DAI V3

(Digital Audio Interface)

Description

The DAI contains dual 24 Bit A/D and D/A converters with software configurable analogue I/O stages to interface two bi-directional audio channels onto a pair of fibre optic link. For critical systems the use of dual redundant fibres is included as is the injection and verification of surveillance signals.

Simultaneous monitoring, control & serial data channels are embedded allowing a comprehensive digital interface & distribution system to be easily implemented

CONFIGURATION & OPERATING MANUAL

Contents

Connecting the DAI

Refer to Appendix C for connector pin-outs.

Audio In Two separate balanced audio line inputs on XLR's. Input 2 is line level only whilst input 1 can be configured for Mic using the Opt.1 module. When configured for Mic it is provided with 24V phantom power, programmable dynamics, a configurable surveillance tone as well as microphone status monitoring. Separate three band programmable EQ and Level is included for each input

Audio Out Two separate balanced line level outputs with power on muting and individual three band programmable EQ and Level control. An adjustable 20KHz surveillance tone can be mixed with the program audio for use with external fault monitoring systems

Transmit Twin (Primary & Secondary) ST fibre connectors for the outgoing fibre connections to other elements of the system. Each output carries the same audio information but separate control data to allow automatic fibre network verification & tests. The system is software configurable for single or dual fibre operation.

Receive Twin (Primary & Secondary) ST fibre connectors for the incoming fibre connections from other elements of the system. The system is software configurable for single or dual fibre operation with correct operation verified and reported.

Control A multifunction port allowing the connection of:-

1. PTT push button for page access,
2. Control keypad for selection of paging zones,
3. Outputs to remote amplifier page access,
4. Outputs to remote routing matrix,
5. Transparent serial data for other communications & control.

Status For connection to external fault monitoring systems. The port carries four configurable status lines to verify the operation status of:-

1. Connected microphone & internal processing,
2. Single or dual fibre network,
3. Power supplies,
4. Remote peripherals.

Power Dual power inputs are provided from both mains and 24V DC. The status of both can be monitored and any deviation from normal operation flagged as a fault.

DAI Software

User Instructions

System connections and configuration

Configuration of the DAI's is via the DAI Control utility. This will operate on a PC running Windows 98 SE with Internet Explorer 5.0 or newer or windows ME, with an unused RS232 port. Connect the PC RS232 to the 9 pin D connector on the DAI front panel.

Control Tab

At start up only the "Find DAI's" button will be visible.

Click Find DAI to locate DAI's connected to the PC. A list of DAI's found will appear.
Select the appropriate DAI to configure.
"Send Settings" and "Upload settings" will appear.

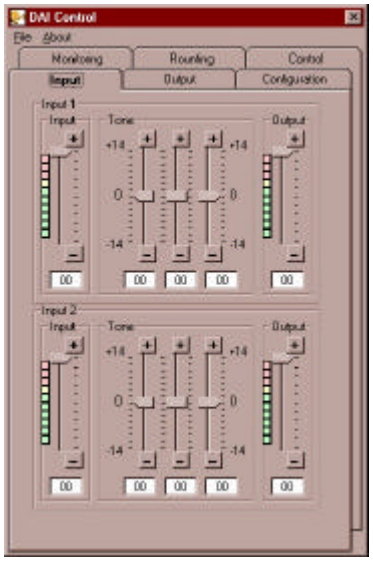
Clicking "Send settings" will transfer the settings from the utility to the DAI. THESE SETTINGS WILL BE THE RESTORED WHENEVER THE DAI IS POWERED UP.

Clicking "Upload settings" will transfer the power up settings from the DAI to the utility.

If the configuration of the DAI is the same as the settings within the utility the "On-line" button will appear. If the "On-line" button is not visible either send or upload the setting to/from the DAI as appropriate. When On-line changing settings in the utility will be immediately transferred to the DAI. ANY CHANGES MADE WHEN ON LINE WILL BE LOST WHEN THE DAI IS POWERED OFF.

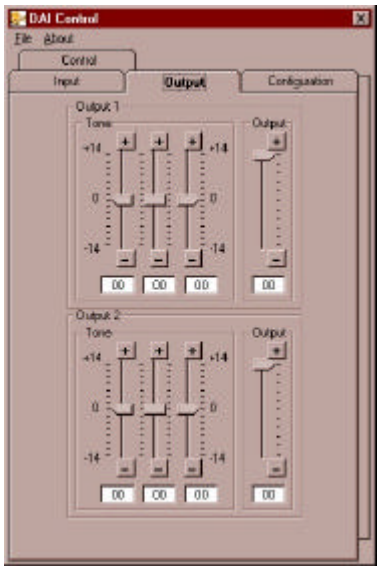
Clicking "Exit" will terminate the utility.

Input levels/EQ Tab



Click the “+” or “-“ buttons to change settings. The “level meters“ only appear when the DAI is online.

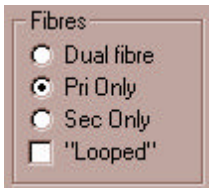
Output levels/EQ Tab



Click the “+” or “-“ buttons to change settings.

Configuration Tab

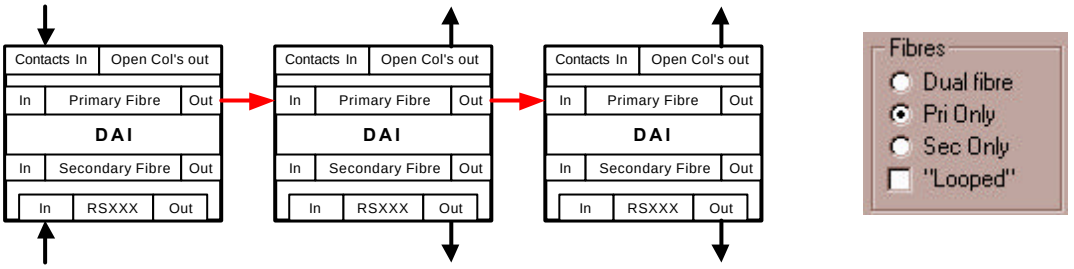
Fibre connections



This section defines how the fibre network is configured. The “looped” option enables communications integrity checking, this means that any control messages sent from the master DAI are checked to see if they returned from the other end of the loop. These errors are reported in Primary and Secondary loop faults.

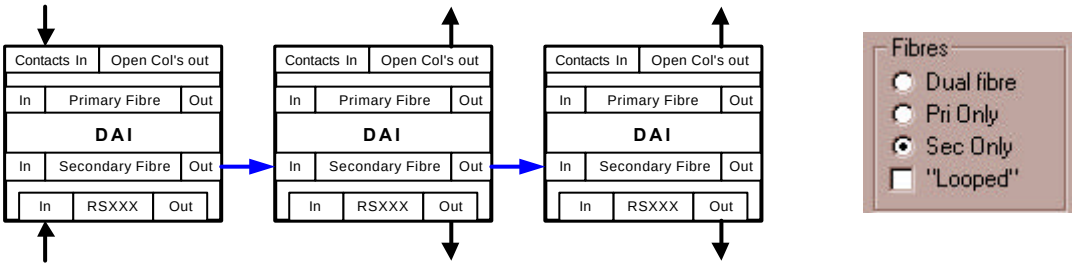
The following demonstrates connections and configuration for possible operating modes of a DAI system. In these the left hand unit is the master of the system, i.e. the master link on the Data I/O connected is made.

