

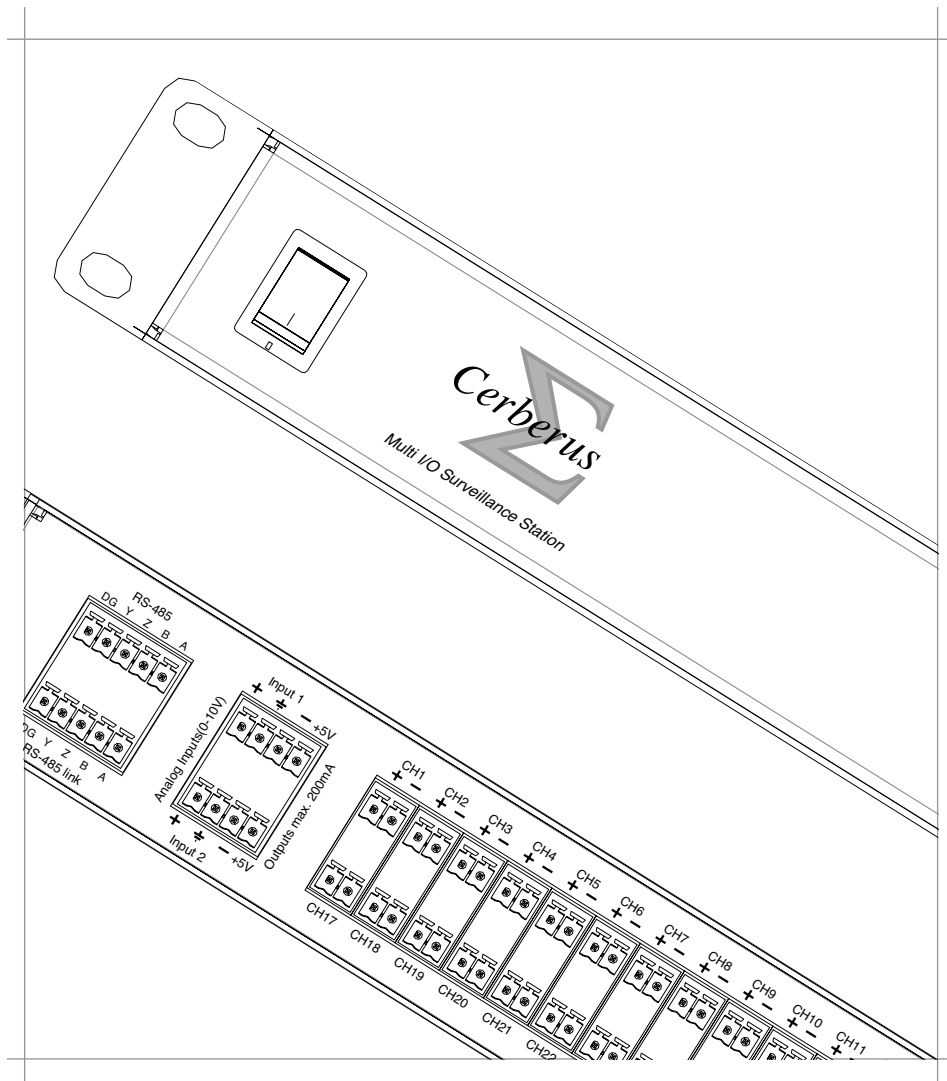
CERBERUS

Installation & User Manual

Applies to Part Number:

TUN-391010

Cerberus multi I/O



Delivering Clear and Intelligible Messages



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 55103-1; E1, E2, E3

EN 55103-2; E1, E2, E3

EN 50130-4

EN 50121-4

Safety:

IEC 60065: 2001 (ed7); A1: 2007, A2: 2010

Mains Harmonics:

EN 61000-3-2: 2001

Insulation:

Class1

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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 the power-supply cord or plug being 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 red rocker switch at the extreme left of the front panel and remove the connector from the mains input socket labelled Mains on the rear panel.



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® Cerberus unit.

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

OVERVIEW

The AXYS Cerberus has been designed to act as a surveillance hub for the various components making up a life-safety or other critical audio system. Cerberus supports a wide variety of products – from Harman Professional or other manufacturers, and will continuously monitor and report the operational status of all equipment connected to it.

System components of all types – for example, digital audio processing units, UPS's or emergency sound stores - which are provided with a "fault" tally or "watchdog" output of some kind, can be connected. This allows full surveillance of all audio system components from a remote location, and, if the audio system has been appropriately configured, can automatically bring secondary backup components on-line when pre-defined failure events occur.

Cerberus may be programmed with AXYS's WinControl software by the installer to recognise fault conditions in connected equipment via 32 digital and 2 analogue inputs, and to report faults in a variety of ways, including RS-485 messages and 8 internal volt-free changeover relays.

