ZIZTEL

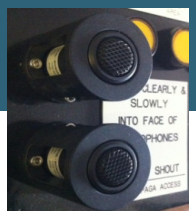
ZIZTEL ZEST PAGA ARCHITECTURE

DS-104 Issue 03 *BECAUSE SAFETY ALWAYS MATTERS*

Thank you for your interest in Ziztel - we are a UK based manufacturer of PAGA and Intercom products. Our systems are mainly designed for use in the Hazardous Oil, Gas and Petrochemical industries.

Ziztel ZEST PAGA is destined for use in dangerous industrial work places as a means of efficiently delivering emergency voice and warning alarm broadcasts to personnel working therein.

Unlike paging and alarm systems available from other vendors, ZEST is not derived from an intercom design and hence fully supports a redundant architecture to secure mission critical high integrity PAGA suitable for life safety applications.



SECURE LIFE SAFETY PAGA

- *Single fault tolerance site wide – no common equipment software/hardware*
- *Reduction of broadcast sound pressure level SPL maximum -3dBA under any single fault scenario*
- *Synchronization of broadcasts with no inter-subsystem dependency*

The Ziztel ZEST PAGA system can be delivered based on a single central core with unduplicated networks of field devices or, for critical applications, with certain key equipment held either on hot stand by or duplicated; N+1. For security the system can be assigned with full redundancy, i.e. A+B or, for ultimate safety, a combination of A+B with N+1 or N+2 execution.

Input/controls *in* to the PAGA system, example microphone access units, interfaces to Fire and Gas panel/ICSS/ESD, are each assigned dedicated connecting cables to improve integrity and speed of service. Multiple access positions sharing single cables are avoided in the ZEST design. Where a redundant N+1 architecture is specified it should be noted that duplication is extended to the entire front end - *including* cable interconnections. This also includes full duplication of the hardware – i.e. dual microphones, dual controls, and dual status indications. The ZEST PAGA system is designed from the onset for critical life-safety applications. It is impossible to deliver the required security from a system that has not been designed primarily for PAGA service. General purpose PA/paging systems and intercom servers/intercom systems cannot reliably support the required system architectures required for a mission-critical PAGA.

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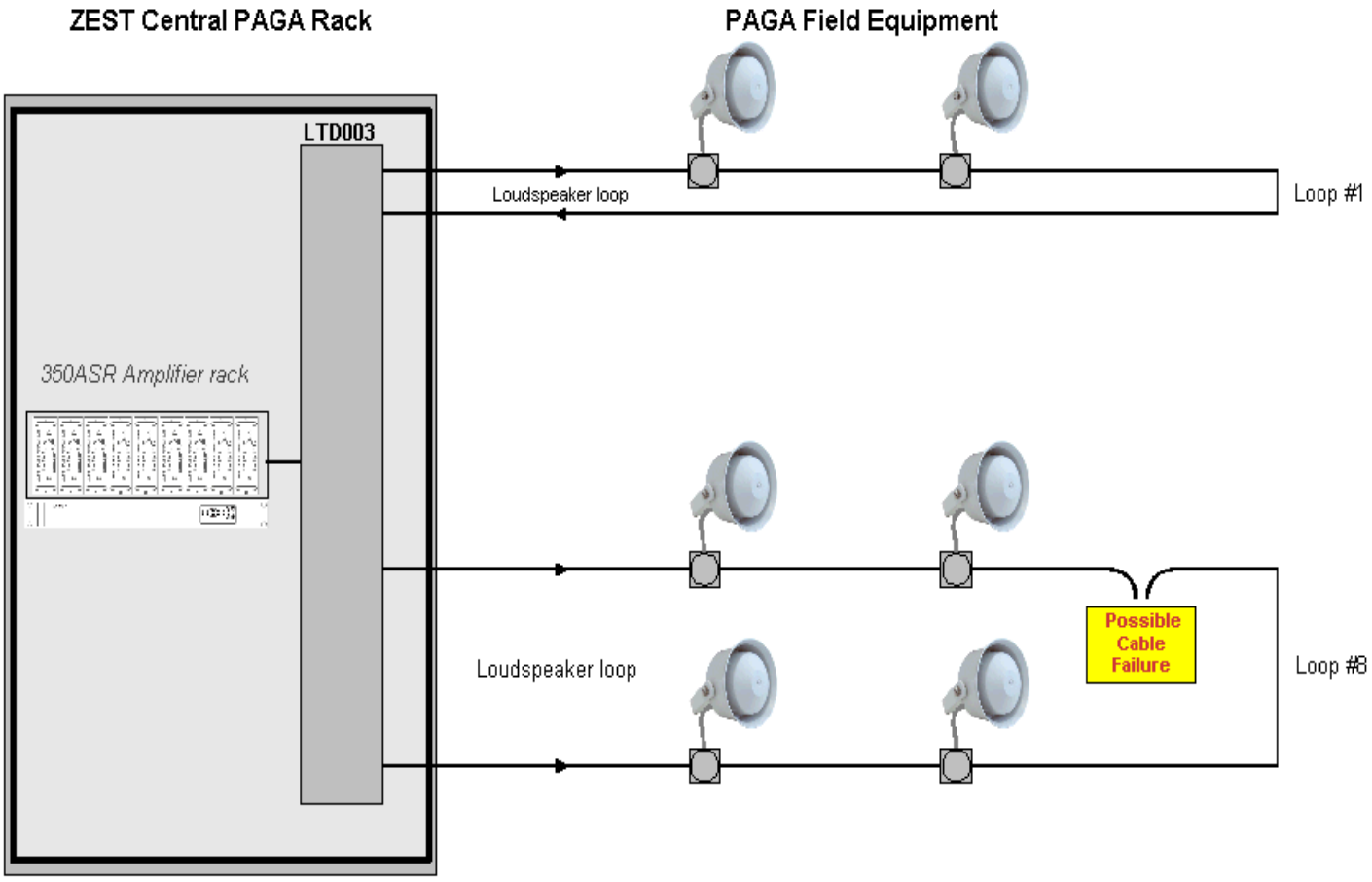
Field devices such as loudspeakers and visual alarms, i.e. flashing beacons, column light indicators, etc..., are connected on self-healing loops. In A+B execution the devices are interleaved to ensure coverage in event of catastrophic failure of either subsystem. An acoustic study determines the position of the A/B field equipment to ensure:

