# RTU32M Redundancy Guidance

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# What's the Redundancy?

Redundancy is the duplication of critical components or functions of a system with the intention of increasing reliability or extend the MTBF (Mean time between failures) of a system.

The main purpose of redundancy in a control system is to eliminate dependence on a single module while at the same time providing multiple options in case of failure. Redundancy in a control system decreases the consequences of a component failure.

The importance of a redundant system also increases in a variety of scenarios including:

- Continuous processes
- Irreversible processes
- Extended restart times

There are different types of redundancy and it's configured according to the type and place of use. Brodersen control system can support different types of redundancy due to its special software and hardware design.



#### RTU32M redundancy architecture



Management Link: Available connection to communicate with upstream systems, like SCADA or FEP

Replication Link: Replicate database between Primary and Partner CPU (Base on Fast Ethernet)

• Note: It's recommended to use dedicated LAN and make a direct connection between both of CPUs (Primary and Partner). IE: Use LAN2 on each one of CPUs for Rep-Link and LAN1 to communicate by SCADA or other systems.

Live Link: LiveLink cable connection is considered to have the same functionality as LiveLink connection via the backplane. Also it is used in parallel to the replication channel by the passive runtime to recognize that the active one has failed – and ensure that both RTU32 is NOT active at the same time.



# Types of redundancy in RTU32M:

Brodersen RTU32M supports five types of redundancy:

- 1- Power Redundancy. (It's capable of combining with other types of redundancy)
- 2- CPU Redundancy with Single I/O Rack.
- 3- CPU Redundancy with Single Shared I/O Rack.
- 4- CPU Redundancy with Dual I/O Configuration.
- 5- Network Redundancy. (It's capable of combining with other types of redundancy)





#### 1- Power redundancy

RTU32M is able to energize by a redundant power supply with different types of input voltage, which means the system can power on by two separate DC main inputs with a wide range of voltage. (10~30 VDC, 30~60 VDC, 50~150 VDC)

Note: (It's capable of combining with other types of redundancy)

2- CPU Redundancy with single I/O (Single Rack)

This type of redundancy contains two pieces of MP32A (Main Controller unit) as redundant CPU in Hot Standby mode.

Note: This type of redundancy is configurable as redundant network too.

3- CPU Redundancy with single I/O (Shared I/O)

This type of redundancy contains two packs of CPU and Communication module with one set of extended I/O (Shared I/O).

Note: This type of redundancy is configurable as redundant network too.

CPUs are mounted on left and right side of I/O Rack and they can read the I/Os from both of side.

#### 4- CPU Redundancy with dual I/O Configuration

This type of redundancy contains two packs of mirrored control system completely. (Power, CPU, I/Os, Communication modules)

All I/Os must be wired as double.

#### 5- Communication Redundancy

Redundancy in network communication only. It included all type of communication and protocols, even serial types. (Single Network, Dual Network, HSR, PRP)

Note: (It's capable of combining with other types of redundancy)

Туре	Power Redundancy	CPU Redundancy	Network Redundancy	I/O Redundancy	Two way to read I/Os
1	Yes	No	Yes	Yes	No
2	Yes	Yes	Yes	Yes	No
3	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Don't care
5	Yes	No	Yes	Yes	No



## how to setup redundancy in Brodersen RTU32M

#### 1- Power redundancy

Power redundancy implementation doesn't need changes in the software application, it only needs to have two power supply modules.

Below figure shows the architecture of power redundancy in RTU32M:



Note: The system can be sourced by two different power sources.



#### 2- CPU Redundancy with single I/O (Single Rack)

This type of redundancy contains two MP32A as redundant CPU in Hot Standby mode.

Note: This type of redundancy is configurable as redundant network too.



Setup IP addresses on both of RTUs and enable redundancy function on them.

- Primary RTU Setup.
- 1- Power on the RTU set, make a direct connection to LAN-1 on the left side MP32A and open web browser with following IP 192.168.0.1.
- 2- Open network tab on "System Configuration\Network". See Figure 1.
  - A. Set the communication IP address for LAN-1. (In this case: 192.168.0.2)
  - B. Set the IP Address for LAN-2 to use for redundancy.
    - a. Deselect "DHCP checkbox" for Ethernet LAN-2.
    - b.Set the IP Address, Subnet Mask, gateway. (See this case example in below)

IP Address	: 192.168.1.2			
Subnet Mask	: 255.255.255.0			
Default Gateway: Blank				

- 3- Set the redundant partner system configuration in "Runtime system\Redundancy Settings\Partners RTU32". See Figure 2.
  - A. Select Use Redundancy checkbox.
  - B. Set the partner IP address (In this case: 192.168.1.3).
  - C. Choose primary state. (One of RTUs must be work as primary and other one work as secondary or redundant).
    - a. In this case this RTU is primary.



