

## New Hot-Swap And Redundant Solution For The WP-8xx7 or VP-25W7/23W7

by [chun@icpdas.com](mailto:chun@icpdas.com) and [cony@icpdas.com](mailto:cony@icpdas.com)

To meet the requirement of the tough industrial application, ICP DAS releases the New Hot-Swap and redundant solution for the WinPAC-8xx7 (or VP-25W7/23W7 or Wincon-8347 / 8747). This redundant system has setup two “Active IP” address points to the active Controller 's LAN1 and LAN2 ports always. One or two or more PC / HMI / SCADA can communicate with this redundant system via one of the two given active IP. So the PC / HMI / SCADA can have access to the system easily without any notice, on which WinPAC-8xx7 (or VP-25W7/23W7 or W-8x47) is currently active. Moreover, the new redundant system can integrate with the RU-87P4 and RU-87P8 expansion unit plus the I-87K high-profile I/O cards to support the hot-swap application. If any I/O card is damaged, the maintenance person just takes one good-card with same model name to hot-swap the damaged one without stopping this redundant system.

The system contains two WP-8xx7 (or two VP-25W7/23W7 or two W-8x47), plus one NS-208 or two NS-205/208 (Industrial Ethernet Switch), and at least one RU-87P4 or RU-87P8 expansion base plus at least one I-87K high-profile I/O card. One Controller is named as ”Main” PAC, the other is called the “Backup” PAC. The Main PAC takes the control in normal case and its LAN1 and LAN2 IP are automatically changed to the Active\_IP1 and Active\_IP2. If it is damaged, the Backup PAC will take the control and also change to the Active\_IP1 and Active\_IP2 automatically. So the PC / HMI don't care about which one is active, and just connects continuously.

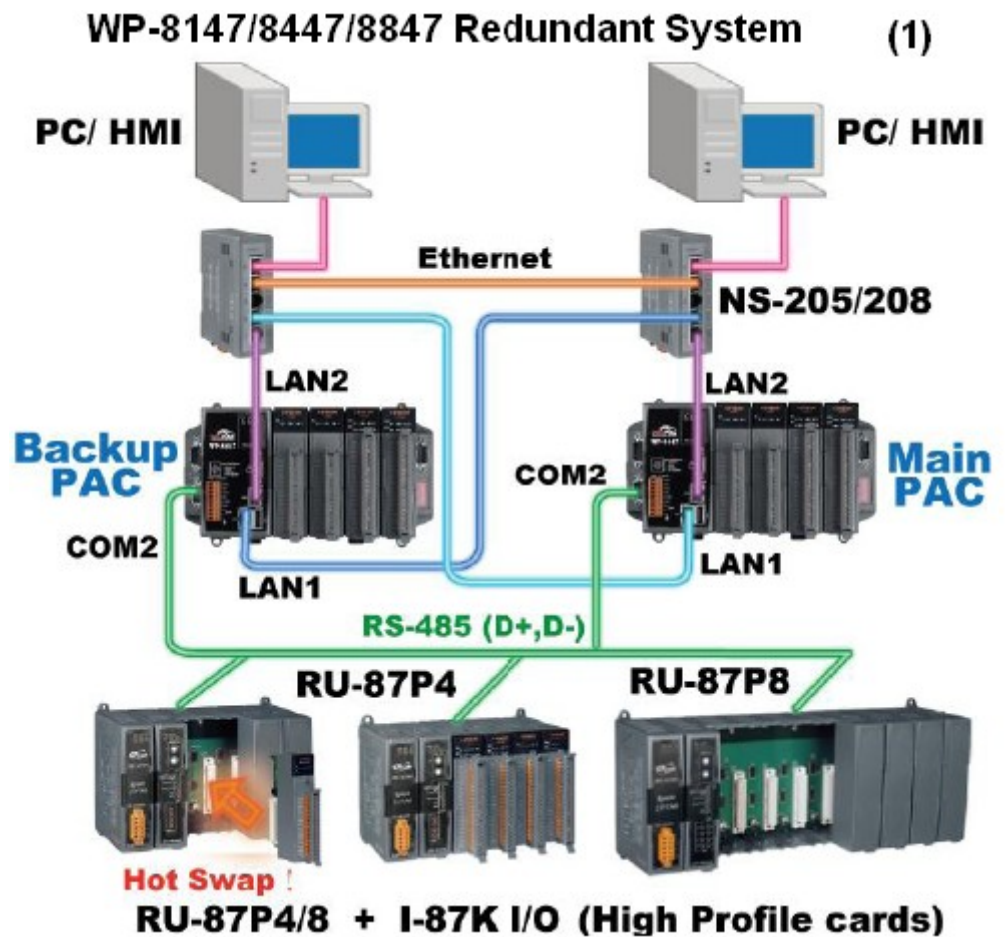
Please refer to more information at [www.icpdas.com](http://www.icpdas.com) > FAQ > Software > ISaGRAF > 093

### Feature :

Controller is redundant

Ethernet is redundant

I/O is Hot-Swap



## New VP-2xW7 Hot-Swap Redundant System (2)

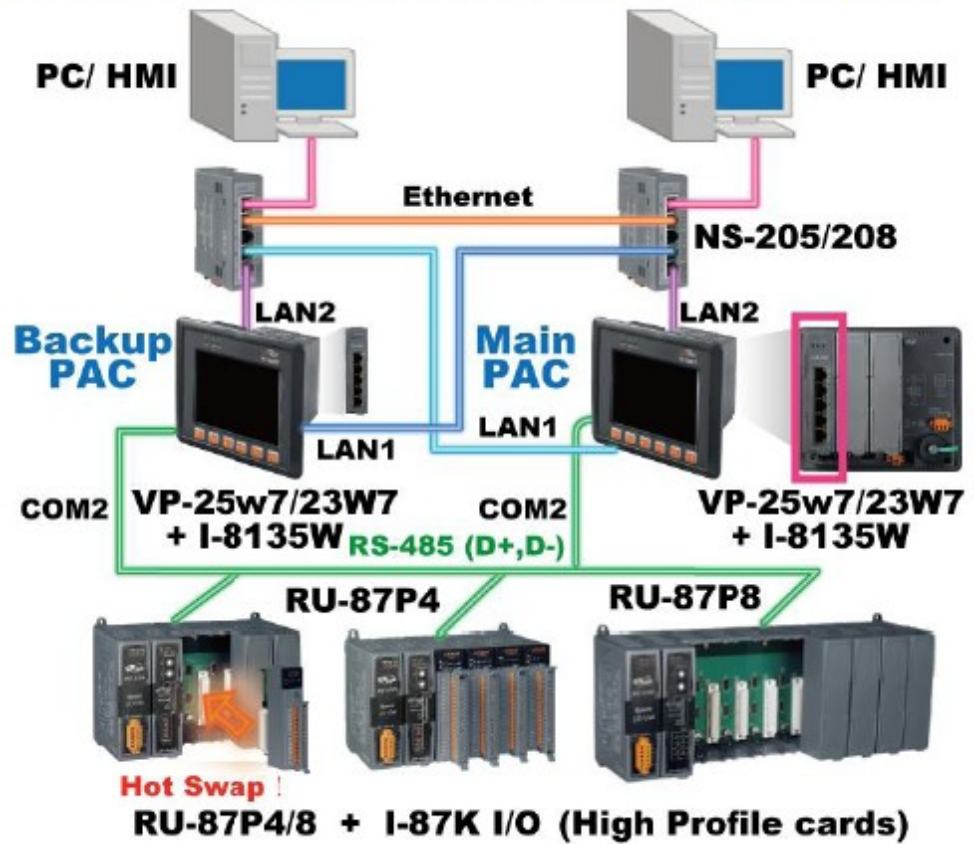
### Feature :

Controller is redundant

Ethernet is redundant

I/O is Hot-Swap

(Note: Please plug one I-8135W in VP-25W7/23W7 to enable the second ethernet port)



Please refer to more information at [www.icpdas.com](http://www.icpdas.com) > FAQ > Software > ISaGRAF > 093

Data Sheet : <http://www.icpdas.com/products/PAC/i-8000/data%20sheet/data%20sheet.htm>

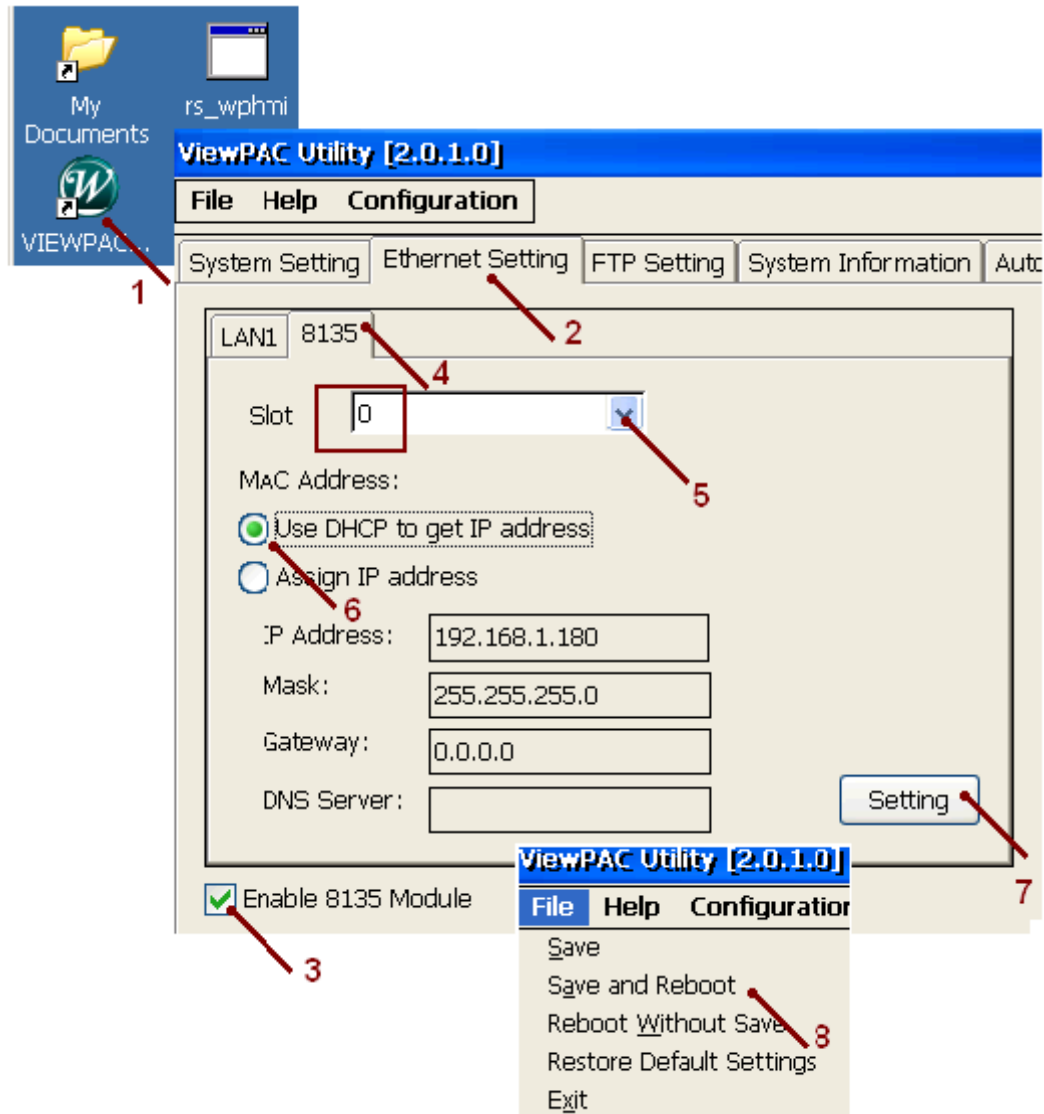
ISaGRAF driver : <http://www.icpdas.com/products/PAC/i-8000/isagraf-link.htm>