- A maximum loss of -3dBA in broadcast sound pressure level
- Visual coverage is still maintained from remaining operational beacons.

Field devices and associated cables from the A/B system are segregated to eliminate as far as possible the risk of common mode failure. To this end loudspeakers and beacons are mechanically separated and cables engage diverse routing using different cable trays, transits raceways, etc...

The respective A+B central racks are isolated by an A-60 firewall if possible. Use of common 'dual type' loudspeaker enclosures are avoided to maintain the mechanical segregation required to achieve true redundancy.



Loudspeakers are"loop" wired to ensure continued service in the event of a single cable break. The maximum load per loop is 350Watts RMS. The loop voltage is 100 or 70 volt line.

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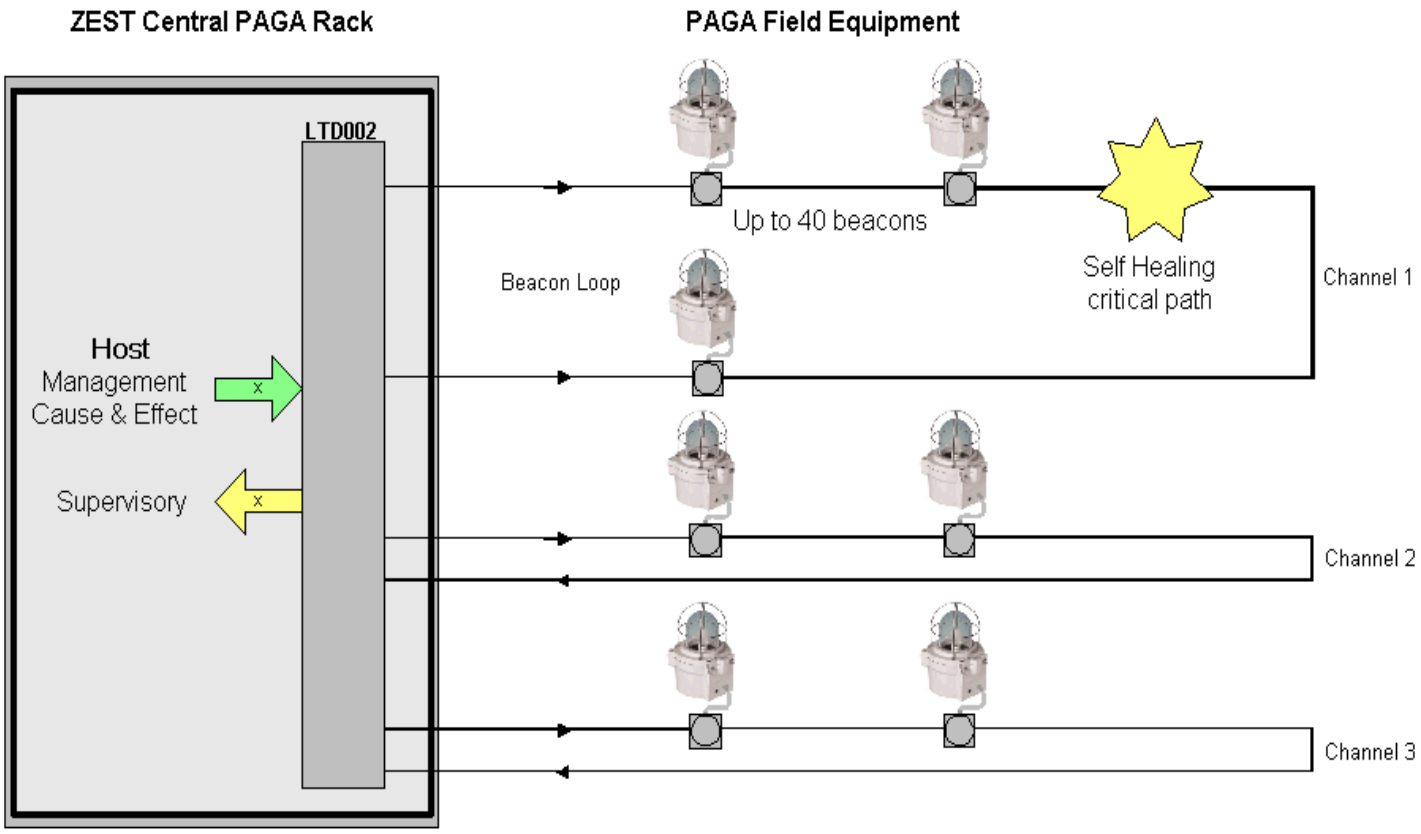