	Network Settings			Redundancy Settings	
System Overview Hardware Overview Runtime Settings I/O Board Settings System Configuration • Serial Ports Card • Network	Ethernet LAN 1 eth0 Obtain an IP Address via DHCP IP address Subnet mask Default gateway Prefered DNS Server	192   1660   0   2 255   255   255   255   0	<ul> <li>&gt; System Overview</li> <li>&gt; Hardware Overview</li> <li>&gt; Runtime Settings         <ul> <li>- Main Settings</li> <li>- Redundancy Settings</li> <li>&gt; I/O Board Settings</li> <li>&gt; System Configuration</li> </ul> </li> </ul>	Use Redundancy  Partners RTU32 IP Address	<u>192</u> . <u>160</u> . <u>1</u> . <u>5</u> 0
<ul> <li>Network Redundancy</li> <li>Static routes</li> <li>Wifi</li> <li>Wireless Modem</li> <li>VPN</li> </ul>	Alternate DNS Server Ethernet LAN 2 eth1 Obtain an IP Address via DHCP		Maintenance     Utilities     Firewall     DNP3 Slave     WTTC-DNP3 Slave	Main Port Port used for Replication	502 9001 0
Time     Services     User Administration     disintenance     Jtilities     Firewall     NVP3 Slave     UTE-DNBP Slave	Obadit an it Softage in Direct Subnet mask Default gateway Preferred DNS Server Alternate DNS Server		User name: admin User group: Administrators Log out	Port used for Replication Second Live Link Rort Second Live Link Timeout Primary Partner LB2 I/O redundancy type	9001 0 Diabled V 500 0 True V R2(Shared J/Os Both CPUs on left of J/Os V
r name: admin	Ethernet USB Lan Adapter	2 0	CPU Temp: 58.4 °C	Timeouts (milliseconds)	
r group: Administrators og out 2022/05/20	Hostname		CPU Load: 23.8 % Memory Usage: 28.8 % Board Temp: 38.3 % Board Type: RTU32M	Connection to Partner Active Runtime Detection Passive Runtime Detection	1000 0 1000 0 1000 0
Temp: 52.3 °C	Current hostname	RTU32-L		Gateway Exchanges When Passive Starts	3000 0 30000 0
nory Usage: 28.1 % and Temp: 32.3 °C and Type: RTU32M	Apply Cancel		Security alert. The RTU is configured to use default passwords.		
	Figure - 1			Figure	- 2

- > Partner RTU Setup.
- 1- Change the direct connection from LAN-1 on the left side MP32A and to LAN-1 on right side MP32A open web browser with following IP 192.168.0.1.
- 2- Open network tab on "System Configuration\Network". See Figure 3.
  - A. Set the communication IP address for LAN-1. (In this case: 192.168.0.3)
  - B. Set the IP Address for LAN-2 to use for redundancy.
    - a. Deselect "DHCP checkbox" for Ethernet LAN-2.
    - b.Set the IP Address, Subnet Mask, gateway. (See this case example in below)
      - IP Address : 192.168.1.3 Subnet Mask : 255.255.255.0 Default Gateway: Blank
- 3- Set the redundant partner system configuration in "Runtime system\Redundancy Settings\Partners RTU32". See Figure 2.
  - A. Select Use Redundancy checkbox.
  - B. Set the partner IP address (In this case: 192.168.1.2).
  - C. Choose primary state. (One of RTUs must be work as primary and other one work as secondary or redundant).
    - a. In this case this RTU is primary.



