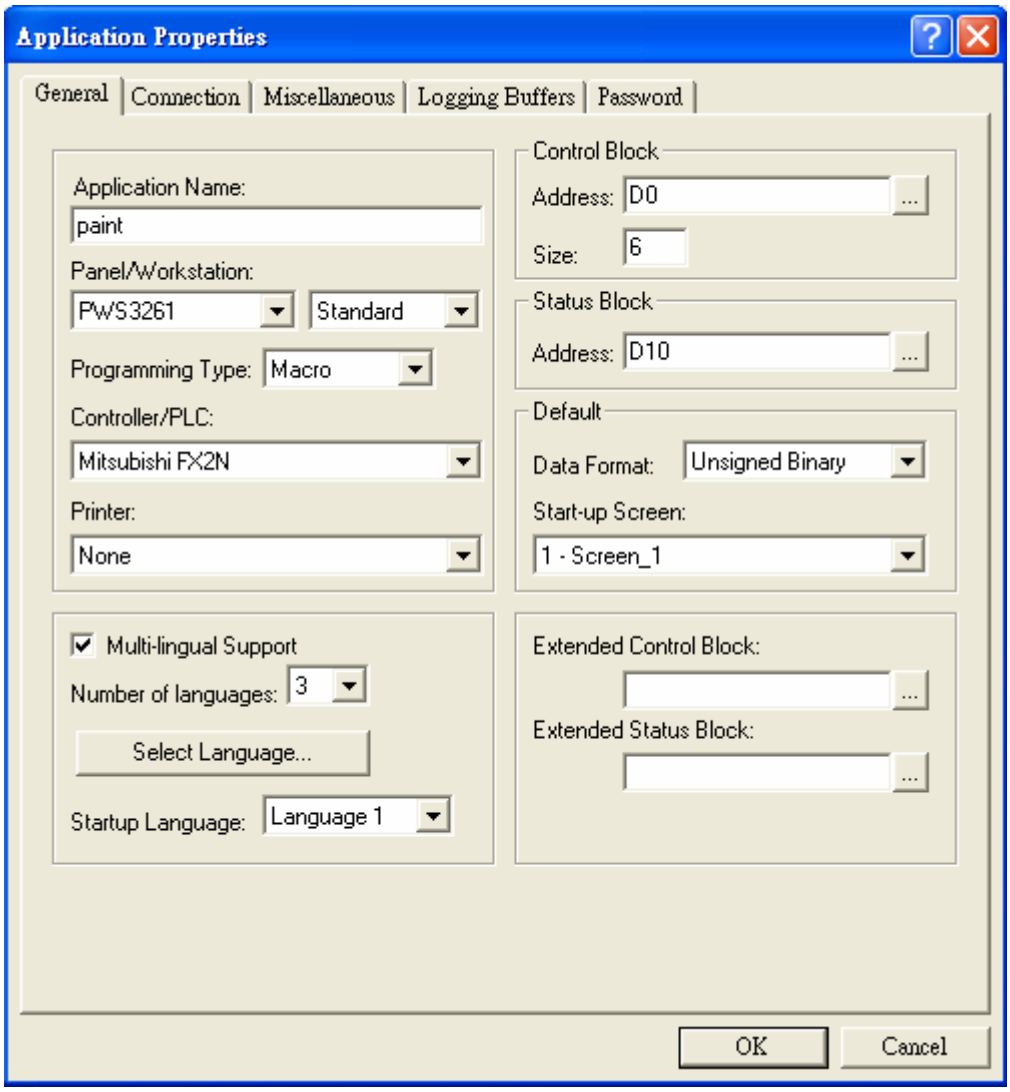

Figure 195. Setup [Control Block] and [Status Block]

The following are Words and its name in PLC. The Words related to read/write recipe displays with light blue background. Please refer to the Chapter 4. Control and Status Block for the complete details.

