Redundant Feature in Ethernet Connection

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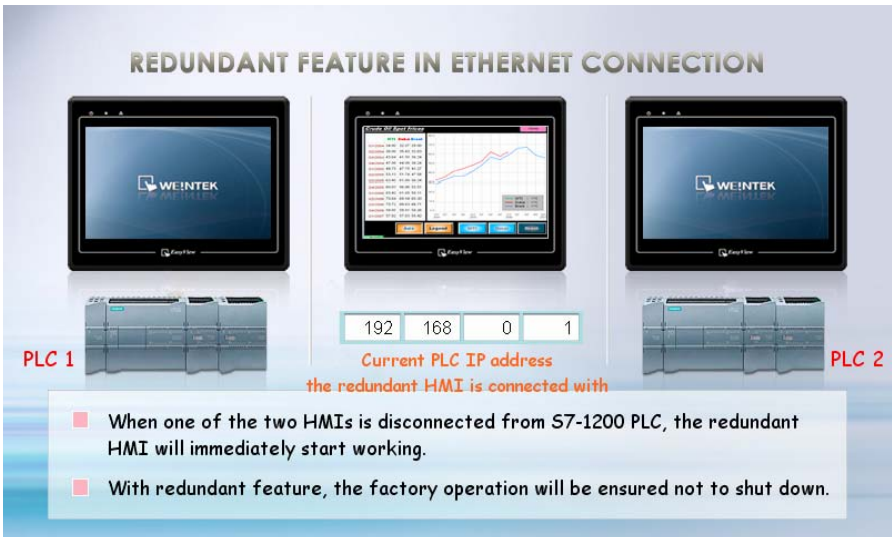
Overview

Worried that the unstable devices will shut down your factory operation all of a sudden?

The Redundant Connection will ensure your factory to work smoothly all the time without sudden stop.



REDUNDANT FEATURE IN ETHERNET CONNECTION

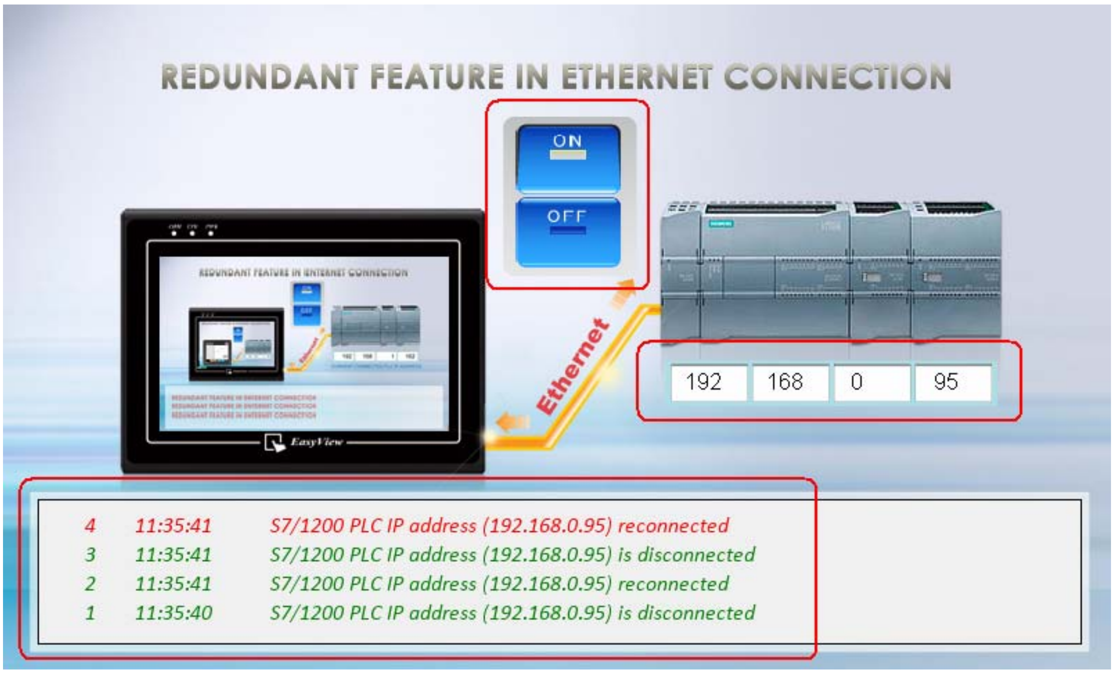
- When one of the two HMIs is disconnected from S7-1200 PLC, the redundant HMI will immediately start working.
- With redundant feature, the factory operation will be ensured not to shut down.

