

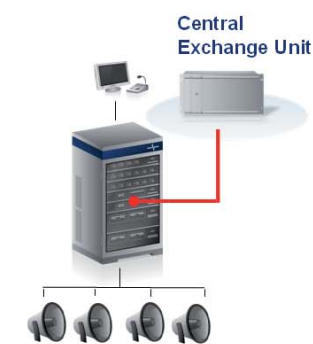
# Redundancy Concepts

## INTRON-D *plus*

Single System with N+1 Components

Duplicated Control System (hot stand-by operation)

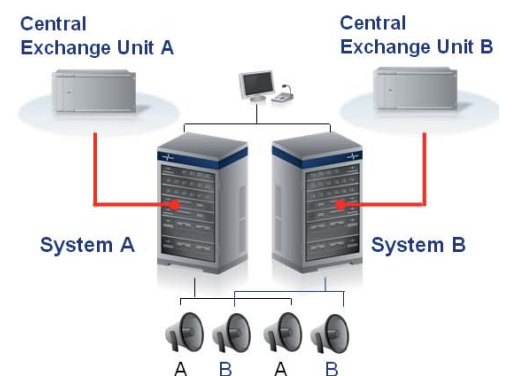
A+B System (shared operation)



Single System



Duplicated Control System



A+B System



## Optimum Protection - Redundancy Concepts

Important components of an Intercom and PA/GA system, which are critical and essential for the proper functioning of the system, should be redundant to increase system reliability.

In order to meet the highest safety demands, INDUSTRONIC provides different redundancy concepts which can be adapted to customer and site requirements. They guarantee optimum protection and safety for personnel, machines, and the environment.

INDUSTRONIC's redundancy concepts are especially designed for challenging environments, e.g. onshore/offshore platforms, chemical and petrochemical plants.

They can also be used in other industrial environments, where absolute reliability of communication and warning systems has top priority.

This brochure will give you a brief overview of the concepts and introduce the different features and options.

# Overview - Component Redundancy

At INDUSTRONIC, we distinguish between two different types of component redundancy concepts which can either be used for single components of a system or as integral part of an all-in-one system redundancy concept.

## N+1 Redundancy

For this redundancy concept **one or several** active components (**N**) are backed by exactly **one** backup component (**+1**) in hot stand-by mode. As soon as an active component fails, the backup component takes over the complete functions of the defective component. The failure of a second active component which is backed by exactly the same backup component is not compensated.

## 1+1 Redundancy

For this redundancy concept **one** active component (**1**) is backed by exactly **one** backup component (**+1**) in hot stand-by mode. As soon as an active component fails, the corresponding backup component takes over the complete functions of the defective component. This way several failures are compensated as each component is backed by its corresponding backup component.



**N+1 Redundancy**



**1+1 Redundancy**



## Flexibility - Redundancy Concepts

All redundancy concepts are provided with integrated continuous system monitoring including watchdog function. This ensures real-time detection and indication of component failures.

INDUSTRONIC offers the following three basic redundancy concepts:

1. Single System with N+1 Components
2. Duplicated Control System  
(hot stand-by operation)
3. A+B System (shared operation)

The flexible concepts can be tailored to customer and site requirements. We at INDUSTRONIC will assist you in finding the right solution.

Learn more about our individual concepts described on the following pages of this brochure.

# Single System with N+1 Components

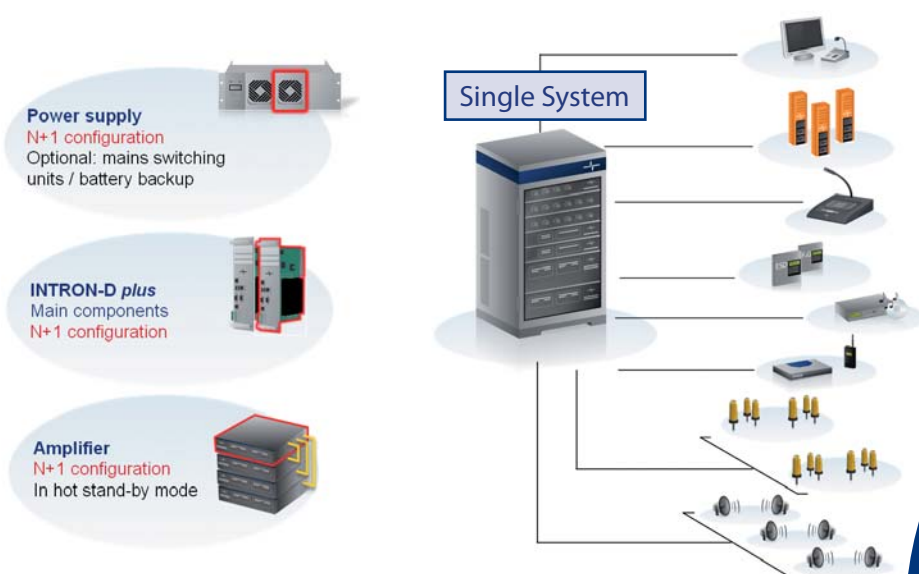
For this redundancy concept one single system is provided. Depending on project or customer requirements there is the option to protect important components by exactly one backup component in hot stand-by mode.

