OCTADRIVE DSP-DN

Installation and User Manual

Applies to Part Numbers:

TUN-391035

Octadrive DSP-DN (Dante™)

Delivering Clear and Intelligible Messages

AXYS®
TUNNEL
by HARMAN

REFERENCE TO EC STATEMENT OF CONFORMITY

This document confirms that products manufactured by Harman Professional Kft. bearing the CE label meet all the requirements in the EMC directive 2014/30/EU and LV directive 2014/35/EU laid down by the Member States Council for adjustment of legal requirements. Harman Professional Kft. products bearing the CE label comply with the following harmonised or national standards:

EMC:
EN 55032:201/AC:2013
EN 55103-2:2009
EN 50130-4:2011

Safety:
IEC 60065: 2014 (Edition 8) and European Group Differences according to EN 60065:2002+A1:2006 +A11:2008+A2:2010+A12:2011

Mains Harmonics:
EN 61000-3-2:2014

Insulation:
Class1

Harman Professional Kft.
Szilva u. 1-3.
H-7632 Pécs
Hungary

USER'S NOTICE AND DISCLAIMER

No part of this manual may be reproduced, transmitted, transcribed, stored in a database system or translated without the express written permission of Harman Professional. Documentation kept by the end user for back-up purposes is excluded from the above.

All products and corporate names mentioned in this manual may be registered trademarks or copyrights of their respective companies. They are used here for indicative purposes only.

The information contained in this manual has been carefully checked for accuracy; however no guarantee is given with respect to its correctness. Harman Professional accepts no responsibility or liability for any errors or inaccuracies that may appear in this manual or the products described in it.

Specifications and information contained in this manual are subject to change at any time without notice.

FCC STATEMENT

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

TABLE OF CONTENTS

IMPORTANT SAFETY INSTRUCTIONS

This symbol is intended to alert you to the presence of uninsulated dangerous voltages within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock.

This symbol is used throughout this manual and is intended to alert you to the presence of important instructions.

1. Read these instructions.

2. Keep these instructions.

3. Heed all warnings.

4. Follow all instructions.

5. Do not use this apparatus near water.

6. Clean only with dry cloth.

7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.

8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.

9. Do not defeat the safety purpose of the polarised or grounding-type plug. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.

10. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.

11. Only use attachments/accessories specified by the manufacturer.

12. Unplug this apparatus during lightning storms or when unused for long periods of time.

13. Refer servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

Warning - To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture and objects filled with liquids, such as vases, should not be placed on this apparatus.

Warning - To disconnect this apparatus from the mains power supply, turn off the power at the power switch on the rear panel and remove the PowerCon® connector from the mains input socket labelled Mains on the rear panel.

Warning - The PowerCon® connector should never be plugged or unplugged when there is power on the connector, regardless of whether the device is switched on or not. ALWAYS ensure that the mains supply is turned off at source before inserting or removing the PowerCon®.

Warning - This apparatus is a Class I device and must be connected to a mains socket outlet that provides a safety ground connection.

INTRODUCTION

Thank you for purchasing this AXYS® Octadrive DSP-DN unit.

In order to get the best out of your Octadrive DSP-DN, please take the time to read through this manual before you install and use it for the first time.

OVERVIEW

The AXYS® Octadrive DSP-DN is essentially a special purpose eight channel audio distribution device. It is primarily intended for use in a life-safety audio system in conjunction with other AXYS® audio products, where AXYS® WinControl software is used to provide configuration, control, and monitoring of the system components. The Octadrive DSP-DN has been specifically designed as a line driver, to allow high-quality analogue audio to be sent over long cable runs. As well as analogue audio inputs and outputs, it has a Dante™ interface, permitting it to be used with high-quality digital audio distributed via a dedicated network using conventional Ethernet hardware. The core of the unit is its DSP (Digital Signal Processing) block, which allows comprehensive adjustment to the audio signals being fed to each output. The unit also incorporates a number of failsafe features, making it very reliable and suitable for use in critical situations.

The Octadrive DSP-DN is configured, controlled and monitored using AXYS® WinControl software, via the Dante™ Ethernet interfaces.

FEATURES

- Eight independent, low impedance transformer balanced analogue outputs
- +19 dBV drive capability
- Two transformer-balanced analogue inputs (0 dBV)
- Ambient Noise Sensing (ANS) / Paging mic input
- Headphone monitoring of all analogue inputs and outputs

- Integral dual-redundant Dante™ audio networking card
- Sixteen digital audio inputs
- Eighteen digital audio outputs
- Input to output audio matrix router
- On-board DSP, providing control of level, EQ, delay, etc. on all inputs and outputs
- Non-volatile storage of all parameters
- Pilot tone detection
- Internal pilot tone generator, routed to analogue and digital outputs (independently configurable)
- Full configuration, control and monitoring using AXYS® WinControl software via the AxysBridge protocol by using the Integral dual-redundant Dante™ Ethernet interfaces
- Ambient temperature sensor input
- Mic capsule monitoring
- Dual-contact surveillance/failure relay, suitable for volt-free or impedance-sensing monitoring
- External DC control voltage input
- Fail-safe DSP hardware bypass function
- Universal power supply (100-240 VAC)
- DC Back-up supply (12-48 VDC)

WHAT'S IN THE PACKAGING

In addition to the Octadrive DSP-DN itself, each unit is shipped with the following items:

- Installation and User Manual (this document)
- AC power cable (2 m), fitted with a Neutrik® PowerCon® connector and a Schuko (European-style) mains plug
- AC power cable (2 m), fitted with a Neutrik® PowerCon® connector and a Type B (USA style) mains plug
- Set of mating screw terminal connectors