Beacons are also loop wired to allow continued service in event of a single cable break; note that multiple loops are configured for both loudspeakers and beacons to improve integrity. The maximum load for the amplifier is 350 Watts example – fourteen 25 Watt loudspeakers or thirty-five 10 Watt loudspeakers; for beacons up to 40 units per circuit maximum (depending on type).

The diagrams show multiple loops and self-healing of individual field cable loops.
Note: that only 'A' circuits are shown for clarity, 'B' circuits are identical for each target area.

System configuration

There are several possible system configurations available on a ZEST PAGA package:-

- N+1
- A+B
- A+B N+2

The basic architectures can be extended on large sites to serve multiple sector PAGA systems each configured on the basis of the above and each interconnected on possible redundant media.

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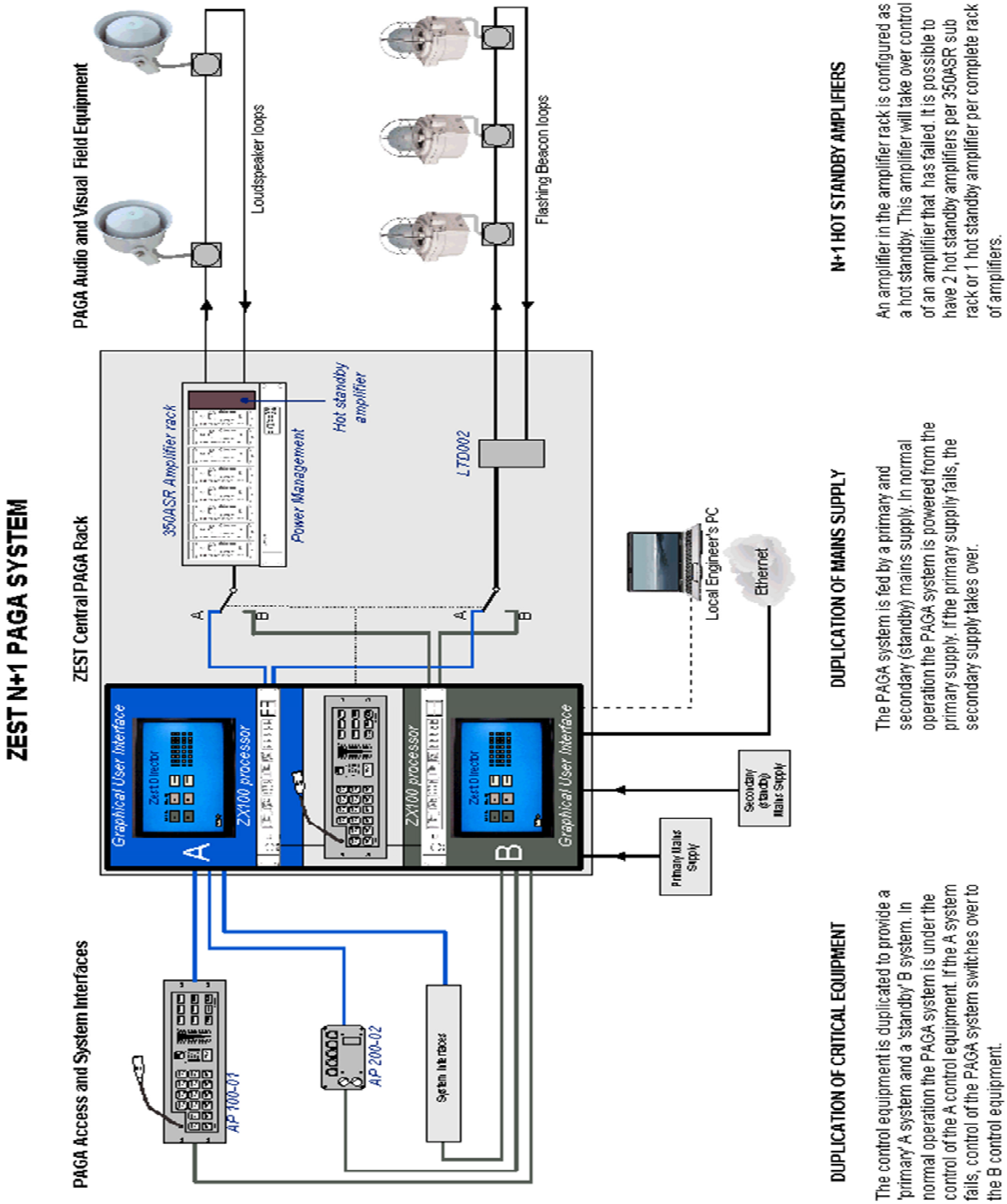
N+1 architecture duplicates the front end A+B. Field devices such as speakers and beacons are <u>not</u> duplicated A+B in this architecture.



