Chapter 16 Redundancy

16.1 Features and Architecture

The ICP DAS Win-GRAF PAC - XP-8xx8-CE6 series support the redundant system:

One redundant system is composed by two Win-GRAF PACs that one is called Main-PAC and the other one is called Backup-PAC. When the PAC that running programs also called Active-PAC is crashed or need to release its control authority by user-defined event, the PAC control authority will automatically switch to the normal one.

Features of the Win-GRAF redundancy

1. Higher safety:

There are three communication cables (LAN1, LAN2 and Alive Port) connected between two PACs. Passive-PAC can backup data when one of LAN cables connects properly. Active-PAC can run Win-GRAF project as long as there is still one cable connecting. In general, if three cables are disconnected (Note: please resume the communication of cables and restart the PAC) or the PAC is crashed, the other PAC will automatically change to Active-PAC.

2. Unique Public IP:

The Win-GRAF redundant system provides a unique public IP address for SCADA/HMI to access it without needing to determine which one is the Active IP address.



3. Easy maintenance:

If one of the redundant PACs is broken during operations, you can remove the broken one. **Note that do not shut down or dismounting the normal PAC, keep it running.** It's no need to download the Win-GRAF project, simply adjust the rotary switch of the same spare Win-GRAF PAC (or a repaired PAC) to the proper position and connect all required communication cables (e.g., LAN1, LAN2, Alive port and I/O), and then re-install this PAC to the redundant system.

Make sure that the normal PAC is still working properly and then power up the spare PAC. Then, the normal PAC will automatically copy the Win-GRAF project and all the redundant data back to this spaer PAC. It is easier for operators of maintenance and installation. They do not have to re-install all files because the normal PAC will automatically do it for the new one.

Exception:

Except the Win-GRAF project if there are other projects such as C, VB.net, C# and eLogger HMI, running in the redundant system, these files need to pre-installed to the spare Win-GRAF PAC (or a repaired PAC) before re-installing this PAC to the redundant system.

4. Easy to design the application:

Users do not need to specify what files or data should be sent to spare PAC because the Win-GRAF redundant system will automatically handle these tasks.

5. Users can specify some safety procedures in the program:

While the SCADA is unable to connect the Active-PAC due to disconnection on LAN1 or RS-485 ports, users can add these kind of conditions to detect these events and to activate safety procedure to transfer control authority from malfunction PAC to the normal one.

6. I/O Redundancy:

Besides PAC Redundancy, users can choose iDCS-8000 system to achieve I/O redundancy. www.icpdas.com/root/product/solutions/remote io/dcs redundancy io/idcs seleection guide.html



Win-GRAF Redundant System 1 (Rotary switch: 7 & 9)

The rotary switch of PAC is set to "7" called Main-PAC and the other one is set to "9" called Backup-PAC.

Note:

LAN1: Ethernet Cable, LAN2: Ethernet Crossover Cable, Alive Port (COM5): RS-232 Crossover Cable.

1. Two PACs without plugged-in I/O modules:



2. Two PACs with the use of DCON I/O modules:



3. Two PACs with the use of Modbus TCP I/O modules:



4. Two PACs with the use of iDCS-8830 I/O modules:

This architecture allows to accomplish both PAC and I/O redundancy.



<u>Note:</u> Each pair of plugged-in redundant I/O modules with iDCS-8830 must be the same model numbers.

5. Two PACs are equipped with Modbus RTU/ASCII I/O modules:



6. The I/O connection architecture of the above (2) \sim (5) can also be mixed with 2 (or more) together.

Win-GRAF Redundant System 2 (Rotary switch: 6 & 8)

The rotary switch of PAC is set to "6" called Main-PAC and the other one is set to "8" called Backup-PAC. Win-GRAF redundant system 2 is suitable for multiple sets of redundant PACs whose LAN2 cable is connected to an Ethernet switch/Hub.Users must set their LAN2 IP address.

Note:

LAN1, LAN2: Ethernet Cable, Alive Port (COM4): RS-232 Crossover Cable.

1. Two PACs without plugged-in I/O modules:

The others are similar to the architecture of Win-GRAF redundant system 1.



16.2 Important Installation Notes (Ports and LED Indicators)

The Win-GRAF redundant PACs require following three communication ports to communicate with each other.

1. Alive Port:

The Win-GRAF redundant PACs use **RS-232 port as the alive port** (also called Heart-beat port). Both RS-232 ports must be connected together with one RS-232 cross cable. The wire connection for RXD, TXD, and GND pins of RS-232 ports is illustrated in the figure below.



<u>Win-GRAF Redundant System 1</u>: using COM5 as the Alive Port. <u>Win-GRAF Redundant System 2</u>: using COM4 as the Alive Port.

2. Replication Port:

Win-GRAF Redundant System 1

The Win-GRAF redundant PACs use LAN2 port as the replication port. In between two LAN2 ports of PACs must connect to one single crossover cable. LAN2 can only be used to transfer redundant data between two PACs in high speed. Do NOT connect LAN2 with any external devices such as Switches or Hubs otherwise it might cause an error or get timed-out.

Main-PAC (LANZ)		Backup-PAC (LANZ)
	In between two LAN2 ports of PACs	
	connect to one single crossover cable.	
	(Do not use a regular Ethernet cable).	

Win-GRAF Redundant System 2

The Win-GRAF redundant PACs allows to use LAN1/LAN2 port as the replication port. In between two LAN1/LAN2 ports of PACs simply connect to an Ethernet Switch/Hub.



LAN1 and LAN2 port use an Ethernet cable.

3. Public IP Port:

The LAN1 port of Win-GRAF PAC should be connect to an Ethernet Switch through a normal Ethernet cable. Then PAC can communicate with SCADA or control external Modbus TCP devices such as I/O modules and Ethernet equipment.

SCADA/HMI could communicate with Win-GRAF redundant system with only one single "Active_IP" address (refer to <u>Section 16.4.1</u>). This means: when Active-PAC takes over the control authority, IP address of LAN1 will automatically switch to "Active_IP"; when this PAC releases out the control authority, IP address of LAN1 will switch to "Active_IP+1".



Win-GRAF Redundant System 1

4. LED Indicators:

The L1 and L2 LED indicators on PAC panel can be used to display the running status of Win-GRAF redundant system.

L1: Active/P	Passive PAC
ON	This PAC is Active PAC
Blinking	This PAC is Passive PAC
L2: Data Syr	nchronization
ON	Using LAN2 port to backup data
Blinking	Using LAN1 port to backup data
OFF	No data synchronization



PAC Installation Notes (Very Important):

Note: If two PACs have never been installed the redundancy project, refer to Section 16.5 - Test the Redundant System 1 and Section 16.6 - Test the Redundant System 2 to download the Win-GRAF project to the Main-PAC first.

st Set the rotary switch

Before power on PACs, make sure the rotary switch of PAC is set properly. Wrong settings might cause redundant system unstable.

Win-GRAF Redundant System 1: One is set to 7, the other one is set to 9.

Win-GRAF Redundant System 2: One is set to 6, the other one is set to 8.

% Connect the communication cables (LAN1, LAN2, and Alive port)

Before power on PACs, make sure following three cables and other communication cables such as RS-485 cables are properly connected.

While you power on PACs with cable unconnected, it might be error for redundant system.

- A. Connect both Alive ports of PACs by using a RS-232 crossover cable.
- B. LAN2 ports on two PACs
 <u>Win-GRAF Redundant System 1</u>: using one Ethernet crossover cable to connect with each other.
 <u>Win-GRAF Redundant System 2</u>: using Ethernet cable to connect to an Ethernet Switch or Hub.
- C. Connect both LAN1 ports of PACs to an Ethernet switch by using Ethernet cables.

※ Replace the spare (or repaired) PAC while needed

When one PAC is running properly, do not power off or shut down this one. Please follow two instructions above to replace the spare (or repaired) PAC; then power on.

※ Only the Active-PAC run the project

When the PAC take over the control authority (called Active-PAC), it will run the Win-GRAF project. The Passive-PAC only receive data and take over the control authority accroding to the logical conditions of the Win-GRAF project or when Active-PAC is crashed.

16.3 What Kinds of Data will Automatically Send to the Passive-PAC?

Win-GRAF redundant system will automatically send a part of data from Active-PAC to Passive-PAC.

What Kinds of Data can Backup Automatically:

- 1. The user's Win-GRAF applications.
- 2. The execution step of programs.
- 3. The value of variables.
- 4. The private data of function block instance.
- 5. The PAC's RTC (Real Time Clock) time.
- 6. Retain memory.
- 7. The configuration file for Schedule-control (refer to <u>Chapter 17</u>).

The most common data that cannot BackUp to the Passive-PAC Automatically?

- 1. The status of Timer variable (Ticking or Sleeping).
- Except for user's Win-GRAF applications and config files of schedule-control, some files in the Active-PAC are unable to send to the Passive-PAC. For example, files that stored in the "\system_disk" or "\Micro_SD" or non-Win-GRAF applications such as C, VB.net, C#, and eLogger applications. These files should be pre-installed in the spare (or repaired) PAC before mounting it to the redundant system.
- 3. If using the COM_OPEN() function to open the serial port, which will not automatically be opened on the Passive-PAC.
- 4. The PAC's data that stored in EEPROM memory cannot be backed up automatically.

For some data that unable to send to the Passive-PAC automatically, users can deal with them by programming as follows. Refer to the "Retain_and_timer" program in the "demo_RDN_2" project.



16.4 Description of Win-GRAF Demo Projects

The Win-GRAF PAC CD provides four demo projects for the redundant system, i.e., "demo_RDN_1.zip", "demo_RDN_2.zip", "demo_RDN_3.zip" and "demo_RDN_4.zip". Refer to <u>Chapter 12</u> to restore these files to the Win-GRAF Workbench.

Project Name	Description	
demo_RDN_1	Using both the COM3 of PACs to connect three DCON I/O modules.	<u>Test</u>
demo_RDN_2	Using two PACs without connecting any I/O module.	<u>Test</u> , <u>Program</u>
demo_RDN_3	Using both the LAN1 of PACs to connect a ET-7050 (Modbus TCP I/O module) through one Ethernet switch.	<u>Test</u>
demo_RDN_4	Using both the LAN1 of PACs to connect an iDCS-8830 through one Ethernet switch. iDCS-8830 supports redundant I/O modules.	<u>Test</u> , <u>Program</u>

Note: XP-8xx8-CE6 series support the redundant system.