(A) Primary fibre only



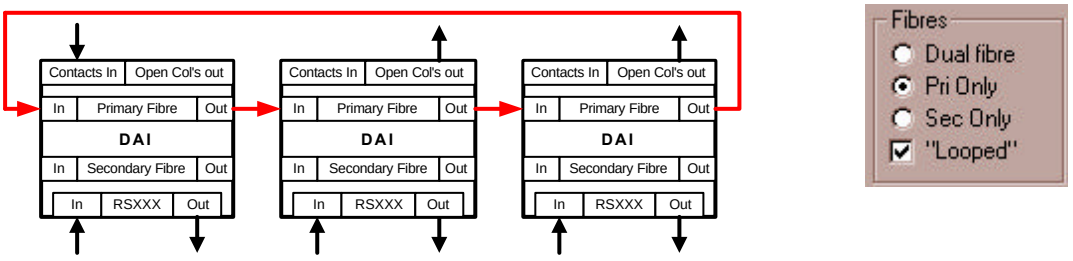
Master is input for audio, contacts and serial. All other units are output only. No communication integrity checking is available. Fibres are not fault tolerant.

(B) Secondary fibre only



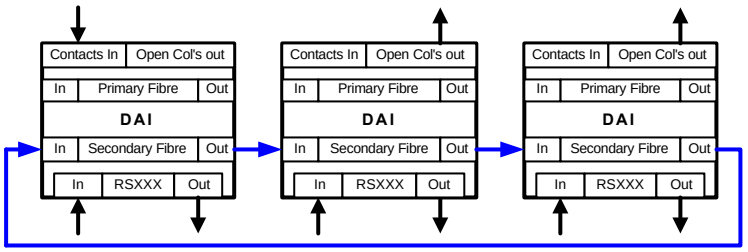
Master is input for audio, contacts and serial. All other units are output only. All other units are output only. No communication integrity checking is available. Fibres are not fault tolerant.

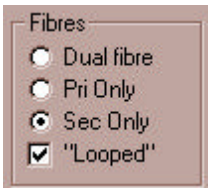
(C) Looped primary fibre only



Master is input for audio and contacts. Serial can be bi-directional to/from each unit. Communication integrity checking is available. Fibres are not fault tolerant.

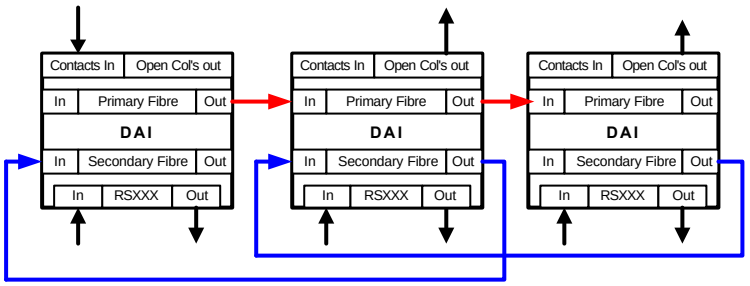
(D) Looped Secondary fibre only

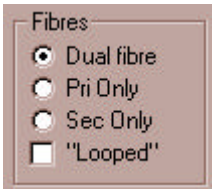




Master is input for audio and contacts. Serial can be bi-directional to/from each unit. Communication integrity checking is available. Fibres are not fault tolerant.

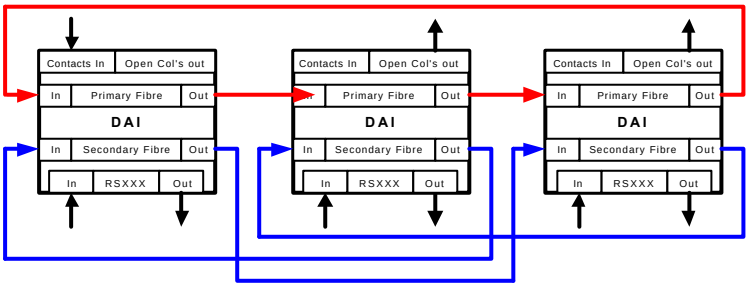
(E) Dual fibre not-looped

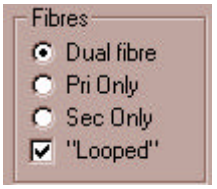




Master is input for audio and contacts. Serial can be bi-directional to/from each unit. No communication integrity checking is available. Fibres are not fault tolerant.

(F) Dual fibre looped

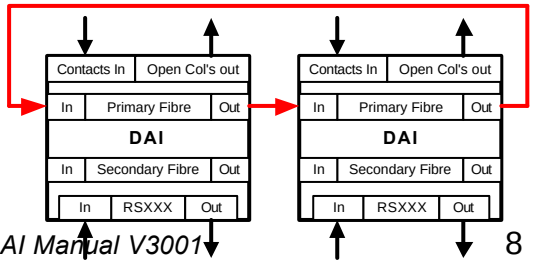


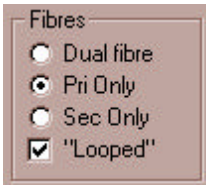


Master is input for audio and contacts. Serial can be bi-directional to/from each unit. Communication integrity checking is active. Fibres are fault tolerant.

Two Units can be used back to back to provide a simple means of transferring audio, contacts and serial in both directions. In these modes BOTH units have their master link made

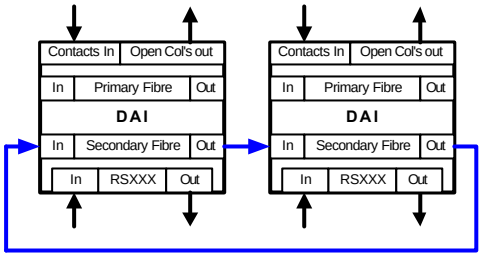
(G) Primary loop only

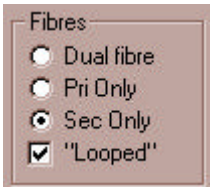




Communication integrity checking is available Fibres are not fault tolerant.

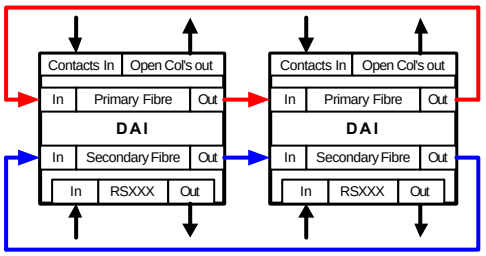
(H) Secondary loop only

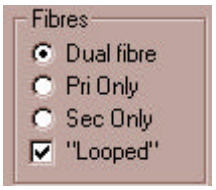




Communication integrity checking is available Fibres are not fault tolerant.

(I) Dual loop



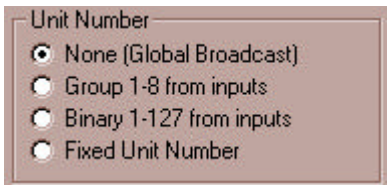


Communication integrity checking is available Fibres are fault tolerant.