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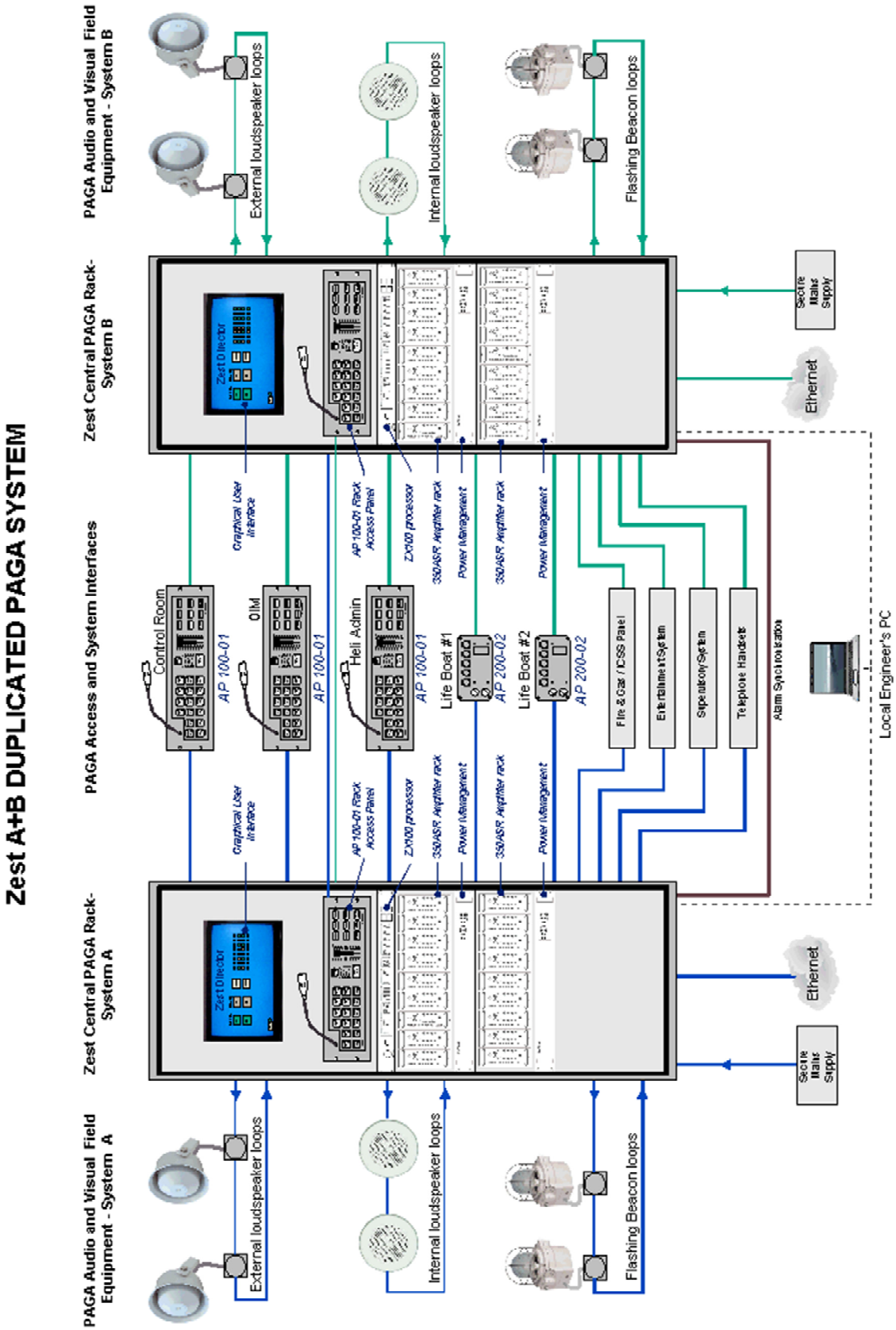
A+B architecture duplicates all field equipment with A System interleaved with B.



