

A+B

Hot Standby

N+1

1+1

N+N



REDUNDANCY CONCEPTS

SYSTEM AVAILABILITY IS KEY

HOT STANDBY SYSTEM



- Maximum flexibility in redundant configuration of critical components

A+B SYSTEM / 1+1 / N+1 / N+N



- Highest system & component availability

A+B SYSTEM



- Optimum protection against failures
- No single point of failure

OUR PHILOSOPHY - WHY REDUNDANCY IS IMPORTANT

PA, PA/GA & Intercom systems are safety-critical applications that have to withstand harsh industrial environments and need to be reliable in the event of an emergency to protect people, machines and the environment.

Eliminate any single point of failure

If you want to increase the availability of your PA, PA/GA & Intercom system, you need to eliminate single point of failures.

Identifying critical components in your system and duplicating them is an adequate solution to avoid system failures and downtimes.

Concepts for any requirements & budgets

INDUSTRONIC offers the following flexible redundancy concepts for the INTRON-X:

- N+1 component redundancy
- Hot Standby System
- A+B System (shared operation)
- A+B System / 1+1 / N+1 / N+N component redundancy

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

INTRON-X modules for different applications

The INTRON-X system provides modules for different types of applications which can be included in your favorite redundancy concept:

- X-Controller (XCO), intelligent processor unit
- Digital Gateway Module (XDG) for the connection of digital terminal devices
- I/O Module (XIO) for reading in inputs and switching of outputs
- Analog Line Module (XAL) for connection of analog intercom stations and third-party systems
- Beacon Control Module (XBC) for the control of flashing warning beacons with optional line monitoring.
- Power Supply Module (XPS) for the power supply of system components

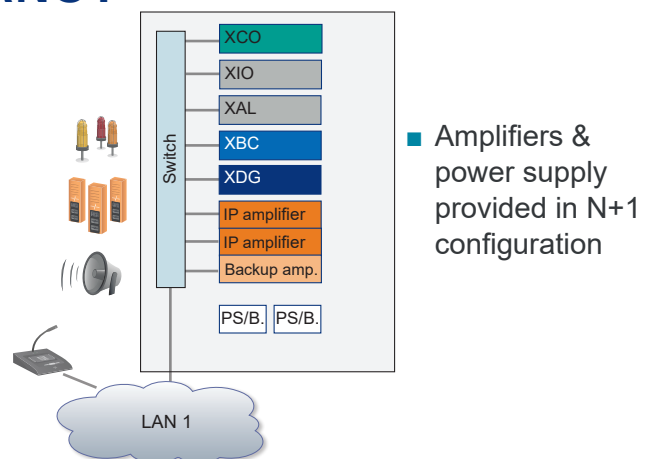
Due to their uniform compact industrial design they can be flexibly combined in a 19" chassis and decentrally or centrally installed into INDUSTRONIC cabinets or existing cabinets on site.

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

N+1 COMPONENT REDUNDANCY

This type of redundancy is the lowest level of redundancy and typically used to backup amplifiers and power supplies.

These are critical components for the whole system. If one of these components fails, a backup component in hot standby mode takes over.



HOT STANDBY SYSTEM



This concept provides maximum flexibility in the redundant configuration of your components according to your safety requirements and budget. You can choose between decentralized and centralized installation of your INTRON-X modules.

1+1 configuration of controller

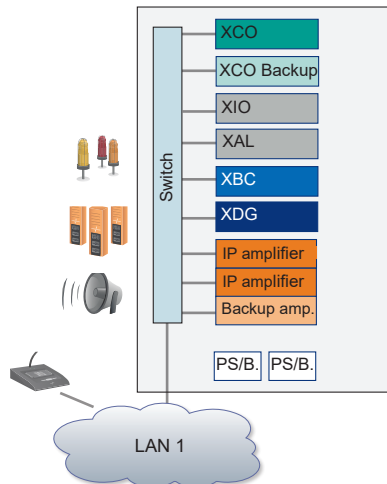
In a Hot Standby System, the X-Controller is provided in 1+1 configuration.

The primary controller is active. The secondary controller is in hot standby mode and takes over when the primary controller fails.