3. Recipe

PLC Internal Data Block

	Word	Bit	Member
Control Block	D0	0 1 2 . . . . . 13 14 15	SNR
	D1	. . . . . **4 5 6**	**CFR**
	D2	.	LBCR#1
	D3	.	LBCR#2
	D4	.	LBCR#3
	D5	**0 1 2 . . . . . 13 14 15**	**RNR**
		. . .	
Status Block	D10	0 1 2 . . . . . 13 14 15	SSR
	D11	. . . . . **4 5 6**	**GSR**
	D12	.	LBCR#1
	D13	.	LBCR#2
	D14	.	LBCR#3
	D15	**0 1 2 . . . . . 13 14 15**	**RIR**
		. . . . .	
Recipe Register	D100	1	1st Recipe,1st Word
	D101	0	1st Recipe, 2nd Word
	D102	0	1st Recipe, 3rd Word
	D103	0	1st Recipe, 4th Word
	D104	3	1st Recipe, 5th Word
		. . .	

- CFR bit#4 is Recipe Write Flag; bit#5 is RCPNo Change Flag; bit#6 is Recipe Read Flag.
- GSR bit#4 is Recipe Write Status; bit#5 is RCPNo Change Status; bit#6 is Recipe Read Status.

3. Setup RNR to read recipe#N. The PLC D5 is assigned to read recipe#N from HMI. For example, 1st recipe N = 1.
4. Then set RCPNo Change Flag ON about 1sec. The HMI internal RCPNo and Current Recipe will be changed to read recipe#N. Remember to set RCPNo Change Flag OFF before re-trigger.

- **Status Block:** When the value of RCPNO is changed, the value of RIR (D15) will be changed as well. And the current recipe#N can be checked from PLC. Besides, if the RCPNo Change Flag sets ON, the GSR bit (D11 bit#5) will be set ON as well. The status bit will turn OFF automatically after the change of RCPNo.

For the steps of addressing recipe data, please refer to the Chapter 4. Addressing Recipe Data- For Enhanced HMI for the complete details.

HMI Data Register

Word	Recipe Data	Member
RCPW0	1	Current Recipe
RCPW1	0	
RCPW2	0	
RCPW3	0	
RCPW4	3	
RCPW5	1	Recipe #1
RCPW6	0	
.	0	
.	0	
RCPW9	3	
RCPW10	0	Recipe #2
RCPW11	1	
.	0	
.	0	
RCPW14	2	
.	.	.
.	.	.
.	.	.
.	.	.
RCPW20	0	Recipe #4
RCPW21	0	
.	0	
.	1	
RCPW24	1	
.	.	.
.	.	.
RCPNo	1	**Specified Recipe#N**
.	.	.
.	.	.

5. Finally, set Recipe Write Flag ON; then the HMI will write the Current Recipe in PLC. The recipe data will be saved in the designated **Recipe Register Block.** Remember to set the Recipe Write Flag OFF before re-trigger. In this example, set D1 bit#4 ON around 1 sec. Then the HMI will write the Current Recipe in PLC D100-D104.

- **Status Block:** When the HMI has written a recipe in, the GSR bit (D11 bit#4) will be set ON automatically. Simultaneously, if the Recipe Write Flag set OFF, the GSR bit will be set OFF as well.

After the above-mentioned steps have completed, the PLC can read one circle of a recipe from HMI. Remember to reset the flag OFF each time to trigger the flag.

Following the above-mentioned steps to set the RNR, RCPNo Change Flag and Recipe Read Flag and read a recipe from PLC to HMI .

3.4. The control of PLC recipe for HMI

The convenience of the HMI display can help user to control the PLC by the designed objects on HMI . The read or write action of the PLC receipe data can be controlled on HMI. Please refer to the Chapter 4. Control and Status Block.

This section takes coating equipment as example to control the PLC recipe data. The following is an illustration of coating equipment on HMI.