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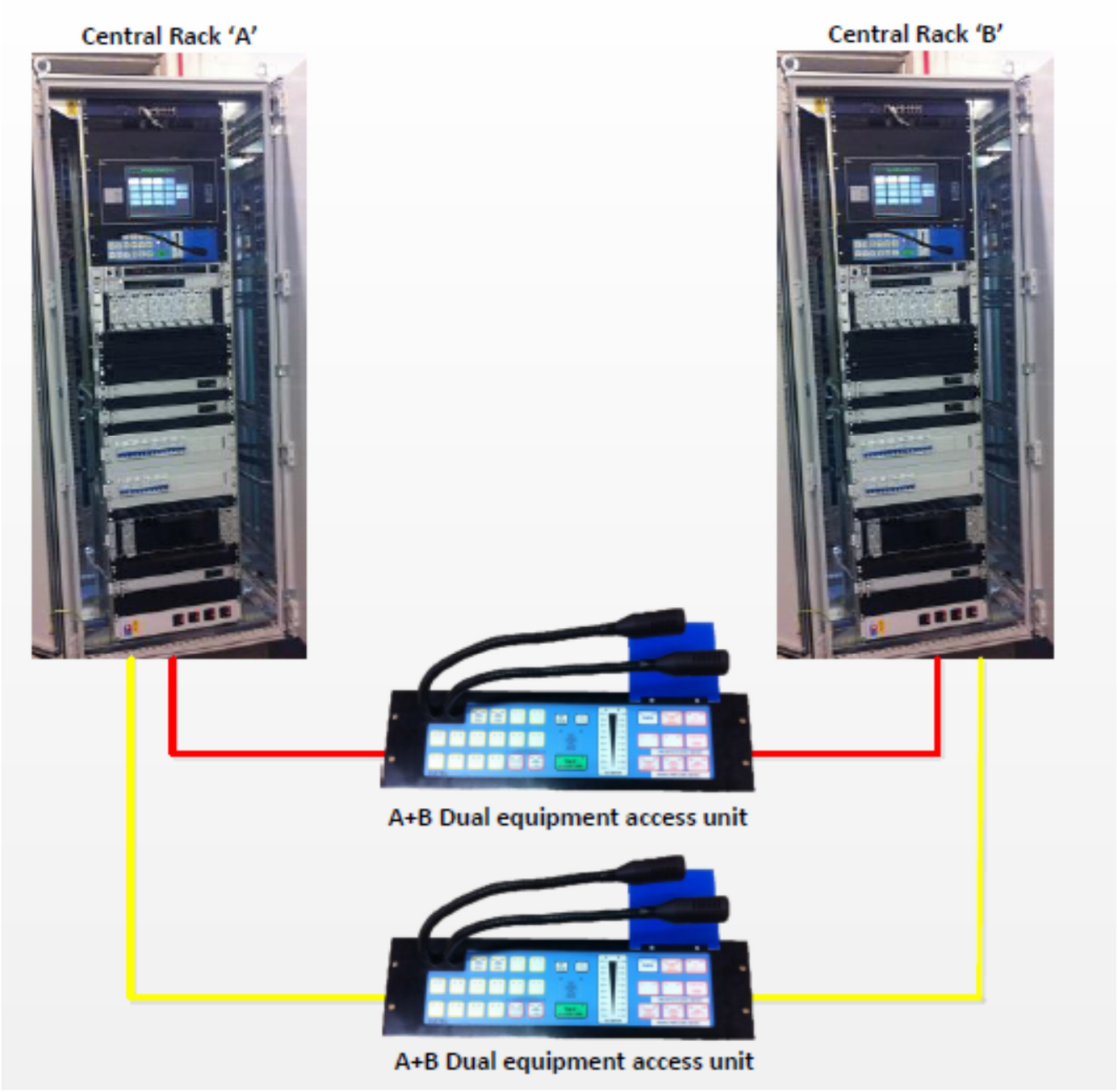

In an A+B configuration there are dedicated cable connections between each device and respective A/B sub system. There is no A/B sub system interconnection except for a non-critical optically isolated cable pair (or fibre) between each central rack. Each A/B system has self-contained resources including independent generation of the site alarm tones. Loss of synchronisation does not impact on speech intelligibility or audibility, the link is intended to ensure that alarm tone cadence is broadcast in unison, the consequence of link failure is possible drifting of the A/B alarm tone cadence relative to each other.