In case of component failure, the backup component takes over completely. After switchover, the system is in full operation again.

This redundancy concept is primarily used to protect individual components from failures caused by age or wear.

It provides a standard backup protection for single components at a reasonable price.

INDUSTRONIC recommends using power supply, central exchange unit components, amplifiers and the digital audio processor in N+1 configuration for increased system availability.



## In a Nutshell

- 1 system with the option to protect important components with one backup (N+1 redundancy)
- Component switchover in case of failure
- Protection of individual components against failure

+ *Increased component availability*

+ *Minimum installation space required*

+ *Lowest costs*

# Duplicated Control System (hot stand-by operation)

For this redundancy concept two independent "control units" are provided. There is an active control unit (the **Main Unit**) which contains all components of the central exchange unit (e.g. exchange control board, line cards, digital audio processor, power supply, etc.) and a second one in hot stand-by mode (the **Secondary Unit**) which is equipped with the same components.

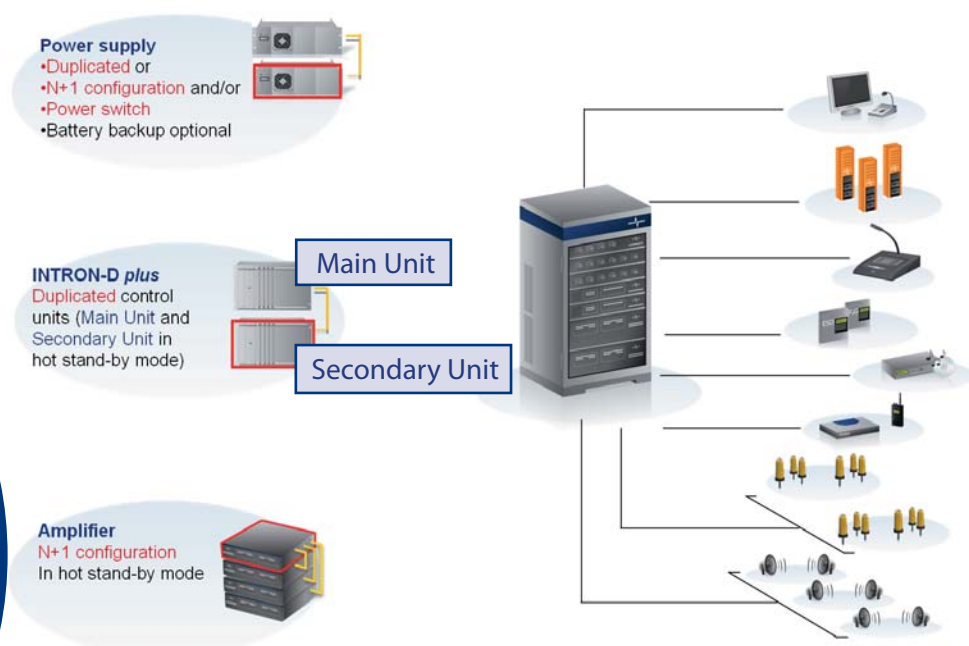
Both control units are synchronized to guarantee that there is no loss of main control and functions. In case of failure, there is an automatic switchover from the Main Unit to the Secondary Unit.

Switching back can be carried out manually via software interface or if available via keypress at a service intercom station.

By default, all intercom stations, amplifiers, speakers, beacons and analog lines (e.g. contacts to fire & gas alarm systems, etc.) are connected to both control units via dual system interface or Ethernet/IP. Analog lines are protected by redundant cabling.

To provide additional protection there is also the option to protect main components by backup components in hot stand-by mode.

This redundancy concept ensures that there is no loss of any warning and alarm functions in case of failure. It provides extra protection by automatically switching to the backup control unit in hot stand-by mode.



## In a Nutshell

- 2 control units (Main Unit & Secondary Unit) equipped with identical components
- Automatic switchover between active and hot stand-by control unit in case of failure
- All intercom stations are connected to both units
- Option to protect individual components against failure

+ High component availability  
+ Little installation space required  
+ Optimum cost and safety balance

# A+B System (shared operation)

For this redundancy concept two independent systems work simultaneously (**System A & System B**). Often they are located in two different places so that occurring incidents or emergencies (e.g. fire, gas alarm) only affect one system.

Both systems are synchronized and connected via redundant cable routes.