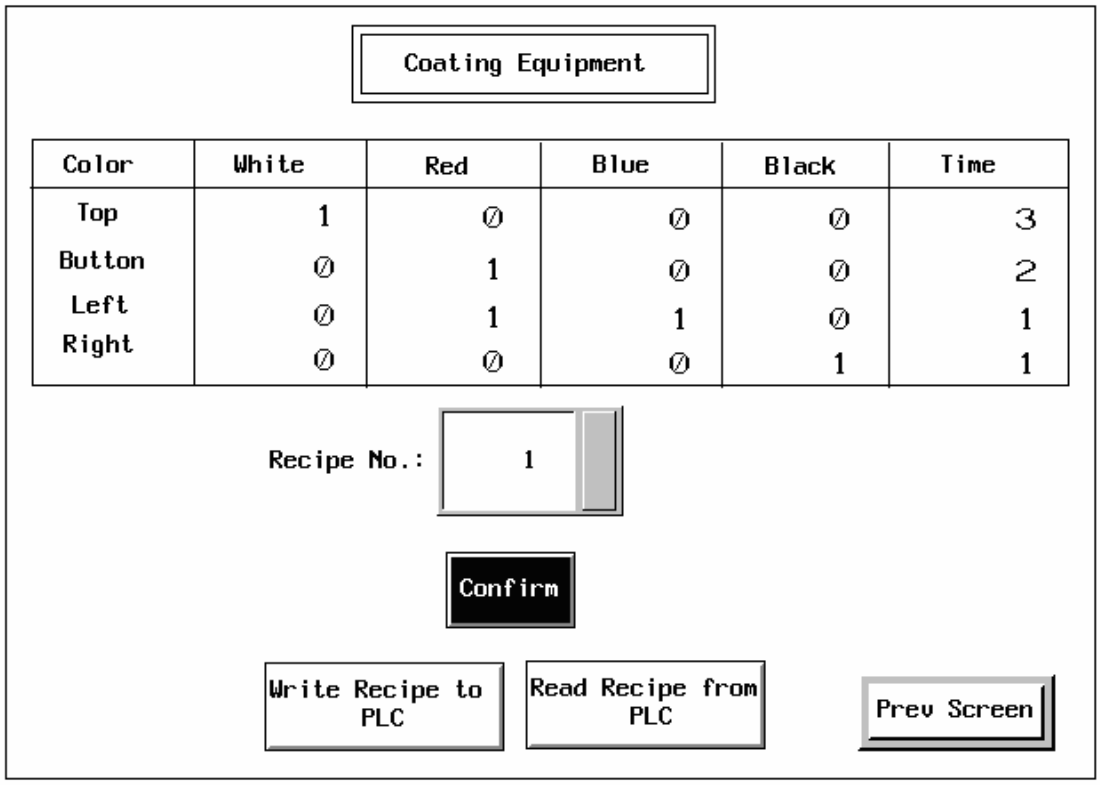

Figure 196. An Illustration of Coating Equipment on HMI

Steps to Object Design:

1. Design an object for user to enter the recipe N and write the recipe N in PLC RNR.

   In ADP, select [Object]/[Numeric Entry] and enter the address of RNR in [Write] box. See below. Take the coating equipment as example, the address of RNR is D5; so the PLC recipe N will write in D5.