FEATURES

- 32 programmable digital "logic" inputs
- 2 programmable analogue "logic" inputs
- 8 programmable isolated changeover relays
- Dual-contact surveillance/failure relay, suitable for volt-free monitoring
- Bi-directional RS-485 interface
- RS-485 breakout connection
- Full configuration, control and monitoring with AXYS WinControl software
- Universal power supply (100-240 VAC, ±10%)

WHAT'S IN THE PACKAGING

In addition to the Cerberus itself, each unit is shipped with the following items:

- Installation and User Manual (this document)
- AC power cable (2 m), fitted with an IEC connector and a European-style mains plug
- Full set of mating screw-terminal connectors

GENERAL DESCRIPTION

BLOCK DIAGRAM AND SYSTEM DESCRIPTION

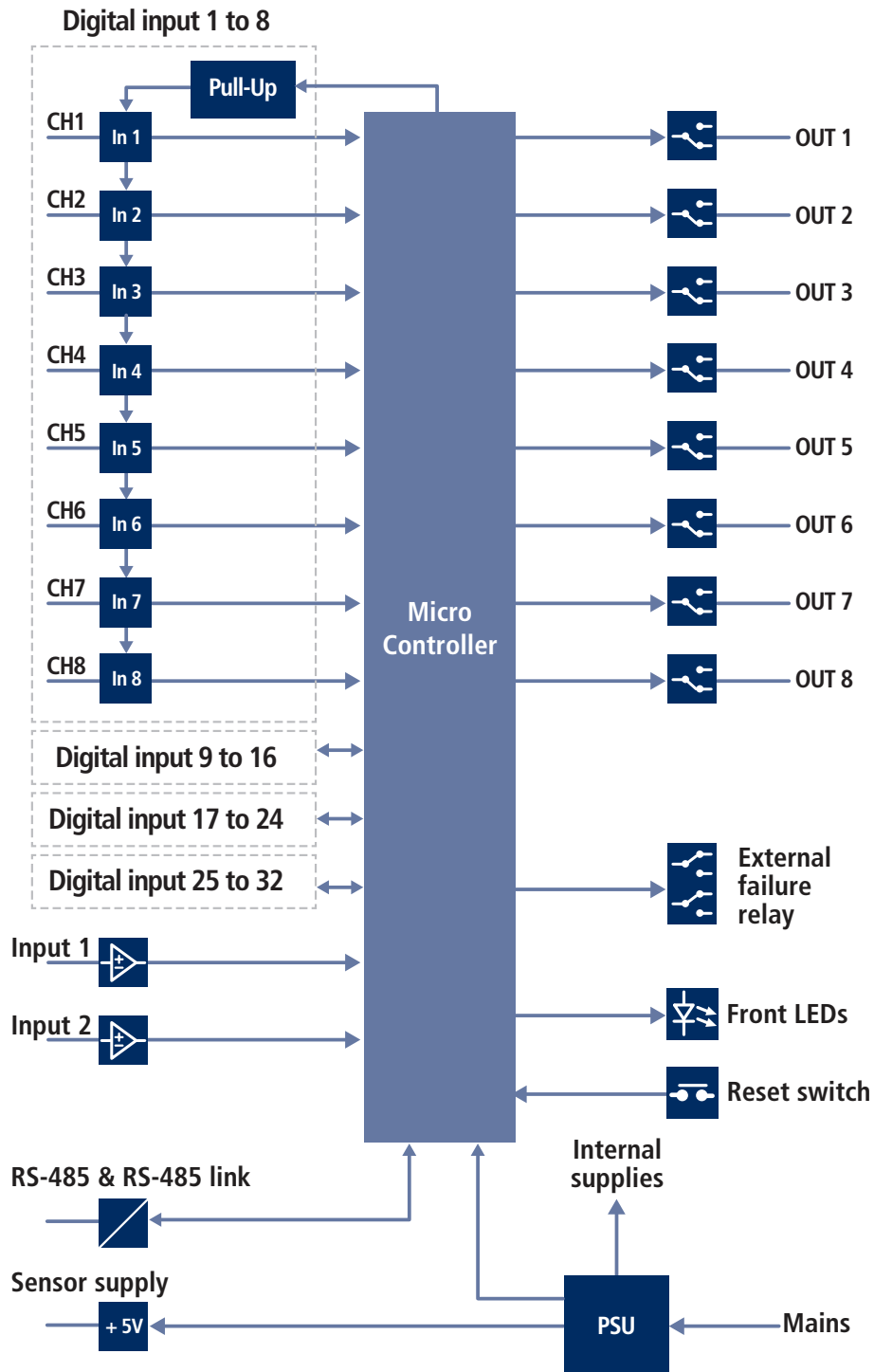


fig.1: Block Diagram

The simplified block diagram “fig.1: Block Diagram” on page 6 shows the unit’s internal signal routing.

The unit has 32 digital “logic” inputs, which may be configured via WinControl (in blocks of 8 inputs) to either monitor input logic levels (nominally 0 or +5 V), or, with a pull-up resistor enabled, as impedance-sensing inputs. Two high-impedance, electronically-balanced inputs for analogue signals are also provided, which are designed to monitor DC voltages between 0 and +10 V.

The inputs are constantly analysed by the internal micro-controller and their states compared with a set of conditions defined by the user in WinControl. Cerberus may be programmed to activate any one (or a combination) of its eight outputs when a defined condition is met at any of the inputs, or in response to a command via the RS-485 network. For example, an input condition might be a fault tally or watchdog output on an item of external equipment going logic high (or low) to indicate a fault state within the item; alternatively an out-of-range voltage from a

temperature sensor connected to an analogue input might indicate an extreme of temperature. The eight outputs are in the form of single-pole changeover relays, with both Active Closed (AC) and Active Open (AO) contacts available.