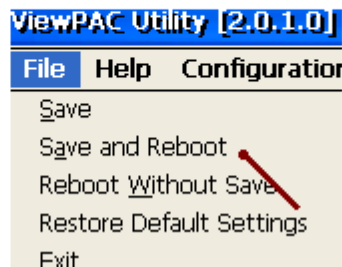
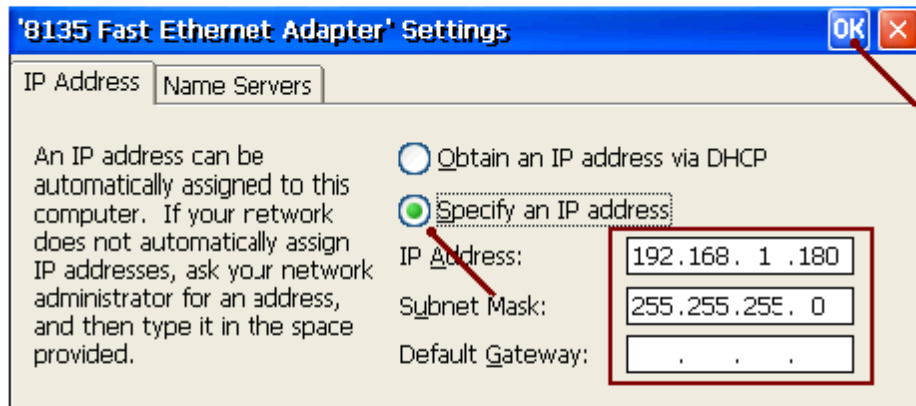
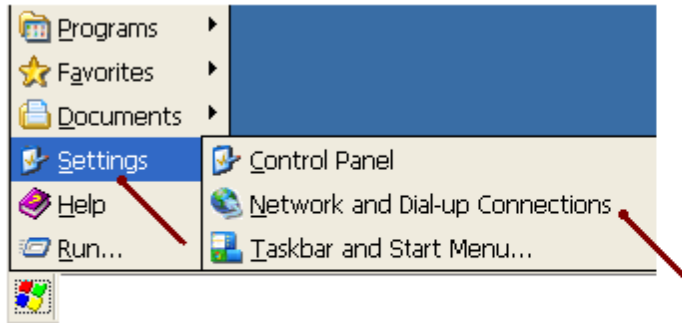
RU-87P4 / RU-87P8 : [http://www.icpdas.com/products/io\\_expansion\\_unit/ru-87p/ru-87p4.htm](http://www.icpdas.com/products/io_expansion_unit/ru-87p/ru-87p4.htm)

I-87K high-profile I/O : [http://www.icpdas.com/products/PAC/i-8000/8000\\_IO\\_modules.htm#i87](http://www.icpdas.com/products/PAC/i-8000/8000_IO_modules.htm#i87)

## How to enable the second ethernet port of the VP-25W7/23W7 plus I-8135W ?

(Please refer to Appendix D of the Getting Started: VP-25W7/23W7 for detail steps)





The following redundant system doesn't install any I-7000 or I-87K I/O or I-8KE4-MTCP or I-8KE8-MTCP I/O.

Please refer to ISaGRAF example program "wpdmo72d.pia"  
(COM2 of these two WP-8xx7 must connect to each other.)

Please refer to more information at [www.icpdas.com](http://www.icpdas.com) > FAQ > Software > ISaGRAF > 093

Data Sheet : <http://www.icpdas.com/products/PAC/i-8000/data%20sheet/data%20sheet.htm>

ISaGRAF driver : <http://www.icpdas.com/products/PAC/i-8000/isagraf-link.htm>

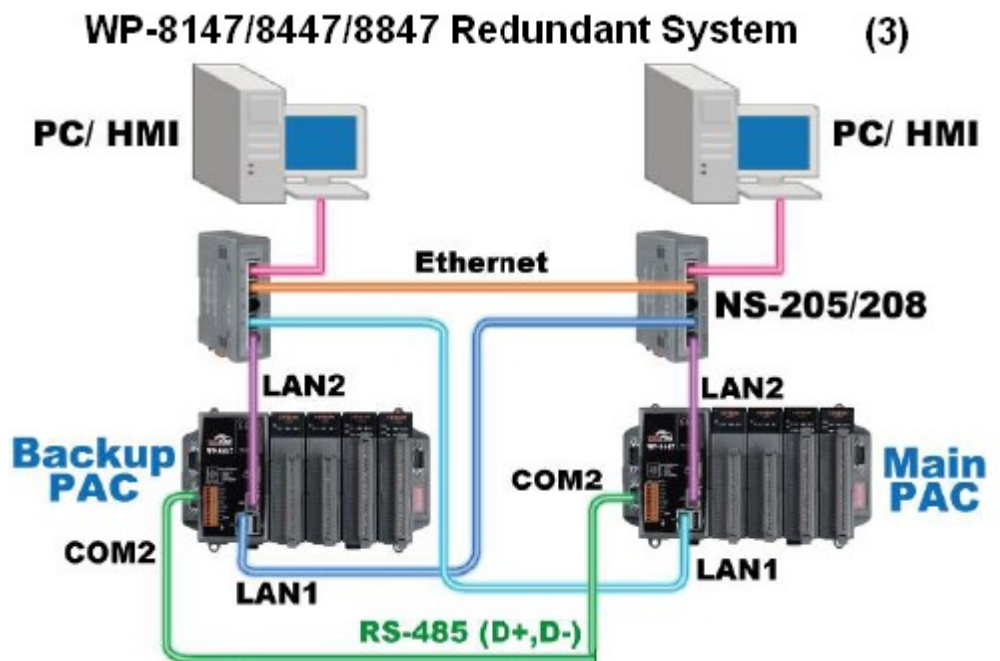
Feature :

Controller is redundant

Ethernet is redundant

No using I-7000 and

I-87K I/O

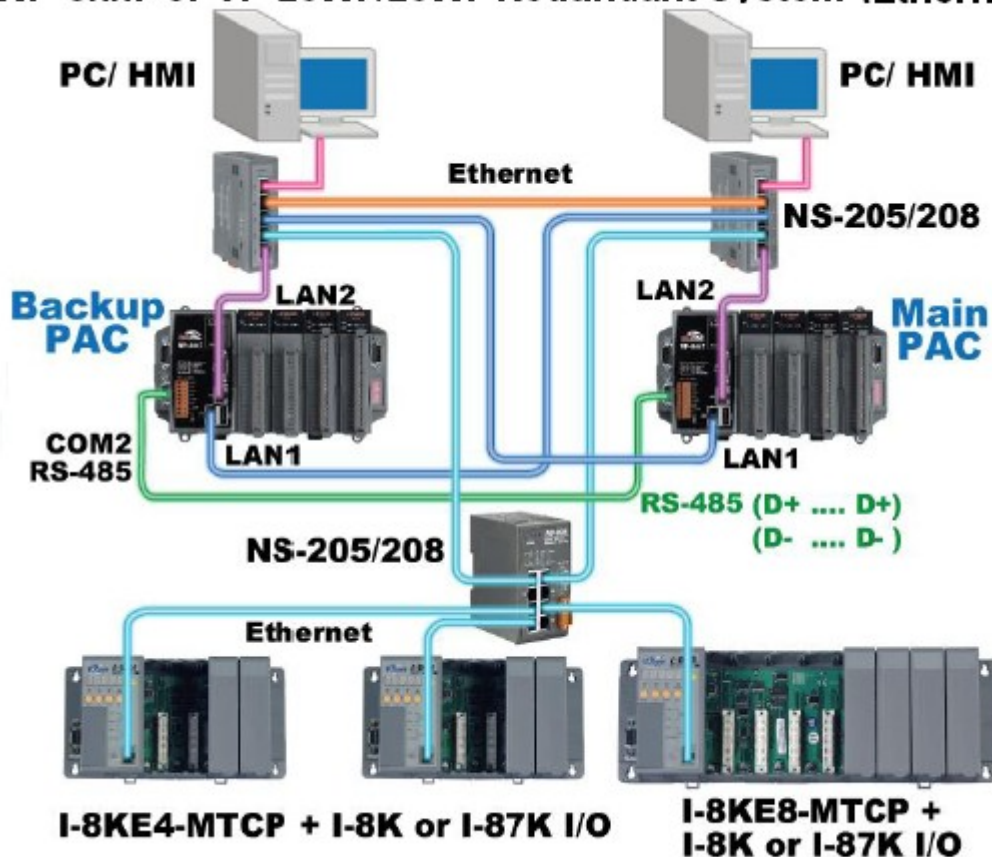


Without RS-485 Remote I/O !

The new redundant system can also integrate with the I-8KE4-MTCP and I-8KE8-MTCP I/O as the following figure. The I/O scan rate will be faster than the RS-485 I/O in RU-87P4 and RU-87P8 expansion base. However it doesn't provide the Hot-Swap feature.

(Please must wire the COM2:RS-485 of these two WinPAC-8147/8447/8847 or VP-25W7/23W7 together if using the I-8KE4-MTCP or I-8KE8-MTCP as I/O. If the controller are using two Wincon-8347/8747, please wire their COM3: RS-485 together )

#### WP-8xx7 or VP-25W7/23W7 Redundant System (Ethernet I/O) (4)



[Note: VP-25W7/23W7 must plug in one I-8135W to support redundant system.]