16.4.1 [Important] "I/O Board" Settings (i_redundancy and i_redundancy_rs485)

♦ Used for demo_RDN_1, demo_RDN_2, demo_RDN_3, and demo_RDN_4:

To enable Redundancy function on PAC, users must add the "i_redundancy" function into the "I/O Boards" window.

IIII I/O Boards		X
0 1 2 3 4 5 6 7 8 9 10 i-redundancy 11 12 13 14 15 Using the Slot 9 or later. 16 (Refer to <u>Chapter 4</u>)	Close Select Delete 10: i_red undancy - Propert Key = 6 Ref = 16#3 Active IP = 192.168.71.37 Passive IP = auto Mask = 255.255.0 Gateway_IP = disabled Reserved0 = 0 Reserved1 = 0 Reserved2 = 0 Reserved3 = 0 Reserved4 = 0	ties ➤ Note: DO NOT set the last digit value of the "Active_IP" as 0 or 254 or 255. It should be in the range of 1 to 253.
	i_redundancy Enable Redundancy in the PAI The following PAC support redu XP-8xx8-CE6 XP-9xx8-CE6 WP-5248	C. Definition of setting

Description of "i_redundancy" I/O board:

The function is used to display the current status of Win-GRAF redundant system.

- Active_IP: This IP address is public for the redundant system to communicate with HMI or SCADA.DO NOT set the last digit value of the "Active_IP" IP address as 0 or 254 or 255.It should be from 1 to 253.
- Passive_IP: "Auto", the LAN1 IP address of the Passive-PAC will automatically be set as Active_IP +1. E.g., if the "Active_IP" is set as "192.168.71.37", the "Passive_IP" will be automatically set as "192.168.71.38".
- Mask: The common settings are either 255.255.255.0 or 255.255.0.0 depending on the network environment.
- <u>Note:</u> After adding the "i_redundancy" in the "I/O Boards" window, it will auto add 12 "BOOL" input channels in the "Variables" window that can be used to display the current status of the redundant system.

Variables									∎⊿×
🍸 Name	Туре	Dim.	Attrib.	Syb.	Init value	User	Tag	Description	
😑 📫 %IX10 - i_redundancy									^
%IX10.0=is_Main_Active	BOOL		Input						
%IV10.1-ie Backup Active	BOOL		Input						
is_Backup_Active	BOOL		Input						
%IX10.3=is_Backup_ready	BOOL		Input						
%IX10.4=is_first_cycle_just_afte	Double-click it	to a	dd a v	/ariab	le				
%IX10.5=is_Main_LAN1_ok	nomo to ooch	chor	unal						
%IX10.6=is_Backup_LAN1_ok	name to each	cnar	inei.						
%IX10.7=is_Alive_port_ok	ROOL		Input						
%IX10.8=is_Passive_ready	BOOL		Input						
%IX10.9=is_Active_LAN1_ok	BOOL		Input						
%IX10.10=is_Passive_LAN1_ok	BOOL		Input						
%IX10.11	BOOL		Input						~
<									>
IO Drivers New Spy1 RDN control	Variables Retain	and time	er /						

Ch.0 (is_Main_Active):	Is the Main-PAC active now?
	TRUE: Active , FALSE: Passive
Ch.1 (is_Backup_Active):	Is the Backup-PAC active now?
	TRUE: Active , FALSE: Passive
Ch.2 (is_Main_ready):	Is the Main-PAC ready?
	If Ch.2 returns FALSE. The possible reason could be the following.
	(1) The Ethernet cable (LAN2) between Main and Backup-PAC is broken.
	(2) The Main-PAC is dead or crashed.
	(3) The rotary switch of the Main-PAC is not set at 7 (or 6).
Ch.3 (is_Backup_ready):	Is the Backup-PAC ready?
	If Ch.3 returns FALSE. The possible reason could be the following.
	(1) The Ethernet cable (LAN2) between Main and Backup-PAC is broken.
	(2) The Main-PAC is dead or crashed.
	(3) The rotary switch of the Main-PAC is not set at 9 (or 8).

Ch.4 (is_first_cycle_just_afte	r_switch): For Active-PAC only.
	True: Now is in the first cycle just after switching.
	False: Now is not in the first cycle after switching.
Ch.5 (is_Main_LAN1_ok):	Is the LAN1 port of the Main-PAC ok?
	TRUE: OK.
	FALSE: Fail or Ethernet cable is disconnected.
Ch.6 (is_Backup_LAN1_ok):	Is the LAN1 port of the Backup-PAC ok?
	TRUE: OK.
	FALSE: Fail or Ethernet cable is disconnected.
Ch.7 (is_Alive_port_ok):	Is the communication status of Alive Port ok?
	TRUE: OK.
	FALSE: Fail or the Passive-PAC is dead or crashed.
Ch.8 (is_Passive_ready):	Is the Passive-PAC ready now?
	If Ch.8 returns FALSE. The possible reason could be the following.
	(1) The Ethernet cable (LAN2) between Main and Backup-PAC is broken.
	(2) The Passive-PAC is dead or crashed.
	(3) The rotary switch setting of the Passive-PAC is incorrect.
Ch.9 (is_Active_LAN1_ok):	Is the LAN1 port of the Active-PAC ok?
	TRUE: OK.
	FALSE: Fail or Ethernet cable is disconnected.
Ch.10 (is_Passive_LAN1_ok):	Is the LAN1 port of the Passive-PAC ok?
	TRUE: OK.
	FALSE: Fail or Ethernet cable is disconnected.
Ch.11 (is_Backup_data_ok):	Is the data synchronization of two PAC ok?
	0: No data synchronization
	1: Using LAN1 port to backup data
	2: Using LAN2 port to backup data

♦ Used for demo_RDN_1:

In this case, using the COM3 (RS-485) of PAC to connect DCON I/O modules. Besides "i_redundancy", also "DCON" must be added in the I/O Boards window. Moreover, the "i_redundancy_rs485" function is used to check if the RS-485 port of Passive-PAC can receive data normally.

III I/O Boards		
	9: DCON - Properties	×
0	Key = 6 Ref = 16#5	
1	Port = 3 Baud_rate = 9600 Using the COM3 of PAC and	
3	Host_watchdog_Enabled = 0 Watchdog_timeout = 5000 the Baud rate is set to 9600.	
4	Checksum_enabled = 0 Delay_ms_between_polls = 0	
6	Reserved 1 = 0	
7	Reserved 2 = 0 Reserved 3 = 0	
9 DCON		
10 redundancy	Definition of setting	11
11 i_redundancy_rs485	DCON	5
12	Enable one serial port (BS-485) to connect remote DCON 1/0s (I-7000 series modules - BU-8785	
14		
15	Note: 1. This "DCON" supports only the communication properties "N.8.1" .	
16	That is "No-parity", "8 character size" and "1 stop bit". So please must configure all DCON I/O modules to "N.8,1".	~

Important Notice:

- 1. The "i_redundancy_rs485" must use with the "i_redundancy" or it doesn't work.
- 2. The "i_redundancy_rs485" only enable RS-485 ports of Passive-PAC to receive data but not to send data.

1 I/O Boards		Close	
1 2 3 4 5 6 7 8 9 DCON 10 <u>i redundancy</u> 11 <u>i redundancy</u> 12 13 14 15	11: i_redundancy_rs485 - F Key = 6 Rof = 16#3A Ch00_Port_No = 3 Ch00_Timeout = 30 Ch01_Timeout = 30 Ch02_Port_No = 0 Ch02_Tort_No = 0 Ch03_Timeout = 30 Ch03_Timeout = 30 Ch04_Port_No = 0 Ch04_Timeout = 30 Ch05_Port_No = 0 Ch05_Tort_No = 0 Ch05_Timeout = 30 Ch06_Port_No = 0 Ch06_Timeout = 30	Chxx_Port_No: Using COM3 of Passi Chxx_Timeout: Set timeout as 30 sec Note: If no data is received of the time-out, the s (0-15) will be display "Variables" window.	ve-PAC (0: Disable) conds. until the expiration status of channel ed as " FALSE" in the
16	Detect the RS-485 port state of The following PAC support redu XP-8xx8-CE6 XP-9xx8-CE6 WP-5248	f the passive PAC of a redundani undancy.	t system. Definition of setting

16.4.2 Declaring Variables (demo_RDN_2)

Users can view or add variables in the "Variable" window (refer to <u>Section 2.3</u>).

Name	Data Type	Description	
Used in the "PAC_Time"	program	·	
Year1			
Month1			
Day1			
WeekDay1	DINT	Used in the "PAC_Time" program:	
Hour1		They are used to get the FAC's system time.	
Minute1			
Second1			
Set_new_time	BOOL	Set it as "TRUE" to set up new system time.	
Year_to_set			
Month_to_set			
Day_to_set		Used in the "PAC_Time" program:	
Hour_to_set	DINT	They are used to set the PAC's system time.	
Minute_to_set			
Second_to_set			
Used in the "Retain_and_	_timer" progra	am	
DINT_1			
DINT_2 Used in the "Retain_and_timer" program:	Used in the "Retain_and_timer" program:		
REAL_1	Set them as retain variables.		
REAL_2			
TMR_1	ТІМЕ	Timer	
TMR_2			
retain_done	BOOL	TRUE: Retain variables are well set up; FALSE: Not set up yet.	
on_line_change_cycle	DINT	Non-zero, means this is the first cycle just after On-Line change.	
tmp_bool		It used to return the Retain status.	
TMR_1_last_state		TRUE: Ticking ; FALSE: Sleeping.	
TMR_2_last_state		TRUE: Ticking ; FALSE: Sleeping.	
To_tick_TMR_1	BOOL	Set it as TRUE to start TIMER1.	
To_tick_TMR_2		Set it as TRUE to start TIMER2.	
To_stop_TMR_1		Set it as TRUE to stop TIMER1.	
To_stop_TMR_2		Set it as TRUE to stop TIMER2.	

16.4.3 Introduction of the "demo_RDN_2" Project

This project includes one LD program and one ST program.

LD Program – "PAC_Time"

It used to get/set the system time of PAC.



LD Program – "RDN_control"

When an error occurs on the LAN1 of the Active-PAC, also the Passive-PAC is ready and its LAN1 is function normally, the Active-PAC will reboot after 10 seconds, and change the control authority to the Passive-PAC.