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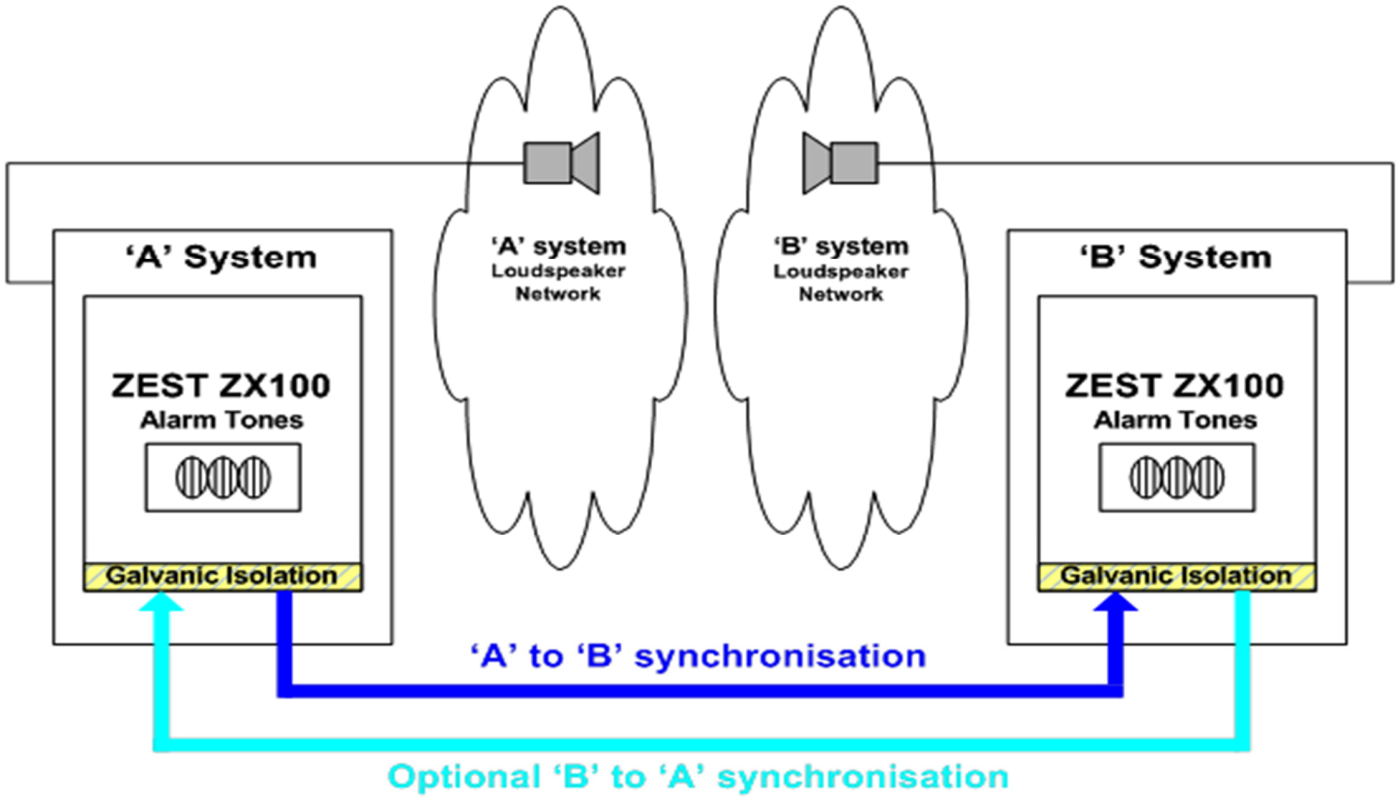

Typical view of an A+B ZEST PAGA system undergoing FAT in our factory. Note the two identical panels which each drive associated A+B field equipment to ensure no common mode failure possibility.