- (WP-8xx7: “wpdmo72a.pia” and VP-25W7: “vdpmo72a.pia” use COM2 to connect RU-87P4 + I-87064W)
- (Wincon-8x47 : “wdmo\_72a.pia” and “wdmo\_72b.pia” use COM3 to connect RU-87P4 + I-87064W as I/O)
- (WP-8xx7 , VP-25W7 : “wpdmo72c.pia” uses I-8KE4-MTCP + I-87064W as I/O)
- (Wincon-8x47 : “wdmo\_72c.pia” uses I-8KE4-MTCP + I-87064W as I/O)
- (Wincon-8x47 : “wpdmo72d.pia” uses no I-7000 and I-87K I/O)

**The major I/O of the WP-8xx7 (or VP-25W7/23W7 or W-8x47) new redundant system must use one of the following.**

1. RS-485 I/O: RU-87P8+I-87K high profile I/O or I-7000 or I-87K4/5/8/9+I-87K I/O cards (only RU-87P8 + I-87K high profile I/O cards support Hot-Swap) (refer to “wpdmo72d.pia” for no I-7000 / I-87K I/O)
2. Ethernet I/O: I-8KE4-MTCP or I-8KE8-MTCP plus I-8K or I-87K I/O cards.

These PAC also support additional I/O if one of the above I/O is installed. They are “RS-485 Modbus RTU Slave I/O” or “RS-485 Modbus ASCII Slave I/O”. Please use the COM5 to COM10 – RS-485 ports in the i-8142 / 8144 / 8142i card plug in W-8x47 's slot 1 to 4 to connect these Modbus I/O. (For WP-8xx7 , there should be one COM3: RS-485 to connect the Modbus RTU/ASCII I/O. )



## 1.1 : Important Note and Operation Principle

The Wincon-8x47 supports the new redundant solution since its **ISaGRAF driver version 4.03**.  
The WP-8xx7 and VP-25W7/23W7 support the new redundant solution (**driver Ver. 1.03 or later**).  
**The OS image of the Wincon-8x47 must use the version released at Jul.01,2008.**

(W-8x37 doesn't support the new redundant solution)

[ftp://ftp.icpdas.com/pub/beta\\_version/WinCon\\_OS\\_Image/](ftp://ftp.icpdas.com/pub/beta_version/WinCon_OS_Image/) (Please refer to FAQ094 to update OS)

English OS: nk\_8x4x\_20080701\_EN\_CAB\_V200.bin

Traditional Chinese OS: nk\_8x4x\_20080701\_TC\_CAB\_V200.bin

Simplified Chinese OS: nk\_8x4x\_20080701\_SC\_CAB\_V200.bin

### Important note:

Before starting up the redundant system, please make sure the WinPAC-8xx7 's (or W-8x47 's) LAN1 and LAN2 cable are setup correctly (Please plug one i-8135W in VP-25W7/23W7 and enable its 2nd ethernet port) and connected to the NS-205 / 208 as the figure listed in the former page. And also check if the WinPAC-8xx7 's COM2:RS-485 cable (or VP-25W7/23W7 's COM2:RS-485 or Wincon-8x47 's COM3: RS-485) is connecting well to at least one RS-485 I/O (WP-8xx7 or VP-25W7/23W7 Main PAC and Backup PAC 's COM2 must link together if I/O is using the I-8KE4-MTCP or I-8KE8-MTCP, while COM3 must link together for the Wincon-8xx7). And check if the Controller 's rotary switch is setting well. (The “Main” PAC must set at 7 position, while position 9 is for the “Backup” PAC). **Then power up controllers only if all of the above installation of LAN1, LAN2, WP-8xx7 's COM2 (or VP-25W7/23W7 's COM2 or W-8x47 's COM3) and rotary switch is OK.**

### Other note:

1. There should be at least one RS-485 I/O module or card connected in the WP-8xx7 or VP-25W7/23W7 's COM2 (or W-8x47 's COM3) to work normally. For example, the I-7000 module, I-87K4/5/8/9+I-87K cards or the RU-87P1/2/4/8 + I-87K high-profile cards (if the I/O is using I-8KE4-MTCP or I-8KE8-MTCP, please plug at least one I-8K or I-87K I/O card). All **output** channels should be installed in the RS-485 remote I/O modules or expansion units (or if the I/O is using I-8KE4-MTCP or I-8KE8-MTCP, install inside them). However the **input** channels can be installed in the RS-485 remote I/O modules or expansion units (or if the I/O is using I-8KE4-MTCP or I-8KE8-MTCP, install inside them) or in WP-8xx7 's slot 0 thru. 7 (or W-8x47 's slot 1 thru. 7).

2. Each WP-8xx7 (or W-8x47) has two 10/100Mbps ethernet ports. One is LAN1, the other is LAN2 (Please plug one i-8135W in VP-25W7/23W7 and enable its 2nd ethernet port). Please enable them both. The new redundant system has four IP address setting in **running mode**. They are Active\_IP1 , Active\_IP2 and InActive\_IP1, InActive\_IP2. These 4 IP address are set in the ISaGRAF project (Not in the VGA monitor of controllers). The new redundant system will auto-change each controller 's ethernet port to the proper IP address. The active controller will use the Active\_IP1 and Active\_IP2, the other In-active controller will use the InActive\_IP1 and InActive\_IP2. These 4 IP address should be set in the same IP domain. That is the first three number should be the same and the last number should be different. For example, setting

Active\_IP1 = 192.168.2.191 , Active\_IP2 = 192.168.2.192,

InActive\_IP1 = 192.168.2.193, InActive\_IP2 = 192.168.2.194. (refer to step 3 listed in section 1.2)

3. To download the ISaGRAF code into the new redundant system, the controller must use four another IP address setting in **design mode**. The IP address in the design mode is set on the controller 's VGA monitor with a mouse. Recommend to set as the following example.

For ex., if the IP in running mode is set as the above item 2, then here can set the two IP of the “Main” PAC

on the VGA monitor as

LAN1 = 200.168.2.191, LAN2 = 200.168.2.192 , Mask = 255.255.255.0.

(The IP address of the design mode should be in the different domain than the IP of the running mode to prevent IP conflict accidentally)

Then for Backup PAC is LAN1 = 200.168.2.193, LAN2 = 200.168.2.194, Mask = 255.255.255.0

4. The redundant system only allow the PC / ISaGRAF to download the ISaGRAF code when the rotary switch is set at position 8 or 0 when power up the controller. Then using IP address setting as item 3 to download it. (The rotary switch position 7 and 9 means the redundant controller is in running mode. It doesn't allow ISaGRAF to stop / download program).

5. If the applied I/O is the **RU-87P1/2/4/8** plus the I-87K high-profile cards, please must use the DCON utility version 5.05 (or newer version) to configure the RU-87Pn + I/O cards once. Then it can be hot-Swap. If the I/O is **I-87K4/5/8/9** plus I-87K I/O (whatever high-profile or not), it doesn't support hot-swap.(DCON utility at [ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/driver/dcon\\_utility/setup/](ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/driver/dcon_utility/setup/) )

### Operation Principle:

1. The new redundant system setup two Active IP pointing to the active WinPAC-8xx7 's (or VP-25W7/23W7 or Wincon-8x47 's) LAN1 and LAN2 ports always. The PC / HMI / SCADA can connect to one or two of the Active\_IP1 and Active\_IP2 without knowing which controller is currently active.

2. The “Main” PAC (the one with rotary switch set at 7) **will** take the control of the new redundant system in normal case when power up both controllers. And its LAN1 IP will auto-change to Active\_IP1, LAN2 will auto-change to Active\_IP2. It controls all of the control logics and all I/Os.

3. The “Backup” PAC (the one with rotary switch set at 9) **will not** take the control of the new redundant system in normal case when power up both controllers. And its LAN1 IP will auto-change to InActive\_IP1, LAN2 auto-change to InActive\_IP2. The “Backup” PAC will take the control when the “Main” PAC is damaged, or power lost or I/O communication has problem .

When the “Backup” PAC takes the control, it controls all of the control logics and all I/O. And also auto-change its LAN1 to be Active\_IP1, while LAN2 auto-change to Active\_IP2.

4. If the “Main” PAC is back on line again after the “Backup” PAC has taken the control, the active “Backup” PAC will not release the control to the “Main” PAC. This In-active “Main” PAC will take the control later when the active “Backup” PAC is damaged , or power lost or I/O communication has problem.

5. All redundant data is exchanged by the connected Ethernet cable. They will be exchanged once in about every 0.075 second . If one cable of the controller is broken, the redundant data will be exchanged by the other connected cable. However if both of the two ethernet cable of controller 's LAN1 and LAN2 are broken, no data can be exchanged.

6. The PAC change-over time is about 0.5 second after the active PAC is damaged if the I/O is using the RS-485 I-7000 or I-87K I/O. The PAC change-over time is about 0.5 to 12 seconds after the active PAC is damaged if the I/O is using the I-8KE4-MTCP or I-8KE8-MTCP I/O.



## 1.2: Writing the ISaGRAF program

The Wincon-8x47 supports the new redundant solution since its **ISaGRAF driver version 4.03**.  
The WP-8xx7 and VP-25W7/23W7 support the new redundant solution (**driver Ver. 1.03 or later**).