BROD	ERSEN		BROD	ERSEN	
	Network Settings			Redundancy Settings	
System Overview Hardware Overview Hardware Overview Hardware Overview Kontine Settings U/D Board Settings System Configuration Setair Ports Card Network Redundancy Setair courds Winf Winf Winf Setair courds UMA Time	Ethernet LAN 1 etb backets bac		System Overview     Hardware Overview     Runtime Settings     Main Settings     Redundancy Settings     I/JO Board Settings     System Configuration     Waintenance     Utilities     Firewall     OMP3 Slave     WITS-OMP3 Slave	Use Redundancy © Partners RTU32 IP Address Main Port Port used for Replication This RTU32	152.,[68.], [
Services     User Administration     Maintenance     Utilities     Firewall     DNP3 Slave     WITS-DNP3 Slave	IP address Subnet mask Default gateway Preferred DNS Server Alternate DNS Server	192 - 160 - 1 - 1 - 2 255 - 255 - 0	User name: admin User group: Administrators Log out 2022/65/20	Port used for Replication Second Link Port Second Live Link Timeout Primary Partner LB2 I/O redundancy type	9001 0 Disabled V 0 Soo 0 Falls V 0 fall Shared JOs: Both CRUs on laft of JOs V 0
User namet admin User group: Administrators Log out 2022/05/20	Allow Ethernet LAN USB adapter to be used Hostname Current hostname	☑ 0 RTU22-R	CPU Tempi 55.9 °C CPU Load: 20.0 % Minimory Ulage: 30.8 % Board Tempi 42.1 °C Board Type: RTU32M	Timeouts (milliseconds) Connection to Partner Active Runtime Detection Passive Runtime Detection Data Replication Gateway Exchanges	1000 1000 500 500 0
CPU Load: 26.4 % Memory Usage: 29.2 % Board Temp: 42.1 *C Board Type: RTU32M	Apply Cancel		Security alert. The RTU is configured to use infault passwords.	When Passive Starts	10000
	Figure - 3			Figure -	4

- 4- Turn off RTU.
  - > RTUs are ready to use.
- 1- Turn on both of RTUs.
- 2- After 25 seconds one of CUPs goes to primary state. Status LED on MP32A will indicate yellow color, and other CPU will be hot standby state, Status LED on MP32A module will indicate blinking yellow color.
- 3- The system is ready to be programmed. Connect primary RTU to WorkSuite for uploading program.

#### > Note:

Redundancy Functions:

- 1- In this type of redundancy, there are access to LAN-1 on primary RTU.
- 2- If you lose your CPU or Power supply on Primary RTU, Secondary RTU change state to primary.
- 3- Rules can be programmed to change the swop from active RTU to passive RTU, this is based on conditions from logic.



#### 3- CPU Redundancy with single I/O (Shared I/O)

This type of redundancy contains two CPUs and Communication module with one set of extended I/O (Shared I/O).

Note: This type of redundancy is configurable as redundant network too.

CPUs are mounted on left and right side of I/O Rack and they can read the I/Os from both of side.



Setup IP addresses on both of RTUs and enable redundancy function on them.

#### Primary RTU Setup.

- 4- Turn on the RTU set, make a direct connection to LAN-1 on the left side MP32A and open web browser with following address192.168.0.1.
- 5- Open network tab on "System Configuration\Network". See Figure 1.
  - A. Set the communication IP address for LAN-1. (In this case: 192.168.0.2)
  - B. Set the IP Address for LAN-2 to use for redundancy.
    - a. Deselect "DHCP checkbox" for Ethernet LAN-2.

b.Set the IP Address, Subnet Mask, gateway. (See this case example in below)

IP Address : 192.168.1.2 Subnet Mask : 255.255.255.0 Default Gateway: Blank

- 6- Set the redundant partner system configuration in "Runtime system\Redundancy Settings\Partners RTU32". See Figure 2.
  - A. Select Use Redundancy checkbox.
  - B. Set the partner IP address (In this case: 192.168.1.3).
  - C. Choose primary state. (One of RTUs must be primary and the other secondary).



a. In this case this RTU is primary.

