How to implement the communication redundancy between the central control station and the local stations?

Download FAQ-119 Demo

This document “FAQ-119” can be found at http://www.icpdas.com/en/faq/index.php?kind=280#751 > FAQ-119. (Or https://www.icpdas.com/en/faq/index.php?type=&model=&fkw=isagraf# > FAQ-119)

In many application control systems, the monitored/controlled devices are scattered and some may be very far away. Therefore, most of these applications are divided into one central control station and some distributed local control stations, similar to the Figure 1.

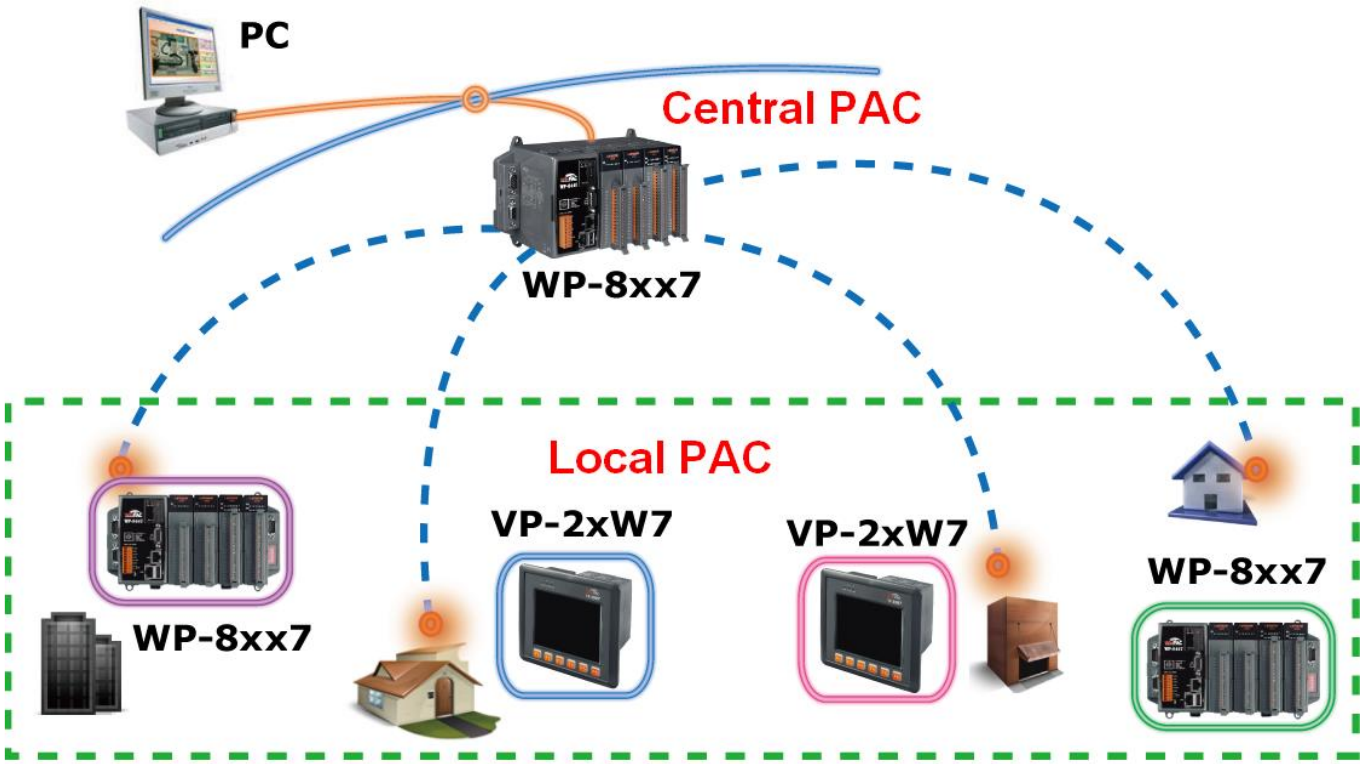