**The OS image of the Wincon-8x47 must use the version released at Jul.01,2008.**

(W-8x37 doesn't support the new redundant solution)

[ftp://ftp.icpdas.com/pub/beta\\_version/WinCon\\_OS\\_Image/](ftp://ftp.icpdas.com/pub/beta_version/WinCon_OS_Image/) (Please refer to FAQ094 to update OS)

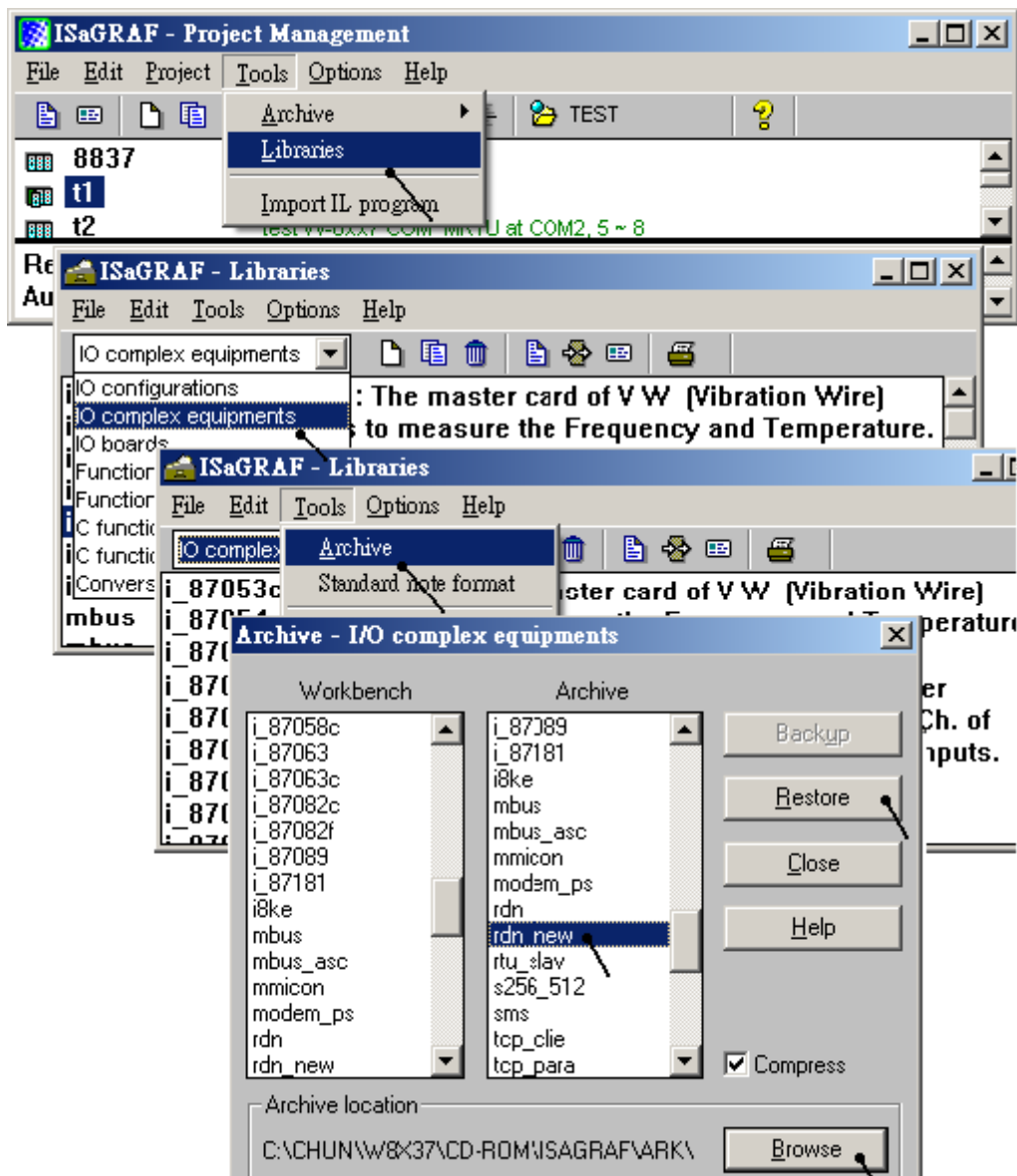
English OS: nk\_8x4x\_20080701\_EN\_CAB\_V200.bin

Traditional Chinese OS: nk\_8x4x\_20080701\_TC\_CAB\_V200.bin

Simplified Chinese OS: nk\_8x4x\_20080701\_SC\_CAB\_V200.bin

Below example is the “wdmo\_72a.pia” and “wdmo\_72b.pia”. (Please refer to section 9.5 of “User's Manual of ISaGRAF PAC” to restore them to ISaGRAF) . They can be download at [www.icpdas.com](http://www.icpdas.com) > FAQ > Software > ISaGRAF > 093 . (For WP-8xx7 is “wpmo72a.pia”, for VP-25W7/23W7 is “vpdmo72a.pia”)

**Step 1 :** Please make sure if the “rdn\_new” - I/O complex equipment has been installed into the ISaGRAF workbench. The file name is “rdn\_new.xia” (visit [www.icpdas.com](http://www.icpdas.com) > FAQ > Software > ISaGRAF > 093).



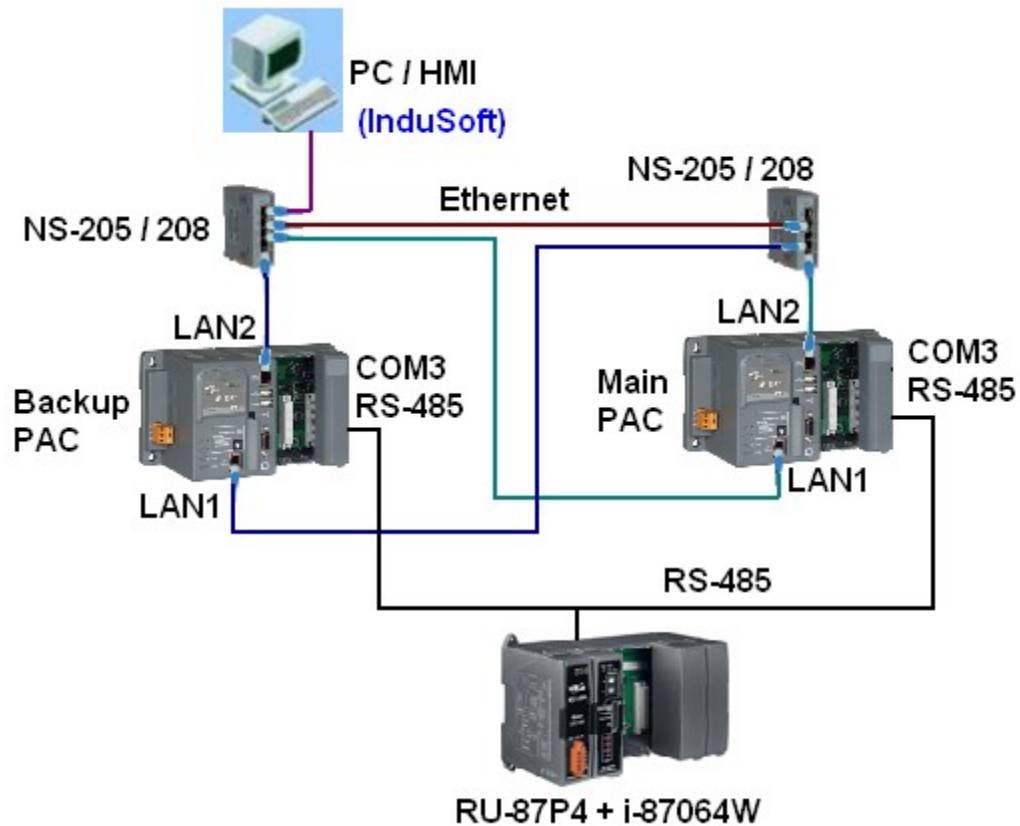
## Step2: Configure the I-87K High-profile I/O Cards and Setup the New Redundant System

(This example is using Wincon-8x47 's “wdmo\_72a” . For WinPAC-8xx7, please use “wpdmo72a”. For VP-25W7/23W7, please use “vpdmo72a”)

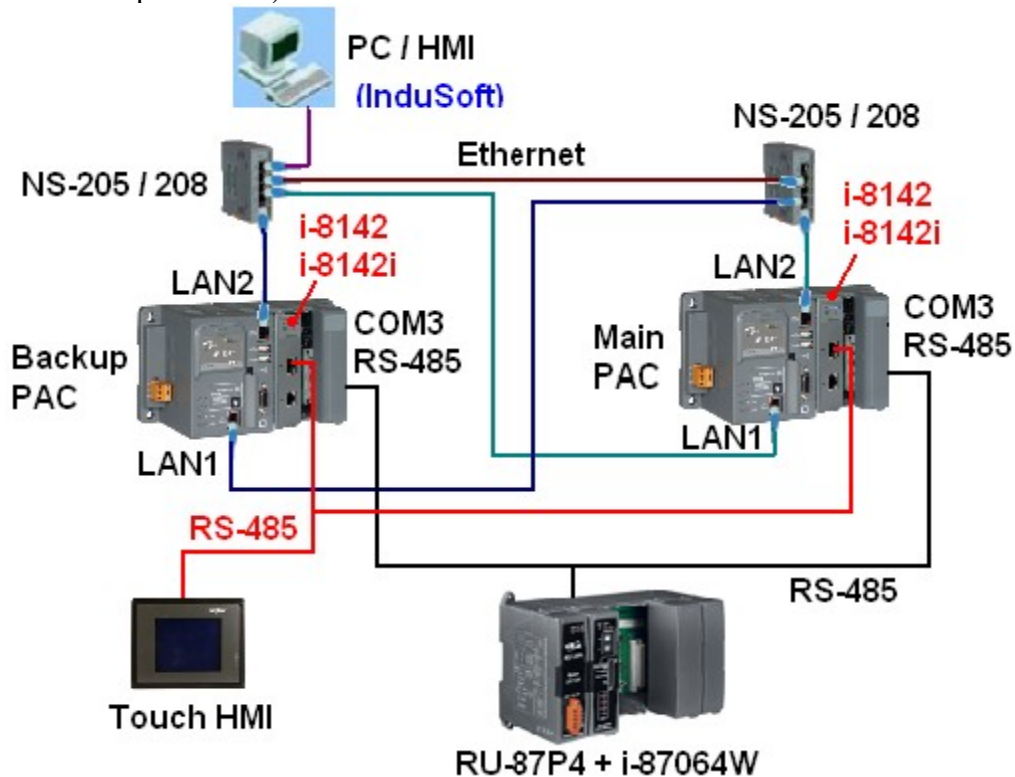
(Please refer to the “wpdmo72d.pia” if there is no I-7000 and I-87K I/O connected. )

In the “wdmo\_72a”, please plug one I-87064W in the first slot of the RU-87P4. Then run the DCON utility to configure it once. This example will apply **9600, 8, N, 1, No Checksum** to connect the I-87064W with **Addr = 2**. Please visit [http://www.icpdas.com/products/io\\_expansion\\_unit/ru-87p/ru-87p4.htm](http://www.icpdas.com/products/io_expansion_unit/ru-87p/ru-87p4.htm) > Manual to know the procedure to configure the RU-87P1/2/4/8 and I-87K high-profile cards. (**Note:** Please set the RU-87P4 to “Auto-Config” mode and set its Addr to 1, then the address of the I-87064W plugged in the first slot will become 2)