GENERAL DESCRIPTION

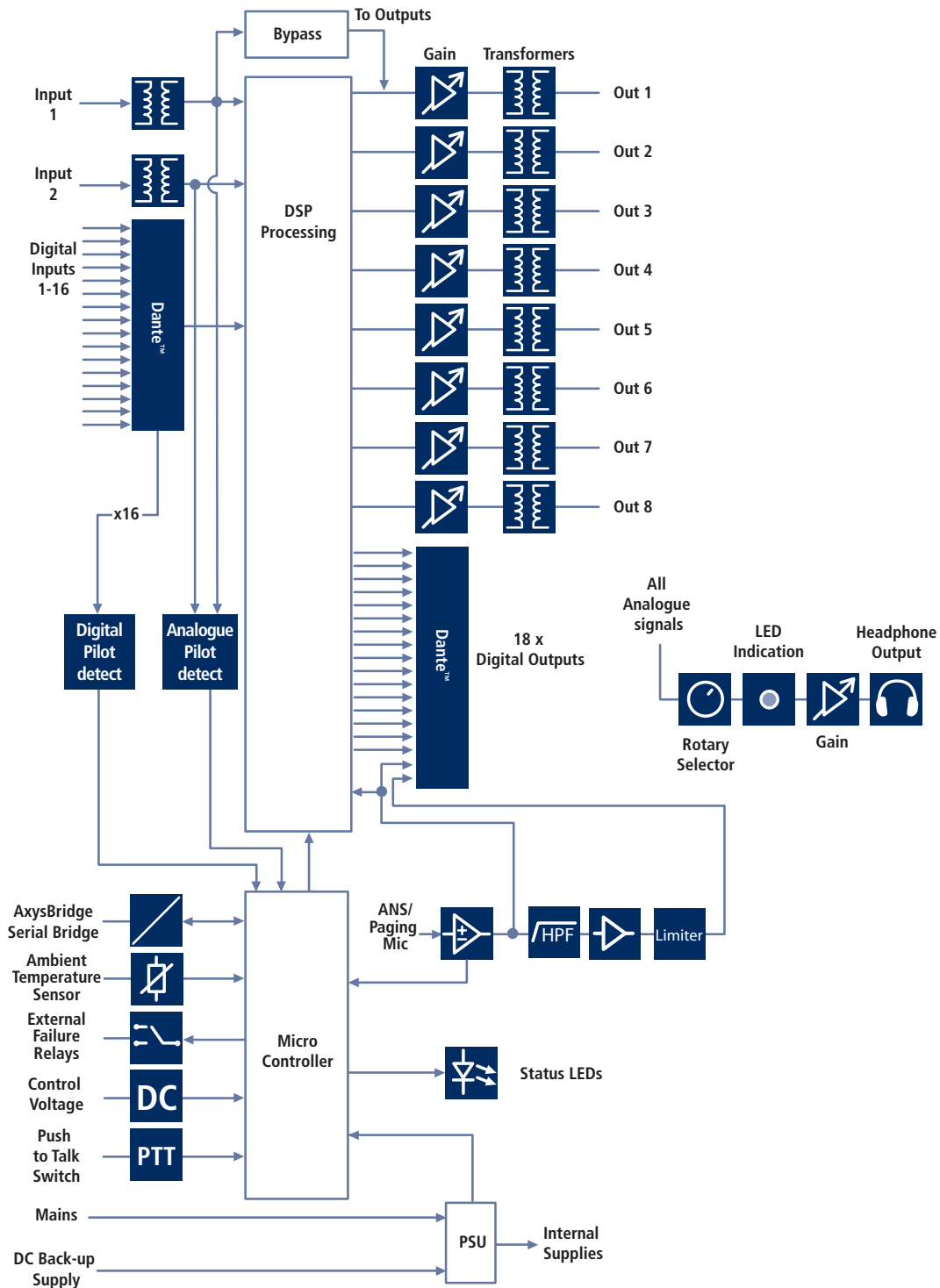## BLOCK DIAGRAM AND SYSTEM DESCRIPTION

fig.1: Block Diagram

The simplified block diagram above shows the unit's internal signal routing.

The unit has two analogue inputs, making it suitable for connection to primary and secondary audio sources in life-safety applications. The inputs are transformer-balanced and offer low noise and very high CMRR (Common-Mode Rejection Ratio).

The audio transformers fitted to the analogue inputs are of professional grade and provide full galvanic isolation from source and destination equipment, eliminating the potential for ground loops to occur between items of equipment which may be running on different AC supplies.

The analogue input and A-D converter stages accept a peak signal level of +21 dBV without clipping. (At high input levels, the digital gain within the DSP block will normally need to be reduced to avoid continuous activation of the limiter section.)

Both inputs can be routed to all eight analogue outputs via the DSP core.

Both analogue inputs feed a pilot tone detector so that continuous monitoring of the input connections may be made. The detector will, when enabled, switch from Input 1 to Input 2 if pilot tone is lost. The Octadrive DSP-DN incorporates surveillance functions which activate an externally-accessible failure relay in the event of a PSU or other malfunction, or a loss of pilot tone.

A further sixteen digital inputs are also available. These are routed to the DSP core along with the analogue inputs, and are also continuously monitored for pilot-tone, with the same auto-switching arrangement as the analogue inputs. All active inputs (as enabled via WinControl) are routed to all output channels.

Pilot tone generation is available on both the analogue and digital audio outputs. The frequency and level settings are independently software configurable for both of these separate output types.

The microphone input can be used for either Ambient Noise Sensing (ANS) or Paging applications. The monitoring scheme is capable of detecting open circuit or short circuit failures for either electret or dynamic microphone types. For paging purposes the microphone signal processing includes a low-cut filter, gain control and limiter. A monitored Push To Talk (PTT) switch input is also available.

The Dante™ interface is bi-directional, the analogue inputs, some of the processed inputs as well as the analogue outputs can be transmitted to the Dante™ network. The input from an optional ANS or Paging microphone is available as an 'unprocessed' and a 'processed' output channel on the Dante™ interface.

The Dante™ card also allows the Octadrive DSP-DN to be controlled by WinControl via the AxysBridge protocol by using the Dante™ Ethernet interfaces. These interfaces can either connect to primary and secondary 1 Gb/s Dante™ networks, or provide daisy-chaining in non-redundant operation mode.