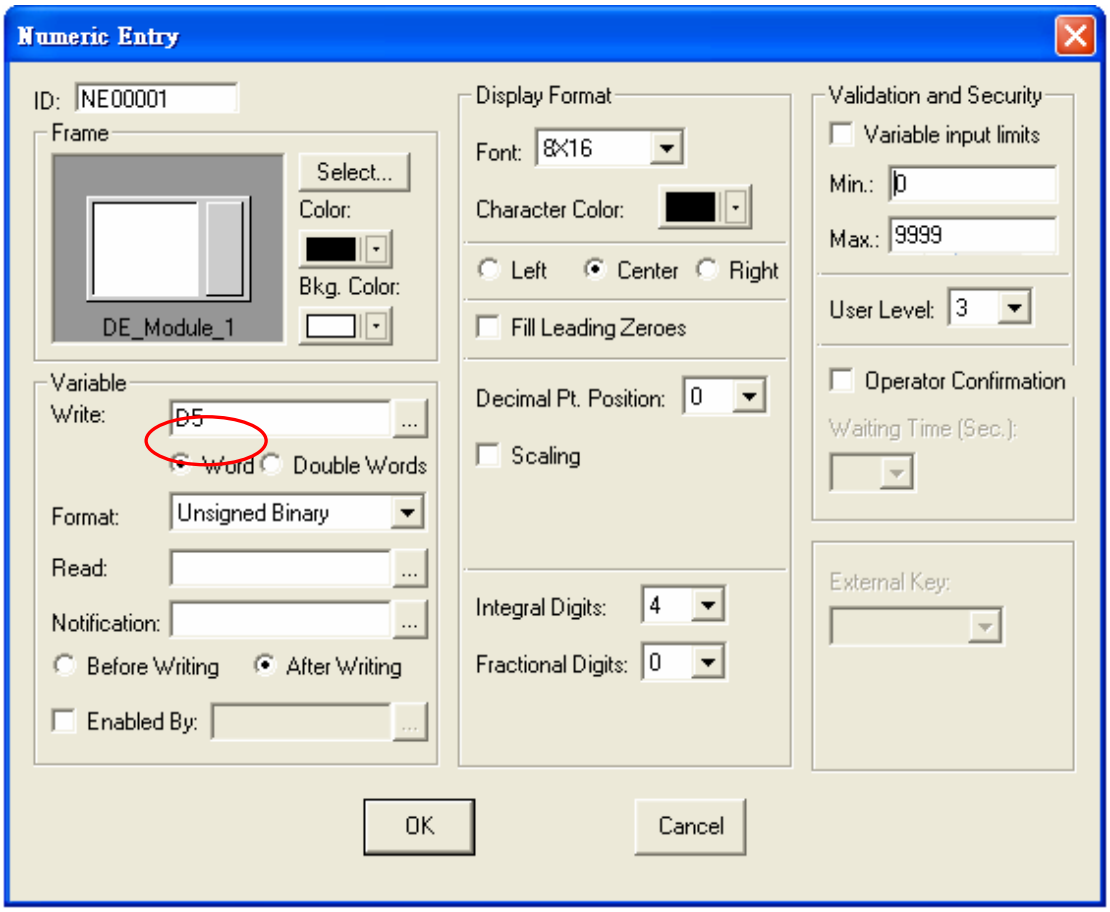

Figure 197. Setup the address to write recipe N in PLC RNR

2. Design an object which can confirm the designated recipe and write the commands to PLC CFR bit#5 RCPNo Change Flag; set the flag ON.

   In ADP, select [Object]/[[Push Button]/[Set Constant]. First, enter the address of CFR in [Write] box. Then enter the constant value in [Value] box to set its register bit. See below.

   Take coating equipment as example, the address of CFR is D1. RCPNo Change Flag is located in CFR bit#5. The constant is set "32" ($2^5 = 32$), so the RCPNo Change Flag will be set ON.