BROD	ERSEN		BROD	ERSEN	
	Network Settings			Redundancy Settings	
<ul> <li>System Overview</li> <li>Hardware Overview</li> <li>Runtime Settings</li> <li>I/O Board Settings</li> <li>System Configuration</li> <li>Serial Ports Card</li> <li>Network Card</li> <li>Network Redundancy</li> <li>Static routes</li> </ul>	Ethernet LAN 1 eth0 Obtain an IP Address via DHCP IP address Subnet mask Default gateway Preferred DNS Server Alternate DNS Server	122         : 168         : 0         : 2           235         : 255         : 255         : 0           -         -         -         -           -         -         -         -           -         -         -         -	<ul> <li>System Overview</li> <li>Hardware Overview</li> <li>Runtime Settings</li> <li>Redundancy Settings</li> <li>I/O Board Settings</li> <li>System Configuration</li> <li>Maintenance</li> </ul>	Use Redundancy  Partners RTU32 IP Address Nain Port	192 . <u>1866</u> . <u>5</u> . 2 0 502 0
Wifi     Wireless Modem     VPN     Time     Services     User Administration     Maintenance     Utilities     Utilities	Ethernet LAN 2 eth Obtain an IP Address via DHCP IP address Subnet mask Default gateway Preferred DISS Server Alternate DISS Server	192         • 160         • 1         • 2           235         • 225         • 235         • 0           -         -         -         -           -         -         -         -           -         -         -         -	Utilities Firewall DNP3 Slave WITS-DNP3 Slave User names admin User group: Administrators	Port used for Replication This RTU32 Port used for Replication Second Live Link Port Second Live Link Timeout Primeric Primeric	9001 0 001 0 002 0 000 0 000 0
> DNP3 Slave > WITS-DNP3 Slave	Ethernet USB Lan Adapter	•	2022/05/20	LB2 I/O redundancy type	RJL:Shared I/Os: This CPU left of I/Os V
User name: admin User group: Administrators Log out 2022/05/20	Allow Ethernet LAN USB adapter to be used		CPU Lead: 16.3 % CPU Lead: 16.3 % Memory Usage: 29.3 % Board Temp: 33 % Board Type: RTU32M	Connection to Partner Active Runtime Detection Passive Runtime Detection Data Replication	1000 1000 500 6
CPU Temp: 52.3 °C CPU Lead: 25.0 % Memory Usage: 28.1 % Board Temp: 32.3 °C Board Type: RTU32M	(Apply) Cancel		Security alert. The RTU is configured to use default passwords.	Gateway Exchanges When Passive Starts	5000 10000 0
	Figure - 1			Figure -	2

#### Partner RTU Setup.

- 5- Change the direct connection from LAN-1 on the left side MP32A and to LAN-1 on right side MP32A open web browser by 192.168.0.1.
- 6- Open network tab on "System Configuration\Network". See Figure 3.
  - A. Set the communication IP address for LAN-1. (In this case: 192.168.0.3)
    - B. Set the IP Address for LAN-2 to use for redundancy.

a. Deselect "DHCP checkbox" for Ethernet LAN-2.

b.Set the IP Address, Subnet Mask, gateway. (See this case example in below)

IP Address	: 192.168.1.3			
Subnet Mask	: 255.255.255.0			
Default Gateway: Blank				

- 7- Set the redundant partner system configuration in "Runtime system\Redundancy Settings\Partners RTU32". See Figure 2.
  - A. Select Use Redundancy checkbox.
  - B. Set the partner IP address (In this case: 192.168.1.2).
  - C. Choose primary state. (One of RTUs must be work as primary and other one work as secondary or redundant).

a. In this case this RTU is primary.



	Network Settings			Redundancy Settings	
vstem Overview ardware Overview untime Settings O Board Settings Stem Configuration Serial Ports Card Hetwork: Network: Static routes Wifi Wireless Modem VPN	Ethernet LAN 1 ebo Obtain an IP Address via DHCP IP address Software and the address Software and the address Software address Performed DHS Sonver Alternate DHS Sonver Ethernet LAN 2 eth 1 Obtain an IP Address via DHCP		System Overview     Hardware Overview     Rutime Settings     Han Settings     More Settings     Volked Settings     System Configuration     Hairtenace     Volkies     Firenall     OIPP3 Slave	Use Redundancy  Partners RTU32 PAddress Main Port Port used for Replication This RTU32	122 . 148 . [. 2 0 522 0 503 0
- Ime - Services - User Administration aintenance tilities rewall MP3 Slave ITS-DNP3 Slave	IP address Subnet mask Default gateway Preferred DNS Server Alternate DNS Server	192     1563     -     1     3       255     1     1255     -     10       -     -     -     -     -       -     -     -     -     -       -     -     -     -     -	User name: admin User group: Administrators Log out	Port used for Replication Second Live Link Port Second Live Link Timeout Primary Partner LB2 I/O redundancy type	9001 0 Diabled V 0 S00 0 False V 0 R3R:Shared 1/Os: This CRU right of 1/Os
rame: admin group: Administrators g out 2022/05/20	Ethernet USB Lan Adapter Allow Ethernet LAN USB adapter to be used Hostname	0	CPU Temp: 48.4 4C CPU Lead: 21.7 % Mamory Usage: 29.5 % Baard Temp: 35.3 4C Board Type: RTU32M	Timeouts (milliseconds) Connection to Partner Active Runtime Detection Passive Runtime Detection Data Readirection	
Temp: 55.9 °C Load: 26.4 % ory Usage: 29.2 % d Temp: 42.1 °C d Temp: 11.1214	Current hostname Apply Cancel	RTU32-R	Security alert. The RTU is configured to use default passwords.	Gateway Exchanges When Passive Starts	0000 00000