The headphone amplifier can be used for local monitoring of all analogue inputs and outputs.

The mains power supply is conservatively-rated and operates on any AC supply voltage from 100 V to 240 V.

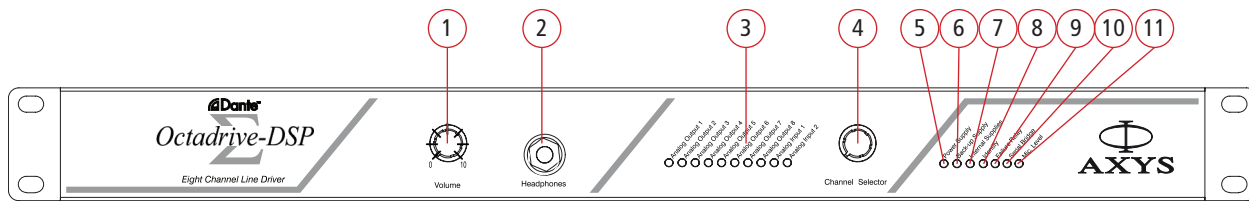The back-up supply operates on a DC supply voltage from 12 V to 48 V.
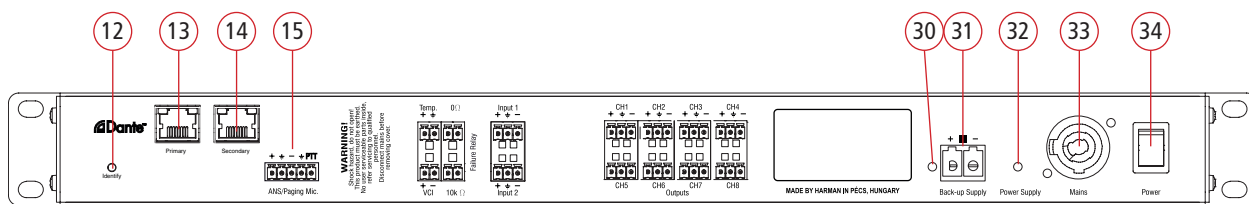
FRONT PANEL

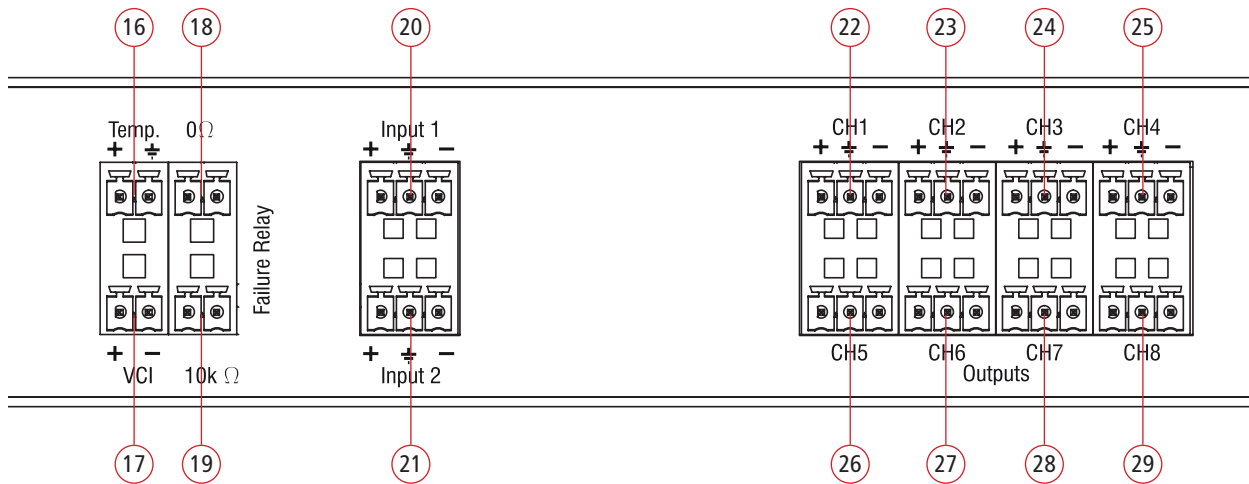fig.2: Front Panel

REAR PANEL

fig.3: Rear Panel

fig.4: Detailed view of Input / Output panel

1. Headphone volume control	9. Failure relay LED	18. Failure relay contacts 1	26. Output 5
2. Headphone socket	10. Serial Bridge activity LED	19. Failure relay contacts 2	27. Output 6
3. Source selection LEDs	11. Mic Level LED	20. Input 1	28. Output 7
4. Headphone source selector encoder wheel	12. Identify LED (rear)	21. Input 2	29. Output 8
5. Power Supply LED	13. Dante™ Primary	22. Output 1	30. Back-up Supply LED (rear)
6. Back-up Supply LED	14. Dante™ Secondary	23. Output 2	31. Back-up Supply connector
7. Internal Supplies LED	15. ANS/Paging Mic	24. Output 3	32. Power Supply LED (rear)
8. Identify LED	16. Ambient temperature sensor	25. Output 4	33. Mains power connector
	17. Control voltage input		34. Power switch

INSTALLATION AND OPERATION

MECHANICAL INSTALLATION

The Octadrive DSP-DN is designed to be mounted in a standard 19″ equipment rack. The front panel is fitted with rackmount ears for this purpose. The Octadrive DSP-DN occupies 1U of vertical rack space.

Ventilation

The Octadrive DSP-DN is cooled by natural convection.

The unit should remain within its operational temperature range under most circumstances, but if it is to be installed in a location of high ambient temperature, and/or in a rack containing a significant quantity of heat-generating equipment (see below), consideration should be given to climate-controlling the room in which the equipment rack is situated.

Installation of the Octadrive DSP-DN in a 19″ rack immediately above or below another item of equipment generating a significant amount of heat (e.g., a power amplifier) is not recommended. Plain or slotted 1U blank panels should be used as spacers.