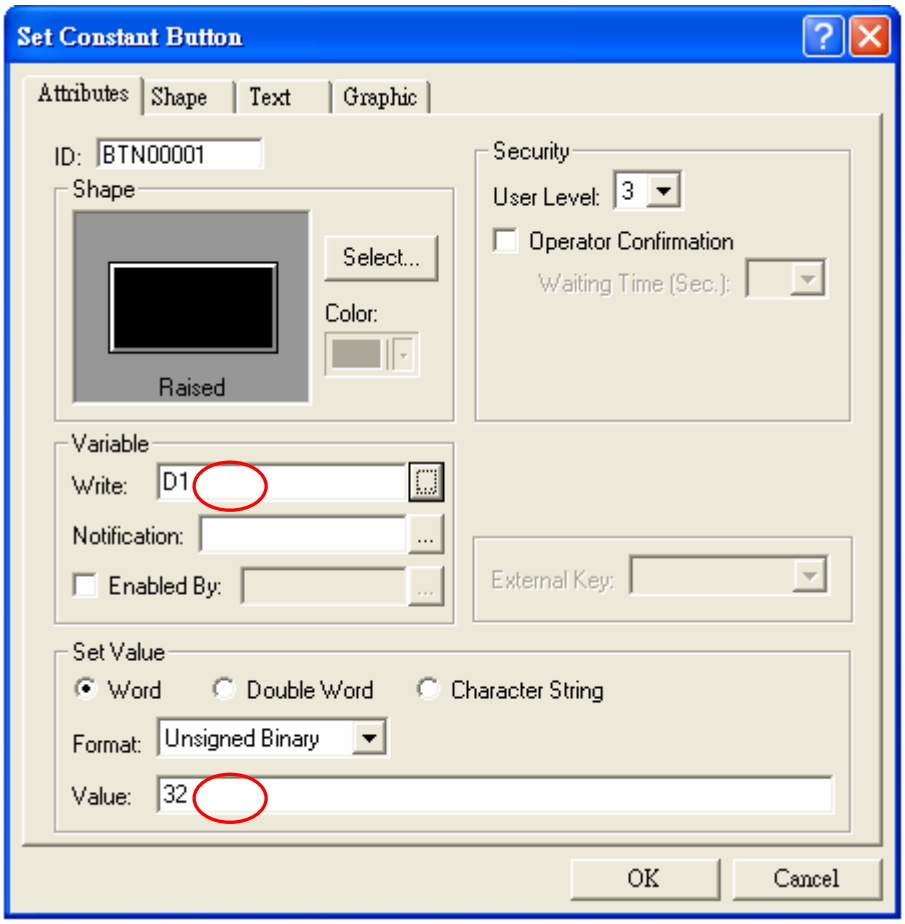

Figure 198. Set RCPNo Change Flag ON

3. Finally, design an object which can set CFR bit#4 Recipe Write Flag ON and write the Current Recipe in PLC.

4. Take coating equipment as example, the address of CFR is D1. The Recipe Write Flag is located in CFR bit#4, enter the value "16" ($2^4 = 16$). Then the Recipe Write Flag located in D1 bit#4 will set ON. See below.