(* Switch to Passive PAC if Passive is ready	and its LAN1 is	ok howeve	er Active LAN1 communication has problem *)		
is_Active_LAN1_ok	Inst_TC IN TON	N Q ET	is_Passive_ready	is_Passive_LAN1_ok	En PAC REBOOT Q

ST Program – "Retain_and_timer"

(* "on_line_change_cycle" is declared as DINT (nonezero means it is in the cycle jsut after doing on line change) . "retain_done" is declared as BOOL and inited as FALSE .

```
"tmp_bool" is declared as BOOL. *)
```

```
on_line_change_cycle := GetSysInfo (_SYSINFO_CHANGE_CYCLE);
if (retain_done = FALSE) or
  (is_first_cycle_just_after_switch = TRUE) or
  (on_line_change_cycle <> 0) then
   retain_done := TRUE; (*just do it one time *)
   tmp_bool := Retain_Var( DINT_1, 1); (* retain a DINT variable *)
   tmp_bool := Retain_Var( DINT_2, 2);
   tmp_bool := Retain_Var( REAL_1, 3); (* retain a REAL variable *)
   tmp_bool := Retain_Var( REAL_2, 4);
```

```
(* if Retain variables havn't been inited yet, use default value *)
if (DINT_1 < -1000000) or (DINT_1 > 1000000) or
   (DINT_2 < -2000000) or (DINT_2 > 2000000) or
   (REAL_1 < -9.9E10) or (REAL_1 > 9.9E10) or
   (REAL_2 < -9.9E10) or (REAL_2 > 9.9E10) then
DINT_1 := 0;
DINT_2 := 0;
REAL_1 := 0.0;
REAL_2 := 0.0;
end_if;
end_if;
```

```
(* is_first_cycle_just_after_switch :
    TRUE : just in the cycle after switching.
    FALSE : other cycle *)
```

```
if is_first_cycle_just_after_switch then
```

(* The Timer ticking state is not auto-redundant. So we have to process them here. Ticking timer in the cycle just after switching if its last state is "ticking" *)

```
if TMR_1_last_state then
    tStart(TMR_1);
    end_if;
    if TMR_2_last_state then
      tStart(TMR_2);
    end_if;
end_if;
```

(* Timer operation *)

```
if To_tick_TMR_1 then
 To tick TMR 1 := FALSE;
 tStart(TMR 1);
 TMR_1_last_state := TRUE ;
end if;
if To tick TMR 2 then
 To_tick_TMR_2 := FALSE ;
 tStart(TMR 2);
 TMR 2 last state := TRUE ;
end if;
if To_stop_TMR_1 then
 To_stop_TMR_1 := FALSE ;
 tStop(TMR 1);
 TMR 1 last state := FALSE;
end if;
if To stop TMR 2 then
 To_stop_TMR_2 := FALSE ;
 tStop(TMR 2);
 TMR_2_last_state := FALSE ;
end if;
```

16.4.4 Introduction of the "demo_RDN_4" Project

In the "demo_rdn_4" project, you can click on the program name to view its content, click "Variables" to see all used variables, or refer to <u>Section 16.4.1</u> to view the I/O Board settings ("i_redundancy"). This section will introduce you the "Modbus Master" function (refer to <u>Chapter 5</u> for more details about operations and the way to set up continuous Offset value for multiple variables).

In this example, we use one redundant I/O expansion unit (iDCS-8830), two redundant DI module (F-8040) plugged in its I/O Solt0, 1, and two redundant DO module (F-8041) plugged in its I/O Solt2, 3. Before testing the project, refer to <u>Section 16.5.4</u> to configure the iDCS-8830 to function properly. Click the "Open Fieldbus Configuration" button to open the "I/O Drivers" setting window.



Next, enable the Modbus Master function to connect two Modbus TCP Slave devices. Each iDCS-8830 redundant I/O unit has two IP addresses, e.g., "192.168.71.**200**" and "192.168.71.**201**" (Port: 502) that can be used to read/write the I/O data and status.

Read Digital Inputs (Using two redundant DI module - F-8040 in the slot0, 1



Note: We use an iDCS-8830 redundant I/O unit in this example, refer to iDCS-8000 user manual (CH4 Modbus Addresses Mapping) to know how to input a proper "Base address". http://ftp.icpdas.com/pub/cd/idcs-8000/usersmanual/fcm-mtcp_software_usermanual_en.pdf

MODBUS Master Request		
Request	ОК	
Slave/Unit: 1	Cancel	
MODBUS Request		
<1> Read Coil Bits <2> Read Input Bits <3> Read Holding Registers <4> Read Input Registers		
Data block		
Nb items: 32	Read 32 DI status from the address 1.	
Activation	"Deriedie: 0 ms" means conding	
Periodic: 0 ms	3000 the request continuously.	>
◯ On call ◯ On change	(If an exception occurred, waiti 3 seconds to send next request	ng).
Misc.		
Timeout: 1000 ms	If no response over 1 second means	
Nb trials: 1	communication timeout.	

Write to Digital Outputs (Using two redundant DO module - F-8041 in the slot2, 3)

In this example, to write 32 DO status from the address "65" (other settings like the figure above).

10 D	IO Drivers					MODBUS Master Request
	Modeling Modeling Master Modeling Modeling Modeling Modeling Modeling Modeling Modeling Modeling Modeling Modeling Stave Modeling Modeling Stave Modeling Stave Modeling Stave Modeling Modeling Stave Mode	68.71.200:502 s (1) [132] - Rear s (1) [6596] - Cor sgisters (1) [5135 sgisters (1) [5776 68.71.201:502 = 1 2000]	<u>d D/l</u> itrol D/O 21] - iDCS 64] - 1/O :	5-8830 si status	atus	Request Operation: Control D/O Slave/Unit: 1 MODBUS Request <5> Write single coil bit <6> Write single holding register <15> Write Coil Bits <16> Write Holding Desisters
∎ + 	Symbol iDCS8830_slot23_F8041_D0[0] iDCS8830_slot23_F8041_D0[1]	Operation Data exchange	Offset 0	Mask FFFF	Storage Default	Base <u>a</u> ddress: 65
	iDCS8830_slot23_F8041_D0[1] iDCS8830_slot23_F8041_D0[2] iDCS8830_slot23_F8041_D0[3] iDCS8830_slot23_F8041_D0[4]	Data exchange Data exchange Data exchange Data exchange	2 3 4	FFFF FFFF FFFF	Default Default Default	Activation
	iDCS8830_slot23_F8041_D0[5]	Data exchange	5	FFFF	Default	On call (on error) On change
	iDCS8830_slot23_F8041_D0[28] iDCS8830_slot23_F8041_D0[29] iDCS8830_slot23_F8041_D0[30]	Data exchange Data exchange Data exchange	28 29 30	FFFF FFFF FFFF	Default Default Default	Misc. Timeout: 1000 ms
	IDUS8830_slot23_F8041_DU[31]	Data exchange	31	FFFF	Default	Nb trials: 1

Read the status of the iDCS-8830

- The "Operation" field of the "iDCS8830_LAN1_error_status" variable is set as "Error report" in order to show an error code when reading failed. The error code will be reset to "0" when reading success. Moreover, its "Offset" field must set as "0".
- Due to the data type of "iDCS8830_System_minor_fault_status" and "iDCS8830_System_major_fault _status" is "DWORD" (32 bit), the "Offset" must use two Modbus address and the "Storage" must set as "DWORD (Low-High)".

10 0	rivers *					
冒	⊟Mo MODBUS Master					
묘	📄 🚠 Open MODBUS: 192.168.7	71.200:502				
*	🗄 *'🛢 <2> Read Input Bits (1)	[132] - Read D/I				
-	😐 ** 🗧 <15> Write Coil Bits (1)	[6596] - Control D7	0			
-	🖅 🗝 <4> Read Input Regist	ers (1) [513521] - iE	CS-88	330 status		
	🗄 * 🛢 <4> Read Input Regist	ers (1) [577664] - Iz	'O stati	us 📐		
	i → 品 Open MODBUS: 192.168.7	71.201:502			•	
	Mg MODBUS Slave					
₫þ	🗄 ··· 🔛 Server - Slave number = 1					
₿Ļ	Symbol	Operation	Offs	et Mask	Storage	Rang
∎ +	Symbol iDCS8830_LAN1_error_status	Operation Error report	Offs O	et Mask FFFF	Storage Default	Rang
∎ +	Symbol iDCS8830_LAN1_error_status iDCS8830_FCM1_mode	Operation Error report Data exchange	Offs O O	et Mask FFFF FFFF	Storage Default Default	Ranç
∎ + 	Symbol iDCS8830_LAN1_error_status iDCS8830_FCM1_mode iDCS8830_FCM2_status	Operation Error report Data exchange Data exchange	Offs O O 1	et Mask FFFF FFFF FFFF	Storage Default Default Default	Ranç
∎ + 	Symbol iDCS8830_LAN1_error_status iDCS8830_FCM1_mode iDCS8830_FCM2_status iDCS8830_system_bus_status	Operation Error report Data exchange Data exchange Data exchange	0ffs 0 1 2	et Mask FFFF FFFF FFFF FFFF	Storage Default Default Default Default	Rang
∎ + 	Symbol iDCS8830_LAN1_error_status iDCS8830_FCM1_mode iDCS8830_FCM2_status iDCS8830_system_bus_status iDCS8830_FPM_status	Operation Error report Data exchange Data exchange Data exchange Data exchange	0ffs 0 1 2 3	et Mask FFFF FFFF FFFF FFFF FFFF	Storage Default Default Default Default Default	Rang
∎ + ₹	Symbol iDCS8830_LAN1_error_status iDCS8830_FCM1_mode iDCS8830_FCM2_status iDCS8830_system_bus_status iDCS8830_System_bas_status iDCS8830_FPM_status	Operation Error report Data exchange Data exchange Data exchange Data exchange Data exchange	0ffs 0 1 2 3 4	et Mask FFFF FFFF FFFF FFFF FFFF FFFF	Storage Default Default Default Default Default Default DWORD (Low - High)	
∎ + 	Symbol iDCS8830_LAN1_error_status iDCS8830_FCM1_mode iDCS8830_FCM2_status iDCS8830_system_bus_status iDCS8830_System_bastatus iDCS8830_System_minor_fault_status iDCS8830_System_major_fault_status	Operation Error report Data exchange Data exchange Data exchange Data exchange Data exchange Data exchange	0ffs 0 1 2 3 4 6	et Mask FFFF FFFF FFFF FFFF FFFF FFFF FFFF	Storage Default Default Default Default Default DWORD (Low - High) DWORD (Low - High)	Ranı
∎ + ₹	Symbol iDCS8830_LAN1_error_status iDCS8830_FCM1_mode iDCS8830_FCM2_status iDCS8830_system_bus_status iDCS8830_FPM_status iDCS8830_FPM_status iDCS8830_System_minor_fault_status iDCS8830_System_major_fault_status iDCS8830_LAN1_ID	Operation Error report Data exchange Data exchange Data exchange Data exchange Data exchange Data exchange Data exchange	0ffs 0 1 2 3 4 6 8	et Mask FFFF FFFF FFFF FFFF FFFF FFFF FFFF	Storage Default Default Default Default Default DWORD (Low - High) DWORD (Low - High) Default	