N+1, 1+1, or N+N configuration of critical components

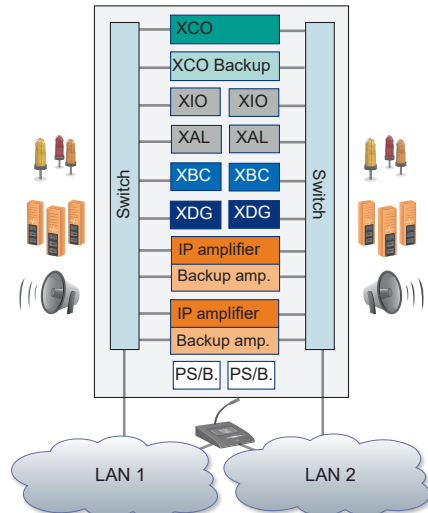
INDUSTRONIC recommends N+1 redundancy for critical components (e.g. power supply and amplifiers). You can also opt for N+N configuration for even more protection. For INTRON-X modules which are connected to critical components, we recommend 1+1 or N+N configuration.

MINIMUM CONFIGURATION



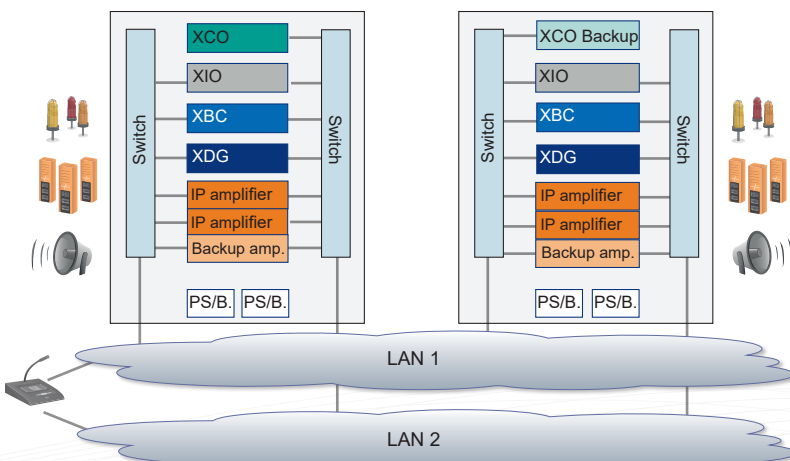
- Controller provided in 1+1
- Amplifiers & power supply provided in N+1

MAXIMUM CONFIGURATION



- Controller provided in 1+1
- INTRON-X interface modules and amplifiers provided in N+N
- Power supply provided in N+1
- Redundant network & switches

DECENTRALIZED INSTALLATION



- Flexible decentralized installation of INTRON-X modules possible
- High security due to physical separation
- Redundant network & switches

A+B SYSTEM (SHARED OPERATION)



For this redundancy concept typically two independent cabinets work simultaneously (Cabinet A & Cabinet B). Often they are located in two different places so that occurring incidents or emergencies (e.g. fire, gas leakage) only affect one cabinet.

Both cabinets are synchronized and connected via redundant networks.

By default, important intercom stations and I/O components (e.g. interfaces to fire & gas alarm systems, etc.) are connected to both cabinets.