#### 8- Turn off RTU.

RTUs are ready to use.

- 4- Turn on both of RTUs.
- 5- After 25 seconds one of the CUPs will go to primary state (Status LED on MP32A module will indicate yellow) the second RTU will be in hot standby state (Status LED on MP32A module will indicate blinking yellow).
- 6- The system is ready to be programmed from WorkSuite, It is only necessary to program the active/primary RTU, program will automatically be mirrored from active to passive RTU

Note:Redundancy Functions:

- 4- In this type of redundancy, there are access to LAN-1 on primary RTU.
- 5- If CPU are malfunction or Power supply fail, Secondary RTU change state to primary.
- 6- Rules can be programmed to change the swop from active RTU to passive RTU, this is based on conditions from logic.



#### 4- CPU Redundancy with dual I/O configuration

This type of redundancy contains two packs of RTU with the same components (Mirror).

Note: This type of redundancy is configurable as redundant network too.



Setup IP addresses on both of RTUs and enable redundancy function on them.

#### > Primary RTU Setup.

- 7- Turn on the RTU, make a direct connection to LAN-1 on MP32A in one of sets and open web browser with following address 192.168.0.1.
- 8- Open network tab on "System Configuration\Network". See Figure 1.
  - A. Set the communication IP address for LAN-1. (In this case: 192.168.0.2)
  - B. Set the IP Address for LAN-2 to use for redundancy.
    - a. Deselect "DHCP checkbox" for Ethernet LAN-2.
    - b.Set the IP Address, Subnet Mask, gateway. (See this case example in below)

IP Address : 192.168.1.2 Subnet Mask : 255.255.255.0 Default Gateway: Blank

- 9- Set the redundant partner system configuration in "Runtime system\Redundancy Settings\Partners RTU32". See Figure 2.
  - A. Select Use Redundancy checkbox.
  - B. Set the partner IP address (In this case: 192.168.1.3).
  - C. Choose primary state. (One of RTUs must be work as primary and other one work as secondary or redundant).
    - a. In this case this RTU is primary.



	Network Settings			Redundancy Settings	
item Overview rdware Overview ntime Settings Board Settings item Configuration Serial Ports Card Network Network	Ethernet LAN 1 eth0 Obtain an IP Address via DHCP IP address Subnet mask Default gateway Preferred DNS Server Alternate DNS Server		<ul> <li>&gt; System Overview</li> <li>&gt; Hardware Overview</li> <li>&gt; Ruthime Settings</li> <li>- Main Settings</li> <li>- Redundancy Settings</li> <li>&gt; V/D Board Settings</li> <li>&gt; System Configuration</li> <li>&gt; Miniserview</li> </ul>	Use Redundancy  Partners RTU32 IP Address Nain Port	192.168.1.9 502.0
tatic routes tifi tireless Modem PN ervices ser Administration	Ethernet LAN 2 eth1 Obtain an IP Address via DHCP IP address Subnet mask		> Utilities > Firewall > DNP3 Slave > WITS-DNP3 Slave	Port used for Replication This RTU32 Port used for Replication	9001 0
tenance ies vall 3 Slave 5-DNP3 Slave	bistration Douris, Index y Level 100 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0	User name: admin User group: Administrators Log out 2022/05/20	Second Live Link Port Second Live Link Timeout Primary Partner LB2 I/O redundancy type	Disabled V 500 0 True V R3.Dual I/Osi I/Os not shared	
ame: admin roup: Administrators	Allow Ethernet LAN USB adapter to be used	2 0	CPU Temp: 57.2 °C CPU Load: 17.0 % Hemory Usage: 38.8 %	Timeouts (milliseconds) Connection to Partner	1000
2022/05/20	Hostname Current hostname	RTU32-L	Board Temp: 37.4 *C Board Type: RTU32M	Active Runtime Detection Passive Runtime Detection Data Replication Gateway Exchanges	1000 0 1000 0 500 0 500 0
ad: 25.0 % y Usage: 28.1 % Temp: 32.3 °C Type: RTU32M	Apply Cancel		Security alert. The RTU is configured to use default passwords.	Apply Cancel	10000