Unit Number

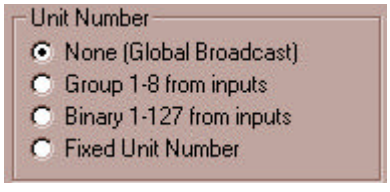
Unit number options control how the units interact on a system

(A) Global operation



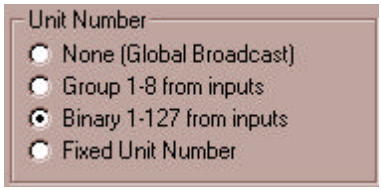
In this mode the system comprises a master and one or more “slave” units. All contacts states and serial message go from the master unit to ALL other DAI units on the system. Push to talk and serial filtering are not available. Serial from the slave units is not available in this mode.

(B) Group operation



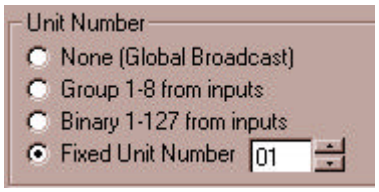
In this mode select inputs are used to define/select one or more of eight “groups”. All contacts states and serial message go from the master unit to ALL other DAI units on the system. Push to talk and serial filtering are available. Serial from the slave units is not available in this mode.

(C) Binary 1-127 from inputs operation



In this mode select inputs are used to define/select a binary unit number from 1 to 127. Address 0 is always used by the master. All contacts states and serial message go from the master unit to ALL other DAI units on the system. Push to talk and serial filtering are available. Serial from the slave units is available in this mode. To use serial from the slave units each unit on the system must have a unique address.

(D) Fixed unit number



This is similar to the Binary mode but the select inputs are ignored and the address defined in the utility is used instead.

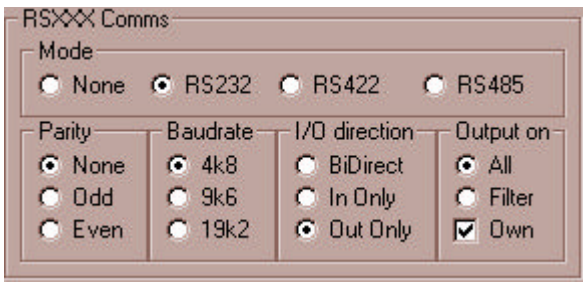
Push to talk controls

The push to talk input delay is only used on the master unit and is intended to allow time for external contacts connected to select input to settle before the push to talk active message is sent to other units on the system.

The push to talk output delay provides a delay between slave unit receiving the push to talk active message from the master unit and its push to talk output becoming active. This can be used top provide a delay for external decoding equipment to react.

The push to talk output can be set to “Global” which means that it will always follow the master DAI irrespective of the slave units select input; or it can be filtered in which case the slave units select inputs must match the master’s inputs before the push to talk output is actuated.

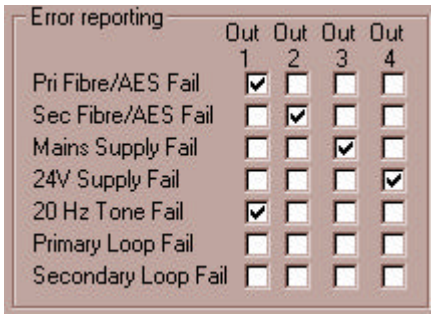
RSXXX comms



These settings control haw the RSXXX port operates. Mode, parity, baud rate and I/O direction select the basic operation of the port. When output on is set to all slave units will output serial data irrespective of the push to talk state of the unit. If set to filtered, serial

data is only outputted if the units push to talk output is active. The own option is only available when units are operating on a fibre loop. When selected a unit will echo back any serial input after it has been passed completely round the fibre loop.

Error reporting

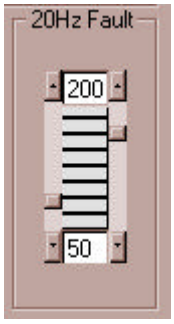


Selects which fault(s) appear on which fault output. They are

1. Pri Fibre/AES fail= the primary input fibre or receiving electronics has failed.
2. Sec Fibre/AES fail= the secondary input fibre or receiving electronics has failed.
3. The 240V mains supply has failed
4. The D.C. supply input has failed.
5. The twenty Hz microphone monitoring has failed.
6. Primary loop fail, a message sent via the primary fibre loop did not return back to the sending unit.
7. Secondary loop fail, a message sent via the primary fibre loop did not return back to the sending unit.

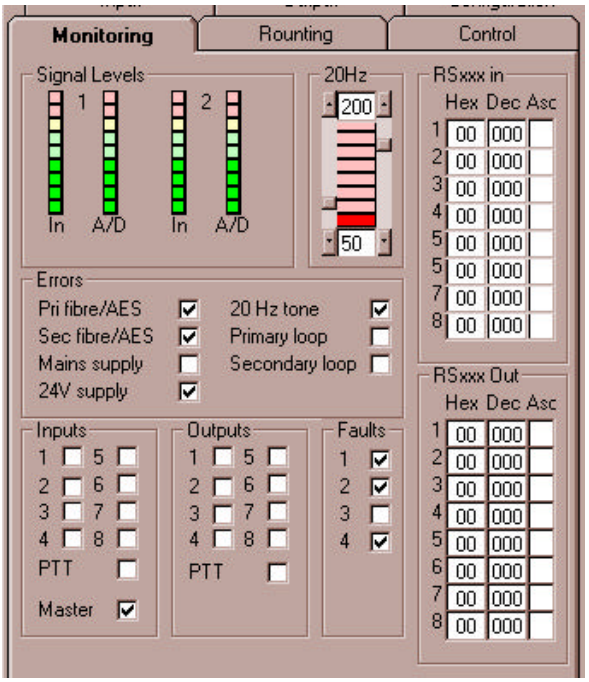
Any selected fault occurring will cause the appropriate fault output to go off.

If the twenty Hz sensing is selected the 20Hz level tool will be displayed.



When on line the central portion of the indicator will display the current level of the 20Hz signal. The two scroll bars should then be moved to provide an “OK” window around this level. The left scroll bar sets the minimum 20 Hz level and the right the maximum level. If the level goes outside these a Twenty Hz fault will be signalled.

Monitoring Tab



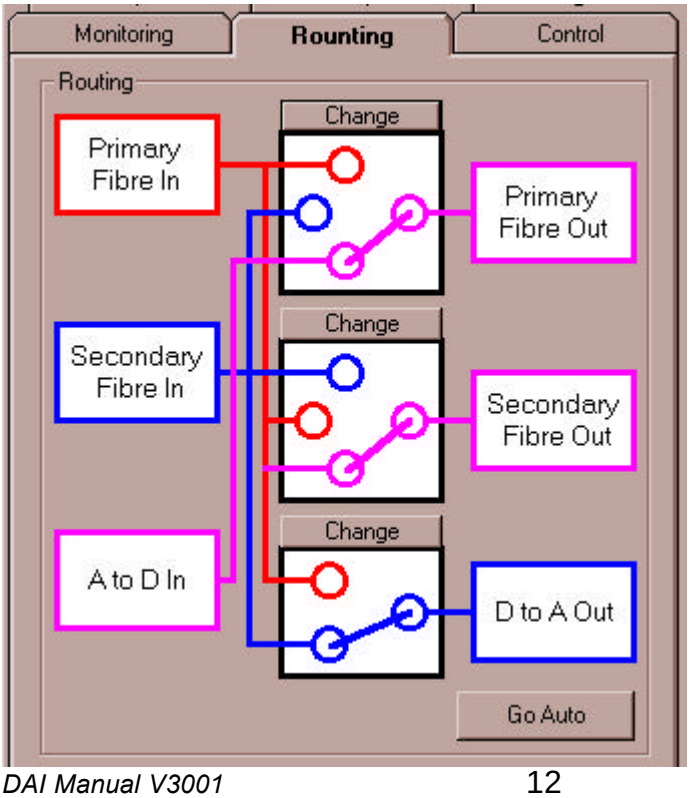
This tab is only available when the DAI is on line.
Displays are provided for

1. Signal levels are for both input both directly at the input and post input level and EQ block.
2. 20Hz fault detection level.
3. Current errors
4. Input levels for select inputs, push to talk and master.
5. Output levels for the select and push to talk outputs.
6. Fault output states.
7. The contents of the RSXXX input buffer displayed in HEX, decimal and an ASCII character. This displays the data received on the DAI's RSXXX input
8. The contents of the RSXXX output buffer displayed in HEX, decimal and an ASCII character. This displays the data transmitted via the DAI's RSXXX output.