Operation

When one of the 2 HMIs is disconnected from S7/1200 PLC, the redundant HMI will immediately start working. Assume that HMI 1 is disconnected from PLC; the redundant HMI will be the replacement of HMI 1 and communicates with PLC 1. At this moment if HMI 2 is disconnected from PLC, both the redundant HMI and PLC 2 will be in a status waiting to be connected. When HMI 1 and PLC 1 recover communication, the redundant HMI will immediately communicate with PLC 2.

2. Setting Up the Screen

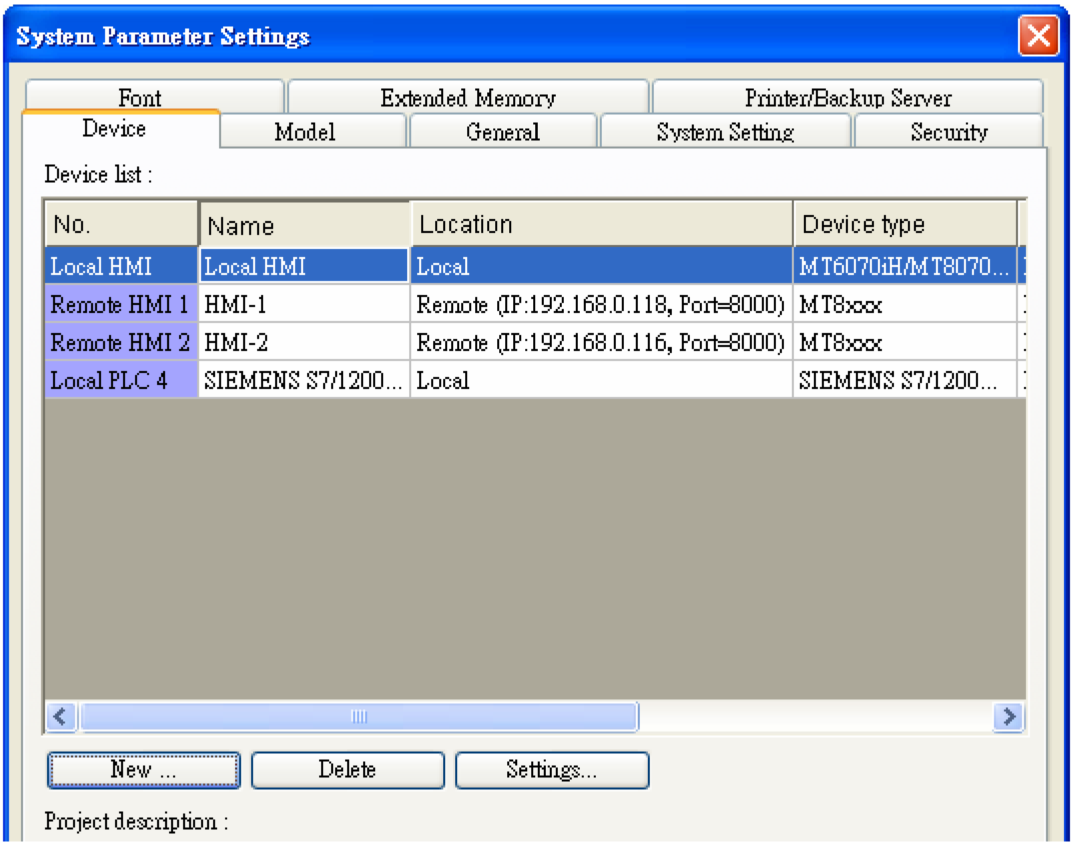
1. Firstly, the projects of HMI1 and HMI2 must be built the same. In this demo project, S7-1200 PLC is used. Users can decide whether or not to display with Event display the communication status between HMI and PLC and relevant properties.