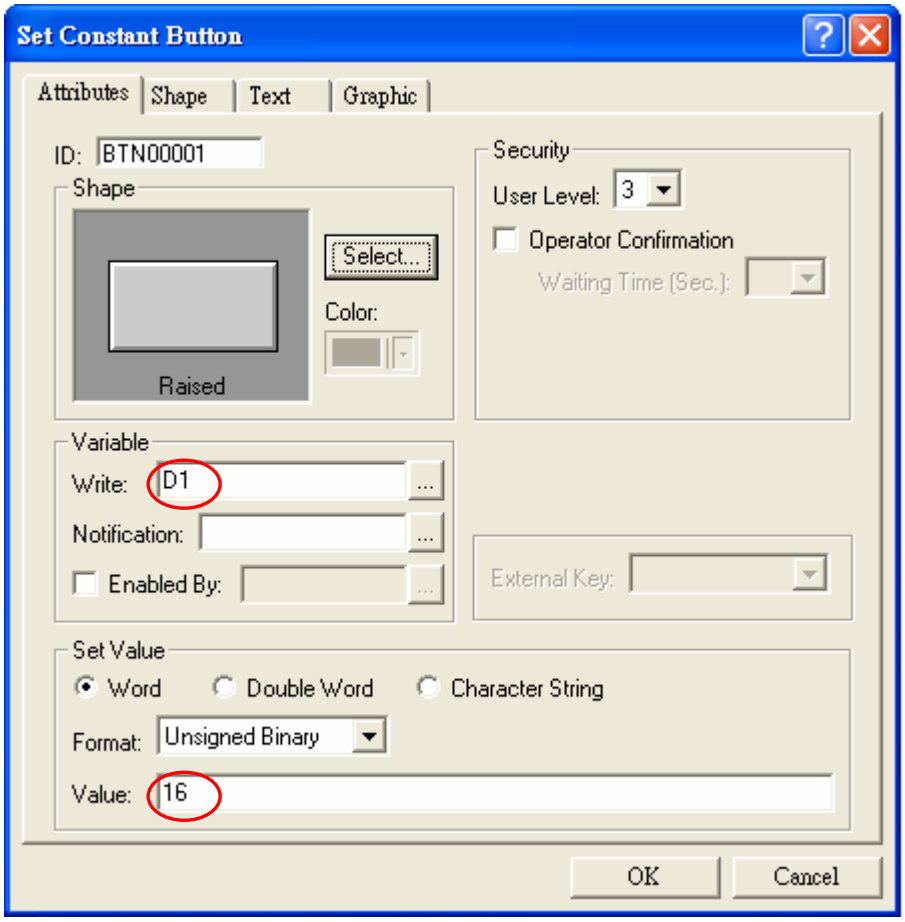

Figure 199. Setup Recipe Write Flag ON

5. If a user wants to read a recipe from PLC to HMI, the Recipe Read Flag located in CFR bit#6 must be set ON.

   Take the coating equipment as example, the address of CFR is D1.The Recipe Flag is located in CFR bit #6 (2^6 = 64). See below.

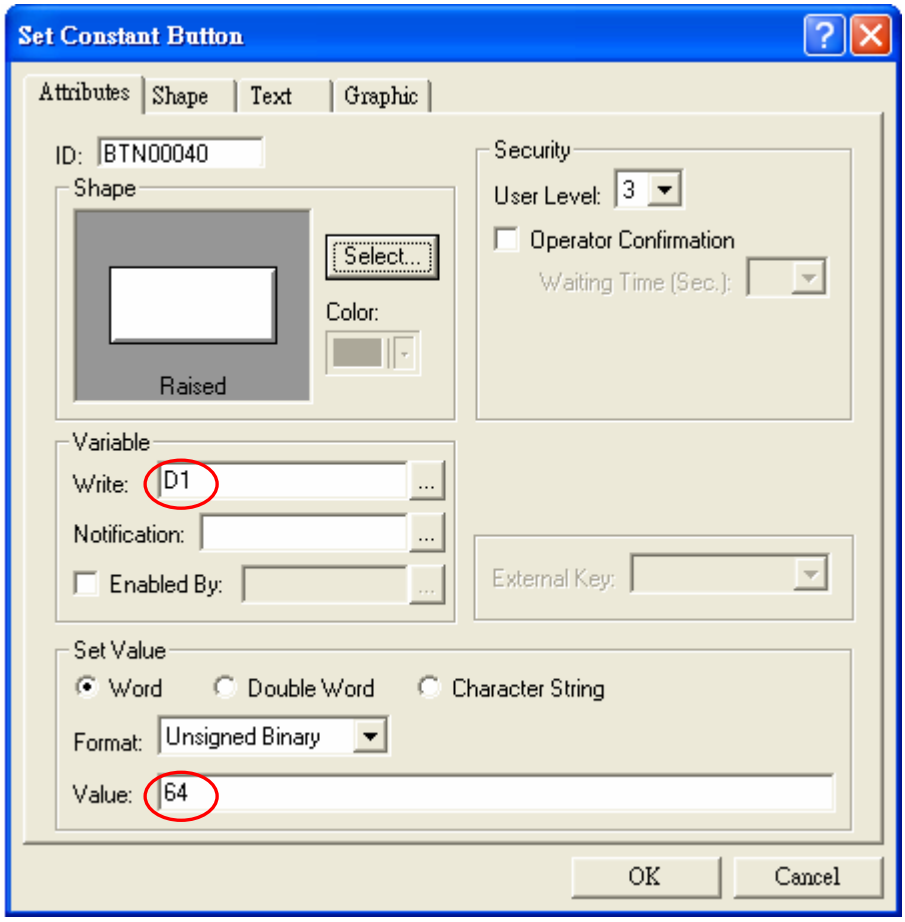

Figure 200. Setup Recipe Read Flag ON

After the above-mentioned steps of object design has completed, a user can execute the actions on HMI conveniently and directly. See Figure 200.