Please note the RSXXX buffers are "circular" buffers i.e. the position of input/output data in the buffer does not have any specific meaning.

Routing Tab

This tab is only available when the DAI is on line.



Normally this tab indicates how the internal routing of the DAI is operating Clicking on "Go manual" allows the utility to directly control the units routing. When on manual control clicking on the change button above each switch will step that switch onto its next setting. Clicking on "Go Auto" will return the DAI to automatic routing. Manual routing control is only provided for testing and is not remembered by the DAI.

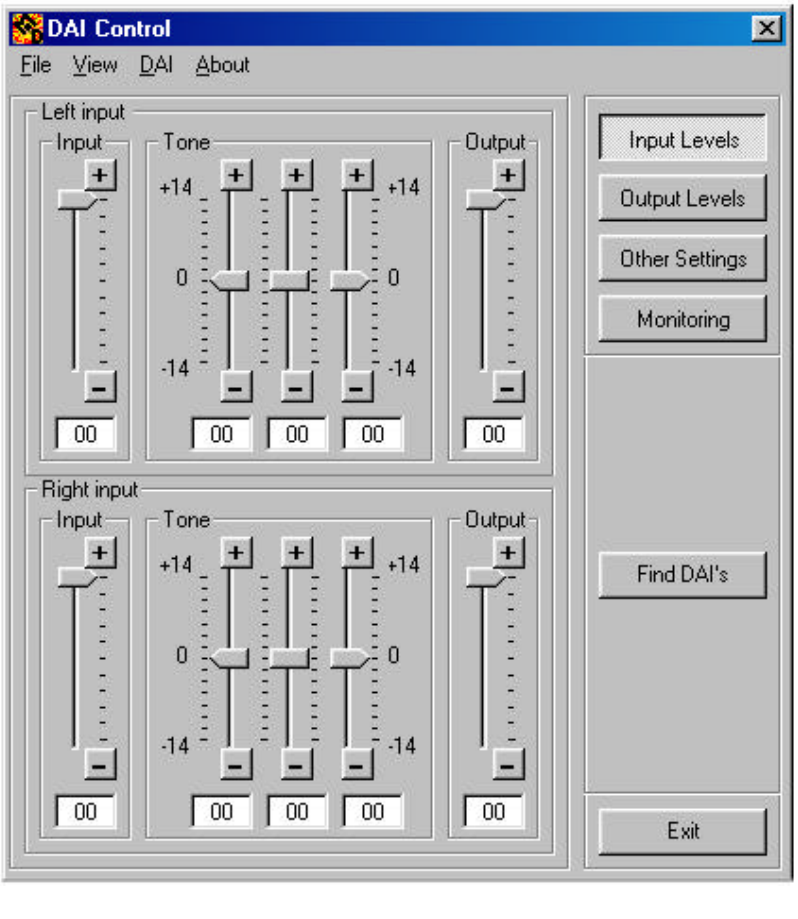
Menu

File menu

New	=	Reset all setting to default.
Open	=	Open an existing DAI file
Save	=	Save settings to current DAI file
Save As	=	Save settings to a new file
0: to 3:	=	List of previously used files
Exit	=	Close utility
About	=	Display utility information.

Input Levels

When on-line to a DAI, level meters appear next to the level controls.



Left = Input 1
Right = Input 2

Input Level
(Match to source)
0dBu to -30dBu

Input Equalisation

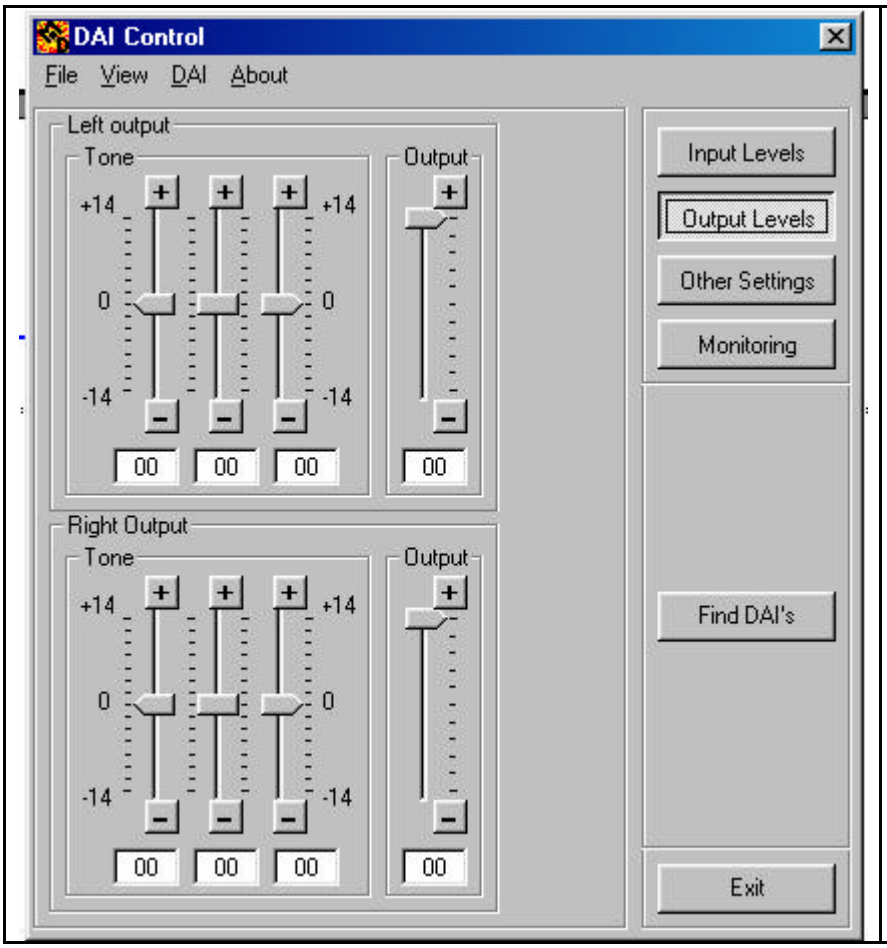
+/- 14dBu @
Low, 100Hz
Mid, 1KHz
High, 10KHz