192 168 0 95

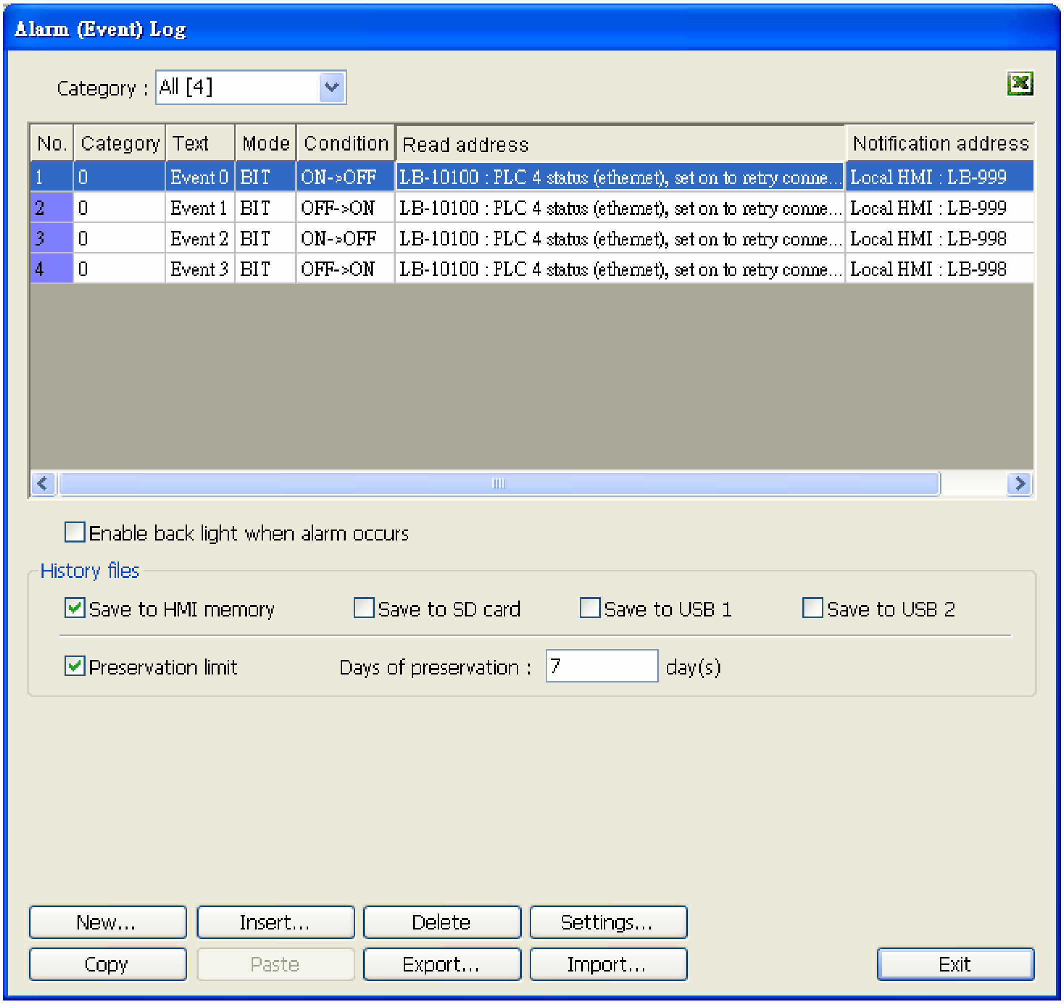
4 11:35:41 S7/1200 PLC IP address (192.168.0.95) reconnected
3 11:35:41 S7/1200 PLC IP address (192.168.0.95) is disconnected
2 11:35:41 S7/1200 PLC IP address (192.168.0.95) reconnected
1 11:35:40 S7/1200 PLC IP address (192.168.0.95) is disconnected

2. Go on to build redundant HMI3 project, firstly, add 2 remote HMIs to Device List, one with the IP address indicates HMI1 and another indicates HMI2, for reading communication status of PLC with HMI1 and HMI2. Then add a S7-1200 PLC, the IP address is not restricted.