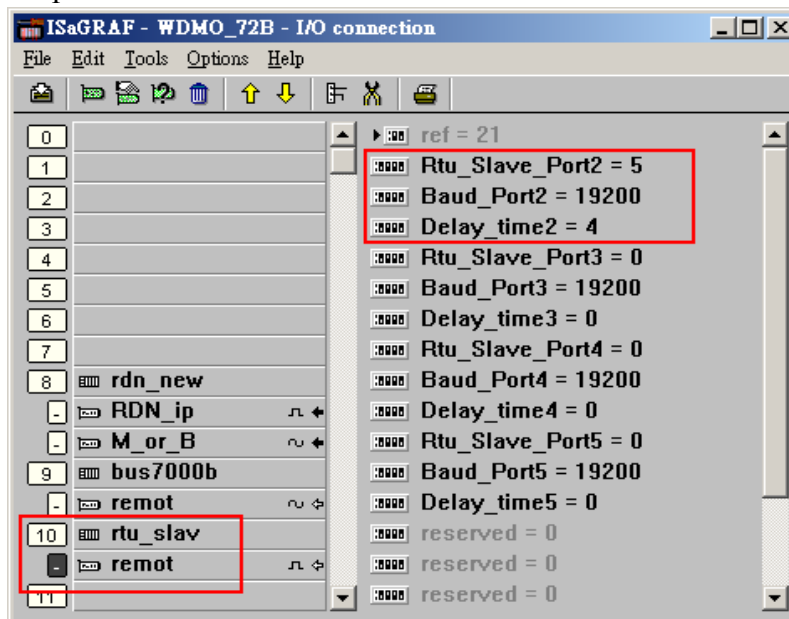
Then please setup the new redundant system as below figure.. (wdmo\_72a)



If there is one touch HMI applied in the redundant system, each W-8x47 must plug one I-8142 or I-8142i or I-8144 ([http://www.icpdas.com/products/Remote\\_IO/i-8ke/i-8142.htm](http://www.icpdas.com/products/Remote_IO/i-8ke/i-8142.htm)) in its slot 1. The connected touch HMI should support the Modbus RTU Master protocol and support 2-wire RS-485 communication. Then setup them as the below figure. (wdmo\_72b) . (For WinPAC-8xx7 is using COM1 + i-7520 to connect the Touch HMI, refer to “wpdmo72b”)



The difference between these two ISaGRAF sample program - “wdmo\_72b” and “wdmo\_72a” is there is one “rtu\_slav” connected in the IO connection windows in the “wdmo\_72b” project . This “rtu\_slav” enables the Modbus RTU slave port at COM5 to communicate with the touch HMI.



### Step 3: Writing ISaGRAF Program

Variables definition in the “wdmo\_72a” and “wdmo\_72b” sample project:

Name	Type	Attribute	Description
RDN_INIT	Boolean	<b>Internal</b>	<b>initial value is “TRUE”</b> . TRUE means first scan cycle
TMP	Boolean	<b>Internal</b>	Internal use
OK1	Boolean	<b>Internal</b>	Comm. State of the I-87064W
DO_1 ~ DO 8	Boolean	<b>Internal</b>	Output Ch.1 to Ch.8 in the I-87064W. <b>The network address is defined as 1 to 8 to R/W by HMI.</b>
is_Active	Boolean	<b>Input</b>	Connect to Ch.0 of “rdn_new > rdn_ip” in IO connection window.
LAN1	Boolean	<b>Input</b>	Connect to Ch.1 of “rdn_new > rdn_ip” in IO connection window. <b>The network address is defined as 201 to R/W by HMI.</b>
LAN2	Boolean	<b>Input</b>	Connect to Ch.2 of “rdn_new > rdn_ip” in IO connection window. <b>The network address is defined as 202 to R/W by HMI.</b>
VAL_11	Integer	<b>Internal</b>	<b>The network address is defined as 11 to R/W by HMI.</b>
REAL_val	REAL	<b>Internal</b>	
This_PAC	Integer	<b>Input</b>	Connect to Ch.0 of “rdn_new > m_or_b” in IO connection. <b>The network address is defined as 101 to R/W by HMI.</b>
T1	Timer	<b>Internal</b>	<b>initial value is set at “T#4s”</b>

To setup the new redundant PAC, please connect the “rdn\_new” in the ISaGRAF IO connection windows . Then fill-in the proper IP address of the “Active\_IP1”, “Active\_IP2”, “InActive\_IP1” and “InActive\_IP2”. (Please refer to item 3 and 4 listed in section 1.1 of this document). If the applied I/O is the RS-485 remote

ISaGRAF - WDMO\_72A - I/O connection

File Edit Tools Options Help

0 ref = 15AFA

1 Active\_IP1 = 192.168.2.191

2 Active\_IP2 = 192.168.2.192

3 InActive\_IP1 = 192.168.2.193

4 InActive\_IP2 = 192.168.2.194

5 Remote\_IO\_type = 1

6 reserved

7 reserved

8 reserved

9 reserved

rdn\_new

RDN\_ip

M\_or\_B

bus7000b

remot

0 is\_Active (\* True: current connected PAC is Active \*)

1 LAN1 (\* Is LAN1 connecting to In-Active PAC well ? \*)

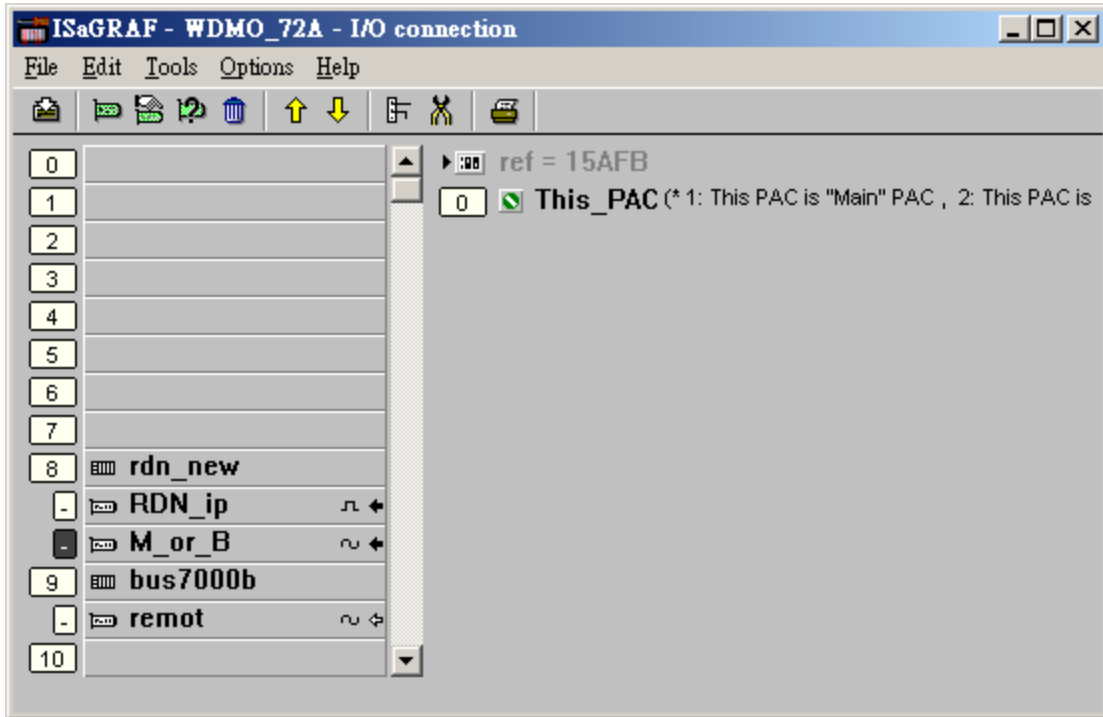
2 LAN2 (\* Is LAN2 connecting to In-Active PAC well ? \*)

Type 1 : I/O is the RS485 I/O (I-7000 or I-87K)  
Type 2 : I/O is the I-8KE4-MTCP or I8KE8-MTCP.

Ch.0: True means the connected PAC is Active currently (It takes the control)  
Ch.1: True means the connected PAC is using LAN1 to exchange data with the other PAC.  
Ch.2: True means the connected PAC is using LAN2 to exchange data with the other PAC.  
Ch 3 and Ch 4 are reserved for future usage.  
Note: If the connected PAC is the Active controller and Ch.1 and Ch.2 are both False, it mean the other PAC is dead or no-power or its LAN1 and LAN2 are both broken.

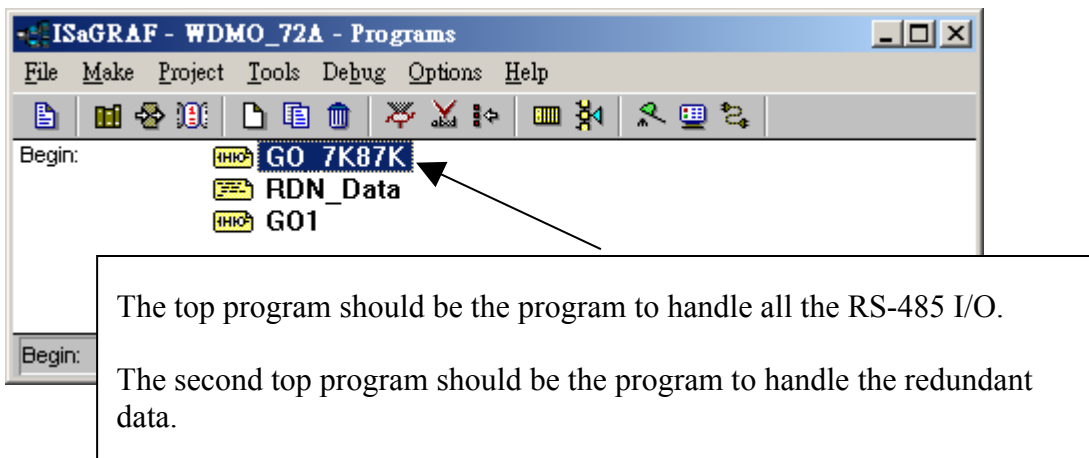
I/O like the I-87K or the I-7000 I/O, please set “Remote\_IO\_type” as 1 (**should be at least one RS-485 I/O connected to the W-8x47 's COM3 when setting as 1 (or WP-8xx7 and VP-25W7/23W7 's COM2)**). Type 2 is for the Modbus TCP/IP Ethernet I/O - the “I-8KE4-MTCP” and “I-8KE8-MTCP” (Please refer to FAQ042 or Chapter 22)

If the below integer input value is 1 (“This\_PAC”), it means the connected controller is the “Main” PAC (Rotary switch at 7 position). Value 2 means it is the “Backup” PAC (Rotary switch at 9 position). Value 0 means setting error.