Output Level

0dBu to –30-dBu

Adjust only if EQ causes overload on the output meter,

Output Levels



Left = Output 1
Right = Output 2

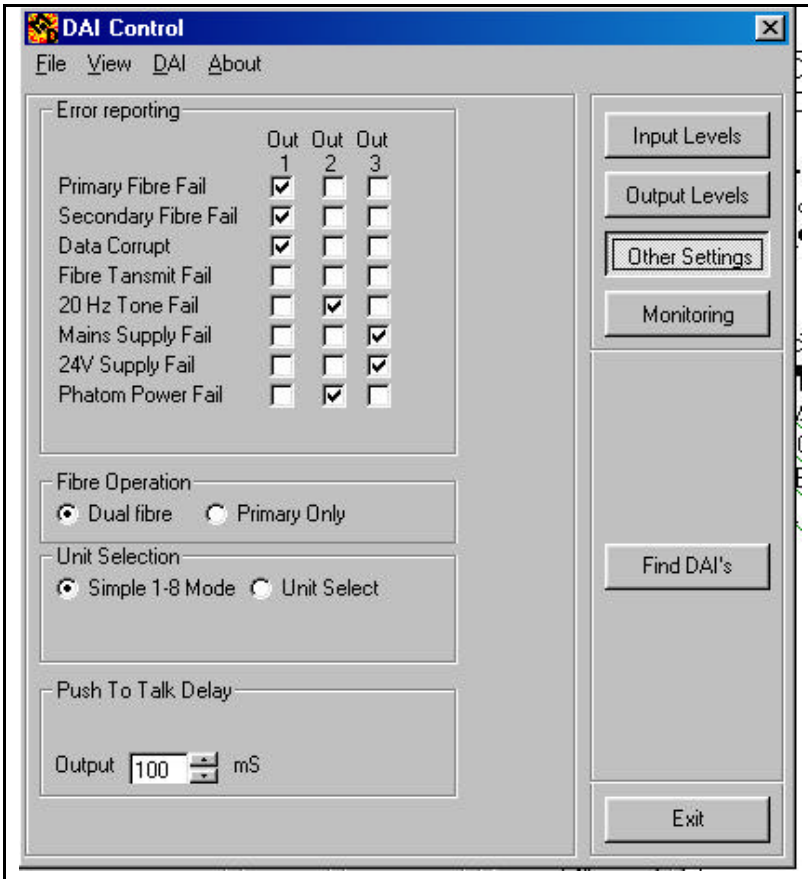
Output Level

0dBu to -30dBu

Output Equalisation

+/- 14dBu @
Low, 100Hz
Mid, 1KHz
High, 10KHz

Error reporting



Error Reporting

Controls which output the error message is sent to on the STATUS "D" connector.

Out1 = Status B
Out 2 = Status C
Out 3 = Status D

Status A is a general *SYSTEM GOOD* signal.

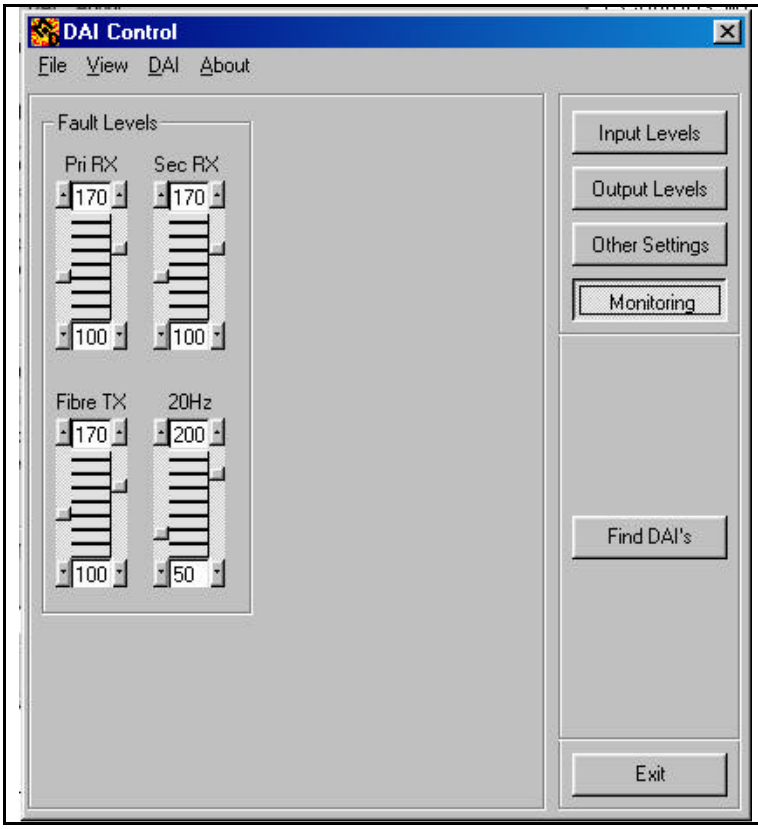
Errors are report to the status output when ticked.

Fibre Operation
Set for Dual or single fibres

Unit Select
For future Use.

Push To Talk Delay
Time delay to allow external hardware to settle.

Fault Levels

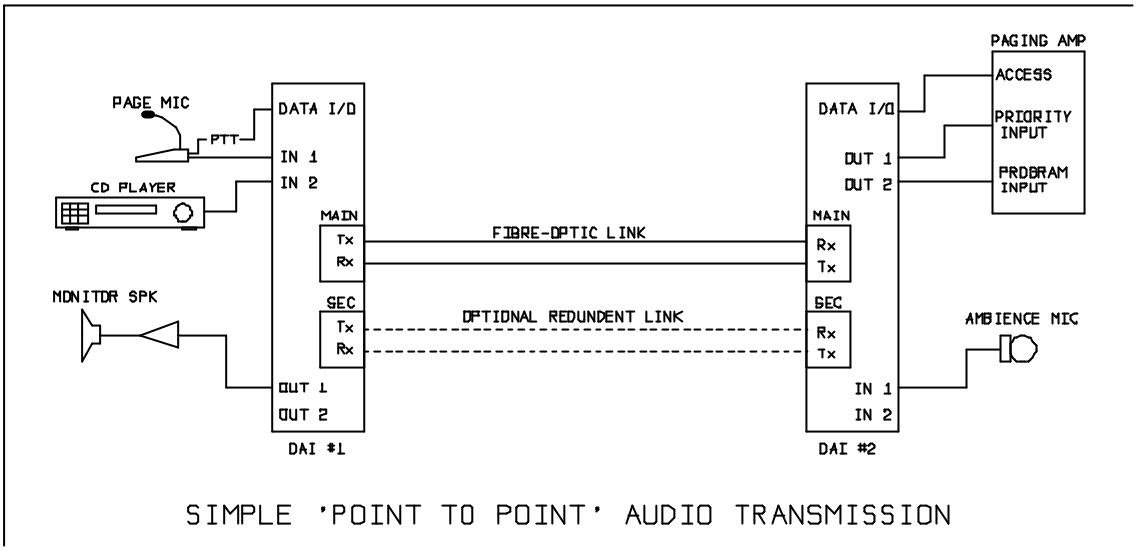


Fault Levels

These monitor the integrity of the fibre connection to assist with installation diagnostics.

Applications

App1:- Point to point audio



SIMPLE 'POINT TO POINT' AUDIO TRANSMISSION

In the above application a simple two station paging system is shown.