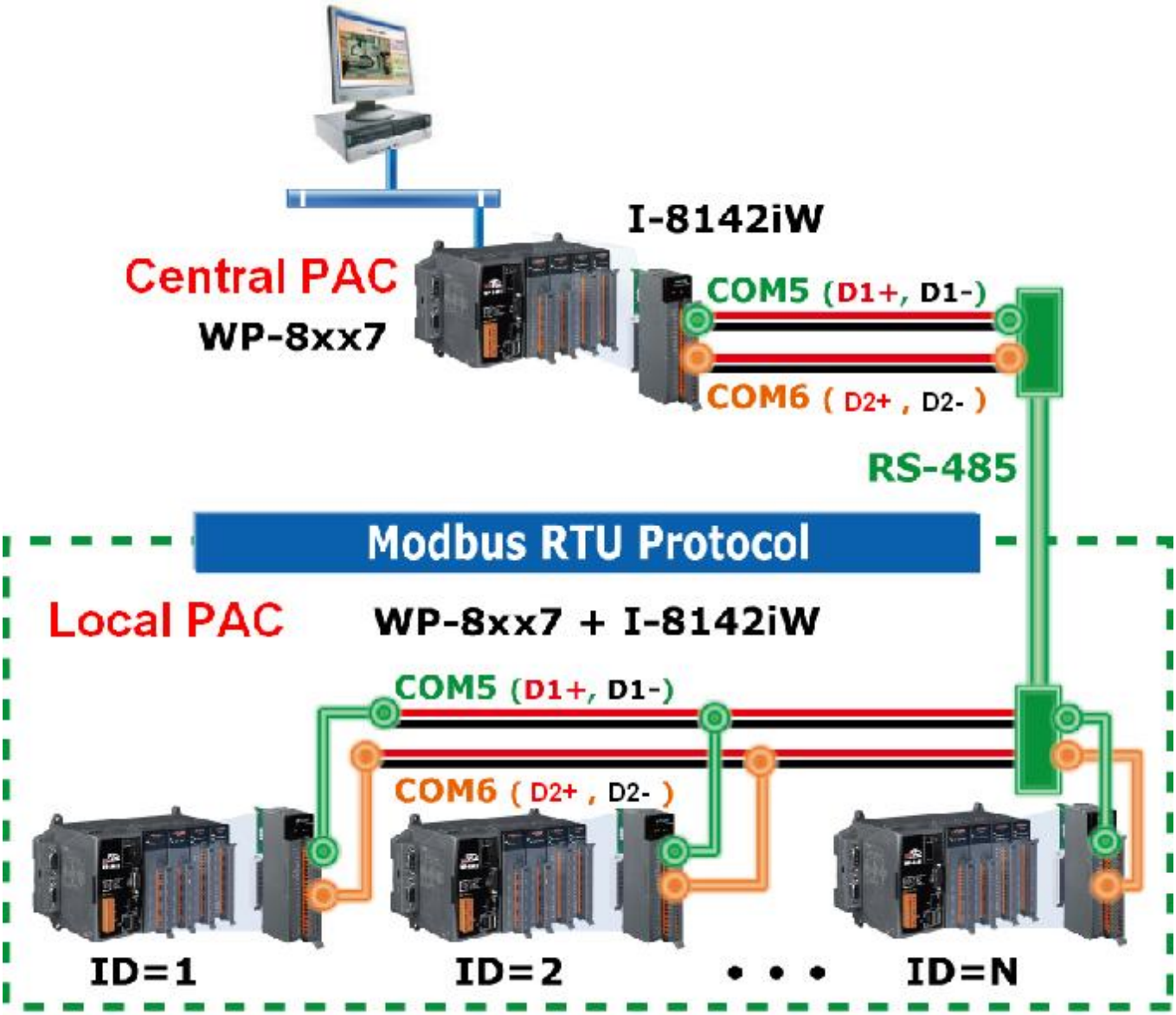


Figure 1

In most of the distributed control systems, there is only one communication network within the central control station and the local control stations. If the communication wire damaged or disconnected, that local station will lost contact and the central station will not control the local devices anymore until repairing the communication wiring. Many applications cannot allow any communication breakdown that will occur to lot of cost and risks. The more the repair time is, the more the losses and risks will be. Therefore, we apply the following two redundant communication mechanisms to solve the problem.