#### Partner RTU Setup.

- 9- Change the direct connection from LAN-1 on current connected set to LAN-1 on other set and open web browser by 192.168.0.1.
- 10- Open network tab on "System Configuration\Network". See Figure 3.
  - A. Set the communication IP address for LAN-1. (In this case: 192.168.0.3)
  - B. Set the IP Address for LAN-2 to use for redundancy.
    - a. Deselect "DHCP checkbox" for Ethernet LAN-2.
    - b.Set the IP Address, Subnet Mask, gateway. (See this case example in below)

IP Address : 192.168.1.3 Subnet Mask : 255.255.255.0 Default Gateway: Blank

- 11- Set the redundant partner system configuration in "Runtime system\Redundancy Settings\Partners RTU32". See Figure 2.
  - A. Select Use Redundancy checkbox.
  - B. Set the partner IP address (In this case: 192.168.1.2).
  - C. Choose primary state. (One of RTUs must be work as primary and other one work as secondary or redundant).
    - a. In this case this RTU is primary.



	network Settings			Redundancy Settings	
ystem Overview ardware Overview untime Settings O Board Settings ystem Configuration - Secial Pactor Conf	Ethernet LAN 1 eth0 Obtain an IP Address via DHCP IP address Subnet mask	192 - 1468 - 0 - 3 255 - 255 - 0	<ul> <li>System Overview</li> <li>Hardware Overview</li> <li>Runtime Settings</li> <li>Main Settings</li> <li>Redundancy Settings</li> </ul>	Use Redundancy © Partners RTU32	
Network     Network Redundancy     Static routes     Wifi	Default gateway Preferred DNS Server Alternate DNS Server Ethernet LAN 2	L/O Boan     System     Unilities     Unilities     Unilities	<ul> <li>I/O Board Settings</li> <li>System Configuration</li> <li>Maintenance</li> <li>Utilities</li> <li>Firewall</li> </ul>	IP Address Main Port Port used for Replication	192 - 168 - 1 - 2 0 502 0 9001 0
VPN     Time     Services	eth1 Obtain an IP Address via DHCP IP address		<ul> <li>&gt; DNP3 Slave</li> <li>&gt; WITS-DNP3 Slave</li> </ul>	This RTU32	
- User Administration aintenance tilities rewall NP3 Slave	Services         Subret mark         255         235         255         0           Leve Administration         Default gateway         1         1         1         1         1           deside at mark         Default gateway         1 </td <td>User name: admin User group: Administrators Log out</td> <td>Port used for Replication Second Live Link Port Second Live Link Timeout Primary Partner LB2 I/O redundancy type</td> <td>9001 0 Disabled V 0 Pales V 0 R1:Dual J/Os: J/Os not shared V</td>	User name: admin User group: Administrators Log out	Port used for Replication Second Live Link Port Second Live Link Timeout Primary Partner LB2 I/O redundancy type	9001 0 Disabled V 0 Pales V 0 R1:Dual J/Os: J/Os not shared V	
113-DIVES Slove	Ethernet USB Lan Adapter				
r name: admin r group: Administrators	Allow Ethernet LAN USB adapter to be used	0	CPU Temp: 54 °C CPU Load: 13.5 % Manmary Usana: 41.4 %	Timeouts (milliseconds)	1000 0
2022/05/20	Hostname		Board Temp: 40.6 °C Board Type: RTU32M	Active Runtime Detection Passive Runtime Detection	1000 1000 500
Temp: 55.9 °C	Current hostname	RTU32-R		Gateway Exchanges When Passive Starts	5000 0
Load: 26.4 % nory Usage: 29.2 % rd Temp: 42.1 °C rd Typer RTU32M	Apply Cancel		Security alert. The RTU is configured to use default passwords.	[Apply] Cancel	

#### 12- Turn off RTU.

> RTUs are ready to use.