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

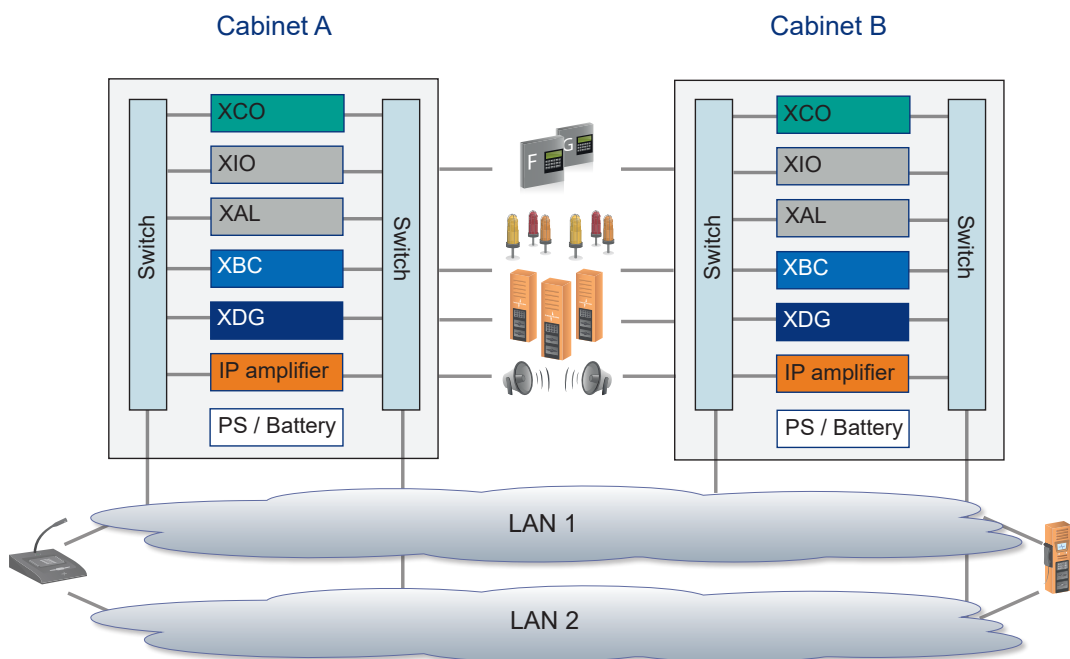
Under normal operation, the A+B System concept provides sound coverage with full power.

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

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

The A+B System concept is typically used for onshore/offshore applications. It is designed for DNV case-by-case approvals and complies with the NORSOK standard.

MINIMUM CONFIGURATION



- Two independent controllers synchronized and operated in parallel
- All critical components are redundant and active
- Different locations of cabinets possible
- Decentralized or centralized installation of modules and components

A+B SYSTEM (SHARED OPERATION)



A+B System / 1+1 / N+1 / N+N component redundancy

For ultimate protection, the A+B System can be combined with 1+1, N+1 or N+N component redundancy.

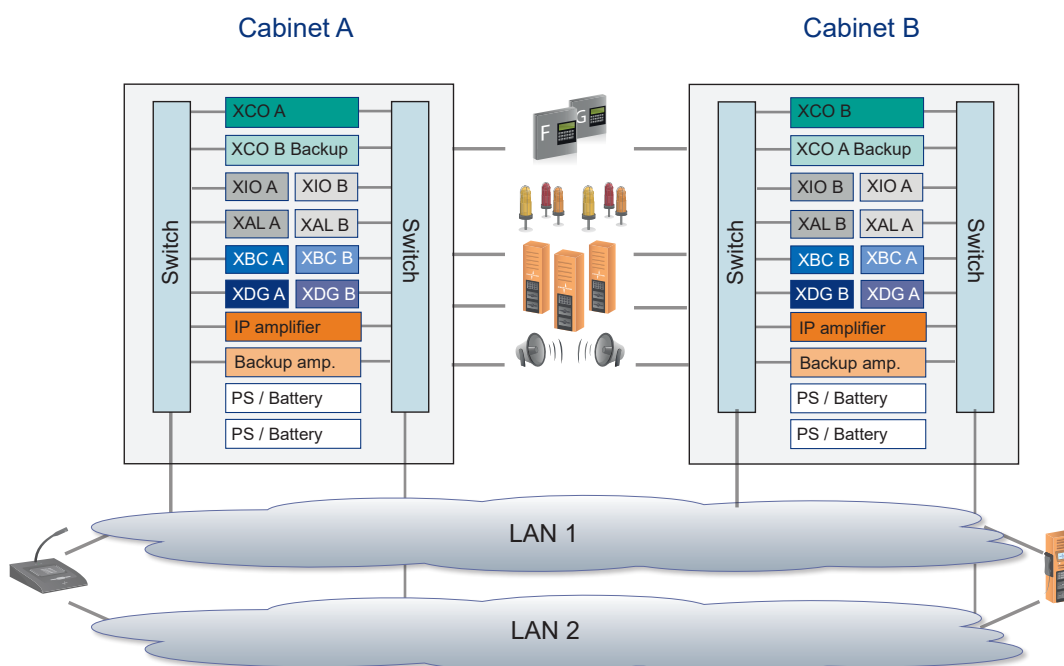
To achieve an additional layer of fail-safety you can equip each cabinet with one active controller and one backup controller in hot standby mode.