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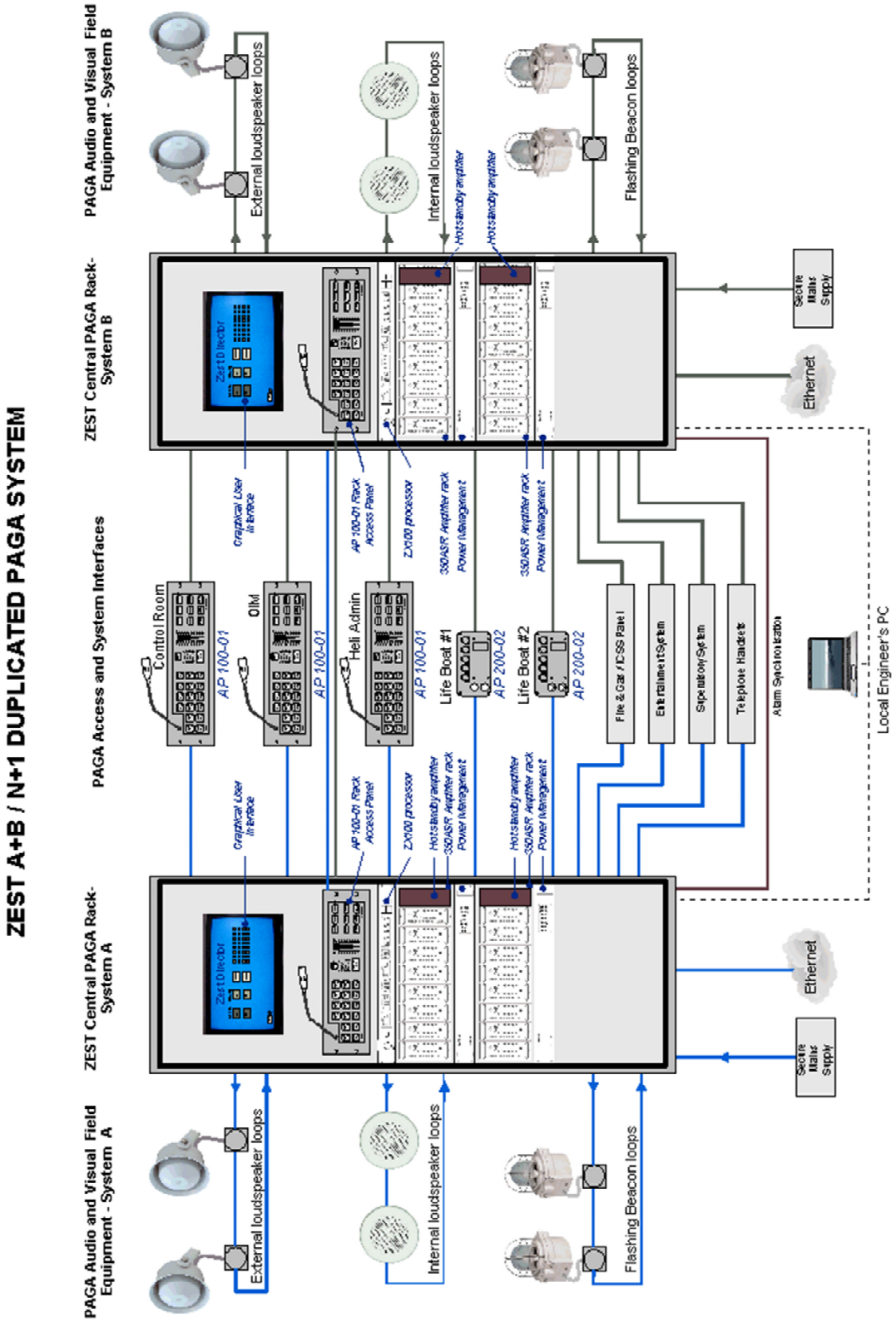
A+B N+1 architecture duplicates and interleaves all field equipment plus certain key hardware elements are included on 'hot standby'.