Cerberus also incorporates its own surveillance function, which activates an externally-accessible two-pole changeover relay in the event of various definable fault conditions. These are also configured in WinControl.

In addition to activation of the output and failure relays, fault reporting is also conducted via the RS-485 serial port. This allows Cerberus to be included in a network of AXYS amplifiers, line drivers and loudspeakers, and the operational state of all equipment connected to it to be continually monitored at a remote location using an AXYS WinControl Server.

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

FRONT PANEL

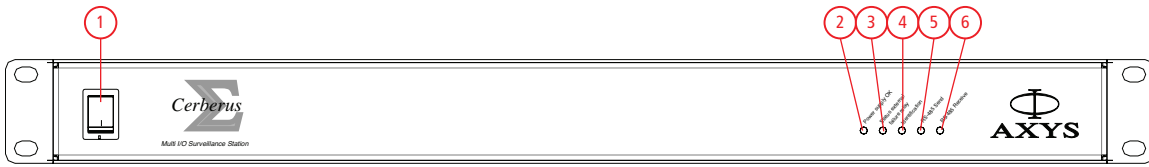


fig.2: Front panel view

REF.	PANEL LEGEND	ITEM
1		Power switch with internal neon indicator (red)
2	Power supply OK	PSU status LED (green)
3	Status external failure relay	Bi-colour LED (green/red), indicates failure state
4	Identification	Unit identification LED (green)
5	RS-485 Send	LED (orange) indicates Cerberus is transmitting RS-485 data to the network
6	RS-485 Receive	LED (orange) indicates Cerberus is receiving RS-485 data from the network

REAR PANEL

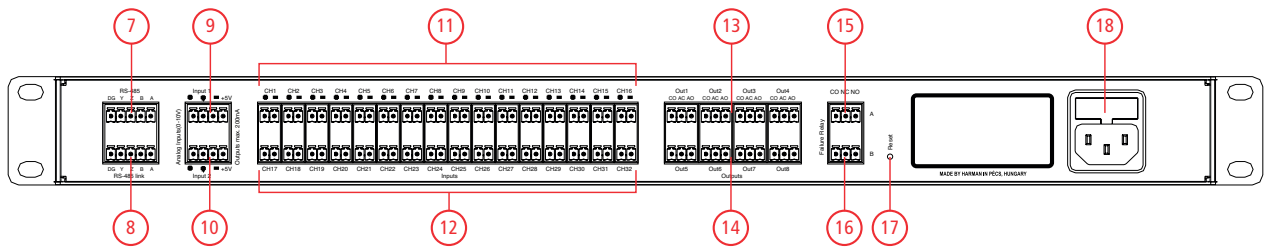


fig.3: Rear panel view

REF.	PANEL LEGEND	ITEM
7	RS-485	RS-485 comms port
8	RS-485 link	RS-485 breakout for further equipment
9	Input 1	Analogue DC voltage input 1
10	Input 2	Analogue DC voltage input 2
11	Inputs (CH1 – CH32)	Digital inputs 1 to 16
12		Digital inputs 17 to 32
13	Out 1 to Out 4	Relay outputs 1 to 4
14	Out 5 to Out 8	Relay outputs 5 to 8
15	Failure Relay A	Failure relay contacts A
16	Failure Relay B	Failure relay contacts B
17	Reset	Processor hardware reset button
18	Mains	IEC mains connector with integral fuse-holder

Wiring details for all the rear connectors can be found in subsequent sections of the manual.


INSTALLATION AND OPERATION

MECHANICAL INSTALLATION

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


Ventilation


Cerberus 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 a Cerberus unit 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

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

 **Warning** - The Presence of mains voltage is not indicated by the front panel Power supply OK LED. This LED indicates the operational status of the unit and should not be used as a mains voltage indicator.

v



AC power is via a rear panel IEC mains connector [18]*. An IEC 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, an IEC mains lead fitted with the correct style of plug should be sourced. Alternatively, fit the correct type of mains plug, carefully observing the following cable colour codes:

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

The Cerberus incorporates a "universal" PSU, and will operate on all AC mains voltages from 100 V to 240 V.

The connector assembly has an integral fuse holder. Note the fuse specifications below:

	230 V & 115 V
Type	T3.15A (slo-blo)
Size	20 x 5 mm
Rating	3.15 A



In the event of a blown fuse always first investigate why it blew. Only replace a fuse with one of the type and rating specified. The fuse holder has space for storage of a spare fuse. Never attempt to replace a fuse without first removing the IEC plug from the unit.

*Numbers in square brackets refer to the figs on pages 8 & 9

Digital Inputs

Connections to the 32 digital inputs are on 2-pin 3.81 mm-pitch screw-terminal connectors. Mating connectors are supplied with the unit.

The inputs are differential, and are designed to operate on nominal logic levels of 0 and +5 V DC. The maximum voltage that can be applied at these inputs is ±24 V DC.