So there is one active controller in Cabinet A and one active controller in Cabinet B. The backup controllers take over in case the active controllers fail. All four controllers are connected to a redundant IP network.

Critical components can additionally be configured in 1+1 configuration for ultimate protection.

Power supply and amplifiers can additionally be provided in N+1 configuration.

MAXIMUM CONFIGURATION



- Two independent controllers (each provided in 1+1) synchronized and operated in parallel
- All critical components (each provided in 1+1) are redundant and active
- Amplifiers & power supply provided in N+1
- Different locations of cabinets possible
- Decentralized or centralized installation of modules and components

PATH REDUNDANCY



You can supplement your redundancy concept by adding path redundancy between different devices or duplicate networks.

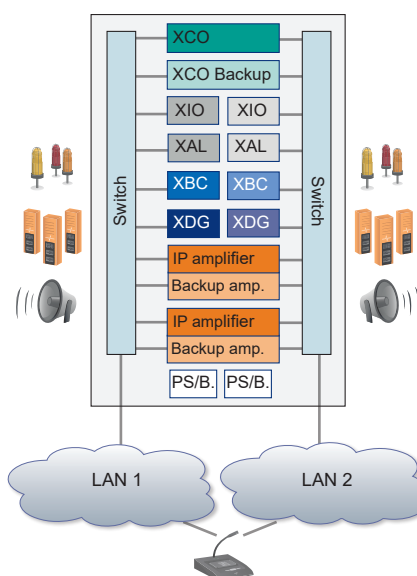
Path redundancy is important to compensate failures that occur on a path caused e.g. by cable breaks, impedance errors, ground leakages or failed network components (e.g. switches) in a network.

NETWORK REDUNDANCY

Network redundancy is achieved by two separated independent network segments (LANs).

Our IP devices are equipped with two network interfaces which allow for redundant network access. If one network fails, data is transmitted via the second one.

Network redundancy is recommended for Hot Standby System and A+B System.

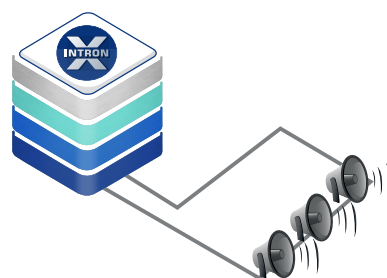


PATH REDUNDANCY FOR SPEAKERS / FLASHING WARNING BEACONS

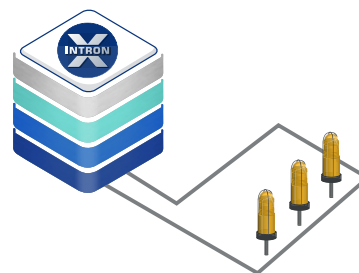
All INDUSTRONIC redundancy concepts provide the possibility that speakers and beacons can be wired as loops. Optional monitoring for all speakers and beacons can be provided.

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.



Loop cabling of speakers



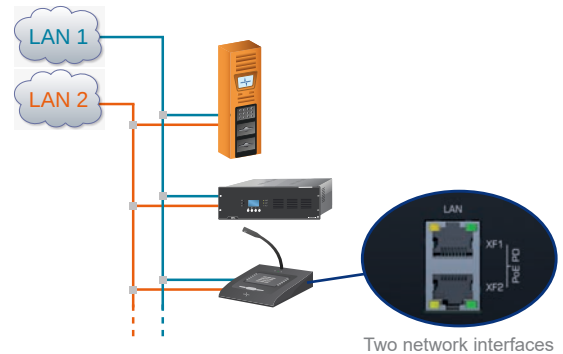
Loop cabling of beacons

PATH REDUNDANCY



PATH REDUNDANCY FOR IP INTERCOM STATIONS

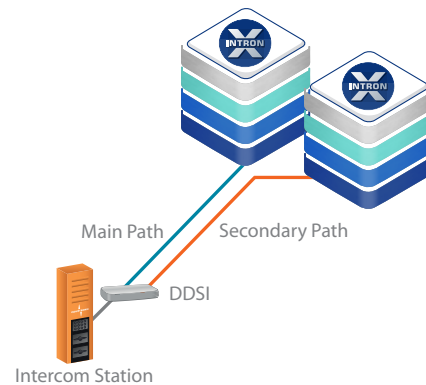
INDUSTRONIC's IP devices are equipped with two network interfaces at the rear which allow for redundant network connection. If one network is no longer available, data is transmitted via the second network.