In the ISaGRAF project, the top program should be the program to handle all the RS-485 remote I-87K I/O and I-7000 I/O modules. (like the “GO\_7K87K” in the “wdmo\_72a” project). The second top program should be the program to handle the redundant data (like the “RDN\_Data” program in the “wdmo\_72a”).

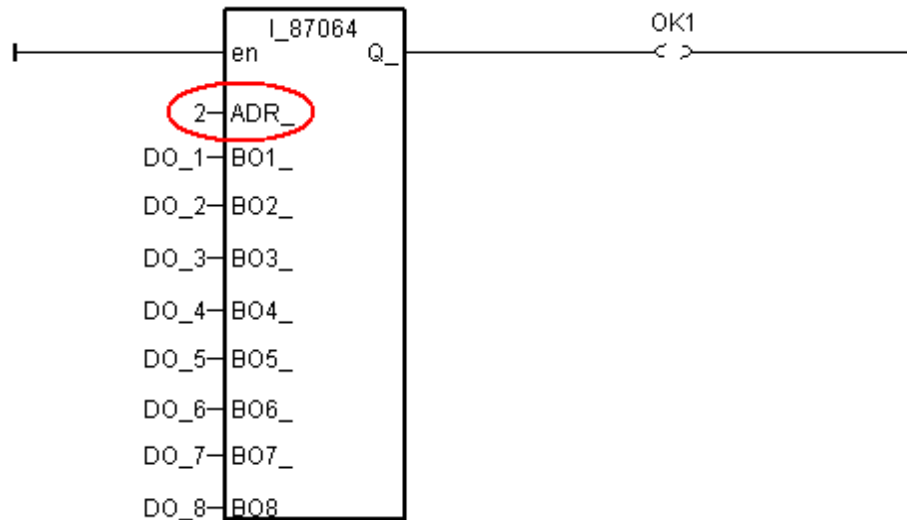
Other program must place below the “GO\_7K87K” and “RDN\_Data” programs.





The top “GO\_7K87K” program in the “wdmo\_72a”:

**Note:** The address setting of the connected I-87064W in the wdmo\_72a and wdmo\_72b project must set as 2 by the DCON utility and the communication parameter should set as 9600, 8, N, 1, No checksum.



The second top “RDN\_data” program is as below. It handles all redundant data between the two controllers.

```

if RDN_init then  (* RDN_init is declared with initial value at True *)
  RDN_init := False ; (* Only do it once in the first PLC scan cycle *)
  (* All output channels must set as redundant data *)
  (* All other control variable must set as redundant data *)
  (* Input channels in I-7000 and in remote I-87K I/O and in W-8x47's slot 1 to 7 are not necessary to
  set as redundant data because they are automatically updated *)
  (* TMP and RND_init are declared as Boolean / Internal *)
  TMP := RDN_T(T1) ;    (* Timer *)
  TMP := RDN_B(DO_1) ;  (* Boolean *)
  TMP := RDN_B(DO_2) ;
  TMP := RDN_B(DO_3) ;
  TMP := RDN_B(DO_4) ;
  TMP := RDN_B(DO_5) ;
  TMP := RDN_B(DO_6) ;
  TMP := RDN_B(DO_7) ;
  TMP := RDN_B(DO_8) ;
  TMP := RDN_N(VAL_11) ; (* Integer*)
  TMP := RDN_F(REAL_Val) ; (* Real *)
end_if ;

```

Please refer to [www.icpdas.com](http://www.icpdas.com) > FAQ > Software > ISaGRAF > 093

### 1.3: Download the ISaGRAF code to the new redundant system and debugging

1. Each WinPAC-8xx7 (or W-8x47) has two 10/100Mbps ethernet port. One is LAN1, the other is LAN2 (Please plug one i-8135W in VP-25W7/23W7 and enable its 2nd ethernet port). The new redundant system has four IP address setting in **running mode**. They are Active\_IP1 , Active\_IP2 and InActive\_IP1, InActive\_IP2. **These 4 IP address are set in the ISaGRAF project (Not in the VGA monitor of the controllers)**. The new redundant system will auto-change each controller 's ethernet port to the proper IP address. The active controller will use the Active\_IP1 and Active\_IP2, the other In-active controller will use the InActive\_IP1 and InActive\_IP2. These 4 IP address should be set in the same IP domain. That is the first three number should be the same and the last number should be different. For example,

Active\_IP1 : 192.168.2.191  
Active\_IP2 : 192.168.2.192  
InActive\_IP1 : 192.168.2.193  
InActive\_IP2 : 192.168.2.194

2. To download the ISaGRAF code into the new redundant system, two controllers must use four another IP address setting in **design mode**. The IP address in the design mode is set on the controller 's VGA monitor with a mouse. Recommend to set as the following.

For example, if the IP in running mode is set as the above item 1, then here can set the two IP of the “Main” PAC on the VGA monitor as the following (The IP address of the design mode should be in the different domain than the IP of the running mode to prevent IP conflict accidently).

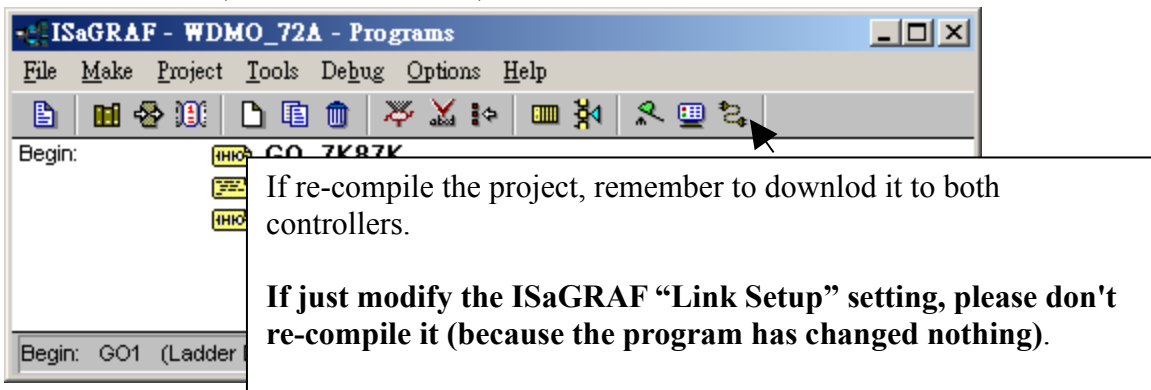
LAN1 : 200.168.2.191  
LAN2 : 200.168.2.192  
Mask : 255.255.255.0

Then for Backup PAC, for example:

LAN1 : 200.168.2.193  
LAN2 : 200.168.2.194  
Mask : 255.255.255.0

3. To download the ISaGRAF code into the redundant system by ethernet cable, please power off the controller, **then switch the Rotary Switch to “8” or “0” position, then power up controller. Then the controller will allow PC / ISaGRAF to stop and download code**. Please use the IP address listed in the above item 2 to download code. (**Controller is not allowed to stop and download code when it is power up with position 7 and 9 <running mode>**. However it can be debug and test in running mode.)

**Note:** If the ISaGRAF project has been modified and re-compiled, the code should be download to both controllers. If download to only one controller, the new redundant system will have error. Because the code in there two WP-8xx7 (or VP-25W7/23W7) will become different, the redundant data is not exchangeable.



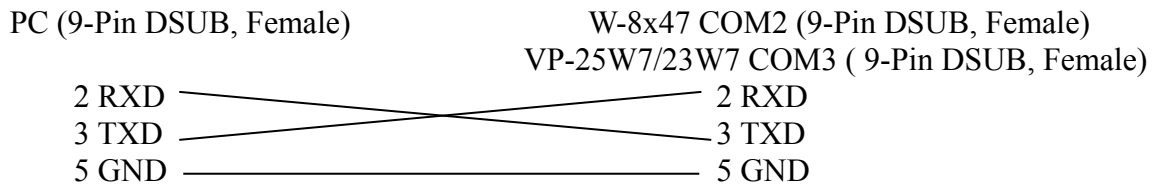
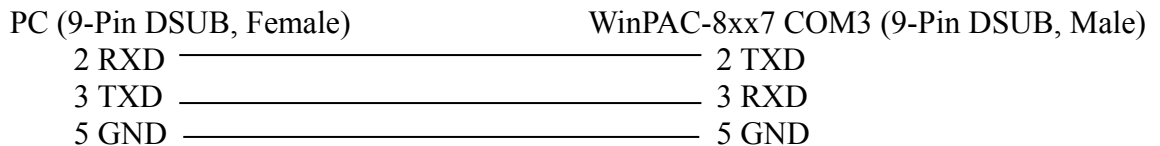
4. Please check if your PC 's IP and mask setting is in the same domain as the WinPAC-8xx7 (or VP-25W7/23W7 or W-8x47) 's IP setting listed in the above item 2 if the ISaGRAF can not connect the controller well.

Remember power OFF the controller and switch the rotary switch back to position 7 and 9 after download is completely finished. **Then check if the LAN1 , LAN2 and WP-8xx7 or VP-25W7/23W7 's COM2 (or W-8x47's COM3) cable is connected well before power ON it.** Then if it is ok, power ON both controllers to be in run-mode.

5. **The PC / HMI / SCADA software must always connect to the Active\_IP1 or to the Active\_IP2,** Please do not use PC / HMI / SCADA software connecting to the InActive\_IP1 and InActive\_IP2. (please refer to section 1.4 of the document to know more about programming InduSoft to connect to the new redundant system).

6. If the PC / HMI / SCADA detects any control switching from “Main” to the “Backup” PAC or from “Backup” to the “Main” PAC, the maintenance person must check if the redundant system has problem. The problem could be controller damaged, or power lost or WP-8xx7 COM2 (or VP-25W7/23W7 COM2 or W-8x47 COM3) cable problem or Ethernet cable problem or others..