<u>Note:</u> Refer to iDCS-8000 user manual (CH4 Modbus Addresses Mapping) to enter the "Base address". <u>http://ftp.icpdas.com/pub/cd/idcs-8000/usersmanual/fcm-mtcp_software_usermanual_en.pdf</u>

MODBUS Master R	leguest				X		
Request Description:	iDC5-8830 si 1	atus			OK Cancel		
MODBUS Request	Bits ng Registers Registers	~					
←Data block Base <u>a</u> ddress: [<u>N</u> b items: [513 9	R	ead 9 AI	val	ues from th	ne address 513.]
Activation <u>P</u> eriodic: On call On change	0	ms 300 (on	00 error)		"Periodic the reque (If an exc 3 second	: 0 ms" means se est continuously. eption occurred, s to send next re	ending waiting quest).
Timeout:	1000	ms 💌	If no	resp	onse over	1 second means	7
Nb trials:	1		comr	nun	ication tim	eout.	

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Read the I/O status of the iDCS-8830

10 E	rivers *						
E	🖃 Modbus Master					•	<u>^</u>
묘	📄 🖓 🖧 Open MODBUS: 192.168.71	1.200:502					
*	🗄 * 🛢 <2> Read Input Bits (1) [[132] - Read D/I					
	🗄 *🛢 <15> Write Coil Bits (1) [I	6596] - Control D7	0				
\sim	🗄 * 🗧 <4> Read Input Register	rs (1) [513521] - iD	CS-8830 :	status			
	🗄*🔒 <4> Read Input Register	rs (1) [577664] - 17	0 status				
	🗄 🗠 品 Open MODBUS: 192.168.71	1.201:502					×
	Symbol	Operation	Offset	Mask	Storage	1	Ra
ŝ.	iDCS8830_io_slot_status[0]	Data exchange	16	FFFF	Default		
Вт	iDCS8830_io_slot_status[1]	Data exchange	17	FFFF	Default		
	iDCS8830_io_slot_status[2]	Data exchange	18	FFFF	Default		
	iDCS8830_io_slot_status[3]	Data exchange	19	FFFF	Default		
	iDCS8830_io_slot_status[4]	Data exchange	20	FFFF	Default		
	iDCS8830_io_slot_status[5]	Data exchange	21	FFFF	Default		
	iDCS8830_io_slot_status[6]	Data exchange	22	FFFF	Default		
	iDCS8830_io_slot_status[7]	Data exchange	23	FFFF	Default		
	iDCS8830_io_emergency_status[0]	Data exchange	32	FFFF	Default		
	iDCS8830_io_emergency_status[1]	Data exchange	33	FFFF	Default		
	iDCS8830_io_emergency_status[2]	Data exchange	34	FFFF	Default		
	iDCS8830_io_emergency_status[3]	Data exchange	35	FFFF	Default		
	iDCS8830_io_emergency_status[4]	Data exchange	36	FFFF	Default	"DWORD	" is a 32-bit data type,
	iDCS8830_io_emergency_status[5]	Data exchange	37	FFFF	Default	and need	s 2 Modbus addresses.
	iDCS8830_io_emergency_status[6]	Data exchange	38	FFFF	Default		
	iDCS8830_io_emergency_status[7]	Data exchange	39	FFFF	Default		
	iDCS8830_io_channel_break_status[0]	Data exchange	72	FFFF	DWORD	(Low - High)	
	iDCS8830_io_channel_break_status[1]	Data exchange	74	FFFF	DWORD	(Low - High)	
	iDCS8830_io_channel_break_status[2]	Data exchange	76	FFFF	DWORD	(Low - High)	
	iDCS8830_io_channel_break_status[3]	Data exchange	78	FFFF	DWORD	(Low - High)	
	iDCS8830_io_channel_break_status[4]	Data exchange	80	FFFF	DWORD	(Low - High)	
	iDCS8830_io_channel_break_status[5]	Data exchange	82	FFFF	DWORD	(Low - High)	
	iDCS8830_io_channel_break_status[6]	Data exchange	84	FFFF	DWORD	(Low - High)	
	iDCS8830_io_channel_break_status[7]	Data exchange	86	FFFF	DWORD	(Low - Hiah)	
	<						>

Note:

Refer to iDCS-8000 user manual (CH4 Modbus Addresses Mapping) to enter the "Base address". <u>http://ftp.icpdas.com/pub/cd/idcs-8000/usersmanu</u> <u>al/fcm-mtcp_software_usermanual_en.pdf</u> In this example, to read 88 AI values from the address 577.

Refer to <u>Chapter 5</u> for more details on Modbus Master settings and refer to <u>Chapter 3</u> for Modbus Slave settings.

MODBUS Master Request

Request			
Description:	I/O status		
<u>S</u> lave/Unit:	1		
MODBUS Request			
<2> Read Input <3> Read Holdi <4> Read Input <5> Write circle	: Bits ng Registers : Registers - coil bit		×
Data block			
Base <u>a</u> ddress:	577		
<u>N</u> b items:	88		
Activation			
• <u>P</u> eriodic:	0	ms	3000
◯ On caḷ ◯ On change		•	(on error)
Misc.			
<u>T</u> imeout:	1000	ms	
Nb trials:	1		

16.5 Test the Redudant System 1 (Rotation switch: 7 & 9)

Important Notes:

- Set the rotation switch properly (Redudant System1: 7 and 9). Make sure that the LAN1, LAN2 and Alive Port are connected properly, and then power on. (Redudant System2: <u>Section 16.6</u>)
- The factory default setting of LAN1 and LAN2 is DHCP that must be set as static IP by using XPAC_Utility. Download the project to Main-PAC (7) first, and then it will be automatically copied to Backup-PAC (9) through LAN2 port.

16.5.1 Download the Redundant Project



1) Device Requirement:

Win-GRAF PAC		Cable	
XPAC * 2	<u>LAN1</u> : Ethernet cable * 2	LAN2: Ethernet crossover cable * 1	<u>Alive Port</u> : RS-232 crossover cable * 1

2) Set IP addresses:

For the first time to download redundant project, run XPAC_Utility and set LAN1 and LAN2 of two PACs as static IP addresses and click the "Apply" button, and then click the File menu and "Save & Reboot" to apply the IP settings.



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After rebooting, the IP Address and Mask will automatically be set as following:

Main-PAC (7):199.193.195.17 / 255.255.255.0;Backup-PAC (9):199.193.195.9 / 255.255.255.0

3) Set the Win-GRAF communication IP address

For the first time to download the redundant project, e.g., demo_rdn_2, enter the LAN1 IP address of the Main-PAC (7). Refer to <u>Section 2.3.5</u> - "Communication Parameters".

Communication Settings	— ×
T5 Runtime 👻	ОК
192.168.1.26:502	Cancel
192 168 1 26:502	Browse
The communication IP.	Help

4) Set the Active_IP address

Set the Active_IP and Mask address for the " i_redundancy" function depends on the network environment.



5) Download the Win-GRAF project

Click the "On Line" button () to download the redundant project to the Main-PAC, refer to <u>Section 2.3.4</u> and <u>Section 2.3.5</u>. After it's downloaded, LAN1 IP address of the Main-PAC(7) will automatically set to the Active_IP address and LAN1 IP address of the Backup-PAC(9) will set to Active IP + 1.

PCIVFETCE5B1	ок 🗙	P	CIVFETCE5B1		ок 🗙
IP Information IPv	6 Information	I	P Information IP	v6 Information	
「Internet Proto	col (TCP/IP)		「Internet Proto	ocol (TCP/IP)————	_
Address Type:	Static		Address Type:	Static	
IP Address:	192.168.79.37		IP Address:	192.168.79.38	
Subnet Mask:	255.255.0.0		Subnet Mask:	255.255.0.0	
Default Gatewa	y: 🔺		Default Gatewa	ay:	
	Details			Details	
<u>R</u> ene w	LAN1 IP address and Mask of the Main-PAC (Active).		Renew	LAN1 IP address and M the Backup-PAC (Pas	1ask of sive).

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6) Change the Win-GRAF communication IP address to the Active_IP address

Right now, Win-GRAF will show "Communication error" because the current IP address of the Active-PAC is automatically set to the Active_IP address. Click the "On Line" button again to stop the connection between the Win-GARF and the PAC.

😗 🕍 <u> Communication en</u>	or
Stop the connection.	

Next, change the Win-GRAF communication IP to the Active_IP address so that this project will always download to the Active-PAC whenever the user wants to debug or change it.

T5 Runtime OK 192.168.79.37:502 192.168.1.26:502 The communication IP. 192.168.79.37:502 Help	Communication Settings		×
192.168.1.26:502 The communication IP. Browse 192.168.79.37:502 Help	T5 Runtime 192.168.79.37:502		OK Cancel
	192.168.1.26:502 192.168.79.37:502	The communication IP.	Browse Help

Note:

- 1. For Win-GRAF and the PAC can communicate properly, both the IP addresses of them must on the same network segment.
- If users need to set the communication timeout (default 3 seconds, refer to <u>Section 2.3.5</u>.
 E.g., set the IP address to "192.168.71.37:502(10)" means that the timeout is set to 10 seconds.
- 3. Open Win-GRAF driver on the XPAC to check which one is the Active-PAC.