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Application 1: RS-485 redundant communication mechanism



ISaGRAF example program:
wpdmo79a (Central station), wpdmo79b (Local station 1), wpdmo79c (Local station 2)

(In the above example programs, please wire these three PAC's COM5 together and also wire their COM6 together. And set the NET-ID of "Local station 1" to 1 and set NET-ID of "Local station 2" to 2.
The "Central station" is using WP-8447 + 0: I-8142iW.
The Local Station 1 and 2 are using WP-8447 + 0: I-8142iW + 2: I-87017RW + 3: I-87055W.

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Please refer to the Appendix E of the WP-8xx7 Getting Started Manual to setup the expansion Comm. ports first (run WinPAC Utility > Muti-serial port Wizard). Then test the above three programs.

Please refer to Chapter 8 of the “ISaGRAF User's manual” for Modbus RTU Master and refer to Chapter 4.1 and 4.2 for declaring network addresses and refer to Appendix G and Appendix E of the “WP-8xx7 Getting Started Manual” for Modbus RTU slave ports.

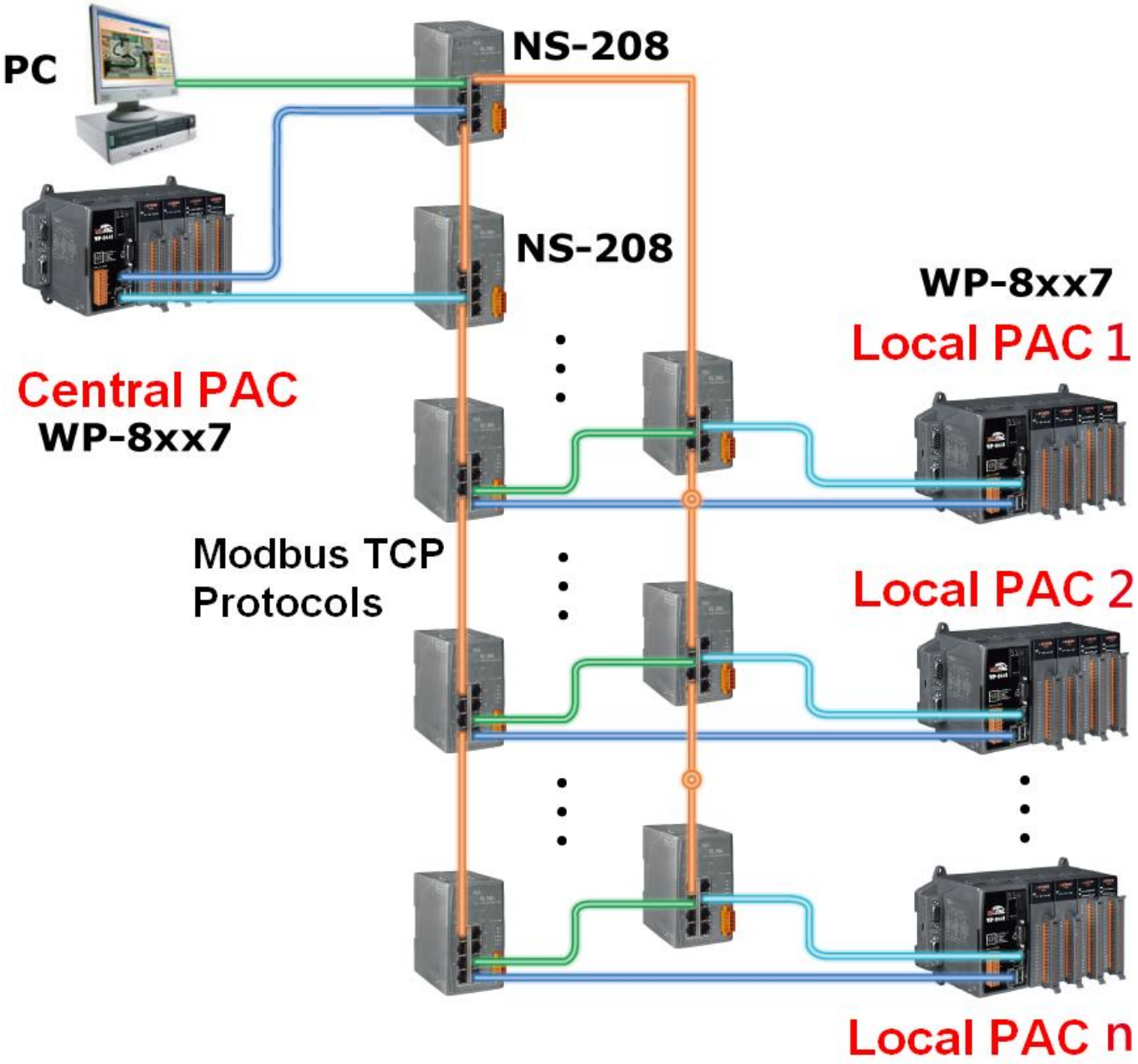
The PAC (Programmable Automation Controllers) in the central control station and the district local stations are WinPAC-8xx7 (The abbreviation of WP-8147, WP-8447, WP-8847, WP-8137, WP-8437 and WP-8837. User may also use VP-25W7, VP-23W7, XP-8047-CE6, XP-8347-CE6, or XP-8747-CE6). In this mechanism, the PAC in the central station is Modbus RTU Master, the PAC in the local stations are Modbus RTU Slaves. There are two sets of RS-485 connections in the central station to connect to two RS-485 serial ports of multiple local stations. When one connection fails, the system can detect out the local communication problems and immediately inform the engineers in time to repair. At the same time, the other connection is still in normal communication state to ensure the entire control system working well.