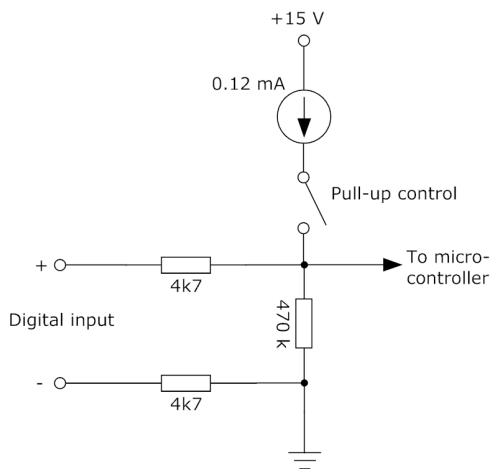


fig.4: Digital Input Diagram

Wiring to the digital inputs will depend on the equipment being connected. Note that the '-' pin of each input is referenced to internal ground via a 4.7 kohm resistor.

Connecting to a relay

The '+' and '-' pins may be connected to an external relay's CO/NO or CO/NC volt-free contacts. In this case, the internal pull-up control will need to be enabled in WinControl. (Note that the pull-ups are enabled in blocks of eight inputs).

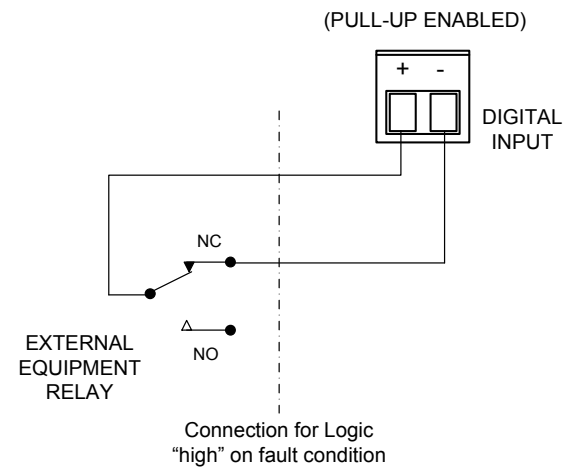


fig.5: External Relay Connection CO/NC

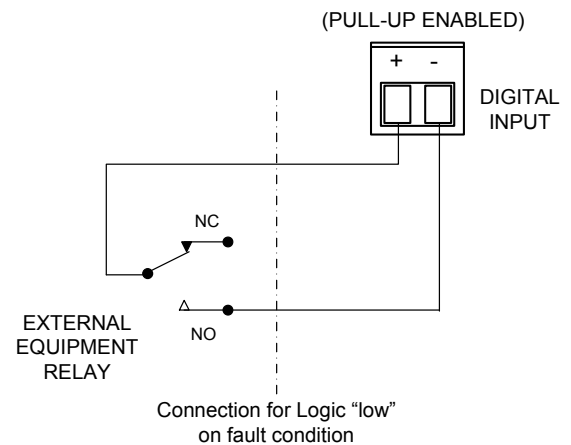


fig.6: External Relay Connection CO/NO

NOTE: Relays are shown in energised state - i.e., "no-fault".

If a changeover relay is available, either NC or NO contacts may be used, and the logic sense programmed accordingly. If the relay is only single-contact, establish from the equipment manual whether it is NO or NC for a non-fault condition, and use the wiring shown. Note that impedance-sensing connections, if available, are preferred for critical applications (see "Connecting to switched-impedance outputs" on page 13).

Connecting to an open-collector output

Some equipment presents an "open-collector" output. With this type of output, a transistor is turned on, lowering its collector voltage to a logic "low" level. The '+' terminal of the digital input should be returned to the +V rail of the equipment, which is usually available on an adjacent terminal. Note that the maximum permissible value of +V is +24 V.

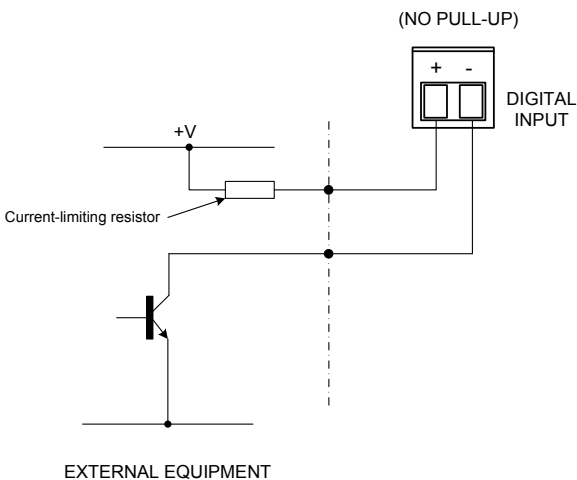


fig.7: Open-Collector Connection

The pull-up control for a digital input connected to an open-collector output should be disabled.

Connecting to opto-coupled outputs

If the equipment being monitored uses opto-coupled outputs, the same principle as above (Connecting to an open-collector output) should be employed, as the "switching" part of the opto-coupler is essentially a transistor. The optical coupling to an LED ensures full electrical isolation between the item of equipment and Cerberus.