CONNECTOR AND WIRING DETAILS

AC Mains

AC power is via a rear panel Neutrik® PowerCon® Type 20 mains connector [33]*. A mating mains cable (power cord) fitted with a European-style plug is supplied with the unit. If the standard AC outlets in the territory are of a different type, the correct type of mains plug should be substituted, carefully observing the following cable colour codes:

CONNECT	COLOUR (EUROPE)	COLOUR (US)
Live	Brown	Black
Neutral	Blue	White
Earth (Ground)	Green/Yellow	Green

*Numbers in square brackets refer to the figs. 2,3 & 4 on page 8.

The Octadrive DSP-DN incorporates a "universal" PSU, and will operate on all AC mains voltages from 100 V to 240 V (50 or 60 Hz). The device has an internal mains fuse which is not user serviceable.

The PowerCon® connector should NEVER be plugged in or unplugged while AC mains is present. This applies whether or not the device is switched on. ALWAYS isolate the AC mains supply at its source before plugging or unplugging the connector.

Warning - This apparatus is a Class I device and must be connected to a mains socket outlet that provides a safety ground connection.

Warning - Presence of mains voltage is not indicated by the LEDs labeled 'Power supply' on the front and rear panel. These LEDs are related to the status of the internal mains-operated power supply and cannot be used as mains voltage indicators.

If the mains switch of the Octadrive DSP-DN is not readily accessible after installation to disconnect the unit when necessary, the mains connection to the Octadrive DSP-DN should incorporate a manual circuit breaker or an accessible mains plug.
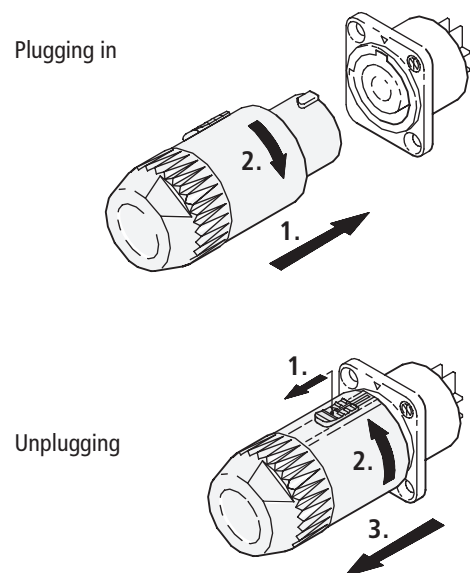
Plugging in

Unplugging

fig.5: PowerCon Connector

Back-up Supply

The back-up supply is on a 2-pin 7.62 mm pitch screw-terminal connector [31]. A mating connector is supplied with the unit. The input voltage range is 12 to 48 VDC. LEDs [6] and [30] indicate the status, refer to section Status LEDs on page 17.

⚠ The back-up supply is a floating design, the - input is not connected directly to chassis ground. The absolute voltage on - as well as + input must be kept within 65 V from chassis ground voltage. The PPTC resettable internal fuse is not user serviceable.

Analogue Audio Connections

All analogue audio connections are on 3-pin 3.81 mm-pitch screw-terminal connectors. Mating connectors are supplied with the unit. All audio connections (both inputs and outputs) should be wired according to the diagram below:
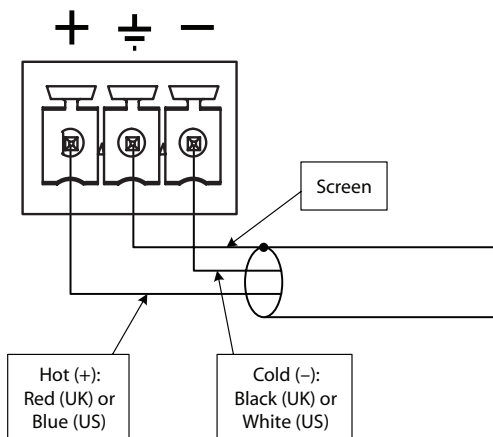

fig.6: Analogue Audio Connectors

To minimise hum and noise pickup, balanced interconnections between audio sources and the Octadrive DSP-DN should always be used wherever possible. If driving from an unbalanced source, use the same wiring as shown above at the Octadrive DSP-DN end, but connect the 'hot' core to the signal output and the 'cold' core to the ground terminal of that output; the cable's own screen should be connected at the Octadrive DSP-DN end only.

⚠ Unbalanced connection to the Octadrive DSP-DN's outputs defeats the unit's primary purpose and should never be used.

Analogue Inputs

The two transformer-balanced **Analogue inputs** are on the connectors [20] and [21]. As with other AXYS® products (e.g., Intellivox loudspeakers and Industry Amps), the normal routing of the input signals may be altered by enabling auto-input switching from WinControl.

In normal operation, both inputs route internally to all eight outputs. If auto-input switching is enabled, only Input 1 is used. If auto-input switching is then triggered - either by pilot-tone failure or low signal level - Input 2 is used instead. Note that input channel priorities are assignable in WinControl, and Input 2 may be used as the "normal" input instead if wished. See "Auto-input switching" on page 15 for more information on use of auto-input switching, and also the WinControl Help files.

The inputs can accept levels up to +21 dBV peak.

Analogue Outputs

The transformer-balanced, low impedance **Analogue outputs** are on connectors [22] to [29]. The output stages are capable of driving long cable runs with minimal signal degradation. However, it should be noted that with very long runs (e.g., >500 m), the cable properties become significant and high frequencies may be attenuated. This may be an issue if the system uses an HF pilot-tone for fault reporting, and the cable used should be a type with low series resistance and capacitance.

The outputs may be globally set to "high-gain" or "low-gain" mode from the unit's `Volume` tab in WinControl. `Analog output gain` has options of 0 dB (low-gain, the default value) or 14 dB (high-gain). The "high-gain" setting should be selected if the Octadrive DSP-DN is being used to drive very long lines where signal loss and potential interference is anticipated.

ANS/Paging Microphone

The microphone input supports either electret or dynamic mic types and features software configurable open circuit and short circuit detection thresholds. The DC impedance of dynamic microphone types should be between 300 and 10k Ω to ensure proper capsule monitoring operation.

