

FOR TUNNELS

Introduction

Tunnels must provide those travelling through with clear and audible communication in case of an emergency. The Jacques/Harman tunnel communication solution offers an environmental-specific public address and help point unit system that provides safety through communication.

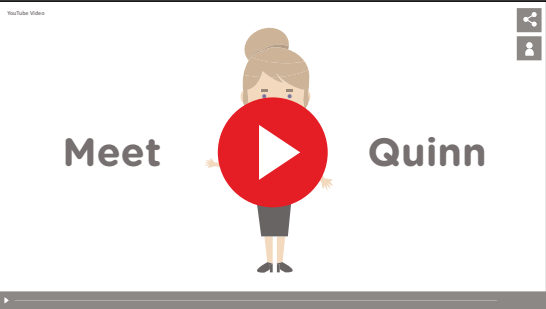
International research has proven that clear and intelligible messages to humans in tunnels will reduce the time to evacuate significantly. Improving the self-reliance of people during a safety incident requires evacuation messages to reach people even in their cars. The public address (PA) system must be able to provide safe and clear communication between the central tunnel control room and persons in the tunnel in case of emergency situations with both running and stationary traffic.

Due to the acoustic circumstances in tunnels such as, high levels of ambient noise caused by traffic, turbo fans, and long reverberation times means that providing an intelligible public address is challenging. The Jacques/Harman tunnel solution, featuring purpose-built, Axys speakers provide quality audio within tunnel environments, plus dedicated Jacques and Harman software and hardware components, and the extensive knowledge of our experienced audio engineers together; produce a high-quality PA and help point unit solution.

Seamless integration to CCTV, access control and SCADA systems ensure those operating the tunnel have complete subsystem control to allow for scenario based evacuations.

Our solution uses patented loudspeaker technology which is well proven and trusted for safety communication in tunnels worldwide.

Tunnels- Meet Quinn video



vimeo.com/748651870

The relationship. The expertise. The experience.



Key Jacques system features

Flexible

As communication needs change, system configuration can change to ensure needs are continually met. Flexibility in system design allows for the unique audio and broadcast requirements for any tunnel to be achieved

Scalable

With unlimited scalability to add intercom, help point or public address endpoints, our system can grow and adapt as required. Jacques products support Power over Ethernet (PoE) allowing for simple plug & play installation

Reliable

Designed and manufactured in Australia, our products are built to last. With over 30 years' experience, our systems receive ongoing and extensive R&D and testing ensuring robustness in challenging environments

Compatible

Compatible with ourselves and others. Backwards compatibility within our system ensures our multi-generational systems operate in harsh environments for decades