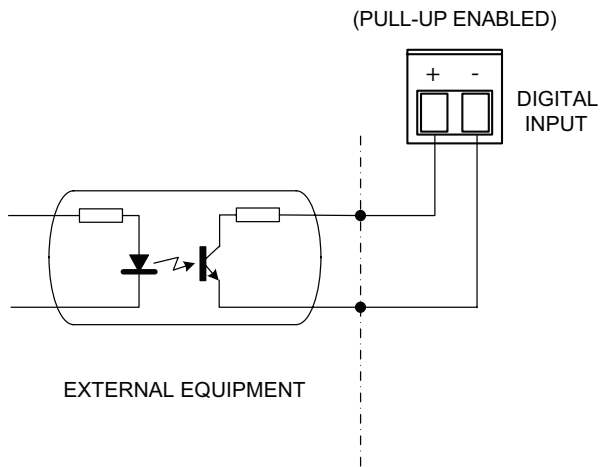


fig.8: Opto-Coupler Connection

The pull-up control for a digital input connected to an opto-coupled output should be enabled.

Connecting to switched-impedance outputs

Some equipment (including many AXYS products) use impedance switching to indicate a fault state. Impedance-sensing has the advantage over simple short/open-circuit detection in that it can distinguish between unit failure and cable faults.

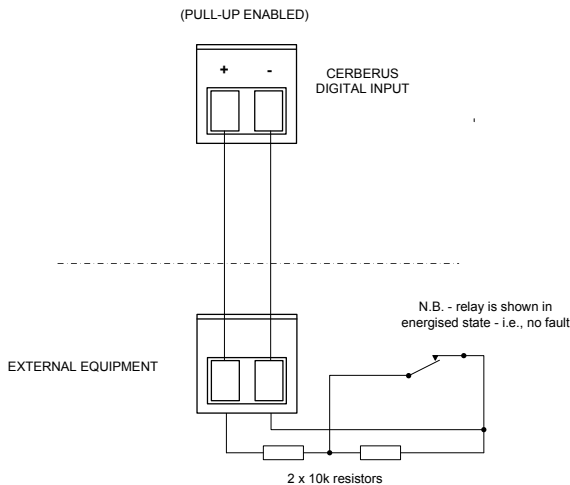


fig.9: Impedance-Sensing Connection

The diagram shows a typical arrangement for impedance-sensed fault indication. The two terminals of the external equipment may simply be connected to the digital input as shown. In a no-fault state, the impedance presented to the digital input is 10 kohms. If a fault condition occurs, the relay opens, and the impedance rises to 20 kohms.

The pull-up control for a digital input configured for impedance sensing should be enabled.

Analogue inputs

Cerberus provides two balanced analogue inputs for external voltage sensing. (These are referred to as "Aux inputs" in WinControl.) They may be connected to any variable DC voltage; possible applications include temperature sensing, monitoring of back-up battery state and of external PSU voltage in a relay-controlled redundant amplifier-switching configuration.

The analogue inputs are on 4-pin 3.81 mm-pitch screw-terminal connectors. Mating connectors are supplied with the unit. Two of the four terminals ('+' and '-') constitute a differential input, and the external voltage being sensed should be applied across these. Use two-core screened cable to connect to the external equipment and connect the screen of the cable to the terminal marked with an earth (ground) symbol. +5 V is also made available at the analogue input connector for situations where a DC voltage is required by a sensor. The DC current which may be drawn from each of the analogue inputs in this way is 200 mA.

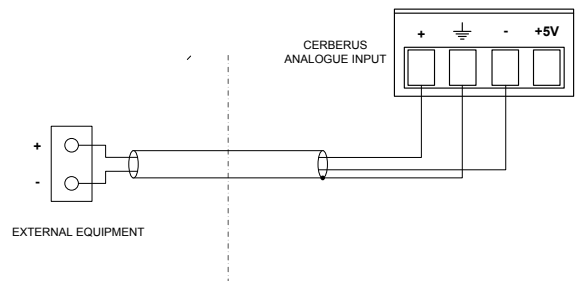


fig.10: Analogue Input Connection

The analogue input is designed to operate in the range 0 to +10 V. Upper and lower thresholds can be set in WinControl; a fault condition will be registered if the external analogue voltage is not between the two thresholds. When configuring the analogue inputs, it is helpful to open the Properties window (**Tools>Status Properties**), open the Input tab and observe the **Aux input properties** of the analogue input to check that the thresholds are being set correctly.

The impedance of the analogue input is 2 Mohms, and thus will not load the source. The maximum level which may be applied to the analogue input is ±50 V.

Relay outputs

The contacts of the each of the eight output relays in the Cerberus are available on 3-pin 3.81 mm-pitch screw-terminal connectors. Mating connectors are supplied with the unit.

The relays are of the single-pole changeover type, and the contacts are rated at 24 V and 100 mA. The contacts are volt-free, and are wired internally as shown below:

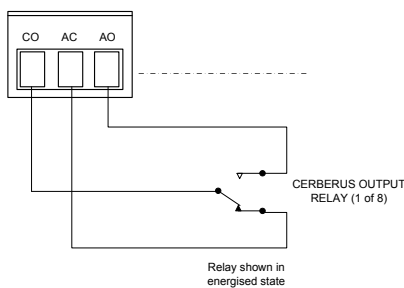


fig.11: Relay Output Connection

Each output may be configured in WinControl to activate the relay either according to definable input conditions ("Failure controlled"), or in response to an RS-485 command from elsewhere in the system ("General purpose").