Connection is via a 5-pin 3.81 mm-pitch screw-terminal connector [15]. A mating connector is supplied with the unit (an ANS microphone only requires a 3-pin connection).

ANS features:

The Octadrive DSP-DN's processor card includes an Autogain algorithm which adjusts the gain through the unit in response to ambient noise levels. To accomplish this, an external Ambient Noise Sensing (ANS) microphone must be connected to the ANS mic input. Signal processing as for paging purposes (low-cut filter etc.) does not affect local Autogain operation.

An 'unprocessed' microphone signal is available as an output and is transmitted on channel 17 of the Dante™ interface.

Paging features:

A 'processed' microphone signal is available as an output and is transmitted on channel 18 of the Dante™ interface. This signal has a low-cut filter, gain control and a limiter. The gain of the signal is software configurable in 10 dB steps (30, 40, 50 or 60 dB). The gain should be adjusted so that the Mic level LED [11] lights green during normal operation, occasional red (limiter active) allowed.

Connect PTT to GND to activate the 'processed' microphone Dante™ transmit channel. For monitored PTT operation, the DC impedance between PTT and GND should be 10k Ω (activated) respectively 20k Ω (deactivated). PTT control by network command is also supported, this operates when PTT is unconnected.
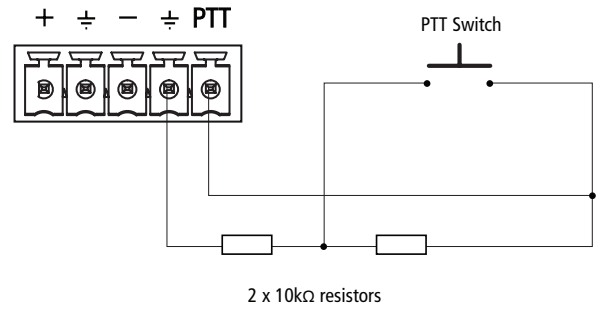

fig.7: PTT Switch Monitoring Circuit.

The PTT switch operation can either be monitored or un-monitored. When monitored, a failure will result in activation of the 'processed' microphone output.

If microphone monitoring is enabled, a failure will result in muting of the 'processed' microphone output channel.

Both the 'unprocessed' and 'processed' microphone outputs do not directly support the addition of a pilot tone for receiver monitoring purposes. A pilot tone can be added by using a local Dante™ loopback for both these microphone outputs.

Failure Relay

The Octadrive DSP-DN includes a two-pole changeover relay whose contacts are accessible on two 2-pole 3.81 mm-pitch screw-terminal connectors. The conditions under which the relay operates are defined as part of the unit configuration in WinControl.

One pole of the relay provides volt-free contacts (Contacts 1, [18]), the other (Contacts 2, [19]) has internal resistors to allow the Octadrive DSP-DN to be connected directly to impedance-sensing line monitoring equipment such as the AXYS® Cerberus.

On Connector [18], the pins of Contacts 1 are short-circuit in normal operation, and become open-circuit when a failure condition arises.
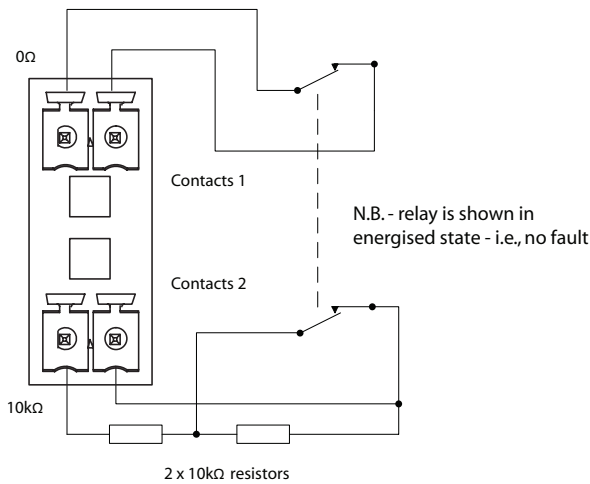
fig.8: Failure relay

On Connector [19], the pins of Contacts 2 present an impedance of 10k Ω in normal operation. When a fault condition occurs, it rises to 20k Ω.

An AXYS® Cerberus or other impedance-sensing fault monitoring equipment may be connected to Contacts 2. The contact wiring arrangement is shown in the diagram.

The relay contacts have maximum current and voltage ratings of 100 mA and 24 V respectively.

Dante™ and Control Interface

Connections to the Dante™ card are made via RJ-45 connectors. Either the Port labeled 'Primary' or labeled 'Secondary' may be used; if a dual redundant network is employed in the installation, then use both ports, connecting each to independent Ethernet switches. Separate networks are required for Dante™, not only separate switches (see Dante™ recommendations). Primary and secondary interface cannot be connected to the same network.

⚠️ A connection to 1 Gb/s network is strongly recommended.

Standard pre-made CAT-5e or higher (CAT-6 etc) network cables (see note hereafter) may be used to connect devices to the local Ethernet switch(es). However, in many installations, the network connection from within a rack to an Ethernet switch will be via structural cabling.

In this case, wire mating RJ-45 plugs (not supplied) as shown below

fig.9: Dante™ Connectors

This is the T-568B standard (preferred), T-568A standard is also used and uses different colour mapping

PIN	CAT-5e CORE
1	White + Orange
2	Orange
3	White + Green
4	Blue
5	White + Blue
6	Green
7	White + Brown
8	Brown

The maximum cable run for reliable operation using CAT-5e cable is of the order of 100 m. If longer distances are involved, the use of multimode fibre-optic cable is recommended. This is generally satisfactory up to 2 km, but repeaters (or the use of single-mode fibre) can be used to increase the distance further. A third-party Ethernet-to-fibre interface will be required in these situations.

The Dante™ interfaces add digital audio I/O and a control method to the Octadrive DSP-DN. They provide sixteen additional audio inputs and seventeen audio outputs, at a sampling rate of 48 kHz and bit depths of 16, 24 or 32 bit.