No.	Name	Location	Device type
Local HMI	Local HMI	Local	MT6070iH/MT8070...
Remote HMI 1	HMI-1	Remote (IP:192.168.0.118, Port=8000)	MT8xxx
Remote HMI 2	HMI-2	Remote (IP:192.168.0.116, Port=8000)	MT8xxx
Local PLC 4	SIEMENS S7/1200...	Local	SIEMENS S7/1200...

3. Add 4 Event Logs, with them to determine if the communication of PLC with HMI1 and HMI2 is normal. When communication error occurs, MACRO will be triggered automatically. These 4 Event Logs read from the same remote address (LB10100), which is PLC4 status (Ethernet), set on to retry connection. Each Event Log detects one type of communication status of remote HMIs with PLC: HMI1 (ON->OFF, OFF->ON) and HMI2 (ON->OFF, OFF->ON). Please set notification bit for Event Log, for notifying one of the bits to trigger MACRO. In this demo project, if there’s a change in HMI1 communication status, LB999 will be notified to trigger MACRO ID1, and for HMI2, LB998 triggers MACRO ID2.



Category : All [4]

No.	Category	Text	Mode	Condition	Read address	Notification address
1	0	Event 0	BIT	ON->OFF	LB-10100 : PLC 4 status (ethernet), set on to retry conne...	Local HMI : LB-999
2	0	Event 1	BIT	OFF->ON	LB-10100 : PLC 4 status (ethernet), set on to retry conne...	Local HMI : LB-999
3	0	Event 2	BIT	ON->OFF	LB-10100 : PLC 4 status (ethernet), set on to retry conne...	Local HMI : LB-998
4	0	Event 3	BIT	OFF->ON	LB-10100 : PLC 4 status (ethernet), set on to retry conne...	Local HMI : LB-998

☐ Enable back light when alarm occurs

History files

☑ Save to HMI memory ☐ Save to SD card ☐ Save to USB 1 ☐ Save to USB 2

☑ Preservation limit Days of preservation : 7 day(s)

4. Now go on to MACRO, the main point of this demo project. There are 4 types of communication status: Both HMI 1 and HMI 2 stay normal; Error occurs on HMI1 but HMI2 stays normal; Error occurs on HMI2 but HMI1 stays normal; Errors occur on both HMI1 and HMI2.

Macro ID 1:

```
macro_command main()

bool a,c,d=1,e=0
short plcip0[4]={192,168,0,1}    //Assign to an arbitrary IP
short plcip1[4]={192,168,0,95} //PLC1 IP connected to HMI1
short plcip2[4]={192,168,0,96} // PLC2 IP connected to HMI2
bool b = 1

GetData(a,"Local HMI",LB,999,1) //Read HMI1 status for error check
GetData(c,"Local HMI",LB,998,1) //Read HMI2 status for error check
```