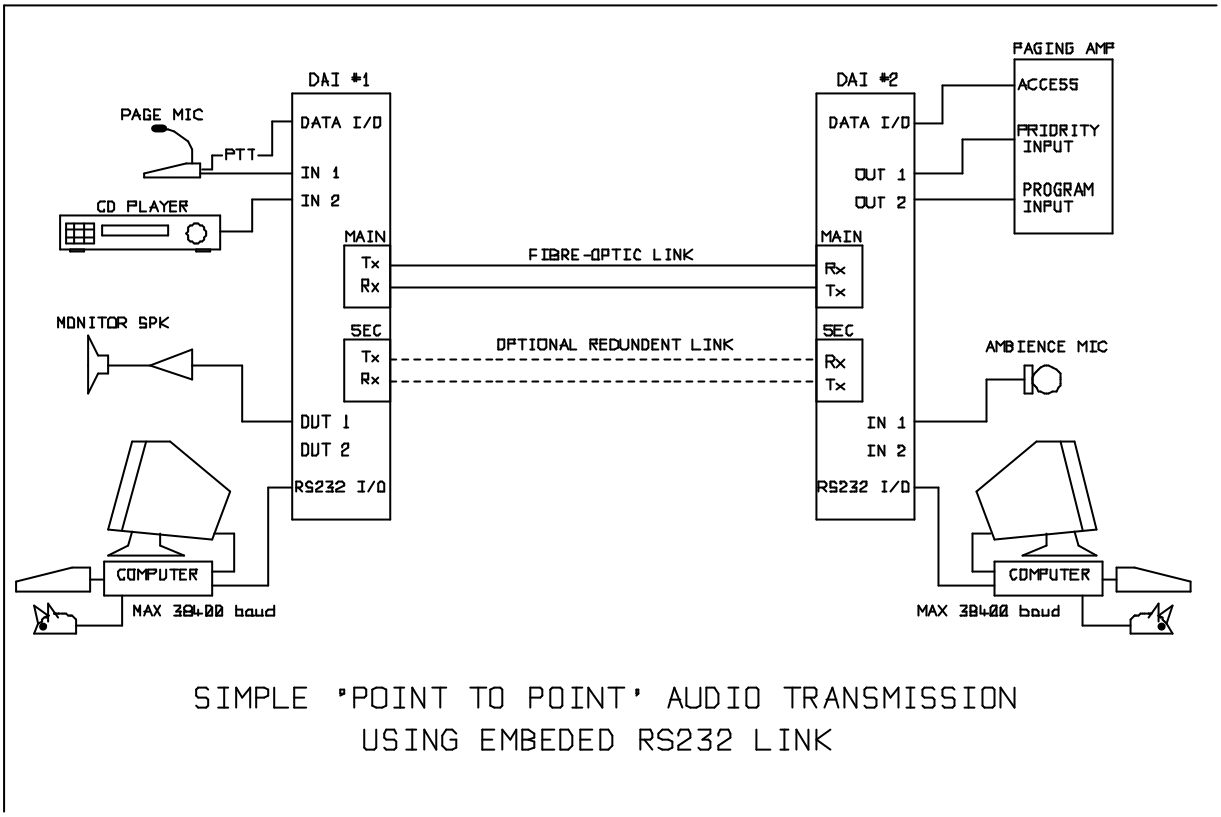
Input 1 of DAI #1 is configured for microphone operation and is used to carry the paging microphone. Input 2 is used to carry background music from a CD although this can be any line level source. DAI #2 is the remote receiver with its two line outputs feeding two inputs of a paging amplifier. Output 2 is used to carry background program signals to the paging amplifier whilst Output 1 is used to feed the priority channel that can either use VOX switching or more commonly a PTT status signal carried from DAI #1.

The return audio from DAI #2 back to DAI #1 is, in this application, used to provide the operator with a feed of ambience from the output zone. In reality the monitor speaker would be via a muting relay linked to the PTT on the microphone to mute the speaker when a page is in progress. A suitable output for this is provided on the DAI's control port.

The two return audio paths can be used for any purpose or dispensed with altogether allowing the lower mauve fibre to be eliminated unless status telemetry from DAI #2 is required for monitoring purposes.

In life safety and similar critical systems the use of the second redundant fibres is recommended.

App2:- Point to point audio and embedded Rs232



SIMPLE 'POINT TO POINT' AUDIO TRANSMISSION
USING EMBEDED RS232 LINK

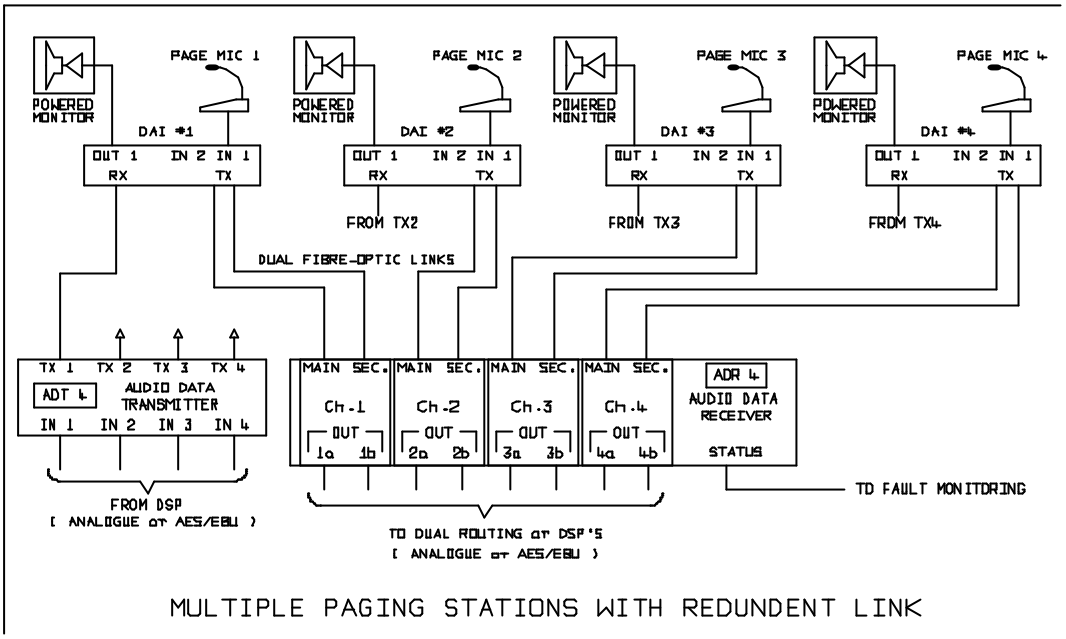
This application is identical to Application 1 but with the transparent data channel utilised.

This data channel, accessible from the Control port, provided a three wire RS232 interface between units. (5 wire RS422 available to order).

In a point-to-point system a computer or any other RS232 device running at any data rate to a maximum of 38,400 baud can be connected to allow a transparent transfer of data between two DAI's. For by-directional communications both primary fibres must be used.

In a ring topology (see application 4) data can also be carried. It originates at the Master DAI and loops at each intermediate DAI but is buffered to provide a RS232 output for control functions.