⚠️ Unscreened CAT-5e UTP cable can be used, but the device may fail to preserve its high level of surge immunity and as a consequence, will no longer be compliant with the standards set out in the EC Statement of Conformity.

CAT-5e twisted pair cable with an overall foil shield (referred to as FTP or F/UTP) is required for compliancy.

Ambient Temperature Sensor

The Octadrive DSP-DN is equipped with a loudspeaker frost protection system which activates the internally-generated pilot tone (analogue outputs only) if the ambient temperature drops below a pre-determined threshold. This is passed to the system's power amplifiers and produces current in the loudspeaker voice coils, warming the drivers slightly. The function may be enabled via WinControl.

This feature is also provided in certain other products. If the Octadrive DSP-DN is being used with third-party amplifiers we recommend that frost protection is enabled if the loudspeakers are in a location where low ambient temperatures are possible..

Frequency and level of the pilot tone generator are software configurable. Note that the actual pilot tone level will be affected by the 'high/low output gain mode' setting.

If this function is required, an external ambient temperature sensor should be wired to the 2-pin 3.81 mm-pitch screw-terminal 'Temp' connector [16] using screened two-core cable. Connect the '+' terminal of the sensor to the '+' pin of the Temp connector, and both the '-' terminal of the sensor and the screen of the cable to the pin of the Temp connector marked with an earth (ground) symbol ⏚ .

External Control Voltage Input

The Octadrive DSP-DN is fitted with an external control port [17] (marked 'VCI' on the rear panel), which can be used to load an internal "emergency" configuration in the form of a preset from memory in the event of, e.g., network failure.

The unit's internal memory has provision for an "emergency" configuration preset to be stored, and automatically recalled and loaded under certain programmable conditions. This preset is defined and configured in WinControl. This is a useful facility where the audio system is to be used for emergency evacuation messages. (See "Presets" on page 17 and the WinControl Help files for more information on Presets.) The emergency preset may also be recalled by an external DC voltage at the VCI input. This input is isolated by an opto-coupler. The emergency preset will be loaded either on a logic high (5 - 24 VDC) or a logic low (0 - 2 VDC) at the input (programmable in WinControl).

The connector is a 2-pole 3.81 mm-pitch screw-terminal type. Be careful to observe the '+' and '-' symbols on this connector when wiring to external equipment.
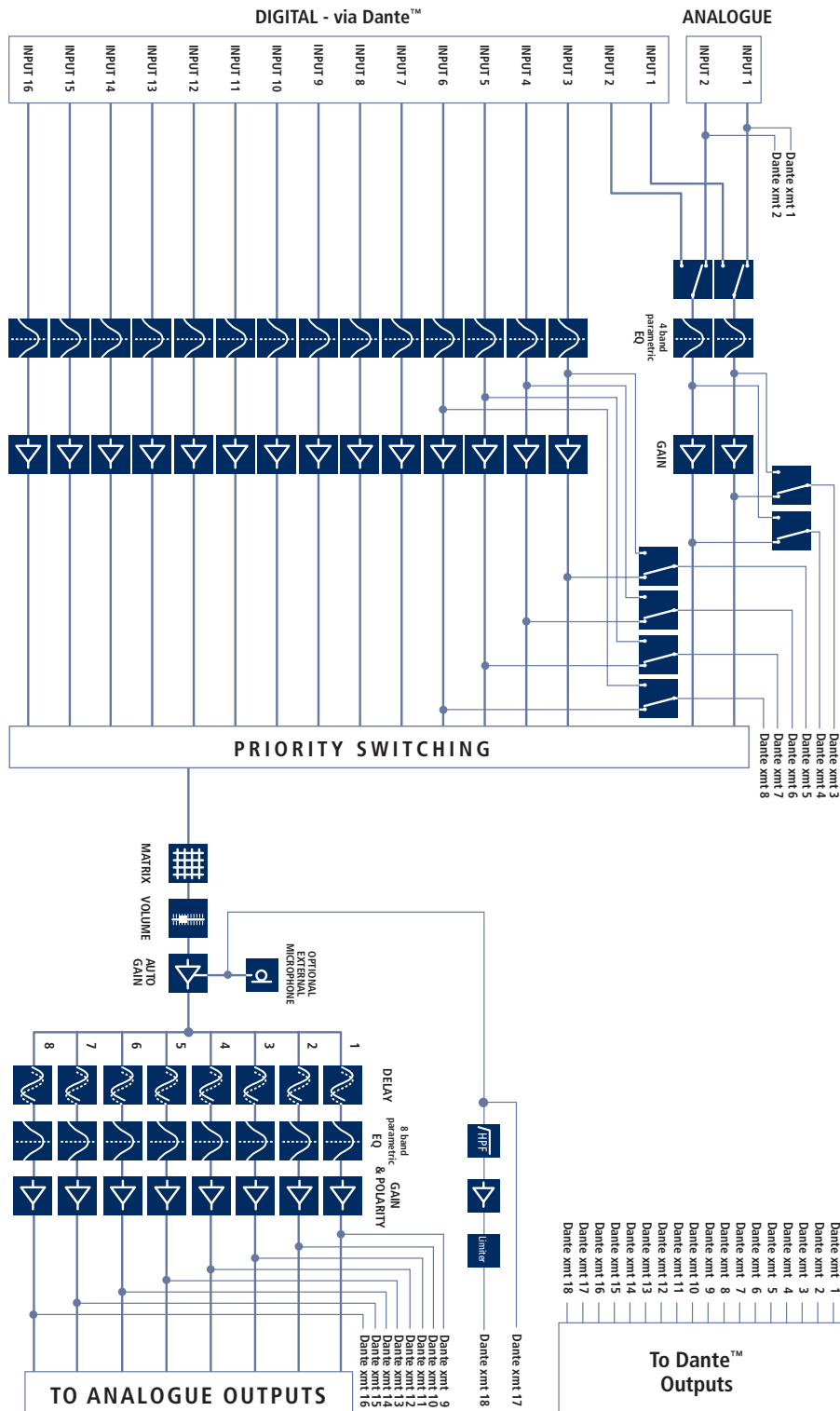
DSP SECTION OVERVIEW

fig.10: DSP block diagram

All DSP functions are adjusted using the WinControl software application. Detailed information on the use of WinControl is beyond the scope of this manual, and users should consult the WinControl Help files.