The relay contacts may be wired to whatever signalisation, alarm or other external equipment is appropriate to the installation. It is important to remember that any fault condition defined in Cerberus's configuration will be reported to WinControl software via RS-485 to provide operator visual feedback. The output relays are intended to be used when a fault condition is required to initiate specific events automatically in an unattended system.

Using the output relays for amplifier changeover

A further application for Cerberus is as part of a redundant amplifier setup. A single AXYS IndustryAmp can be used as a redundant amplifier for up to 8 other audio amplifiers. In the event of an amplifier failure this redundant amplifier

can be automatically reprogrammed and take over from the failed one. The AXYS Cerberus unit is used to support the switching of both audio inputs and loudspeaker lines in this situation. Please note that additional components are required.

Full details are beyond the scope of this manual, but an Application Note covering the topic is available from Harman Professional on request.

Control connections

RS-485 interface and link

Cerberus units need a permanent RS-485 network connection for remote monitoring and control. In most practical installations, Cerberus will be connected to a network which includes all other AXYS system components, such as Octadrive DSP line drivers, amplifiers and active loudspeakers. This enables the status of the entire audio system to be monitored and its performance adjusted from a single location, on a computer running WinControl.

The RS-485 network connection is a 5-pin 3.81 mm-pitch screw-terminal connector, and should be wired as shown in the diagram below:

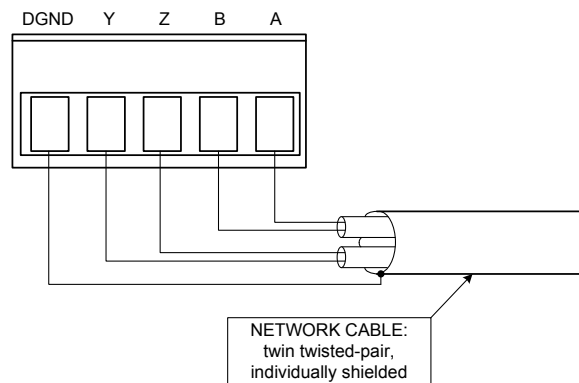


fig.12: RS-485 Wiring

Note that 2-pair cable, with each pair individually-screened, should be used for RS-485 connection. The transmit (Tx) and receive (Rx) balanced data lines must be wired via their own twisted pairs. CAT-5 type UTP or FTP cable is NOT suitable. Please refer to the Appendix section of the manual for cable specifications.

The RS-485 interface permits multiple devices to be “daisy-chained” in parallel (see diagram below), so that all units are controlled by the same PC. In such a system, each device must have its own unique network address; this is set up via WinControl.

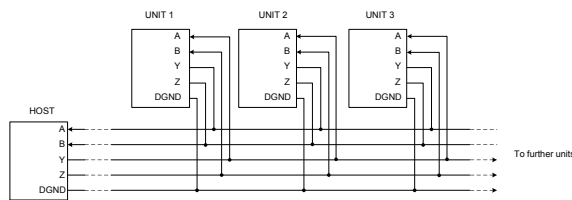



fig.13: RS-485 Network

Note the pinout of the RS-485 interface is as follows:

PIN	RS-485
DG	Digital ground
Y	Tx +
Z	Tx -
B	Rx -
A	Rx +

The maximum cable length over which the network connection will operate reliably depends on the cable type and the baud rate used. With good quality cable, a safe maximum figure for the overall network (at 19.2 kbaud) is 2000 m. If the distance is significantly longer than this, a network repeater will be required.

 Before connecting multiple devices to the same network subnet, ensure that their network addresses do not overlap. Each device should be set to a unique network address (determined via WinControl).



In some installations, it is normal practice to disconnect the RS-485 network from the USB-to-RS-485 converter at the host (computer) during normal operation. This removes the possibility of extraneous data being inadvertently transmitted over the network. In such a situation, the converter is only reconnected when system maintenance or checks are required. Disconnecting from the convertor in this way leaves the Rx lines of the devices unterminated. In most situations this does not present any problems, but with a large network in a hostile EMC environment, it is recommended that the host Y and Z lines (host Tx/device Rx) are terminated in a 100 ohm resistor for normal operation. This can be easily achieved by plugging the XLR5F connector into a spare male connector with the resistor on the appropriate pins. This termination can then be removed and the convertor reconnected when necessary. (If there is any doubt about which pins should be terminated, shorting all five pins will generally be equally effective.)

RS-485 Link connector

Cerberus, in common with most AXYS products, includes a hardware “link” (or “loophrough”) output, for ease of interconnecting units on the network. In this case, the network topology is as shown below:

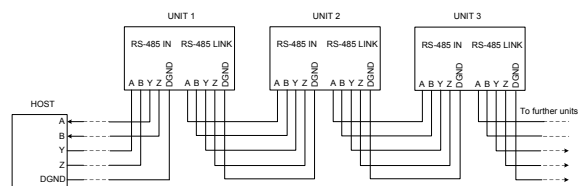


fig.14: Daisy-chain Topology of RS-485 Network

The connector and pinout of the RS-485 Link connector is identical to that of the RS-485 Interface.