PAC side - Win-GRAF Driver:

	Win-GRAF-XP-8xx8-CE6	ОК
	XP-8xx8-CE6 driver Version 1.08 , Jan.03,2018 build 01	
	This product is licensed.	
P_8xx8_CE6	Project: demo_rdn_2, Ver=27, CRC=f040046e, Extra_port: None	
	Elapsed time : 0. 1: 6: 5 (Passive-Ready)	
	This one is the Active-PAC .	End Driver
		N U
Note:	WIN-GRAF-XP-8XX8-CED	UK
Since Win-GRAF Driver	XP-8xx8-CE6 driver Version 1.08 , Jan.03,2018 build 01	
LED indicator on the PAC.	This product is licensed.	
ON: Active PAC ;	Redundancy : Backup-PAC	
OFF: Passive PAC.	Static This one is the Passive-PAC .	
		End Driver

16.5.2 Test the Redundant Project (demo_rdn_2)

Refer to <u>Section 16.4</u> for the description of demo projects and <u>Section 16.5.1</u> to download the project.

1. View the status of redundant PACs

After Win-GRAF connects to the PAC, click "NewSpy1" to open the spy list window and check the current status of the redundant system.

🔿 u 👁 🚓
, 😜 🖷 🖷 🕶 J
AC now.
νΔC are
Actic
esses are
fundations
unction
_
of
-PAC are

Note:

- 1. Before switching the control authority, make sure the Passive-PAC is ready (i.e., "is Passive ready" = TRUE).
- 2. Users can also click the "Redundancy" button (🍄) to manually switch the control authority.

RUN	9) i i i i i i i i i i i i i i i i i i i
Redundancy	
 Redundancy is not enabled in the rule Running as active runtime 	ntime Refresh Close Set as passive
Passive runtime is alive	he PAC is Active-PAC right now.
O Running as passive runtime	

2. Set the value of variables

- 1) Assign a value to DINT_1, DINT_2, REAL_1 and REAL _2 variables.
- 2) Set the To_tick_TMR_1 and To_tick_TMR_2 to "TRUE" (this status will automatically reset to FALSE) to start the "TMR_1" and "TMR_2" ticking, and the statuses of TIMER will be changed from FALSE to TRUE.

	NewSpy1.spl			
	Name	Value	Description	
	is_Active_LAN1_ok	TRUE		*
	is_Passive_LAN1_ok	TRUE		
₽Ļ	DINT_1	9	Setup as Retain variable in the program "Retain_and_timer"	
	DINT_2	1234 🚽	Setup as Retain variable in the program "Retain_and_timer"	
	REAL_1	22.299999	Entors value able in the program "Retain_and_timer"	
	REAL_2	33.5	able in the program "Retain_and_timer"	
	TMB_1	t#1m10s26ms		
	TMR_1_last_state	TRUE	TRUE: ticking , FALSE: sleep	
	To_tick_TMR_1	FALSE	Set TRUE to start ticking timer1	
	To_stop_TMR_1	FALSE	Set TRUE to stop the ticking of timer1	Ξ
	TMR_2 Set timer	t#36s996ms		
	TMR_2_last_state_ to "TRUE"	TRUE	TRUE: ticking , FALSE: sleep	
	To_tick_TMR_2	FALSE	Set TRUE to start ticking timer2	
	To_stop_TMR_2	FALSE	Set TRUE to stop the ticking of timer2	Ŧ

3. Test the redundant system

- 1) Make sure the Passive-PAC is ready (i.e., is_Passive_Ready is TRUE).
- 2) Remove the LAN1 cable of the Active-PAC (or power the PAC off and on). In this example, the Active-PAC will automatically reboot after a specific time and give control authority to the other PAC (refer to the "RDN_control" program). Then, users can check if all the values still exist and timer1 and timer2 are still ticking.

	NewSpy1.spl						
	Name	Value	The Backup-PAC is Active-PA	C now.			
	is_Main_Active	FALSE	The backup-I Ac IS Active-I Ac now.				
	is_Backup_Active	TRUE	NewSpy1 spl				
∎∔	is_Main_ready	TRUE		Value			
	is_Backup_ready	TRUE		9			
	is_first_cycle_just_after_switch	FALSE		1234			
	is_Main_LAN1_ok	FALSE	B+ BFAL 1	22 299999			
	is_Backup_LAN1_ok	TRUE	BEAL 2	33.5			
	is_Alive_port_ok	TRUE	TMB 1	t#29m38s510ms			
	is_Passive_ready	TRUE	TMB 1 last state	TRUE			
	is_Active_LAN1_ok	TRUE	To tick TMB 1	FALSE			
	is_Passive_LAN1_ok	FALSE		FALSE			
			TMB 2	t#29m5s480ms			
			TMR_2_last_state	TRUE			
			To_tick_TMR_2	FALSE			
			To_stop_TMR_2	FALSE			

Note:

Plug in the LAN1 cable on the Main-PAC (Passive), the statuses of "is_Main_LAN1_ok" and "is_Passive_LAN1_ok" will become "TRUE".

16.5.3 Test the Redundant Project (demo_rdn_3, demo_rdn_1)

demo_RDN_3:

Using both the LAN1 of PACs to connect a ET-7050 (Modbus TCP I/O module) through one Ethernet switch.



1. Configure the ET-7000 module

Refer to the ET-7000 manual to set the IP address and I/O settings (refer to <u>Section 5.2.1</u>). Manual: <u>http://ftp.icpdas.com/pub/cd/6000cd/napdos/et7000_et7200/document/</u> Users can also use <u>VxComm Utility</u> to search and modify the IP, mask, and gateway addresses of the ET-7000.

2. Download the Win-GRAF project ("demo_rdn_3")

Refer to <u>Section 16.5.1</u> to download the "demo_RDN_3" project. If users have ever downloaded the redundant project before, only modify the Active_IP, Mask, and Win-GRAF communication IP addresses properly, and then download the project to the Active-PAC.

3. View settings of the Win-GRAF project

In the "I/O Drivers" window, enabled the PAC as Modbus TCP Master to connect an ET-7050 module (Modbus TCP Slave, Addr. = 1) and create some data blocks to read/write the DI and DO data (refer to <u>Section 5.2</u>). Next, double-click on the program name which is shown in the Workspace window to view program codes.



4. View the status of redundant PACs

Click "NewSpy1" to open the spy list, now the Main-PAC is the Active-PAC.



5. Set the value of variables

- 1) Assign a value to DINT_1, DINT_2, REAL_1 and REAL _2 variables.
- 2) Set the To_tick_TMR_1 to "TRUE" to start the "TMR_1" ticking.
- 3) Set the ET-7050_Do_x to "TRUE" and the ET-7050_DO_x_ReadBack will return "TRUE". If the Ethernet cable of ET-7050 is removed, the "ET-7050_COM_err" will return a non-zero value to indicate the communication error.

6. Test the redundant system

- 1) Make sure the Passive-PAC is ready (i.e., is_Passive_Ready is TRUE).
- 2) Remove the LAN1 cable of the Active-PAC (or power the PAC off and on). In this example, the Active-PAC will automatically reboot after a specific time and pass control authority to another PAC (refer to the "RDN_control" program).

	🔲 NewSpy1.spl			
	Name	Value	Description	
	is_Main_Active	FALSE		^
	is_Backup_Active	TRUE	The Backup BAC is Active BAC new	
₽Ļ	is_Main_ready	TRUE	The Backup-PAC is Active-PAC now.	
	is_Backup_ready	TRUE		

is first cycle just after switch	FALSE	
is_Main_LAN1_ok	FALSE	
is_Backup_LAN1_ok	TRUE	Plug in the LAN1 cable of Main-PAC (Passive)
is_Alive_port_ok	TRUE	to become the TRUE status.
is_Passive_ready	TRUE	
is_Active_LAN1_ok	TRUE	
is_Passive_LAN1_ok	FALSE	
DINT_1	9	When the Backup-PAC switch to the
DINT_2	3700	Active DAC, all variable values still exist
REAL_1	3.9	Active-PAC, all variable values still exist
REAL_2	5.8	and timer is still ticking.
TMR_1	t#5m9s526ms	
To_tick_TMR_1	FALSE	Set TRUE to start ticking timer1
To_stop_TMR_1	FALSE	Set TRUE to stop the ticking of timer1
ET7050_COM_err	130	0: No error (comm. ok) , Communication error of the ET-7060
ET7050_D0_0_ReadBack	TRUE	✓ ET-7050_COM_err:
ET7050_D0_1_ReadBack	FALSE	A non-zero value indicates an error.
ET7050_D0_2_ReadBack	FALSE	If the ET 70E0, DO wis set to TRUE the
ET7050_D0_3_ReadBack	TRUE	
ET7050_D0_4_ReadBack	FALSE	ET-7050_DO_x_ReadBack will return
ET7050_D0_5_ReadBack	TRUE	TRUE to indicate communication is OK .
ET7050_D0_0	TRUE	
ET7050_D0_1	FALSE	Relay_U ~ 5 of the ET-7050
ET7050_D0_2	FALSE	Relay_0 ~ 5 of the ET-7050
ET7050_D0_3	TRUE	Relay_0 ~ 5 of the ET-7050
ET7050_D0_4	FALSE	Relay_0 ~ 5 of the ET-7060
ET7050_D0_5	TRUE	Relay_0 ~ 5 of the ET-7060
<		
New Spy 1/10 Drivers PAC Time	RDN control	Retain and timer Variables

demo_RDN_1:

Using both the COM3 of PACs to connect three DCON I/O modules.



Refer to the test methods of "demo_RDN_3" noted above. Before two PACs connect to remote DCON I/O modules, refer to <u>Chapter 8</u> to configure each module by using DCON Utility.Visit "DCON Utility" web page to download the software and user manual <u>www.icpdas.com/products/dcon/introduction.htm</u>. Also, users can review Win-GRAF programs and the "i_redundancy" setting (refer to <u>Section 16.4.1</u> I/O Boards Settings).

16.5.4 Test the Redundant Project (demo_rdn_4)

Use both LAN1 of two PACs and one iDCS-8830 to connect with an Ethernet switch. iDCS-8830 supports redundant I/O modules.



Refer to <u>Section 16.2</u> to know the important communication ports and installation notes for the redundant system. Following table lists all used devices in this project:

Products	Quantity	Products	Quantity
XP-8048-CE6	2	DN-DI-32DW	1
RS-408	1	1	
iDCS-8830	1	1 DN-DO-16DR-B	
F-8040	2	CA-37 10 AM (1M Cable) or	Λ
F-8041	2	CA-37 20 AM /30 AM /50 AM /100 AM	4

The following describes modules plugged in iDCS-8830 from left to right. Visit the web page to download the software and user manual.