App3:- Multiple paging stations with redundant link



MULTIPLE PAGING STATIONS WITH REDUNDENT LINK

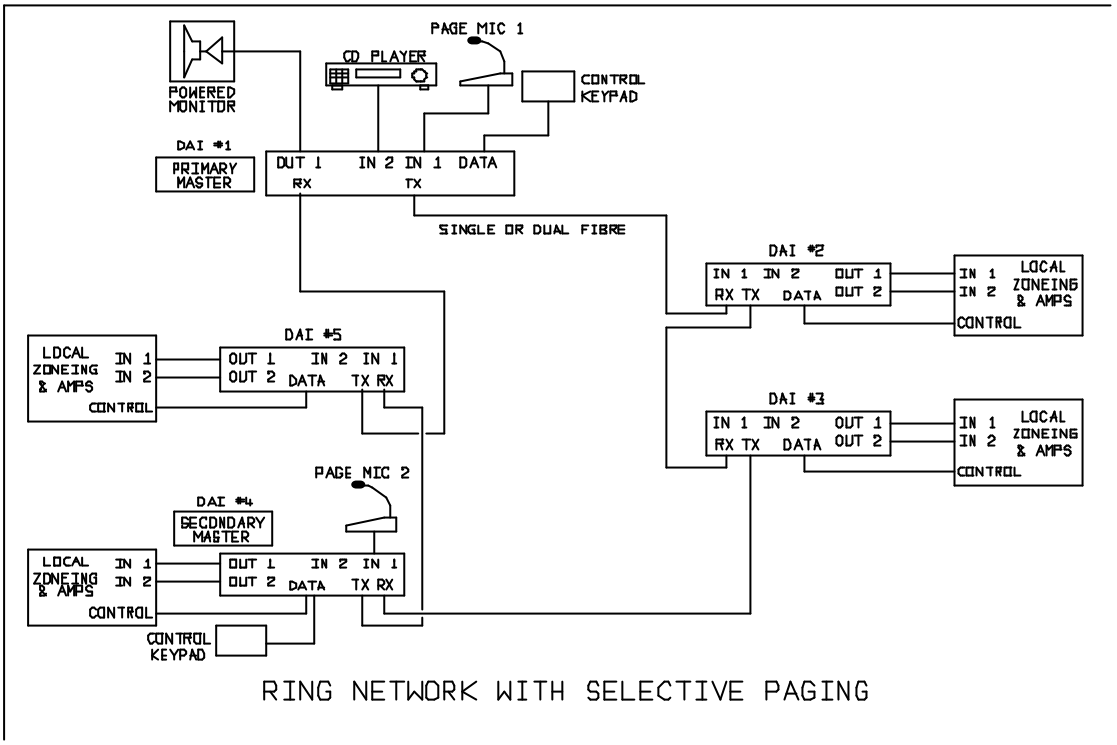
Application 3 is typical of a life safety system as used in Sports Venues, Exhibition Centres etc..

The DAI units are used to provide a monitored paging microphone and confidence monitor. The microphone is linked to a dedicated Audio Data Receiver (Ikon AVS model ADR4). Both the Primary & Secondary links from the DAI's are monitored as well as the remote DAI's status. Any faults are reported to the fault monitoring system via the ADR4. Whilst not show on the diagram, control data can be carried from the DAI's and independently accessed at the ADR4's control port.

The ADR4 provides two identical but buffered outputs of each incoming paging microphone designed to feed dual signal processing & routing systems. Two variants are available for the ADR4, one providing balanced line analogue audio (ADR4-A) and a second providing Digital outputs in AES/EBU format (ADR4-D).

Return audio data to the remote DAI's is generated in the Ikon AVS ADT4. As with the ADR4, two variants are available, ADT4-A analogue audio to fibre transmitter and the ADT4-D, AES/EBU to fibre transmitter.

App4:- Ring network with selective paging



RING NETWORK WITH SELECTIVE PAGING

The DAI's can be configured for operation as a simple ring system to provide a twin channel distributed audio & paging system. Normally a designated master station would originate both background music and paging information. Audio channel 2 (from input 2) would be distributed to all remote DAI's where it is fed into the non-priority input of paging amplifiers, routing matrixes etc.. The remote DAI's would be software configured to received incoming data and re-transmit the same data to the next node.

Audio Channel 1 (input 1) would be the paging microphone. In addition to the usual PTT push button a keypad would be included allowing selected zone(s) to be accessed. The remote DAI's would be similarly configured each with a unique zone code within the system.

The system supports dual fibre ring operation and can also support a Secondary Master DAI that can control the system in the event of a failure in the Primary Master DAI. The primary master will always take priority.

In the above example the primary master DAI is shown only with a monitor loudspeaker, this could be a full paging amplifier or similar as per the remote DAI's.

Full Status monitoring is available and can be accessed at each DAI for inclusion into a separate fault monitoring network.

The ring network also allows the use of the RS232 (or RS422) auxiliary data channel running at any data rate to a maximum of 38,400 baud.

The system can be configured in two modes:-

Loop Mode The default for ring operation allowing a RS232 data originating device to be connected at the Primary Master DAI with the transmitted data appearing at each remote DAI as a buffered RS232 output only. Normally used for control over serial routing matrixes or similar this expands the control access for remote zones allowing the remote matrix to sub zone & route the two audio channels.

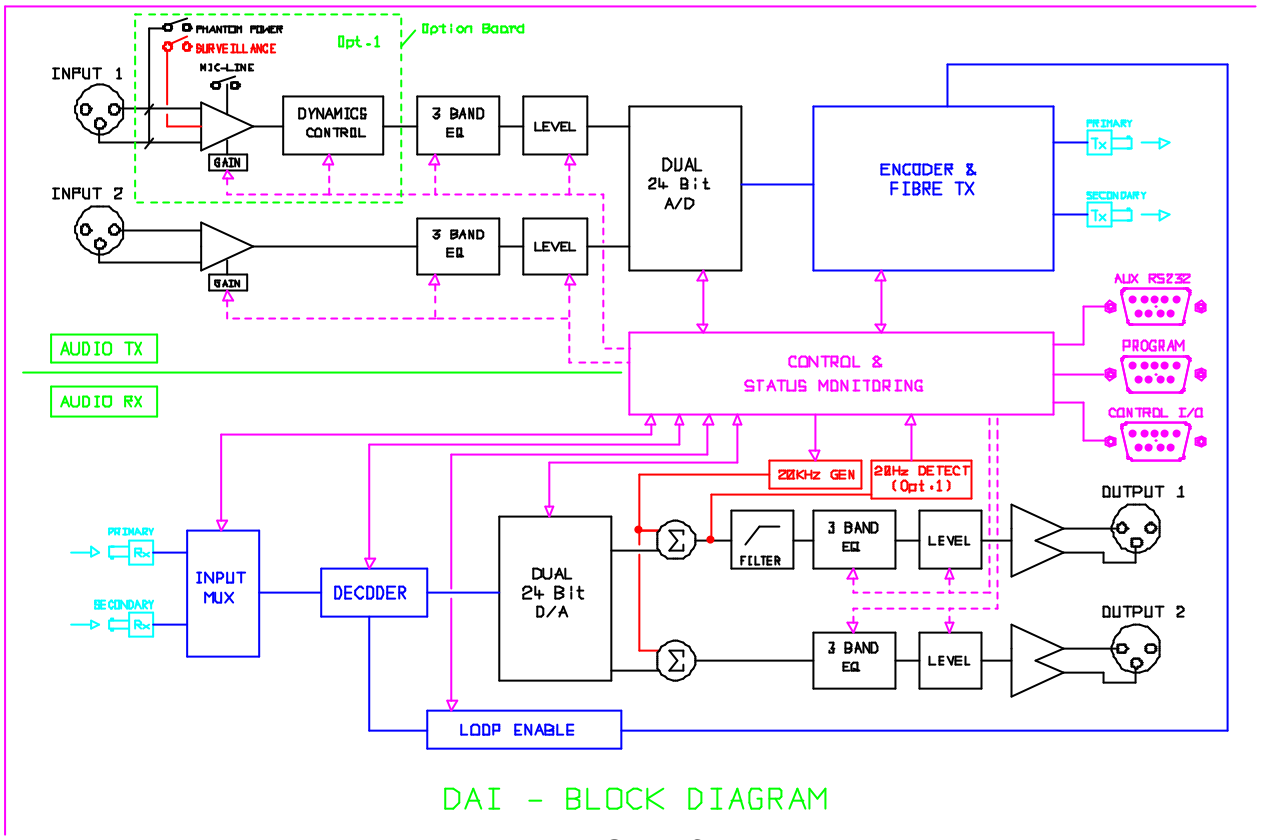
Through Mode At each DAI the incoming data is fed into an external RS232 device for processing and control. The external device will, after appropriate processing, send RS232 data onto the next DAI and associated RS232 device.