Failure relay

Cerberus provides a two-pole changeover relay whose contacts are accessible on two 3-pin 3.81 mm-pitch screw-terminal connectors. The two poles are electrically independent, and are marked 'A' and 'B' on the rear panel. The pins are labelled CO (changeover), NC (normally-closed) and NO (normally-open).

Note that in this case, 'NO' and 'NC' refer to the relay states as applied to the Cerberus in normal use; 'NC' is connected to 'CO' while the unit is powered and operating normally; in the event of a fault condition, 'CO' is connected to 'NO'.

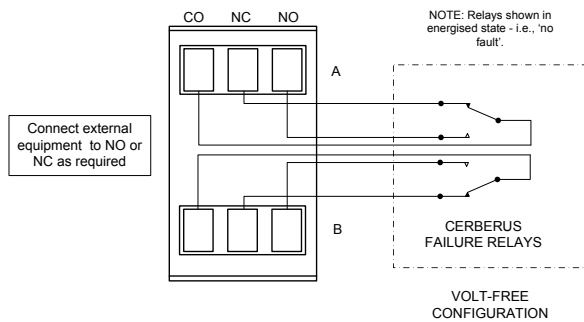


fig.15: Failure Relay

The conditions under which the relay operates are defined as part of the unit configuration in WinControl, and may include network failure, short or open circuit detection at any digital input, out-of-range voltages at the analogue inputs, and so on.

Each set of contacts has maximum current and voltage ratings of 100 mA and 24 V respectively.

STATUS LEDs

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

Power supply OK (green) [2]: illuminates when the Cerberus is switched on and the PSU is functioning normally.

Status external failure relay (bi-colour) [3]: 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.

Identification (green) [4]: This LED can be illuminated temporarily ("pinged") from WinControl. This feature is provided so that in an installation using multiple AXYS units, each particular physical unit can be positively identified if necessary.

RS-485 Send (orange) [5]: indicates that the Cerberus is transmitting data to the RS-485 network.

RS-485 Receive (orange) [6]: indicates that the Cerberus is receiving data from the RS-485 network.

CONFIGURING CERBERUS WITH WINCONTROL

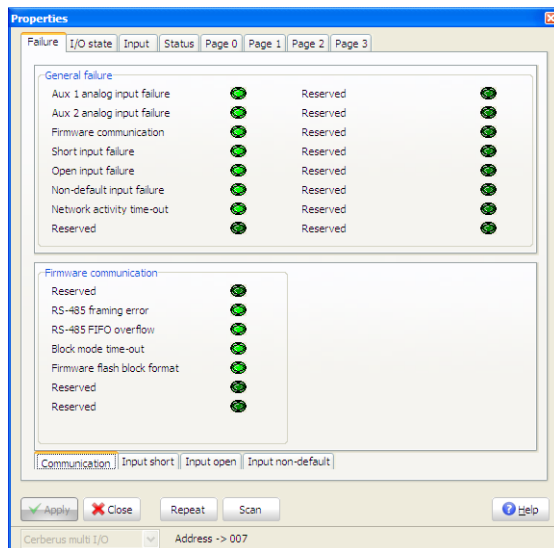
The AXYS WinControl software runs on any PC and allows full control and monitoring of all AXYS products on the RS-485 network connected to it (normally via a USB-to-RS-485 interface).

A full description of the operation and use of WinControl is beyond the scope of this manual. WinControl is supplied with an extremely comprehensive set of context-sensitive Help files; please see these for more detailed information.

However, a general overview of WinControl as applied to Cerberus is given below.

UNIT STATUS

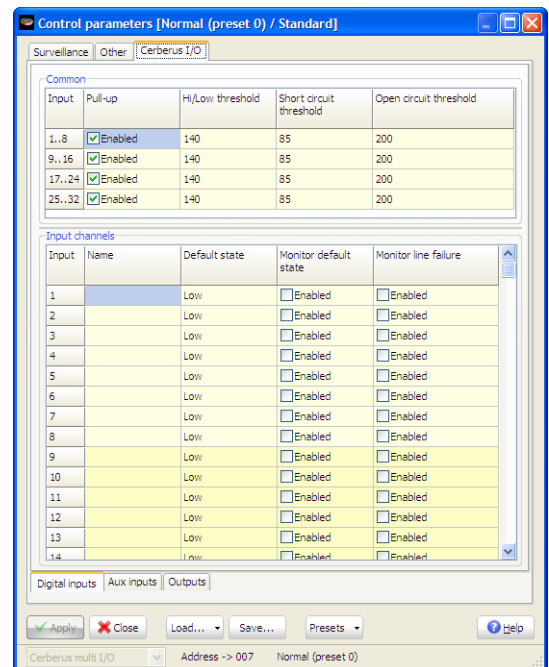
When Cerberus forms part of the active network, selecting its on-screen icon and pressing F5 will open the **Properties** window, which has numerous upper and lower tabs. The **Communications/Failure** tab is illustrated below:



Similar tabs are available which display the status of the inputs and outputs with various degrees of detail.