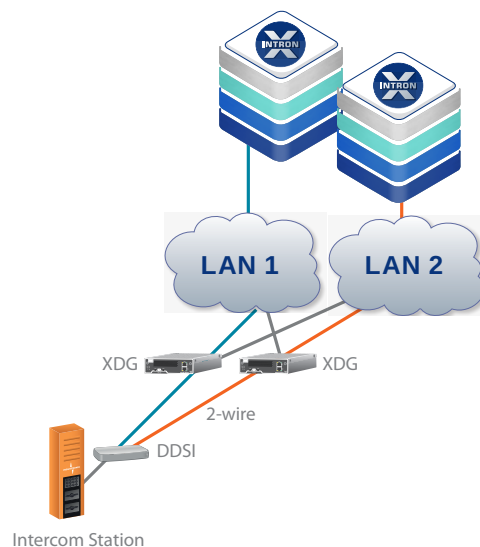
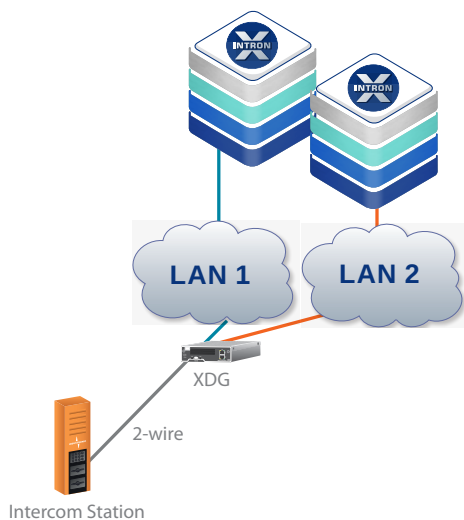
2-WIRE PATH REDUNDANCY FOR DIGITAL INTERCOM STATIONS

Digital intercom stations can be connected to two controllers via the digital dual system interface (DDSI).

The intercom stations are continuously monitored. If the primary path fails (e.g. cable break), the secondary path takes over.



MIXED PATH REDUNDANCY FOR DIGITAL INTERCOM STATIONS



These two pictures show the flexibility in mixing different transmission technologies: 2-wire lines and network.

POWER SUPPLY REDUNDANCY

The INTRON-X system can be supplied with 110 / 230 V AC or directly with 48/60 V DC.

Two independent power sources

For redundant power supply solutions the following general requirement has to be fulfilled: Two independent power sources must be connected to a system or to system modules.

This requirement can be met by using two independent AC mains or one AC mains in combination with a battery backup solution.

The table below shows different architectures of redundant power supply solutions.

In applications with two AC mains inputs (Main AC and Backup AC) also AC/DC conversion has to be installed in a 1+1 or N+1 configuration.

The AC/DC converters are running in load sharing mode. In case of a drop out of one AC/DC converter the full power load is still provided.

For power supply solutions with an integrated battery backup the AC/DC conversion in redundant configuration is not absolutely needed but improves reliability.

For the highest level of redundant power supply the entire power supply can be fully duplicated.

Power supply solutions for INTRON-X

INDUSTRONIC offers a wide variety of combinations for redundant power supply solutions in different form factors (19" chassis, DIN rail modules,...) for different power classes.

The XPS power supply modules in 1/3 19" design or the DRPS power supply modules for DIN rail mounting are ideal for lower power solutions up to several hundred Watts.

For high power and for battery backup solutions we recommend the PMOD PS E48V power supply system.

Together we will find the ideal power supply solution for your project.

	110/230 V AC + 110/230 V AC UPS With Automatic Transfer Switch (ATS)	110/230 V AC + Local Battery Backup (also possible with ATS for two main inputs)	110/230 V AC + 48/60 V DC UPS (also possible with ATS for two main inputs)
Single Rectifier			
Rectifier in N+1 Configuration (load sharing mode)			
Duplicated Power Supply			





For more information on the
INTRON-X system, please
visit our product page.