Level Controls

The gain of each analogue input and each digital input may be adjusted independently over the range -70 dB to +20 dB. For the analogue line inputs the nominal input level with 0 dB gain is 0 dBV, and the maximum input level is +21 dBV (peak).

The source of DSP audio input 1 and 2 (either analogue or Dante™) is software configurable.

The level of each output channel can also be set independently, with a range of 80 dB.

Note that after the inputs have been summed, there is also a master level control (in the Volume tab of WinControl), which provides a single-point adjustment of the levels at all outputs, and a separate Analog output gain setting, which selects "low-gain" (0 dB) or "high-gain" (+14 dB) modes.

Polarity (phase) inversion is also available for each input and output.

EQ Adjustment

The DSP section provides very comprehensive signal equalisation for both inputs and outputs. Each analogue input and each digital input has its own 4-band parametric equaliser. Each output channel has its own 8-band parametric equaliser. These provide up to 25 dB of cut or boost per band (depending on filter type selected) over the range 10 Hz to 24 kHz, with per-band selection of filter type.

Output equalisation can be used to construct crossover filtering to allow the Octadrive DSP-DNs to be used with multi-way loudspeaker systems. Input equalisation permits tailoring of individual input signals for optimum clarity.

Matrix

A matrix is provided so that any of the sixteen inputs can be routed to any of the outputs. Where more than one input is selected to go to the same output then the inputs are summed.

Delay

Delay may be inserted in the output channel of the audio signal chain.

Autogain

The DSP section includes an autogain algorithm which can be set to automatically adjust the overall volume level according to the ambient noise level detected by a microphone connected at the ANS mic input. The algorithm measures the ambient noise in gaps in the programme material being fed via the Octadrive DSP-DN. Once enabled, the amount of additional gain per dB of ambient noise increase can be controlled, as well as the threshold at which gain adaption begins. Note that this feature is not available when the mic input is used for paging.

SURVEILLANCE FUNCTIONS

The Octadrive DSP-DN incorporates various surveillance features to ensure continuous operation in critical applications.

⚠️ The surveillance functions described in this section do not encompass all device features.

Auto-Input Switching

Normal configuration of the IndustryAmp is for up to sixteen inputs to be permanently summed, so that signals on all enabled inputs are always fed through the system (matrix selection dependent). However, if wished, priorities may be assigned to individual inputs so that audio through the system is normally derived from one input only. The inputs are then monitored, either for presence of pilot tone, or for a continuous signal level above a pre-determined threshold. In the event of non-detection of the pilot tone or input signal, the signal source can be switched to that on an alternative input.

This arrangement is primarily intended to provide redundancy; by utilising more than one audio distribution path, a high degree of system of security can be gained.

The Input Mode setting in WinControl (at `Input > Common parameters`) allow selection of auto-switching mode. A brief description of each mode follows; see the WinControl Help files for full details.

Normal

Auto-switching is disabled. All inputs are active, if more than one inputs is selected to go to an output (selected using the matrix) then the inputs are summed.

Level-Controlled Priority Switching

When enabled, the inputs will switch when the signal level at the detection point drops below -60 dBFS (default value), but this threshold may be set to any level between -80 dBFS and -20 dBFS. The detection point is either 'At input' or 'After processing'. In the latter case filtering may be applied, for example to reduce the level of an input pilot tone. When using analogue inputs, the relationship between dBFS and dBV's measured at the device's inputs should be taken into consideration; WinControl's Help files give full details.

It is also possible to set a Hold Time, so that unwanted switching does not occur between natural gaps in the programme.

Pilot Tone-Controlled Priority Switching

It is common practice in critical audio systems to permanently route a low level, high-frequency tone through the system. The presence of this pilot tone can then be detected by various items of equipment to verify the continued operation of the audio paths. Set Input Mode to Pilot tone-controlled priority switching to enable this mode.

The Octadrive DSP-DN's pilot tone detector on the analogue inputs operates in the frequency range of approximately 20 kHz to 28 kHz. The detector is most sensitive in the center of this frequency range, the detection threshold is not software configurable. On the digital (Dante™) inputs the frequency range is 19.2 kHz to 23.5 kHz and the threshold may be set between -10 dBFS and -60 dBFS.

The Octadrive's action on non-detection of a pilot tone can be configured via WinControl. A fault condition can be "flagged", and/or the input can be set auto-switch to that with the next priority.

⚠ A notch filter should be inserted to suppress the pilot tone if its frequency is less than half the internal processor's sample frequency ($F_s/2$, typically

24 kHz). If the pilot tone is not sufficiently suppressed, signal detection (and other functions such as frost protection and Autogain) will not function properly. Further, this may result in excessive dissipation downstream, in the power amplifiers and/or connected loudspeakers, or interference with the internally-generated pilot tone. Pilot tone frequencies above $F_s/2$ are sufficiently suppressed by the anti-aliasing filter of the ADC. Any pilot tone frequency received via the digital inputs is < Fs/2 by default.

Take notice of the following when configuring the parameters for the input pilot tone detection:

⚠ It is advised to use a few seconds of Grace time in order to avoid spurious input pilot tone monitoring errors.

⚠ Use a fixed frequency if the frequency of the externally applied pilot tone is known and fixed.

See WinControl help file for details.

Failure Relay

The two-pole changeover failure relay may be wired to a 'common fault' or other external fault monitoring system so that any fault condition detected by the Octadrive DSP-DN is immediately reported. The conditions which cause activation of the failure relay may be defined in WinControl, and may include any or all of: DSP, microphone, PTT switch, pilot tone detection, mains supply, DC back-up supply, internal supplies, Dante™ board clock faults etc. See the WinControl Help files for full details.