By default, all intercom stations and analog lines (e.g. contacts to fire & gas alarm systems, etc.) are connected to both systems.

Speakers and beacons are evenly distributed among the different speaker zones. There is always one speaker/ beacon of System A and one speaker/ beacon of System B installed per location. Usually, 50 % of the amplifiers are connected to System A and the remaining 50 % are connected to System B.

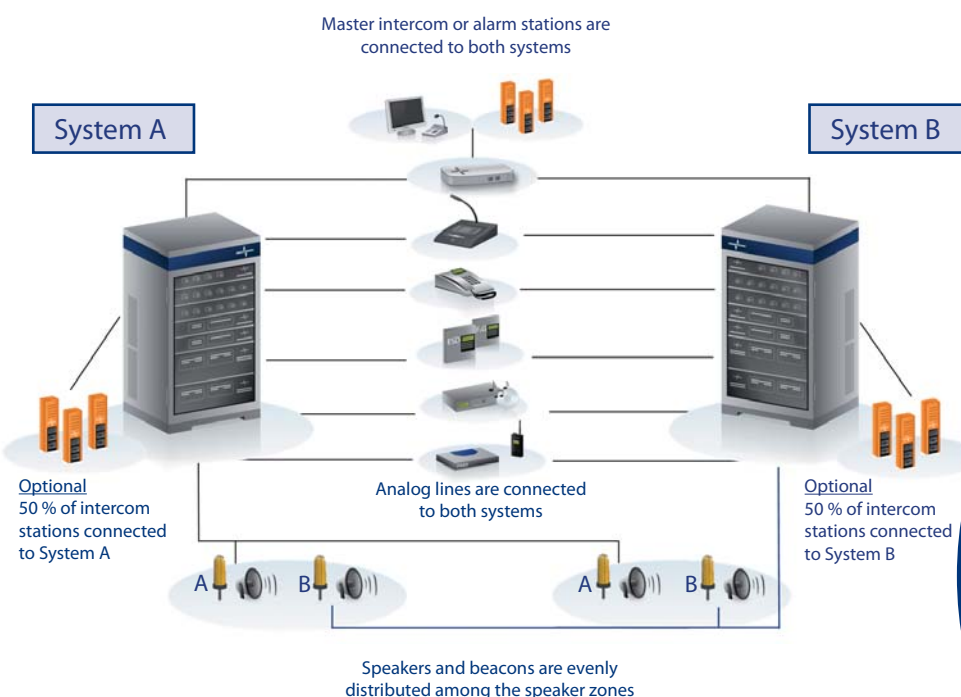
Under normal operation, the A+B System concept provides full sound coverage.

In the worst case, when one system fails, the sound level is only reduced by a maximum of 3 dB which is barely audible to human ears.

To provide additional protection there is of course the option to protect main components by backup components in hot stand-by mode.

This redundancy concept provides maximum protection against failure. There is no loss of any warning and alarm functions in case of failure.

For onshore/offshore applications this is a typical redundancy concept. It complies with DNV and NORSOK standards.



## In a Nutshell

- Synchronized systems in parallel operation
- Maximum protection against failures
- All intercom stations can be connected to both systems
- Connection of amplifiers divided among the systems
- Local interferences only affect one system not both

+ *Highest system availability*  
+ *Different locations possible*  
+ *Save investment*

# Tailored to Your Needs - Power Supply

The INTRON-D *plus* can be supplied with 110 / 230 VAC or directly with 48 / 60 VDC. INDUSTRONIC offers a wide variety of combinations for power supply.

By default, there is one single AC/DC rectifier module which can be combined with a static switch for a backup UPS or for two mains inputs. A battery backup can also be integrated to additionally protect your system.

Optionally, you can also equip your power supply with a rectifier in N+1 configuration. The backup rectifier can then be operated in load sharing mode or in hot stand-by mode. For load sharing mode both rectifier modules are permanently active.

It is also possible to implement a secondary mains feed-in which is always active to avoid switchover times.

For the highest level of emergency power supply you can fully duplicate your entire power supply.

Please refer to the overview table below to view the variety of combinations. It's your decision - together we will find the ideal power supply solution concerning availability and costs.

Contact us if you need further details.

	Static Switch 110/230 VAC + 110/230 VAC UPS	110/230 VAC + Local Battery Backup  (also possible with static switch for two main inputs)	110/230 VAC + 48/60 VDC UPS  (also possible with static switch for two main inputs)
Single Rectifier			
Rectifier in N+1 Configuration  (load sharing/hot stand-by mode)			
Duplicated Power Supply			



# Increased Safety - Speakers & Beacons

All INDUSTRONIC redundancy concepts provide the possibility that speakers and beacons can be wired as loops or can be connected to one line. Optional monitoring for all speakers and beacons can be provided.