- 7- Turn on both of RTUs.
- 8- After 25 seconds one of the CUPs will go to primary state (Status LED on MP32A module will indicate yellow) the second RTU will be in hot standby state (Status LED on MP32A module will indicate blinking yellow).
- 9- The system is ready to be programmed from WorkSuite, It is only necessary to program the active/primary RTU, program will automatically be mirrored from active to passive RTU.

Note:Redundancy Functions:

- 7- In this type of redundancy, there are access to LAN-1 on primary RTU.
- 8- If CPU are malfunction or Power supply fail, Secondary RTU change state to primary.
- 9- Rules can be programmed to change the swop from active RTU to passive RTU, this is based on conditions from logic.



5- Example of combination of CPU and Network Redundancy (Bonding IP) in Brodersen RTU32M.



Setup IP addresses on both of RTUs and enable redundancy function on them.

Primary RTU Setup.

Turn on the first RTU and open web browser with following address 192.168.0.1.

- 13- Set the communication IP address in System "Configuration\Network Redundancy\Network Bonding" and select Enable Network Bonding on Active-Backup mode. See Figure 1.
  - A. In this case: 192.168.0.2.



Figure 1

14- Set the IP to use redundancy in "System Configuration\Network". See Figure 2.



A. In this case: 10.10.10.2.



Figure 2

- 15- Set the redundant partner system configuration in "Runtime system\Redundancy Settings\Partners RTU32". See Figure 3.
  - A. Select Use Redundancy.
  - B. Set the partner IP address (In this case: 10.10.10.3).
  - C. Choose primary state. (One of RTUs must be work as primary and other one work as secondary or redundant).
    - a. In this case this RTU is primary.
  - D. Choose your RTU position in R3 types. (One of RTUs is in the left of I/Os and other one is on the right)
    - a. In this case this RTU in on the left side of I\Os.

BROD	ERSEN	
	Redundancy Settings	
System Overview     Hardware Overview     Buntime Settings	Use Redundancy 0	
Main Settings     Redundancy Settings     I/O Board Settings     System Configuration     Maintenance     Utilities     Firewall     ONP3 Slave	Partners RTU32 IP Address Main Port Port used for Replication	10 . 13 . 10 . 2 0 500 0 500 0
User name: admin User group: Administrators Log out 2022/05/20	Port used for Replication Second Live Link Port Second Live Link Timeout Primary Partner LB2 1/O redundancy type	Boot     0       Disabled     0       Soo     0       True     0       R3L:Shared I/Os: This CRU left of I/Os     0
CPU Temp: 60.8 °C CPU Load: 5.2 % Memory Usage: 30.5 % Board Temp: 33.9 °C Board Trype: RTU32M Settings have changed. To activate the new settings	Timeouts (milliseconds) Connection to Partner Active Runtime Detection Passive Runtime Detection Data Replication Gateway Exchanges When Passive Starts	1000 1000 0 000 000 0 000 0 0 0 0 0 0
the RTU32 must be rebooted.	Apply Cancel	

16- Turn off RTU.



Secondary (Redundant) RTU setup.

Turn on the second RTU and open web browser by 192.168.0.1.

- 17- Set the communication IP address in System "Configuration\Network Redundancy\Network Bonding" and select Enable Network Bonding on Active-Backup mode. See Figure 4.
  - A. In this case: 192.168.0.3.

BROD	DERSEN	
	Network Redundancy Settings	
System Overview     Hardware Overview     Runtime Settings     1/0 Board Settings     System Configuration     Serial Ports Card     Network     Network     Retwork Redundancy     Static routes     Wifi     Wirfless Modem	Network Redundancy Protocols Enable Network Redundancy Protocol HSR Version HSR/NRP Supervision IP address Subnet mask Default gateway HSR Clone MAC	HBR V 0 0 V 0 252.   1666 + 2 20 255.   255 - 255 - 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
VPN     Time     Services     Vuer Administration     Maintenance     Vueritation     Firewall     Divibility     VITIS-DNP3 Slave     VITIS-DNP3 Slave	Network Bonding Mode Obisin an IP Address via DHCP IP address Subnet mask Default gateway Preferred DIXS Server Alternate DIXS Server	21           attri-Bakes ▼           0           122           123           125 </th
Log out 2022/05/20	Apply Cancel	

Figure 4

18- Set the IP to use redundancy in "System Configuration\Network". See Figure 5.A. In this case: 10.10.10.3.