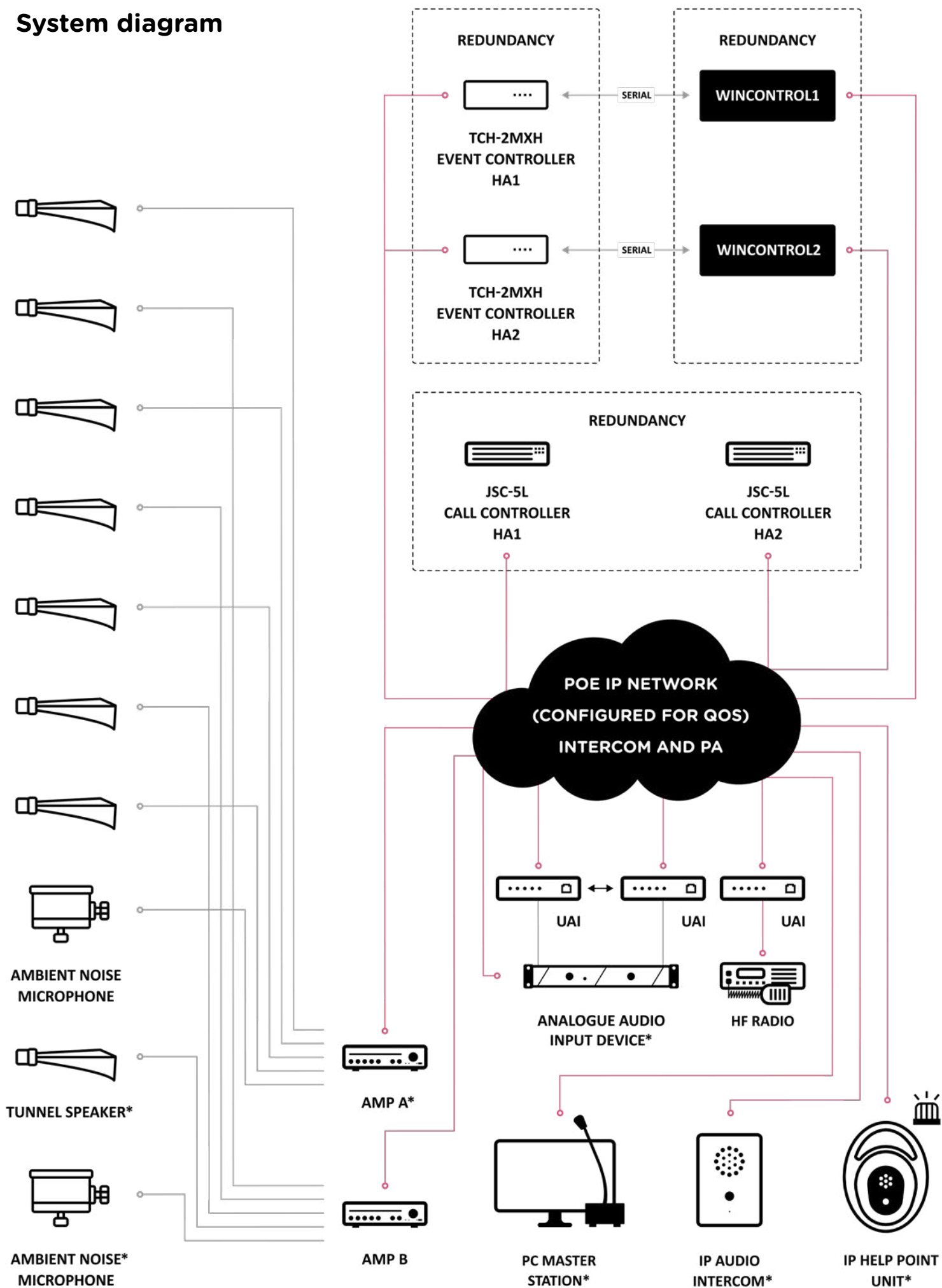
Tunnel PA systems designed to deliver audible announcements to motorists, operation & maintenance persons within tunnels and tunnel associated areas