Loop cabling provides the highest availability of speakers and beacons as an interruption of one line will not cause the speaker or beacon to fail.

Using the monitoring function a failure can be easily detected and indicated as short circuit, ground fault, line interruption or impedance failure so that it can be quickly eliminated.



**Line cabling of speakers and beacons**



**Loop cabling of speakers and beacons**

# Overview - System Redundancy Concepts

Use the following table to compare the different types of system redundancy concepts described above and to find the right concept for your needs.

Depending on project and customer requirements, you can easily integrate the different types of component and power supply redundancy into the system concept selected.

	Single System with N+1 Configuration	Duplicated Control System	A+B System
No. of systems or control units	1 system	1 system with 2 control units (Main Unit & Secondary Unit)	2 systems (System A & System B)
<b>Components of the Central Exchange Unit</b>			
Default	No redundancy	1+1 configuration (all components of the central exchange unit installed in the Main Unit are duplicated in the Secondary Unit)	1+1 configuration (all components of the central exchange unit installed in System A are duplicated in System B)
Option	N+1 configuration of exchange control board, digital audio processor and/or internal DC power supply	N+1 configuration of digital audio processor and/or internal DC power supply for each control unit	N+1 configuration of digital audio processor and/or internal DC power supply for each system
<b>Intercom Stations</b>			
Default	All intercom stations are connected to the single system	All intercom stations are connected to both control units via dual system interface or Ethernet/IP	All intercom stations are connected to both systems via dual system interface or Ethernet/IP
Option	Important intercom stations (e.g. master intercom stations) can be duplicated (EN54-16)	Important intercom stations (e.g. master intercom stations) are connected to both control units + the remaining intercom stations are only connected to the Main Unit	Important intercom stations (e.g. master intercom stations) are connected to both systems + 50 % of the remaining intercom stations are connected to System A, the other 50 % are connected to System B
<b>Amplifiers</b>			
Default	N+1 configuration (1 backup amplifier)	All amplifiers are connected to both control units (no backup amplifier)	50% of amplifiers are installed in System A, remaining 50% are installed in System B
Option	1+1 configuration (same amount of backup amplifiers)	N+1 configuration (1 backup amplifier) or  1+1 configuration (same amount of backup amplifiers)	N+1 configuration (1 backup amplifier for each system)  1+1 configuration (same amount of backup amplifiers for each system)
<b>Analog Interfaces (Speakers, Beacons, Analog Telephone, Radio, F&amp;G)</b>			
Default	No redundancy	All analog interfaces are connected to both control units	All analog interfaces are connected to both systems  Speakers and beacons from both systems are evenly distributed among the different speaker zones
Option	Loop cabling (of speakers and beacons)  Monitoring possible	Loop cabling (of speakers and beacons)  Monitoring possible	Loop cabling (of speakers and beacons)  Monitoring possible

	Single System with N+1 Configuration	Duplicated Control System	A+B System
No. of systems or control units	1 system	1 system with 2 control units (Main Unit & Secondary Unit)	2 systems (System A & System B)
<b>Digital Interfaces / Supported Network Protocols (SIP, CANopen, Modbus/TCP, SNMP)</b>			
Default	No redundancy  All digital lines are monitored	All digital interfaces are connected to both control units  All digital lines are monitored	All digital interfaces are connected to both systems  All digital lines are monitored
<b>Power Supply</b>			
Default	Please refer to page 8		
Option			
<b>Switchover</b>			
Default	Automatic switchover to redundant components	Automatic switchover from Main Unit to Secondary Unit and to redundant components  Manual switchover from Secondary Unit to Main Unit via software interface or if available via keypress at a service intercom station	No switchover, two systems operate in parallel  Automatic switchover to redundant components
<b>In a Nutshell</b>			
	<ul style="list-style-type: none"> <li>1 system with the option to protect important components with one backup (N+1 redundancy)</li> <li>Component switchover in case of failure</li> <li>Protection of individual components against failure</li> </ul>	<ul style="list-style-type: none"> <li>2 control units (Main Unit &amp; Secondary Unit) equipped with identical components</li> <li>Automatic switchover between active and hot stand-by control unit in case of failure</li> <li>All intercom stations can be connected to both units</li> <li>Option to protect individual components against failure</li> </ul>	<ul style="list-style-type: none"> <li>Synchronized system in parallel operation</li> <li>Maximum protection against failures</li> <li>All intercom stations are connected to both systems</li> <li>Connection of amplifiers divided among the systems</li> <li>Local interferences only affect one system not both</li> </ul>
<b>Availability</b>			
	+ Increased component availability	+ High component availability	+ Highest system availability
<b>Costs</b>			
	+ Lowest costs	+ Optimum cost and safety balance	+ Save investment



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