If it is required to interface the Octadrive DSP-DN to impedance-sensing fault-monitoring equipment such as the AXYS® Cerberus, failure relay Contacts 2 should be used. See "fig.8: Failure relay" on page 12 for connection details.

PRESETS

In addition to retaining all current parameters and settings in non-volatile memory so that the device resumes the same operational status after a power failure, the Octadrive DSP-DN also has seven further internal memories (Presets), each of which may contain an alternative unit configuration. These Presets are normally accessed via WinControl, but any third-party control system capable of transmitting the AxysBridge control commands via UDP/IP. (e.g. Crestron, AMX, etc.) may also be used.

One of the Presets may be assigned as an Emergency Preset, and automatically loaded in the event of loss of network communication or change of DC voltage at the VCI input. In the case of Dante™ equipped models in life-safety systems, it is generally advisable to provide an analogue back-up audio feed and configure the device to switch to a Preset including this in the event of a network failure. See the WinControl Help files for full details.

DSP BYPASS

The Octadrive DSP-DN's DSP system is continually monitored for correct operation, and in the event of failure, Analogue Input 1 is connected directly to the inputs of all eight output channels. This failsafe bypass ensures that the primary audio inputs always feed the loudspeaker system, even in the event of a major failure. The conditions for bypass are configurable from WinControl Service version. By default, a 'DSP not running' condition triggers the bypass action.

As with all other internally-monitored device functions, a DSP failure is reported to the WinControl server, as well as triggering the external failure relay (if configured to do so).

STATUS LEDS

The front panel carries a set of seven LEDs showing the status of various unit functions. From left to right:

Power Supply (green) [5]; illuminates when the Octadrive DSP-DN is connected to the mains supply, power is switched on and the internal mains-operated PSU functions normally. A second LED mimicking this functionality is fitted to the rear panel [32].

Back-up Supply (green) [6]; illuminates when the Octadrive DSP-DN is connected to a valid DC back-up supply via connector [31]. A second LED mimicking this functionality is fitted to the rear panel [30]. Note that the power switch has no relation to the status of this LED, the power switch is related to mains operation only.

Internal Supplies (green) [7]; illuminates when all the internal supplies are OK.

Identify (green) [8]; this LED can be illuminated temporarily ("pinged") from WinControl or from Dante™ Controller software. This feature is provided so that in an installation using multiple AXYS® units, each particular physical unit can be positively identified if necessary. A second LED mimicking this functionality is fitted to the rear panel [12].

Failure Relay (bi-colour) [9]; normally green, indicating no fault state exists; turns red to indicate that a fault condition has de-energised the failure relay. The conditions defining a failure are set up via WinControl.

Serial Bridge (green) [10]; illuminates on AxysBridge communication activity (transmit or receive).

Mic. Level (bi-colour) [11]; green LED is on for microphone level >= -23 dBFs, red LED is on for level >= -11 dBFs. Level refers to the peak level before limiter when tested with 1 kHz sine. The limiter threshold is fixed at -13 dBFs.

LOCAL HEADPHONE MONITORING

The Octadrive DSP-DN is equipped with an internal headphone amplifier, the output being on a standard 3-pole ¼″ (6.35 mm) jack socket on the front panel [2]. Headphone monitoring is in mono. Headphones of between 32 and 600 ohms impedance are suitable.

The signal to be monitored in the headphones is selected by the Channel Selector control [4]. The choice is any of Analogue Outputs 1 to 8, or either of Analogue Inputs 1 or 2, and the source currently selected is confirmed by one of the ten green LEDs [3] being illuminated. The level in the headphones may be adjusted with the Volume control [1].

DANTE™ CONFIGURATION

The Dante™ card fitted to the Octadrive DSP-DN is self-organising and requires no adjustments. However for configuring systems with multiples of Octadrive DSP-DN units, each device must have been assigned a unique IP address. This, as well as the audio routing, is defined using Audinate's Dante™ Controller software application. For systems that incorporate one or more AXYS® WinControl Server PCs for system management, this application will be pre-installed on each computer.

This topic is beyond the scope of this manual, and further information can be found in the documentation related to the WinControl Server configuration.

APPENDIX

TECHNICAL SPECIFICATIONS

Full technical specifications on all models are available at:

www.axystunnel.com;

MAINTENANCE AND WARRANTY INFORMATION

Maintenance

Maintenance should only be performed by qualified service personnel. In case of doubt always contact your dealer.

Warranty Information

This IndustryAmp is covered by Harman Professional's standard product warranty, and is subject to the terms and conditions of the warranty.

Please consult **www.axystunnel.com** for a full statement of warranty policy.

COMMON ANALOGUE GROUNDING ISSUES

Correctly connecting the IndustryAmp to ground has several benefits. A full discussion of the issues involved can be found at **www.axystunnel.com**;

Basic points to observe are:

1. Safety. The GND terminal of the PowerCon® mains connector provides a direct low impedance path from the metal parts of the chassis to ground. Always connect this terminal.

2. Reduction of RF emission. Although the IndustryAmp electronics are well shielded and external connections are decoupled to prevent RF emission from the internal high speed digital circuits, this protection will not work properly if the chassis is not connected to ground.

3. RF Immunity. RF currents induced in the signal cables by external RF fields are effectively shorted to chassis ground, provided that the cable screen (shield) is of sufficiently low impedance.

The pins with a $\perp$ symbol on the audio line input connectors and the ambient SPL mic connector are connected internally directly to the chassis of the amplifier. These pins are for connecting the screen (shield) of the audio cables.

SOFTWARE AND FIRMWARE UPDATES

The AXYS® WinControl (User version) application is freely available and can be downloaded from the download area of our website; **www.axystunnel.com**. We advise installers, users and engineers to check our site regularly for updates. For further information about how to use WinControl please refer to the WinControl Help files.

AXYS TUNNEL
by HARMAN

www.axystunnel.com