BRODERSEN				
	Network Settings			
<ul> <li>System Overview</li> <li>Hardware Overview</li> <li>Rurtime Settings</li> <li>VD Board Settings</li> <li>System Configuration</li> <li>Servial Ports Card</li> <li>Network</li> <li>Network</li> <li>Network Redundancy</li> <li>Network Redundancy</li> <li>Wifi</li> <li>Wireless Modem</li> <li>VPN</li> <li>Services</li> <li>Gerkvices</li> <li>Gerkvices</li> <li>Ustraintenance</li> <li>Ustraintenance</li> <li>Ustraintenance</li> <li>Ustraintenance</li> <li>Ustraintenance</li> <li>Ustraintenance</li> <li>Withis</li> <li>Firewall</li> <li>PINP3 Slave</li> <li>WITS-DNP3 Slave</li> </ul>	Ethernet CM02 LAN 1 eth3 Obtain an IP Address via DMCP IP address Subnet mask Default gateway Preferred DNS Server Alkemate DNS Server			
	Ethernet USB Lan Adapter Allow Ethernet LAN USB adapter to be used	0		
	Hostname Current hostname	RTU32-R		
User name: admin User group: Administrators Log out 2022/05/20	Apply Cancel			

Figure 5

- 19- Set the redundant partner system configuration in "Runtime system\Redundancy Settings\Partners RTU32". See Figure 6.
  - A. Select Use Redundancy.



- B. Set the partner IP address (In this case: 10.10.10.2).
- C. Choose primary state. (One of RTUs must work as primary and other one as secondary). a. In this case this RTU is secondary.
- D. Choose your RTU position in R3 types. (One of RTUs is in the left of I/Os and other one is on the right)
  - a. In this case this RTU in on the side of I\Os.

BRODERSEN			
	Redundancy Settings		
<ul> <li>System Overview</li> <li>Hardware Overview</li> <li>Runtime Settings</li> <li>Main Settings</li> <li>VO Board Settings</li> <li>D'O Board Settings</li> <li>System Configuration</li> <li>Maintenance</li> <li>Utilities</li> <li>Firewall</li> <li>D'073 Slave</li> <li>WITS-ONP3 Slave</li> </ul>	Use Redundancy 0		
	Partners RTU32		
	IP Address Main Port Port used for Replication	10 . 10 . 10 . 2 0 502 0 9001 0	
	This RTU32		
User name: admin User group: Administrators Log out 2022/05/20	Port used for Replication Second Live Link Port Second Live Link Timeout Primary Partner LB2 I/O redundancy type	900 0 Disabile V 0 500 0 False V 0 R3R:Shared 1/Os: This CPU right of 1/Os V 0	
CPU Temps 57.7 °C CPU Lead: 10.2 % Memory Usage: 25.0 % Board Temps: 41.9 °C Board Types: RTU32M Settings have changed. To activate the new settings the RTU32 must be rebooted.	Timeouts (milliseconds)		
	Connection to Partner Active Runtime Detection Passive Runtime Detection Data Replication Gateway Exchanges	1000 1000 1000 500 500 0	
	When Passive Starts           Apply         Cancel	0000	



#### 20- Turn off RTU.

- RTUs are ready to use.
- 21- Turn on both RTUs.
- 22- After 25 seconds one of the RTUs will go to primary state (Status LED on MP32A module will indicate yellow) the second RTU will be in hot standby state (Status LED on MP32A module will indicate blinking yellow).
- 23- The system is now ready to be programmed from Brodersen WorkSuite. It is only necessary to program the active/primary RTU, i.e., the application code will automatically be transferred to the passive RTU.

# Note:Redundancy Functions:

- In this type of redundancy, the two network cards on the RTU are bonded into a virtual one which is accessible via one IP address. If the LAN 1 fails, the RTU automatically uses LAN 2.
- If the CPU module or power supply fails on the active RTU, the standby RTU automatically changes its state to active in less than a second
- It is possible to create some rules, which specifies when and if the standby RTU should takeover as active RTU. The rules need to be implemented in application code.