For long distance communication, please optional select I-2541 converter to convert RS-485 signals to fiber signals that can transmit a signal up to 2 km. Please refer to website:
http://www.icpdas.com/en/product/I-2541

(Please refer to the next page for Application 2)

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Application 2: Ethernet redundant communication mechanism



ISaGRAF example program:
wpdmo80a (Central station), wpdmo80b (Local station 1), wpdmo80c (Local station 2)

In the above example programs, please wire these three PAC's LAN1 and LAN2 in the same IP domain. And set the NET-ID of the Local station 1 and station 2 to number 1.
The "Central station" is using WP-8447. (Set LAN1 as 192.168.1.182, LAN2 as 192.168.1.183)
The Local Station 1 and 2 are using WP-8447 + 2: I-87017RW + 3: I-87055W.

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Set LAN1 IP of Local station 1 to 192.168.1.178 and LAN2 to 192.168.1.179.
Set LAN1 IP of Local station 2 to 192.168.1.180 and LAN2 to 192.168.1.181.
Then test the above three programs.

Please refer to Chapter 4.1 and 4.2 for declaring network addresses and refer to http://www.icpdas.com/en/faq/index.php?kind=280#751 > FAQ-113 for using Modbus TCP Master.

The PAC (Programmable Automation Controllers) in the central control station and the district local stations are WinPAC-8xx7 (The abbreviation of WP-8147, WP-8447, WP-8847, WP-8137, WP-8437 and WP-8837. User can also use VP-25W7, VP-23W7, XP-8047-CE6, XP-8347-CE6, or XP-8747-CE6). In this mechanism, the PAC in the central station is Modbus TCP Master, the PAC in the local stations are Modbus TCP Slave. There are two sets of Ethernet connections in the central station to connect to two Ethernet ports of multiple local stations. When one connection fails, the system can detect out the local communication problems and immediately inform the engineers in time to repair. At the same time, the other connection is still in normal communication state to ensure the entire control system working well.

For long distance communication, please optional select the following converters to convert Ethernet signals to fiber signals.
NS-205FC, NS-205FT, NS-206FC, NS-206FT, and NS-209FC, NS-209 FT: max. 2 km or
NS-205FCS, NS-206FCS, NS-209FCS: max.15 km
Please refer to website:
http://www.icpdas.com/en/product/guide+Industrial__Communication+Ethernet__Communication+Ethernet__Switch#1008

For Data Sheet of the relation PAC products please refer to the website:
http://www.icpdas.com/en/download/index.php?nation=US&kind1=&model=&kw=isagraf

ISaGRAF PAC website:
http://www.icpdas.com/en/product/guide+Software+Development__Tools+ISaGRAF#442

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