MiniOS7 Utility: <u>http://ftp.icpdas.com/pub/cd/8000cd/napdos/minios7/utility/</u> iDCS-8000 Utility: <u>http://ftp.icpdas.com/pub/cd/idcs-8000/utility/</u> (Software Installation: Ch2.2) iDCS-8000 User Manual/Website:

http://ftp.icpdas.com/pub/cd/idcs-8000/usersmanual/

http://www.icpdas.com/root/product/solutions/remote io/dcs redundancy io/idcs introduction.html

FPM-D2440 * 2: Power module1, Power module2 (for power input, 24V).

FCM-MTCP * 2:

MCU1 (set the SW2 to "C", the SW1 to "8", and the IP address to 192.168.71.200).

MCU2 (set the SW2 to "C", the SW1 to "9", and the IP address to 192.168.71.201).

SW2/SW1 means the fourth IP address of the MCU (Main Control Unit). (C8₁₆ = 200; C9₁₆ = 201)

Configure IP addresses by using MiniOS7 Utility:

Refer to Section 2.3 of iDCS-8000 user manual for more details. Open "MiniOS7 Utility" and click "Search" to search current IP addresses of iDCS-8830 (i.e., MCU1/2), and click "Stop" to stop searching. In this example, set both IP addresses as "192.168.71.200" and "192.168.71.201" and set the Mask as "255.255.0.0". Next, click the "Set" button and close MiniOS7 Utility.

🛅 ICPDAS	•	🛗 MiniOS7 Utili	ity Ver 3.26 🔶	📸 MiniOS7 Utility Ver 3.20	6
🛅 WinZip	•	@ iDCS-8000	•	👔 MiniOS7 Utility Ver 3.20	6 Manual 1
🛅 Win-GRAF	•	🛅 DCON_Utility	MiniOS7	Itility Version 3.2.6	
🛅 DAQPro	•	🛅 Modbus Utilit	: 🙈 170. 🔿	Commention Disco	🖾 Confirmation 🖃
🛅 Modbus Poll	•	📷 Smart 4	рана 🕞	Connection V 💦 Command	S Configuration
		_	Look jn:	<u>N</u> ew connection F2 <u>L</u> ast Connection Alt+F2	💽 🔇 🤌 🖡
			Name	Disconnect Ctrl+F2	Size Type 🔥
			🛅 bin	Search	File Folder

MiniOS7 Scan							
	Connect Clea <u>r</u>		E <u>x</u> it			🖄 IP Setting	×
	IP/Port	N	Alias	Mask	Ga	Recommend Settings	
3 adCast	192.168.11.9	<u>ک</u> 4	EtherIO	255.255.0.0	19		
TCP BroadCast	192.168.11.10	Web		255.255.0.0	19	IP: 192.168.71.200	
TCP BroadCast	192.168.11.8	.10	test1	255.255.0.0	19		
FCP BroadCast	192.168.71.200	FCM-MTCP	iDCS-8830	255.255.0.0	19	Mask: 255.255.0.0	
TCP BroadCast	192.168.71.201	FCM-MTCP	iDCS-8830	255.255.0.0	19	Gateway: 192.168.0.1	
TCP BroadCast	100.100.11.11			255.255.0.0	19		
TCP BroadCast	Select it and	l click "IP setti	ing".	255.255.0.0	19	Alias: iDCS-8830	
TCP BroadCast	132.100.70.02	VE 141 345	VE413X01	255.255.0.0	19		
TCP BroadCast	192.168.11.7	WISE-5800	WISE-5800	255.255.0.0	19	G Diable C Enable	

Cancel

Set

5

F-8040 * 2 :

32-channel DI modules, plug them into the I/O slot0 and slot1.

F-8041 * 2:

32-channel DO modules, plug them into the I/O slot2 and slot3.

Configure I/O modules by using iDCS-8000

Refer to Section 2.3 of iDCS-8000 user manual for more details.

1) Open iDCS-8000 Utility and enter the IP address of the iDCS-8830 to connect.

ND	iDCS-8000 Utility ver 3.2.2						
MBus	File Online Setting Help						
iDCS-8000 Utility	Connect Us 2 Upload Download Monitor						
N	Controller						
	IP 192.168.71.200	Note: Your PC and the iDCS-8830 must in the same network segment (e.g., 192.168.71. 99 and 192.168.71 .200)					
		to connect successfully.					

2) Click "Upload" to upload the current I/O settings that used in the iDCS-8830.



3) Click the 1st FCM-MTCP (MCU1) and set "IOM_0 \sim 3" (F-8040/F-8041) as "Duplex" Mode.

4) If the F-8040/F-8041 has not yet connected to termination boards, set the "Break Line" as "OFF".



If the F-8040/F-8041 has connected to the following termination boards, set the "Break Line" as "ON".

DN-DI-32DW * 1 : 32-channel DI termination board. Connect to F-8040 DI modules on slot 0 to 1.

DN-DO-16DR-A * 1: 16-channel DO termination board that used for channel 0 to 15.

DN-DO-16DR-B * 1: 16-channel DO termination board that used for channel 16 to 31. Connect DN-DO-16DR-A (CN1, CN2) to F-8041 DO modules (slot2, slot3), and then connect DN-DO-16DR-A (CN3) to DN-DO-16DR-B (CN1).

CA-3710AM * 4 : 1m 37-pin Male-Female D-sub cable, which used to connect to I/O modules and the termination boards.

5) Click "Set" and click "Download" to download settings to iDCS-8830, and then close iDCS-8830 utility.

Start testing:

First, users must refer to <u>Section 16.5.1</u> to know how to set Win-GRAF communication IP address and Active_IP address, and download Win-GRAF project ("demo_RDN_4"). The following is a description of testing iDCS-8830. Before testing, make sure all devices are connected properly and then establish the connection between Win-GRAF and the PAC.

Note: Make sure both of IP addresses of the PC and PAC are on the same network segment. For example, if the IP address of PAC is "192.168.71.37" and the Mask address is "255.255.255.0", set the IP address of PC as "192.168.71.x".

After connecting to the PAC, click "New Spy1" to open the spy list.

🚾 Win-GRAF - demo_rdn_4				
File Edit View Insert Project I	ools	Window Help		
🗃 🔒 🖭 🕘 🔍 🔏 📭	<u>a</u> ×	. 🙀 😓 🖉 🗠 🔚 🏭 🛔	ß 😨 🟠	E 🐅 🔐 🌘 📶 RUN 🛛 >>>> 🎉 🏭 🛱 💷 🦉 🚳
Workspace		NewSpy1.spl		
demo_rdn_4 [RUN]		Name	Value	Description
Exception programs		Hour1	11	~
📄 💼 Programs		Minute1	4	
🔤 📆 DO_demo	⊒ ∔	Second1	1	
PAC_Time		is_Main_Active	TRUE	
		is_Backup_Active	FALSE	
		is_Main_ready	TRUE	
🔤 📷 Retain_and_timer		is_Backup_ready	TRUE	
📄 🛁 Watch (for debugging)		is_first_cycle_just_after_switch	FALSE	
Soft Scope		is_Main_LAN1_ok	TRUE	
saulaulaitiat 📰		is_Backup_LAN1_ok	TRUE	
NewSpy1		is_Alive_port_ok	TRUE	
Binding Configuration		is_Passive_ready	TRUE	
🚽 🕺 🚽 Global defines		is_Active_LAN1_ok	TRUE	
Contraction of the second seco			TRUE	
	1	30_LAN1_error_status		Value : 0: ok , inon-zero : error. LAN error status of the 1st FCM-MTCP.
CIICK New S	LYC	 B0_LAN2_error_status 	0	Value : 0: ok , non-zero : error. LAN error status of the 2nd FCM-MTCP.
	-	80_FCM1_mode	32	Value : 16#0020 : Master , 16#0021: Slave. Modbus start-addr = 513. Redundant mode of the 1st FCM-MTCP.
		iDCS8830_FCM2_mode	33	Value : 16#0020 : Master , 16#0021: Slave. Modbus start-addr = 513. Redundant mode of the 2nd FCM-MTCP.
		iDCS8830_FCM1_status	16	Value : 16#0000: Empty , 16#0001: Timeout , 16#0002: Undefined , 16#0010: Normal. Modbus-addr = 514, FCM1 status.
		iDCS8830_FCM2_status	16	Value : 16#0000: Empty , 16#0001: Timeout , 16#0002: Undefined , 16#0010: Normal Modbus-addr = 514, FCM2 status.
		iDCS8830_FPM_status	3	Value: 0x0000: No FPM plugged , 0x0001: FPM1 Good / FPM2 Off , 0x0002: FPM1 Off / FPM2 Good , 0x0003: Two FPM are Good. Modbus-addr = 516,
		iDCS8830_System_minor_fault_status	0	Value: 0: normal , non-zero: something wrong (refer the iDCS-8830 software manual). Modbus-addr = 517 / 518 , System minor fault status.
		iDCS8830_System_major_fault_status	0	Value: 0: normal , non-zero: something wrong (refer the iDCS-8830 software manual). Modbus-addr = 519 / 520 , System major fault status.
		iDCS8830_io_slot_status		Value: 16#0001: Empty , 16#0002: Halt, 16#0004: Bootup, 16#0008: Bootloader, 16#0010: Pre-operation, 16#0020: Operation, 16#0040: Stop. Modbus
		iDCS8830_io_slot_status[0]	32	Value: 16#0001: Empty , 16#0002: Halt, 16#0004: Bootup, 16#0008: Bootloader, 16#0010: Pre-operation, 16#0020: Operation, 16#0040: Stop. Modbus
		iDCS8830_io_slot_status[1]	32	Value: 16#0001: Empty , 16#0002: Halt, 16#0004: Bootup, 16#0008: Bootloader, 16#0010: Pre-operation, 16#0020: Operation, 16#0040: Stop. Modbus
		iDCS8830_io_slot_status[2]	32	Value: 16#0001: Empty , 16#0002: Halt, 16#0004: Bootup, 16#0008: Bootloader, 16#0010: Pre-operation, 16#0020: Operation, 16#0040: Stop. Modbus
		iDCS8830_io_slot_status[3]	32	Value: 16#0001: Empty , 16#0002: Halt, 16#0004: Bootup, 16#0008: Bootloader, 16#0010: Pre-operation, 16#0020: Operation, 16#0040: Stop. Modbus
		iDCS8830_io_slot_status[4]	1	Value: 16#0001: Empty , 16#0002: Halt, 16#0004: Bootup, 16#0008: Bootloader, 16#0010: Pre-operation, 16#0020: Operation, 16#0040: Stop. Modbus
		iDCS8830_io_slot_status[5]	1	Value: 16#0001: Empty , 16#0002: Halt, 16#0004: Bootup, 16#0008: Bootloader, 16#0010: Pre-operation, 16#0020: Operation, 16#0040: Stop. Modbus
		iDCS8830_io_slot_status[6]	1	Value: 16#0001: Empty , 16#0002: Halt, 16#0004: Bootup, 16#0008: Bootloader, 16#0010: Pre-operation, 16#0020: Operation, 16#0040: Stop. Modbus
		iDCS8830_io_slot_status[7]	1	Value: 16#0001: Empty , 16#0002: Halt, 16#0004: Bootup, 16#0008: Bootloader, 16#0010: Pre-operation, 16#0020: Operation, 16#0040: Stop. Modbus
		iDCS8830_io_emergency_status		Value: 0: 0K , Value: 16#0100: cable break-off , 16#0020: CJC error. Modbus start-addr = 609. ID Emergency status of the iDCS-8830 's slot 0 ~ 7.
		iDCS8830_io_emergency_status[0]	0	Value: 0: 0K , Value: 16#0100: cable break-off , 16#0020: CJC error. Modbus start-addr = 609. ID Emergency status of the iDCS-8830 's slot 0 ~ 7.
		iDCS8830 io emergency status[1]	0	_Value; 0: 0K , Value: 16#0100: cable break-off , 16#0020: CJC error. Modbus start-addr = 609. 10 Emergency status of the iDCS-8830 's slot 0 ~ 7 . 📃 💌
	< >	10 Drivers Variables D0 demo N	ew Spy 1/PA	C Time RDN control ReadMe Retain and timer /
	Run	time	Call stack	trasknoints Digital sampling trace Remet Hull Code Checker
l Ready		, saw or second and the second		RIN (192 168 71 37:502) All 0.252 1029 x 18 287 72 100% A