**JACQUES & HARMAN AXYS
FOR TUNNELS**

 **JACQUES**

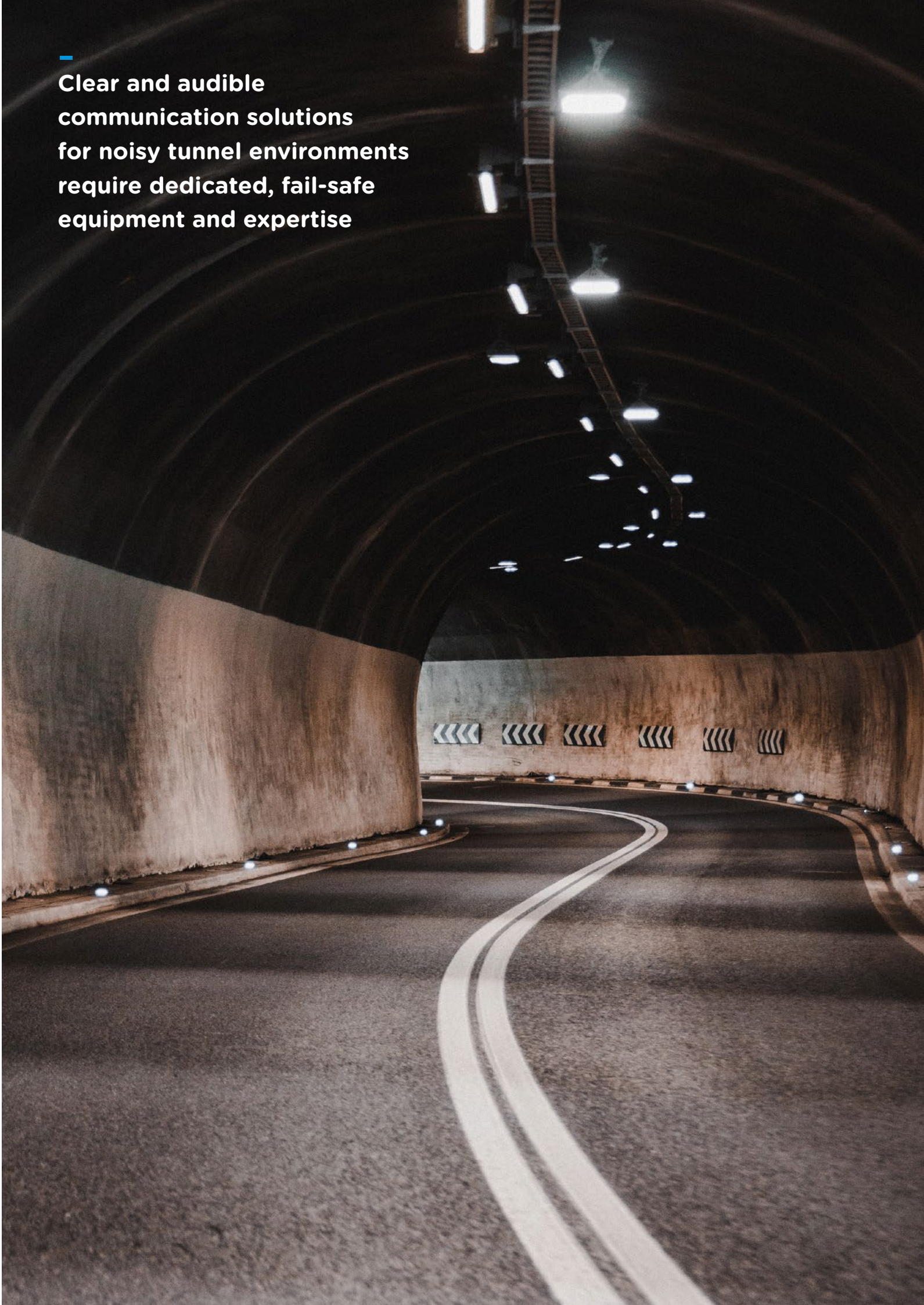


System diagram



*Quantity as required. Virtually unlimited. Dependent on server configuration and network bandwidth

Clear and audible communication solutions for noisy tunnel environments require dedicated, fail-safe equipment and expertise





System design

Our project solution provides clear and audible communication and allows for events, faults, and alarms to be monitored and conditionally controlled, to ensure a safe tunnel environment. The solution offers the following:

Integration of the communication system to third-party security and safety systems allow for the analysis and reaction to system events

- CCTV
- Access control
- Building management
- Fire protection systems
- Supervisory management systems (SCADA)
- HF broadcast systems & mobile radio

Comprehensive and flexible equipment fault and alarm tracking

System redundancy at multiple levels to ensure uptime and communication reliability

- Server
- WinControl
- Amplifiers
- Field devices (UAI)

Dedicated Jacques PC master stations with configurable and flexible user interface allowing for the control and administration of tunnel communications and monitoring of faults and alarms

- Zone calling
- System monitoring
- Live and pre-recorded public address announcements
- System alarm notification
- Device monitoring
- Map or list view of endpoints
- Dynamic selection of endpoints
- Answer help point unit and intercom
- Integration of CCTV camera views to allow for complete audio/visual view

Scheduled public address announcements and tones via dedicated announcement scheduling software (JAS)

Audio and/or announcements can be manually triggered, time scheduled, or event triggered

Call priority

- 256 levels of call priority ensuring urgent messages take precedence

Comprehensive reporting and diagnostics software module (IRS)

Help Point Unit & intercom stations within the tunnel environment

- Hands-free, one button calling
- Quality audio, even in noisy environments
- Robust and vandal resistant design and construction
- Relay module onboard which can be used to trigger external equipment such as a warning strobe
- Can be associated with nearby CCTV, to allow for CCTV switching on call event

Quality PA components to achieve exceptional audio reproduction

- Loudspeakers: ABF260 tunnel speakers
 - Clear, intelligible broadcast at appropriate sound pressure levels
 - Resistance to ingress of water/dirt including from any deluge system installed for fire suppression
 - Equalisation with digital signal processing with time delay
 - Digital audio switching facility with speaker line supervisory and control system
 - Automated level control
- PB800 amplifier: fully designed to drive the ABF260 at maximum power without damage and provide on-board DSP allowing gain, EQ, delay and other parameters to be controlled from a central control location
- Octadrive interface to connect audio sources (optional)
- Wincontrol server to continually pass status, alarms and fault information to Jacques relating to each amplifier
- Specialised configuration for speakers; inputs, outputs, delays, presets, and sections.
- Noise sensing microphones; used to sense the background noise and adjust audio level accordingly

Tunnel products



PC MASTER STATION



IP HELP POINT UNIT



IP AUDIO INTERCOM



TUNNEL HORN



ANALOGUE AUDIO INPUT DEVICE



NETWORKED AMPLIFIERS

Project recommendations

We recommend the following when designing a communication-critical tunnel system. Our team of specialists in this field are always on hand to assist with the details, as every tunnel is different.