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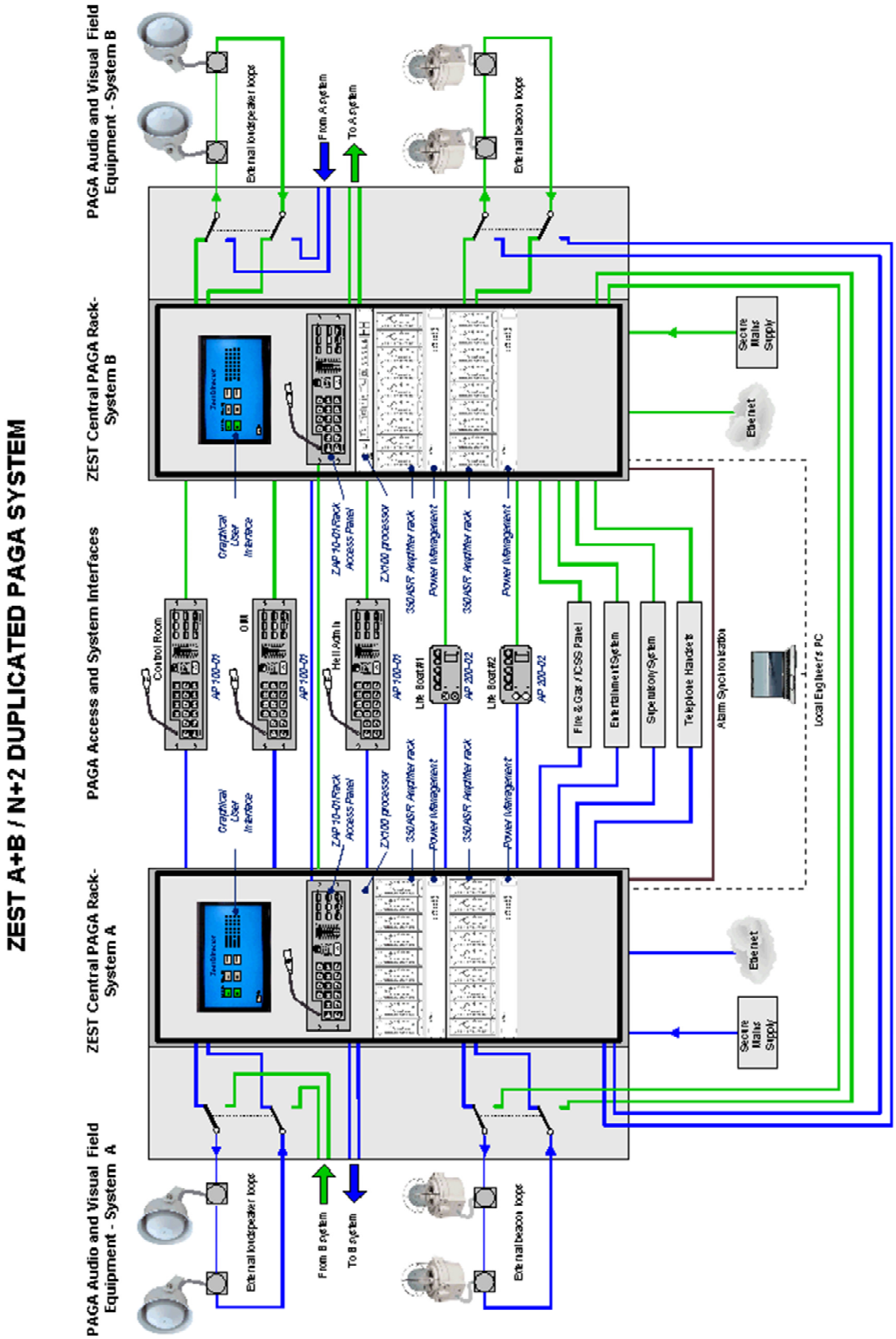
A+B N+ 2 duplicates and interleaves all field equipment – capacity is fitted within each rack A/B to manage the entire site loudspeaker and flashing beacon assignment.



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PAGA Core security

Software

To improve integrity and simplify operation there is no software in the ZEST system critical path

- Eliminates latent software 'bugs'
- No system re-boots required
- Greater immunity to supply disturbances/"brown outs"/EMC
- Major Improvement in overall system availability and reliability

Switching

Switching in the critical path is minimized to improve integrity and where fitted by necessity is supervised.

Fail-Safety

Control inputs are arranged to fail to 'alarm broadcast' or highest priority, example; emergency speech.

- Multiple loudspeaker outputs – no shared lines. A failure in one circuit does not impact on remaining operational circuits.
- Multiple access control inputs – no shared lines. A catastrophic failure of one access position (for example; a fire or an explosion), does not disable access from other locations.
- Multiple visual warning flashing light outputs – no shared lines. A failure in one circuit does not impact on proper site coverage from other devices.
- Field device cabling philosophy – loudspeakers and flashing beacons are loop wired to allow self-healing/single-fault tolerance.
- Auto alarm control inputs – example Fire and Gas, are star wired no shared lines.

Summary

Hot standby N+1

Certain elements of the system are further duplicated to improve availability. Namely the loudspeaker amplifiers which are assigned hot standby backup to take the place of possible on-line amplifier trouble.

Duplication A+B

To improve security the complete system is duplicated A + B, with hardware arranged such that there can be *no common mode failure* and that coverage is maintained with a major fault resident in either the A or B sub-system. There is no common mode failure possibility, each subsystem operating independently of the other. A single optical cable connection interconnects the two racks for alarm synchronisation purposes, failure of this link cannot impact on the operation of the alarm tone generation systems in each rack.

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