iDCS-8830's Communication Status:

Name	iDCS8830_	_LAN1_erro	or_status	iDCS8830_LAN2_error_status		
Test Stens	1. Unplug (or pl	ug in) the L	AN cable of the 1	lst FCM-MTCP. Value: Non-0 (or 0).		
Test Steps	2. Unplug (or plug in) the LAN cable of the 2nd FCM-MTCP. Value: Non-0 (or 0).					
Return Value	Return Value 0 : Communication OK ; Non-0 : Communication Error					
iDCS8830_LAN1_error_status130Value : 0: ok _ non-zero : error. LAN				zero : error. LAN error status of the 1st FCM-MTCP.		
iDCS8830_LAN2_error_status		0	Value : 0: ok , non-	zero : error. LAN error status of the 2nd FCM-MTCP.		

iDCS-8830's Power Status:

Name			iDCS8830_FPM_status		
Tost Stops	1. Unplug (or	r plug in) the p	ower cable of the 1st FCM-MTCP. Value: 2 (or 3).		
Test Steps	2. Unplug (or	r plug in) the p	ower cable of the 2nd FCM-MTCP. Value: 1 (or 3).		
Potum Value	0 : No FPM is	plugged.	1 : FPM1 Off ; FPM2 Good.		
Return value	2 : FPM1 Goo	d ; FPM2 Off.	3 : Both of these FPM are plugged.		
	rror obshuo	0 Value : 0	ek - nen zere i ever I AN ever status ef the 1st ECM MTCD		
iDCS8830_LAN1_e	rror_status	0 Value: 0.	ok , non-zero ; error. LAN error status of the 2nd FCM-MTCP.		
iDCS8830_FCM1_n	node	32 Value : 1	5#0020 : Master , 16#0021: Slave. Modbus start-addr = 513. Redundant mode of the 1st FCM-		
iDCS8830_FCM2_mode 33		33 Value : 10	Value : 16#0020 : Master , 16#0021: Slave. Modbus start-addr = 513. Redundant mode of the 2nd FCM		
iDCS8830_FCM1_status 16		16 Value : 10	6#0000: Empty , 16#0001: Timeout , 16#0002: Undefined , 16#0010: Normal. Modbus-addr =		
iDCS8830_FCM2_s	tatus	16 Value : 10	6#0000: Empty,16#0001: Timeout,16#0002: Undefined,16#0010: Normal Modbus-addr = !		
iDCS8830_FPM_sta	atus	2 Value: 0x	0000: No FPM plugged , 0x0001: FPM1 Good / FPM2 Off , 0x0002: FPM1 Off / FPM2 Good ,		

FCM-MTCP's Redundant Mode and Status:

Name	iDCS8830_FCM1_1 iDCS8830_FCM1_9	mode status	iDCS8830_FCM2_mode iDCS8830_FCM2_status		
	Unplug the 1st FCM-MTCP module (FCM1).				
Test Step	iDCS8830_LAN1_error_status iDCS8830_LAN2_error_status iDCS8830_FCM1_mode iDCS8830_FCM2_mode iDCS8830_FCM1_status iDCS8830_FCM1_status	130 Value 0 Value 32 Value 32 Value 1 Value 16 Value	: 0: ok , non-zero : error. LAN error status of the 1st FCM-MTCP. : 0: ok , non-zero : error. LAN error status of the 2nd FCM-MTCP. : 16#0020 : Master , 16#0021: Slave. Modbus start-addr = 513. R∉ : 16#0020 : Master , 16#0021: Slave. Modbus start-addr = 513. R∉ : 16#0000: Empty , 16#0001: Timeout , 16#0002: Undefined , 16 : 16#0000: Empty , 16#0001: Timeout , 16#0002: Undefined , 16		
Description	iDCS8830_LAN1_error_stat It means the FCM1 commun iDCS8830_FCM1_mode = 32 The redundant mode still di iDCS8830_FCM2_mode = 32 It means the FCM2 is taking iDCS8830_FCM1_status = 1	us = 130 nication error. 2 isplayed as "32" 2 ; over now and i means that the	(Master) because the FCM1 is unplug. ts redundant mode is "Master" (32). FCM1 is timeout.		
Return Value	iDCS8830_FCM1_mode / iDCS8830_FCM2_mode 32 : Master 33: Slave iDCS8830_FCM1_status / iDCS8830_FCM2_status 0: Empty 1: Timeout 2: Undefined 16: Normal				
Plug in the FCM1, it will change to "Slave" mode (33), and becomes a normal status (16).iDCS8830_LAN1_error_status0Value : 0: ok , non-zero : error. LAN error status of the 1st FCM-MTCP.iDCS8830_LAN2_error_status0Value : 0: ok , non-zero : error. LAN error status of the 2nd FCM-MTCP.iDCS8830_FCM1_mode33Value : 16#0020 : Master , 16#0021: Slave. Modbus start-addr = 513. RiDCS8830_FCM2_mode32Value : 16#0020 : Master , 16#0021: Slave. Modbus start-addr = 513. RiDCS8830_FCM1_status16Value : 16#0000: Empty , 16#0001: Timeout , 16#0002: Undefined , 16iDCS8830_FCM2_status16Value : 16#0000: Empty , 16#0001: Timeout , 16#0002: Undefined , 16					
You can try to iDCS8830_L/ iDCS8830_L/ iDCS8830_F(iDCS8830_F(iDCS8830_F(iDCS8830_F(unplug the FCM2, and then N1_error_status 0 N2_error_status 130 CM1_mode 32 CM2_mode 33 CM1_status 16 CM2_status 1	the FCM1 will b Value : 0: ok , no Value : 0: ok , no Value : 16#0020 Value : 16#0020 Value : 16#0000: Value : 16#0000:	ecome the Master (32) and take over. m-zero : error. LAN error status of the 1st FCM-MTCP. m-zero : error. LAN error status of the 2nd FCM-MTCP. : Master , 16#0021: Slave. Modbus start-addr = 513. Re : Master , 16#0021: Slave. Modbus start-addr = 513. Re Empty , 16#0001: Timeout , 16#0002: Undefined , 16 Empty , 16#0001: Timeout , 16#0002: Undefined , 16		
Plug in the FC iDCS8830_L/ iDCS8830_F(iDCS8830_F(iDCS8830_F(iDCS8830_F(iDCS8830_F(M2 afterward. M1_error_status 0 M2_error_status 0 M1_mode 32 CM2_mode 33 CM1_status 16 CM2_status 16	Value : 0: ok , no Value : 0: ok , no Value : 16#0020 Value : 16#0020 Value : 16#0000: Value : 16#0000:	on-zero : error. LAN error status of the 1st FCM-MTCP. on-zero : error. LAN error status of the 2nd FCM-MTCP. : Master , 16#0021: Slave. Modbus start-addr = 513. Ro : Master , 16#0021: Slave. Modbus start-addr = 513. Ro Empty , 16#0001: Timeout , 16#0002: Undefined , 16 Empty , 16#0001: Timeout , 16#0002: Undefined , 16		

The Status of I/O Slot and I/O Emergency:

Name	iDCS8830_io_slot_status	iDCS8830_io_emergency_status
	Unplug the cable between the 1st F-804 0 (sl	ot 0) and the terminal board DN-DI-32DW.
Test step	□ iDCS8830_io_slot_status iDCS8830_io_slot_status[0] 64 iDCS8830_io_slot_status[1] 32 iDCS8830_io_slot_status[2] 32 iDCS8830_io_slot_status[3] 32 iDCS8830_io_slot_status[3] 32 iDCS8830_io_slot_status[4] 1 iDCS8830_io_slot_status[5] 1 iDCS8830_io_slot_status[6] 1 iDCS8830_io_slot_status[6] 1 iDCS8830_io_slot_status[6] 1 iDCS8830_io_emergency_status 256 iDCS8830_io_emergency_status[1] 0 iDCS8830_io_emergency_status[2] 0 iDCS8830_io_emergency_status[3] 0	Value: 16#0001: Empty , 16#0002: Halt, 16#0004: Bootup, 16#0008 Value: 16#0001: Empty , 16#0002: Collecteraterateraterateraterateraterateratera
Description	iDCS8830_io_slot_status[0] = 64, which mea iDCS8830_io_emergency_status[0] = 256 It means the cable which plugged into this m Plug in this cable and then you can try to unp	ns this module (slot0) is stop working. nodule (slot0) is disconnected. plug others cable for testing.
Return Value	iDCS8830_io_slot_status[x] 1: Empty 2: Halt 4: Bootup 8: Bootloader 1 iDCS8830_io_emergency_status[x] 0 : Normal 32: CJC Error 256: Cable Break	.6: Pre-operation 32: Operation 64: Stop -off