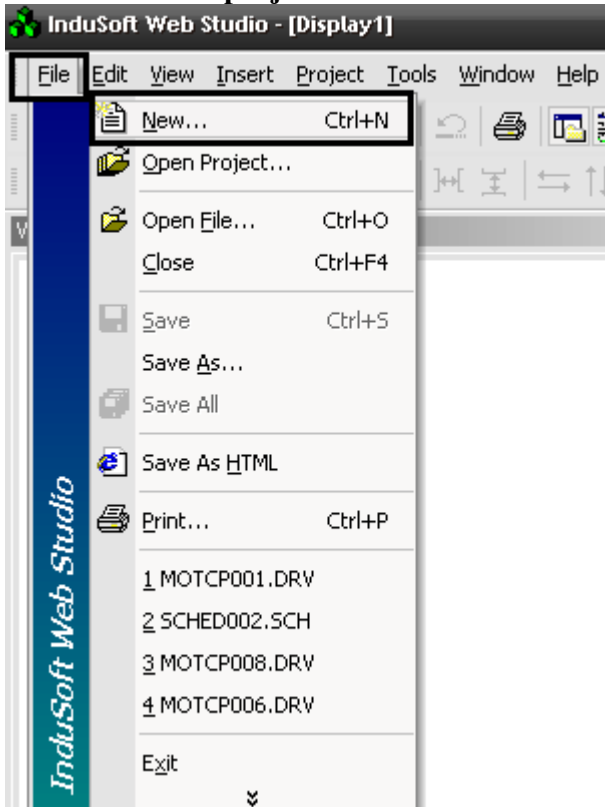
In design time, it is better to use the RS-232 cable to download the ISaGRAF project to the WP-8447/8847 (or VP-25W7/23W7 or W-8x47) new redundant system (Then you don't have to change the PC 's IP address frequently) . To do that, please power off these two controllers, turn the rotary switch to position 8 or 0, then power ON them. Then double click the “W4” on the bottom-right of the controller 's VGA monitor. Please set the “Setting” > “Modbus RTU Slave Port” to “COM3, 19200, 8, N, 1” for WinPAC-8447/8847 (COM3, 19200, 8, N, 1” for VP-25W7/23W7) (COM2:19200, 8, N, 1 for Wincon-8x47) . Then re-cycle the controller 's power once. Then later you can use the below RS-232 cable to download the ISaGRAF project (Controllers must power up with the rotary switch set at 8).



Note: The WinPAC-8147 doesn't have COM3 and COM4, however it can integrate with one I-8142iW or I-8144iW in its slot No. 0 to expand two or four RS-485 ports (COM5 thru. COM8).

## 1.4: Programming InduSoft Project

Step1: Create a new project of InduSoft: 1. Select "File" → "New"



The InduSoft sample project is the "MTCP-RD.zip".

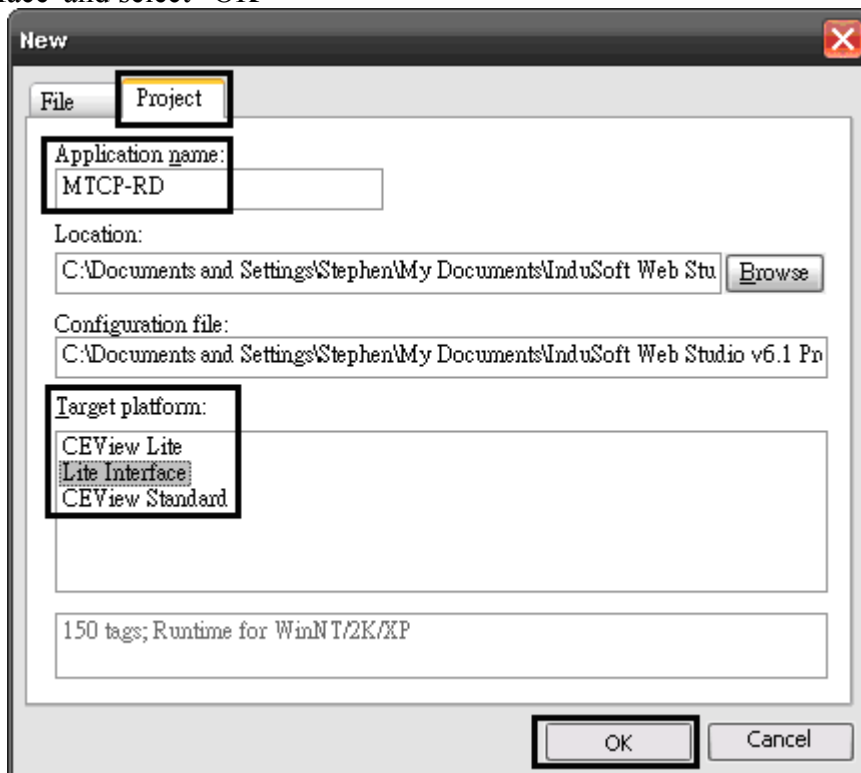
Please visit [www.icpdas.com](http://www.icpdas.com) > FAQ > Software > ISaGRAF > 093 to download it.

Then please un-zip it in a driver in your PC. For example, to D:\InduSoft\ . Then run the

"MTCP-RD.app" to start the InduSoft HMI.

**Note:** Your PC must have the InduSoft installed, or it will not work.

2. Select "Project" and key in the project name as "MTCP-RD". Then, select "Target platform" as "Lite Interface" and select "OK"



**Step2: Declare InduSoft variables**

**1. Declare a "class" name as "Trig\_Sts"**

**2. The members of "Trig\_Sts" class as following table**

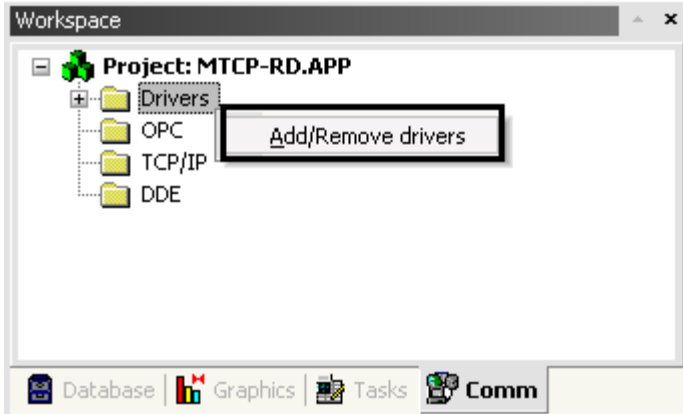
Name	Type	Description
M_DI_Trig	Boolean	Master PAC DI Read Trigger
S_DI_Trig	Boolean	Secondary PAC DI Read Trigger
M_DI_Sts	Boolean	Master PAC DI Read Sttus
S_DI_Sts	Boolean	Secondary PAC DI Read Status
M_AI_Trig	Boolean	Master PAC AI Read Trigger
S_AI_Trig	Boolean	Secondary PAC AI Read Trigger
M_AI_Sts	Boolean	Master PAC AI Read Sttus
S_AI_Sts	Boolean	Secondary PAC AI Read Status
M_DO_Trig	Boolean	Master PAC DO Write Trigger
S_DO_Trig	Boolean	Secondary PAC DO Write Trigger
M_DO_Sts	Boolean	Master PAC DI Write Sttus
S_DO_Sts	Boolean	Secondary PAC DI Write Status
M_AO_Trig	Boolean	Master PAC AO Write Trigger
S_AO_Trig	Boolean	Secondary PAC AO Write Trigger
M_AO_Sts	Boolean	Master PAC AO Write Sttus
S_AO_Sts	Boolean	Secondary PAC AO Write Status

**3. Declare "variables" as following table**

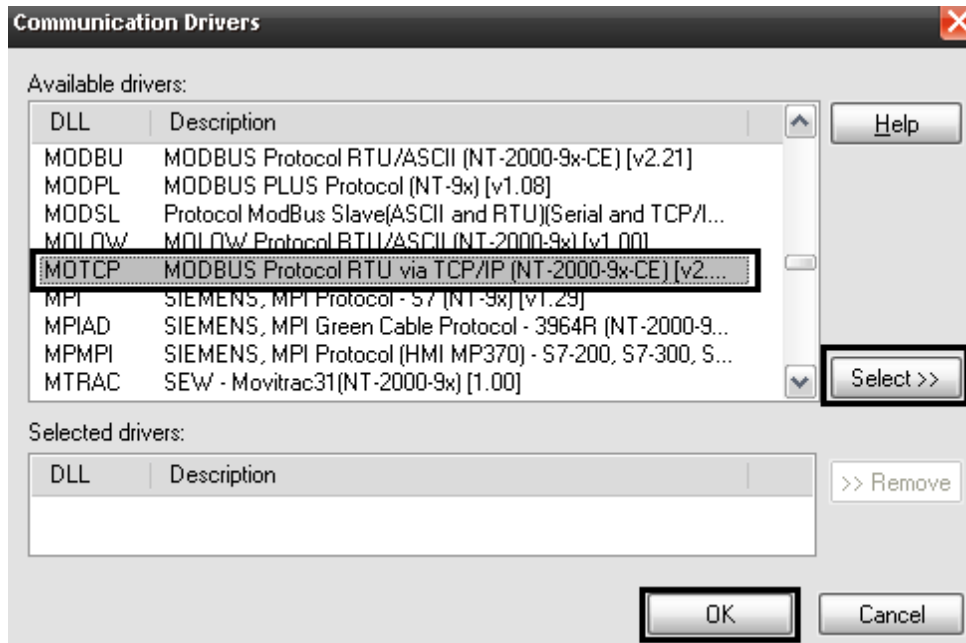
Name	Size	Type	Description	Scope
PAC_Trig_Sts	0	Trig_Sts	PAC Trigger and Status Class	Server
DI	2	Boolean	DI Value Array	Server
DO	2	Boolean	DO Value Array	Server
AI	0	Real	AI value	Server
AO	0	Real	AO value	Server
WhichPAC	0	Integer	1 for Main PAC & 2 for Backup PAC	Server
COM1	0	Boolean	In-Active PAC Status	Server
COM2	0	Boolean	In-Active PAC Status	Server

**Step 3: Declare Modbus address**

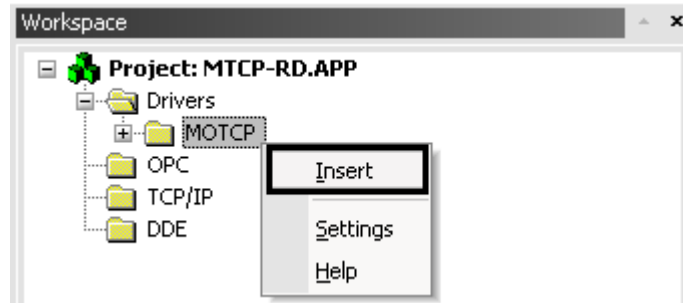
1 : Add Modbus TCP driver: Click right mouse button on "Drivers" icon then select "Add/Remove drivers"