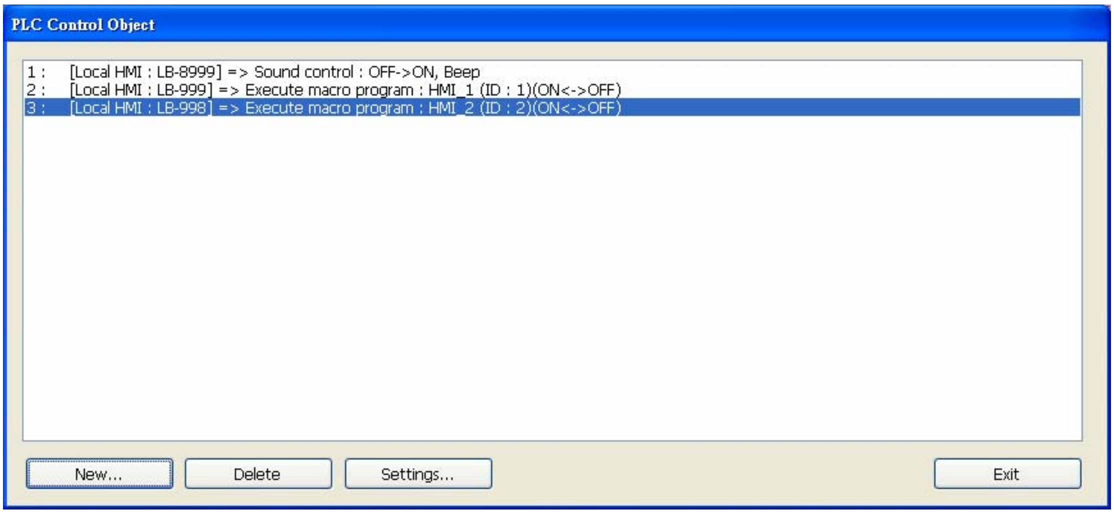
```
if a==1 and c==0 then //When error occurs on HMI1 but HMI2 stays normal
SetData(plcip1[0],"Local HMI",LW,9600,4) // Write PLC1 IP into the PLC IP address the redundant HMI connects to
SetData(e, "Local HMI", LB, 10, 1)
else if a==1 and c==1 then //When errors occur on both HMI1 and HMI2
SetData(plcip2[0],"Local HMI",LW,9600,4)
SetData(d, "Local HMI", LB, 10, 1)
else if a==0 and c==1 then //When error occurs on HMI2 but HMI1 stays normal
SetData(plcip2[0],"Local HMI",LW,9600,4) //Write PLC2 IP into the PLC IP address the redundant HMI connects to
SetData(e, "Local HMI", LB, 10, 1)
SetData(e, "Local HMI", LB, 20, 1)
else if a==0 and c==0 then //The status of both HMI1 and HMI2 stay normal
SetData(plcip0[0],"Local HMI",LW,9600,4) //Randomly provide an IP for redundant HMI to connect
SetData(e, "Local HMI", LB, 10, 1)
end if

SetData(b,"Local HMI",LB,10070,1) //forced to reconnect PLC4 when IP changeed

end macro_command
```

Macro ID 2:

```
macro_command main()

bool a,c,d=1,e=0
short plcip0[4]={192,168,0,1}
short plcip1[4]={192,168,0,95}
short plcip2[4]={192,168,0,96}
bool b = 1

GetData(a,"Local HMI",LB,998,1)
GetData(c,"Local HMI",LB,999,1)
```

```
if a==1 and c==0 then
SetData(plcip2[0],"Local HMI",LW,9600,4)
SetData(e, "Local HMI", LB, 20, 1)
else if a==1 and c==1 then
SetData(plcip1[0],"Local HMI",LW,9600,4)
SetData(d, "Local HMI", LB, 20, 1)
else if a==0 and c==1 then
SetData(plcip1[0],"Local HMI",LW,9600,4) //
SetData(e, "Local HMI", LB, 20, 1) //
SetData(e, "Local HMI", LB, 10, 1) //
else if a==0 and c==0 then //
SetData(plcip0[0],"Local HMI",LW,9600,4) //
SetData(e, "Local HMI", LB, 20, 1) //
end if

SetData(b,"Local HMI",LB,10070,1) //

end macro_command
```

5. Create a PLC Control Object to trigger MACRO, as described in point 3, LB999 is set to trigger MACRO ID1, and for LB998, MACRO ID2.



```
1 :    [Local HMI : LB-8999] => Sound control : OFF->ON, Beep
2 :    [Local HMI : LB-999] => Execute macro program : HMI_1 (ID : 1)(ON<->OFF)
3 :    [Local HMI : LB-998] => Execute macro program : HMI_2 (ID : 2)(ON<->OFF)
```

6. In the end, users can refer to some relevant properties then decide whether or not to use other descriptions or graphics to display current communication status.

3. Addresses

The Object Addresses used in this demo project are listed below: Users can change the Addresses and Object ID base on actual usage.

Object	**Address**	**Object ID**	**Detail**
Window 10			
Set Bit	LB11963	SB_0	Disable PLC NO RESPONSE pop-up window
Numeric Display	LW9600	ND_0	Display PLC4's IP0 address
	LW9601	ND_1	Display PLC4's IP1 address
	LW9602	ND_2	Display PLC4's IP2 address
	LW9603	ND_3	Display PLC4's IP3 address
Window 15			
Direct Window	LB10	WC_0	Pop-up direct window prompting that redundant HMI is currently occupied by PLC2
	LB20	WC_1	Pop-up direct window prompting that redundant HMI is currently occupied by PLC1