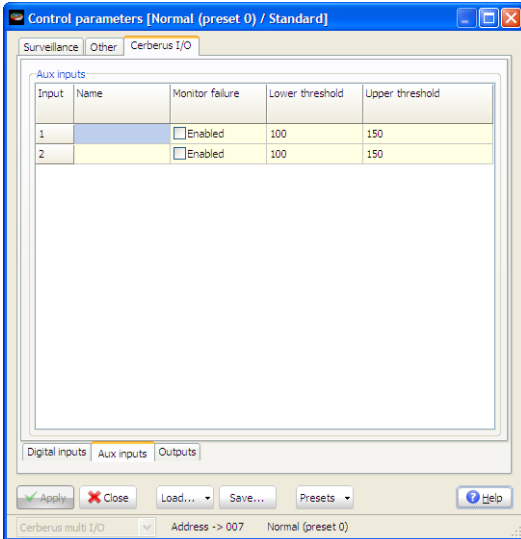
DIGITAL INPUTS

Double-clicking the active icon opens the **Control parameters** window, where the unit's configuration may be defined. The screenshot below shows the digital inputs configuration page; each input may be named, its default logic state defined and the type of monitoring specified; additionally, pull-up control may be enabled and definitions of short- and open-circuit made.



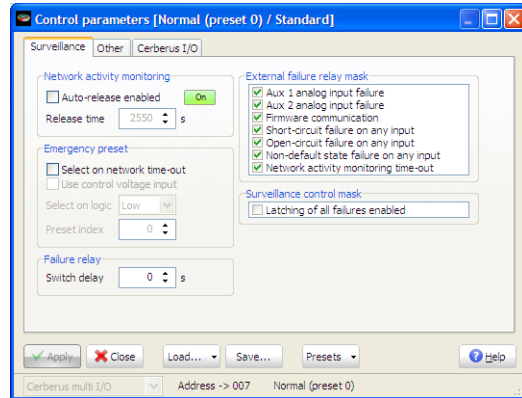
ANALOGUE INPUTS

WinControl allows adjustment of the upper and lower thresholds, between which the input voltage at the analogue inputs should remain under no-fault conditions.



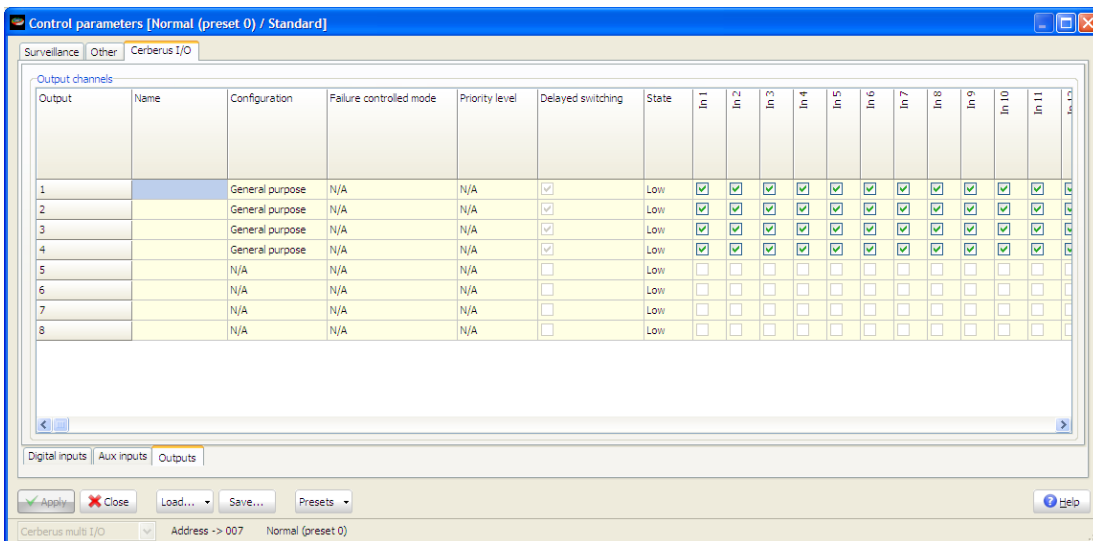
SURVEILLANCE FUNCTIONS

This page allows definition of the conditions under which the failure relay changes state.



OUTPUTS

Each output relay may be configured to activate either as the result of a defined fault condition, or in response to a network command.



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.

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.

NETWORK CABLES

The type of cable necessary for correct operation of the RS-485 network is twin twisted pair with each pair individually shielded. Numerous cables of this type are readily available and cables broadly meeting the specifications of the example cable given below are likely to be suitable.

Example of a preferred cable type:

Type	BELDEN 'Datalene' series No. 9729 2-pair
Characteristic impedance	100 ohms
Capacitance (core to core)	41 pF/m
Capacitance (core to screen)	72.5 pF/m
DC resistance (core)	78.7 ohms/km
DC resistance (screen)	59.1 ohms/km



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