Redundant DO module:

Name	iDCS8830_slot23_F8041_DO					
	Plug in the 1st F-804 1 DO module	(slot2).				
	□ iDCS8830_io_slot_status			Value: 16#0001: Empty , 16#0002: Halt,		
	iDCS8830_io_slot_status[0]		32	Value: 16#0001: Empty , 16#0002: Halt,		
	iDCS8830_io_slot_status[1]		32	Value: 16#0001: Empty , 16#0002: Halt,		
	iDCS8830_io_slot_status[2]		2	Value: 16#0001: Empty , 16#0002: Halt,		
	iDCS8830_io_slot_status[3]		32	Value: 16#0001: Empty , 16#0002: Halt,		
Test step	□ iDCS8830_slot23_F8041_D0		F-80	041 Digital Output in the slot 2 - 3 (Duplex mode) of iDCS-8830		
-	iDCS8830_slot23_F8041_D0[0]	TRUE	F-80	041 Digital Output in the slot 2 - 3 (Duplex mode) of iDCS-8830		
	iDCS8830_slot23_F8041_D0[1]	TRUE	F-80	F-8041 Digital Output in the slot 2 - 3 (Duplex mode) of iDCS-8830		
	iDCS8830_slot23_F8041_D0[2]	TRUE	F-80	041 Digital Output in the slot 2 - 3 (Duplex mode) of iDCS-8830		
	iDCS8830_slot23_F8041_D0[3]	TRUE	F-80	041 Digital Output in the slot 2 - 3 (Duplex mode) of iDCS-8830		
	iDCS8830_slot23_F8041_D0[4]	TRUE	F-80	041 Digital Output in the slot 2 - 3 (Duplex mode) of iDCS-8830		
	iDCS8830_slot23_F8041_D0[5]	TRUE	F-80	F-8041 Digital Output in the slot 2 - 3 (Duplex mode) of iDCS-8830		
	iDCS8830_slot23_F8041_D0[6]	TRUE	F-80	041 Digital Output in the slot 2 - 3 (Duplex mode) of iDCS-8830		
	iDCS8830_slot23_F8041_D0[7]	TRUE	F-80	041 Digital Output in the slot 2 - 3 (Duplex mode) of iDCS-8830		
	At first, the LED indicator (called D	000 ~ 7) of	the 1	st F-8041 module (slot2) will light up		
Description	sequentially. When you unplug this module, the 2nd F-8041 module (slot3) will take over					
Description	and do the same thing. Then, you can view the status value of the iDCS8830 io slot					
	status[2] is "2" which means this r	nodule (slo	ot2) is	s halted. (Plug in this module again.)		
			, 10			

16.6 Test the Redudant System 2 (Rotation switch: 6 & 8)

Important Notes:

- Set the rotation switch properly (Redudant System2: 6 and 8). Make sure that the LAN1, LAN2 and Alive Port are connected properly, and then power on. (Redudant System1: Section 16.5)
- The factory default setting of LAN1 and LAN2 is DHCP that must be set as static IP by using XPAC_Utility.

16.6.1 Download the Redundant Project



1) Device Requirement:

Win-GRAF PAC	Cable		
ΧΡΔ Γ * 2	LAN1 \ LAN2:	Alive Port:	
	Ethernet cable * 4	RS-232 crossover cable * 1	

2) Set IP addresses:

The factory default setting of LAN1 and LAN2 is DHCP, set them as static IP by using XPAC_Utility.

	IC Utility [1.2.7. e Help neral General2 [4] Displat IP Config Network Devi	ce Information]	Auto Execution Rotary Exe
	LAN 1:		LAN 2:	
	MAC Address:	00-0D-E0-70-01-00	MAC Address:	00-0D-E0-6E-0C-19
	Use DHCP	to get IP address	OUse DHCP t	xo get IP address
	🔿 Assign IP a	ddress	🔿 Assign IP a	ddress
出廠預設 DHCP	IP Address:	192.168.1.19	IP Address:	192.168.1.25
	Mask:	255.255.0.0	Mask:	255.255.0.0
	Gateway:	192.168.1.1	Gateway:	192.168.1.1
	DNS Server:	139.175.1.244	DNS Server:	139.175.1.244
		Apply		Apply

Note:

When using multiple sets of redudant system (i.e., Win-GRAF redudant system 2), it must assign LAN2 IP address for each set.

- 1. If Main PAC = LAN2 IP, the Backup PAC must be LAN2 IP + 1.
- 2. Both the Mask address of two PACs must be the same.

Rotary Switch (6, 8)	LAN2	Description
Main PAC (6)	IP	The Active PAC by default (i.e., L1 LED = ON) Please download the Win-GRAF project to this PAC.
Backup PAC (8)	IP+1	The Passive PAC by default (i.e., L1 LED = OFF)

For example,

Main-PAC (6):	LAN2 IP = 192.168.79 .25 ; Mask = 255.255.0.0
Backup-PAC (8):	LAN2 IP = 192.168.79 .26 ; Mask = 255.255.0.0

LAN 1:	LAN 2:	
MAC Address: 00-0D-E0-70-01-00	MAC Address: 00-0D-E0-6E-0C-19	Main PAC (6)
O Use DHCP to get IP address	O Use DHCP to get IP address	
C Assign IP address	Assign IP address	
IP Address: 192.168.1.26	IP Address: 192.168.79.21	
Mask: 255.255.0.0	Mask: 255.255.0.0	
Gateway:	Gateway:	Backup PAC (8)
DNS Server:	DNS Server:	LAN 2:
Apply		MAC Address: 00-0D-E0-6E-0B-59
	O Use DHCP to get IP address	🔿 Use DHCP to get IP address
	Assign IP address	Assign IP address
	IP Address: 192.168.1.7	IP Address: 192.168.79.22
	Mask: 255.255.0.0	Mask: 255.255.0.0
	Gateway:	Gateway:
	DNS Server:	DNS Server:

After completing the settings, click the "Apply" button and restart two PACs to apply the IP settings. Check to see if IP addresses are correct. In addition, the LAN1 IP of Backup PAC will automatically be set as Active_IP+1 after downloading the project to the Active PAC.

3) Set the Win-GRAF communication IP address

For the first time to download the redundant project, e.g., demo_rdn_2, enter the LAN1 IP address of the Main-PAC (6). Refer to <u>Section 2.3.5</u> - "Communication Parameters".

Communication Settings	—
T5 Runtime	OK
192.168.1.26:502	Cancel
192.168.1.26:502	Browse
The communication IP.	Help

4) Set the Active_IP address

Set the Active_IP and Mask address for the " i_redundancy" function depends on the network environment.

Note: remember to change the Active_IP address when using multiple sets of redundant system.



5) Download the Win-GRAF project

Click the "On Line" button () to download the redundant project to the Main-PAC, refer to <u>Section 2.3.4</u> and <u>Section 2.3.5</u>. After it's downloaded, LAN1 IP address of the Main-PAC(6) will automatically be set to the Active_IP address. And then LAN1 IP address of the Backup-PAC(9) will be set to Active IP + 1.



6) Change the Win-GRAF communication IP address to the Active_IP address

Right now, Win-GRAF will show "Communication error" because the current IP address of the Active-PAC is automatically set to the Active_IP address. Click the "On Line" button again to stop the connection between the Win-GARF and the PAC.

🕒 🕍 🔁 Communication error			
Stop the connection.			

Next, change the Win-GRAF communication IP to the Active_IP address so that this project will always download to the Active-PAC whenever the user wants to debug or change it.

Communication Settings		- ×-
T5 Runtime 192.168.79.37:502	(OK Cancel
192.168.1.26:502 192.168.79.37:502	The communication IP.	Browse Help

To view the status of Win-GRAF redundant system in the "Variables" window. Refer to <u>Section 16.4.1</u> <u>I/O Boards Settings</u> to see the description of the "i_redundancy" function.

<u>Test</u>:

- 1. After unplugging the LAN2 cable of Backup PAC, it will automatically synchronize data through LAN1.
- 2. After turning off the Main PAC, the Backup PAC will become Active PAC (L1 LED = ON) $\,^\circ$

[Variables]						
Name	Value	Туре	Dim	. Attrib.	Syb.	
🚰 Global variables						
🛃 RETAIN variables						
🗆 👼 %IX9-i redundancy		_	. [
%IX9.0=is_Main_Active	TRUE	BOOL		The Mai	n-PAC	is Active-PAC now.
%IX9.1=is Backup Active	FALSE	BOOL		Input		
%IX9.2=is_Main_ready	TRUE	BOOL		✓ Main-	-PAC ar	nd Backup-PAC are
%IX9.3=is_Backup_ready	TRUE	BOOL		roady		NI1 ID addrossos ar
%IX9.4=is_first_cycle_just_after_switch	FALSE	BOOL		reauy	, and L	ANT IP dudiesses an
%IX9.5=is_Main_LAN1_ok	TRUE	BOOL		funct	ion nor	mally.
%IX9.6=is_Backup_LAN1_ok	TRUE	BOOL		✓ Alive	Port (R	S-232) are function
%IX9.7=is_Alive_port_ok	TRUE	BOOL		norm	ally.	
%IX9.8=is_Passive_ready	TRUE	BOOL		✓ Passiv	ve-PAC	is ready.
%IX9.9=is_Active_LAN1_ok	TRUE	BOOL		√ Poth		Daddrassas of
%IX9.10=is_Passive_LAN1_ok	TRUE	BOOL		• BUUI		
%IX9.11=is_Backup_data_ok	2	BYTE		Active	e-PAC a	and Passive-PAC are
				funct	ion nor	mally.
. If the university of the shown of 11 is 0, make as it is that the				🗸 Using	LAN2	to synchronize data

<u>Note:</u> If the value of the channel 11 is 0, make sure both the <u>LAN2 IP</u> of two PACs are correct.