The PA solution shall be designed so that average sound levels will not be louder than 105 dB at a hearing height of 1.5 meters above pavement level, to prevent hearing damage, while equally covering every single inch of tunnel space

The PA system shall be created to reach a measurable intelligibility performance on average of above 0.45 Speech Transmission Index (STI), including compensation for all background noise, such as turbo fans and traffic noise

When measuring system performance, we recommend objective standards and performance criteria IEC 60268-16:2011 be used as a guideline to measure the intelligibility performance of the tunnel PA solution

Automatic volume control is provided as a basic standard which intelligently adapts the volume at the loudspeakers to suit the ambient noise level in the tunnel under all circumstances

Acoustic behaviours within tunnel environments vary greatly from tunnel to tunnel. Therefore, we require detailed information on the tunnel design, specification, ambient noise levels and used materials for ceilings, walls and pavement is required to establish a realistic and optimised solution

Note: When talking about clear communication, it is essential to set a measurable PA system performance, based on the acknowledged scientific method. Just reproducing a loud signal (measured in Decibels, dB) is not enough to guarantee that persons inside a tunnel can understand a broadcasted speech message. For that purpose, we refer to intelligibility, which is expressed in an objectively measured performance with an index called Speech Transmission Index (STI).

Project references

Jacques and Harman both have extensive experience in the transport and tunnel markets. The integration between us, provides a complete public address solution for the worldwide tunnel market.

Abu Dhabi International Airport, AE	Gympie Road Busway Tunnel, AU*	Markusbjerg Tunnel, NL
Airport Link Tunnel, AU	Hatfield Tunnel, UK	Micheville Tunnel, LU
Ameti Tunnel, NZ	Heathrow Tunnels, UK	Niklasdorf Tunnel, AT
Bad Godesberg Tunnel, DE	Heidkopf Tunnel, DE	Noord Tunnel, NL
Baldock Tunnel, UK	Heinenoord Tunnel, NL	NorthConnex Tunnel, AU
Bell Common Tunnel, UK	Hindhead Tunnel, UK	O-Bahn Tunnel, AU
Benelux Tunnel, NL	Holmesdale Tunnel M25, UK	Olandixo Tunnel, ES
Berg Bock Tunnel, DE	Hörnchenberg Tunnel, DE	Pellinger Berg Tunnel, NL
Blackwall Tunnel North & South, UK	Hösbach Tunnel, DE	Ramsgate Road Tunnels, UK
Bongpyeong Tunnel, KR	Howald Tunnel, LU	Rotherhithe Tunnel, UK
Bosrucktunnel, AT	IJtunnel, NL	Saltash Tunnel, UK
Botlek Tunnel, NL	Innfjord Tunnel, NO	Saltash Tunnel, UK
Caldecott Tunnel, USA	Kedron Brisbane Busway Tunnel, AU*	Schwetzingen Tunnel, DE
Drecht Tunnel, NL	Kilt Tunnel, NL	Sijtwende Tunnel, NL
Dublin Port Tunnel, IE	Kö-Bogen-Tunnel, DE	Sluiskil Tunnel, NL
Dublin Port Tunnel, IE	Kobotoke Tunnel, JP	St HelenaTunnel (T2E), AU
Dunnae Tunnel, KR	Kohlberg Tunnel, DE	Stauffer Tunnel, DE
Elb Tunnel, DE	Koning Willem-Alexander Tunnel, BE	Terrace Tunnel, NZ
Eurasia Tunnel, TU	Krohnstieg Tunnel, DE	Tsuburano Tunnel, JP
Frans Tijsmans Tunnel, BE	Leidsche Rijn Tunnel, NL	Tunel pod Martwą Wisłą, PL
Gaasperdammerweg Tunnel, NL	Lutwyche Brisbane Busway Tunnel, AU*	Vierarmen Tunnel, BE
Gmünder Einhorn-Tunnel, DE	Maas Tunnel, NL	Weser Tunnel, DE
Götschka Tunnel, AT	Makkah Tunnel, SB	West Connex Tunnel, AU*
Grouft Tunnel, LU	Malmasin Tunnelak, ES	Wimpasing Tunnel, DE

*Denotes Jacques tunnel installation, others are Harman tunnel installations.

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