2. Select “Insert” on the icon of”MOTCP” to add MOTCP sheet (10 sheets for all)



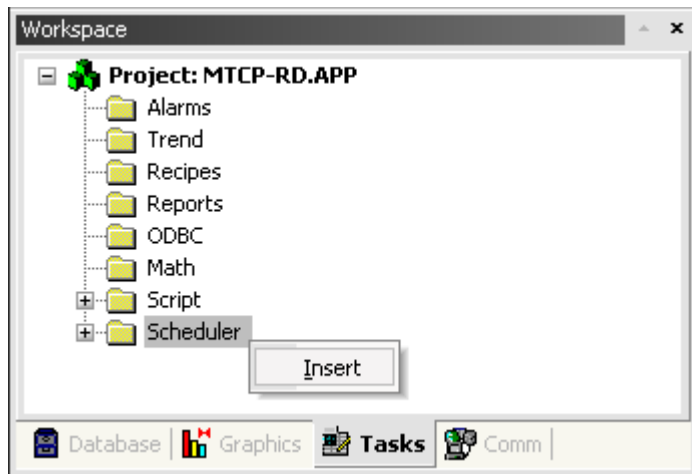
Sheet	Description	Read Trigger	Read Status	Write Trigger	Write Status	Station	Header
1	192.168.2.191(M-IP DI)	PAC_Trig_Sts.M DI Trig	PAC_Trig_Sts.M DI Sts			192.168.2.191:502:1	1X:0
2	192.168.2.192(S-IP DI)	PAC_Trig_Sts.S_ DI Trig	PAC_Trig_Sts.S_ DI Sts			192.168.2.192:502:1	1X:0
3	192.168.2.191(M-IP AI)	PAC_Trig_Sts.M AI Trig	PAC_Trig_Sts.M AI Sts			192.168.2.191:502:1	FP3:0
4	192.168.2.192(S-IP AI)	PAC_Trig_Sts.S_ AI Trig	PAC_Trig_Sts.S_ AI Sts			192.168.2.192:502:1	FP3:0
5	192.168.2.191(M-IP DO)			PAC_Trig_Sts.M DO Trig	PAC_Trig_Sts.M DO Sts	192.168.2.191:502:1	0X:0
6	192.168.2.192(S-IP DO)			PAC_Trig_Sts.S DO Trig	PAC_Trig_Sts.S DO Sts	192.168.2.192:502:1	0X:0
7	192.168.2.191(M-IP AO)			PAC_Trig_Sts.M AO Trig	PAC_Trig_Sts.S AO Sts	192.168.2.191:502:1	FP:0
8	192.168.2.192(S-IP AO)			PAC_Trig_Sts.S AO Trig	PAC_Trig_Sts.S AO Sts	192.168.2.192:502:1	FP:0
9	192.168.2.191(M-IP AI Sts)	PAC_Trig_Sts.M AI Trig	PAC_Trig_Sts.M AI Sts			192.168.2.191:502:1	3X:0
10	192.168.2.192(S-IP AI Sts)	PAC_Trig_Sts.S_ AI Trig	PAC_Trig_Sts.S_ AI Sts			192.168.2.192:502:1	3X:0

The configuration for each sheet as below:

Sheet	Tag Name	Address	Sheet	Tag Name	Address
1	DI[0]	1	2	DI[0]	1
	DI[1]	2		DI[1]	2
	DI[2]	3		DI[2]	3
	COM1	201		COM1	201
	COM2	202		COM2	202
3	AI	11	4	AI	11
5	DO[0]	1	6	DO[0]	1
	DO[1]	2		DO[1]	2
	DO[2]	3		DO[2]	3
7	AO	11	8	AO	11
9	WhichPAC	101	10	WhichPAC	101

#### Step 4: Configure "Scheduler"

1. Add "Scheduler" object



2. Define this object as " R/W data from M/S IP" and add following data

Event	Time	Tag	Expression	Disable
Clock	00:00:00.2	PAC_Trig_Sts.M_DI_Trig	not PAC_Trig_Sts.M_DI_Trig	PAC_Trig_Sts.M_DI_Sts <>0 and PAC_Trig_Sts.S_DI_Sts=0
Clock	00:00:00.2	PAC_Trig_Sts.S_DI_Trig	not PAC_Trig_Sts.S_DI_Trig	PAC_Trig_Sts.M_DI_Sts=0
Clock	00:00:00.2	PAC_Trig_Sts.M_AI_Trig	not PAC_Trig_Sts.M_AI_Trig	PAC_Trig_Sts.M_AI_Sts <>0 and PAC_Trig_Sts.S_AI_Sts=0
Clock	00:00:00.2	PAC_Trig_Sts.S_AI_Trig	not PAC_Trig_Sts.S_AI_Trig	PAC_Trig_Sts.M_AI_Sts=0
Clock	00:00:00.2	PAC_Trig_Sts.M_DO_Trig	not PAC_Trig_Sts.M_DO_Trig	PAC_Trig_Sts.M_DO_Sts <>0 and PAC_Trig_Sts.S_DO_Sts=0

Event	Time	Tag	Expression	Disable
Clock	00:00:00.2	PAC_Trig_Sts.S_DO_Trig	not PAC_Trig_Sts.S_DO_Trig	PAC_Trig_Sts.M_DO_Sts=0
Clock	00:00:00.2	PAC_Trig_Sts.M_AO_Trig	not PAC_Trig_Sts.M_AO_Trig	PAC_Trig_Sts.M_AO_Sts <>0 and PAC_Trig_Sts.S_AO_Sts=0
Clock	00:00:00.2	PAC_Trig_Sts.S_AO_Trig	not PAC_Trig_Sts.S_AO_Trig	PAC_Trig_Sts.M_AO_Sts=0

Step 5: Design HMI: 1. Refer to the following picture to make a HMI page

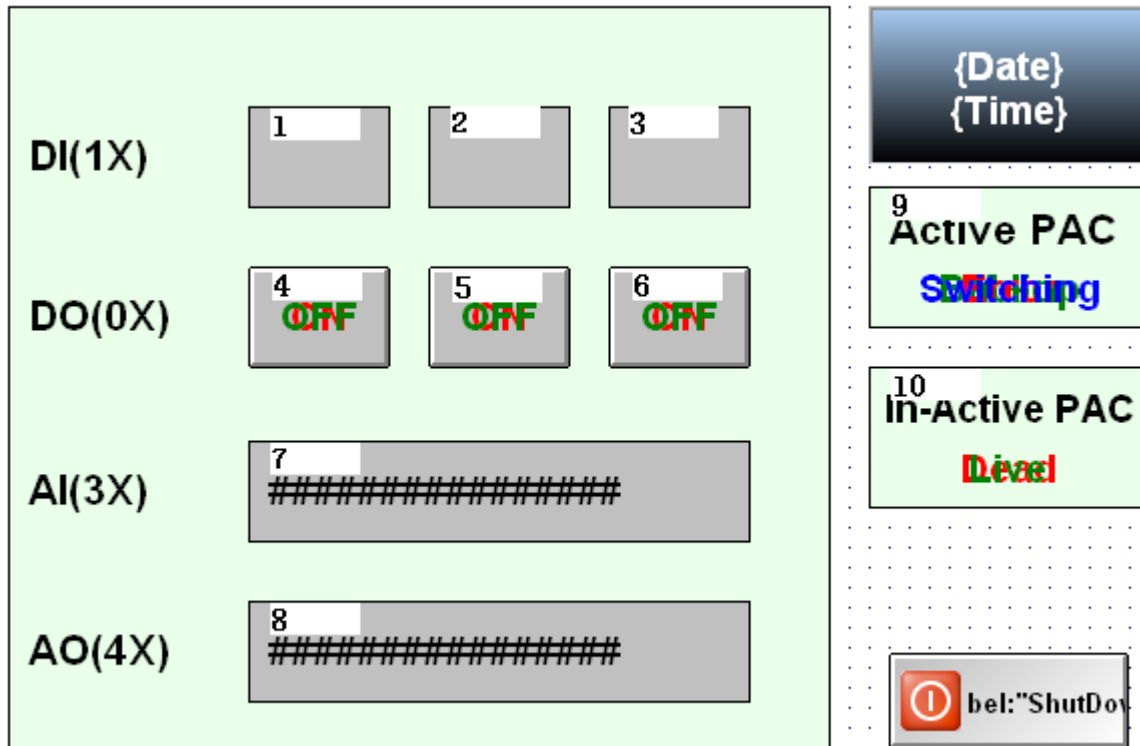
The HMI design tool interface shows a control panel with the following elements:

- DI(1X):** A circular indicator with a '3' above it.
- DO(0X):** Three rectangular indicators, each with 'OFF' in red text. A label '2+3+4+7' is above them.
- AI(3X):** A wide rectangular indicator with a label '1+3+5' above it and a row of hash symbols (#) inside.
- AO(4X):** A wide rectangular indicator with a row of hash symbols (#) inside.
- Active PAC Switching:** A box with 'Active PAC' in black and 'Switching' in blue/red text. A label '1+3+7' is above it.
- In-Active PAC Level:** A box with 'In-Active PAC' in black and 'Level' in red text.
- ShutDown:** A button with a red circle containing a white '1' and the text 'bel:"ShutDown"'. A label '1' is above it.
- Time/Date:** A box with '{Date}' and '{Time}' in white text on a dark background.

The toolbar at the bottom contains three sections:

- Static Objects:** Icons for line, rectangle, circle, oval, square, and text. Numbered 1, 2, 3.
- Active Objects:** Icons for various dynamic objects like buttons, indicators, and clocks. Numbered 4, 5, 6, 7.
- Dynamic Properties:** Icons for property editors like color, font, and visibility. Numbered 4, 5, 6, 7.

2. Configure link between HMI components and tags



Component No.	Attribution	Tag	Expression	Caption	Show on condition	Input Enable
1	Colors	DI[0]				
2	Colors	DI[1]				
3	Colors	DI[2]				
4	Command	DO[0]	Not DO[0]			
	Text			ON		
	Position				DO[0]	
	Text			OFF		
5	Command	DO[1]	Not DO[1]			
	Text			ON		
	Position				DO[1]	
	Text			OFF		
6	Command	DO[2]	Not DO[2]			
	Text			ON		
	Position				DO[2]	
	Text			OFF		
	Position				not DO[2]	

7	Text			##### #####		
	Text I/O	AI				

Component No.	Attribution	Tag	Expression	Caption	Show on condition	Input Enable
8	Text			##### #####		
	Text I/O	AO				v
9	Text			Backup		
	Position				WhichPAC = 2	
	Text			Main		
	Position				WhichPAC = 1	
	Text			Error		
	Position				(WhichPAC <> 1) and (WhichPAC <> 2) and (WhichPAC <> 0)	
	Text			Switching		
	Position				WhichPAC = 0	
10	Text			Dead		
	Position				COM1 = 0 and COM2 = 0	
	Text			Live		
	Position				(COM1=1 and COM2=0) or (COM1=1 and COM2=1) or (COM1=0 and COM2=1)	

**Step 5: Run InduSoft:** Select "Project" → "Run Application"