A combination of both methods is possible as would be required if a two master system was to be used.

The user RS232 data is carried around the ring on the same fibres as the audio and is in addition to any control and status monitoring data.

Appendix A

Internal block diagram



DAI - BLOCK DIAGRAM

Engineering Specification

	Analogue Input 1	Analogue Input 2
Type	Electronic Balanced	Electronic balanced
Impedance	10K ohms, (Optional Mic: 5K ohms)	10K ohms
Sensitivity	Mic: -50dB to -20dB Line: -10dB to +10dB	Line: -10dB to +10dB
Phantom Power	+24V	-
Equalisation	HF: +/- 14dB @ 10KHz MF: +/- 14dB @ 1KHz LF: +/ - 14dB @ 100Hz	HF: +/- 14dB @ 10KHz MF: +/- 14dB @ 1KHz LF: +/ - 14dB @ 100Hz
Max input level	+12dB	+12dB
Attenuation Range	0dB to –48dB in 1dB steps and Mute	0dB to –48dB in 1dB steps and Mute

Outputs	Digital Audio Processing	Overall
Type: Electronic Balanced	A/D: 24 bit 64x oversampling	Freq. Resp.: 20Hz to 20KHz +/- 1dB
Impedance: 150 ohms	D/A: 24 bit 8 x oversampling	THD + Noise: < 0.05%
Max Level: +10dBu	Sample Freq.: 48KHz	S/N Ratio: Better than 98dB A Weighted.
EQ: As Inputs		
Level Range: As Inputs		

Appendix B

Current consumptions

Mains Operation

Quiescent current	45mA
Inrush current	450mA

Mains Fuse = T500mA, 250V

24V DC Operation

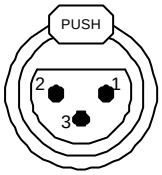
Quiescent current	500mA
Inrush current	>1.2A

Appendix C

Audio Connections

Analogue Inputs

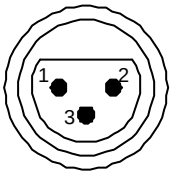
Dual analogue line level inputs are provided with programmable three band EQ and Level.



1 Ground
2 Hot (Phase)
3 Cold (Anti-Phase)

Analogue Outputs

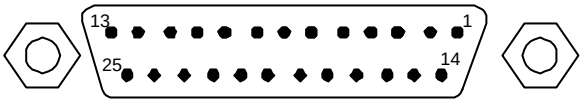
The two analogue balanced outputs are each fitted with programmable three band EQ, Level and Mute. Both outputs can have an adjustable 20KHz surveillance tone mixed with the audio signal.



1 Ground
2 Hot (Phase)
3 Cold (Anti-Phase)

Data I/O

Simple data connections to support selective paging and channel routing are incorporated accessible for the Control Port.



25W 'D' Remote Socket	Description	Comment
1	In 0	For use with external push buttons etc. Link to 0V to activate.
2	In 1	as above
3	In 2	as above
4	In 3	as above
5	In 4	as above
6	In 5	as above
7	In 6	as above
8	In 7	as above
9	In PTT	as above
10	Master	Link to 0V on master unit only.
11		
12	0V	
13	0V	
14	Out 0	Open Collector <30v 100ma
15	Out 1	Open Collector <30v 100ma
16	Out 2	Open Collector <30v 100ma
17	Out 3	Open Collector <30v 100ma
18	Out 4	Open Collector <30v 100ma
19	Out 5	Open Collector <30v 100ma
20	Out 6	Open Collector <30v 100ma
21	Out 7	Open Collector <30v 100ma
22	Out PTT	Open Collector <30v 100ma
23		
24	+12V DC	
25	0V	

All inputs are designed to 'pulled down' to 0V via an electrically isolated contact.

All outputs are open collectors.

A DAI is defined as the system master when then the Master Input is grounded, if it is left open the unit operates as a Slave. The Master Input is tested during power up; it is ignored the rest of the time.

The select inputs can be used in three ways

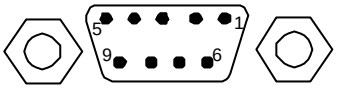
1. Digital inputs, which are mirrored on all other units in the system.
2. Group inputs, used in conjunction with push to talk filtering. Each slave unit is programmed a member of eight groups, i.e. if input 1 is grounded it is a member of group 1, if 2 than a member of group 2 etc. A slave can be a member of more than one group. The select inputs on the master unit then define which group is active when the push to talk input is activated. I.e. if input 1 is active on the master when its push to talk input is activated will activate the push to talk output on all slave units whit input 1 activated. Multiple inputs on can be activated at the same time to select several groups at the same time.
3. Binary inputs. This is similar to the group mode but the first 7 inputs are used to provide a binary unit address both for the slave and master units. Only one slave can be selected at any time.

The “push to talk” input is only monitored on a master DAI. It’s state is transferred to the “push to talk” outputs on the other units in the system. Operation of the push to talk output can be configured to operate globally, i.e. follows the master input, or filtered in which case it will only actuate when a specific DAI is selected using the select inputs. Configurable delays are available on both for the push to talk inputs and outputs, to allow contacts to settle.

The select outputs on all units follow the states of the master DAI select inputs.

RS Port

This port provides a serial data channel, it can be configured to RS232, RS422 or RS485 levels with baud rates of 4800, 9600 or 19,200, which is carried transparently over the same network as the audio.



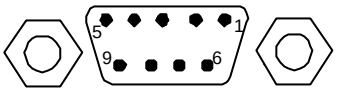
9 Pin 'D' RS232	Description	Comment
1		
2	Tx	Data from DAI to external equipment
3	Rx	Data from external equipment to DAI
4		
5	Signal Screen	
6		
7		
8		
9		

9 Pin 'D' RS422	Description	Comment
1		
2	Tx A (Y)	Data from DAI to external equipment
3	Rx A (Y)	Data from external equipment to DAI
4		
5	Signal Screen	
6		
7	Tx B (Z)	Data from DAI to external equipment
8	Rx B (Z)	Data from external equipment to DAI
9		

9 Pin 'D' RS485	Description	Comment
1		
2	A (Y)	Link to pin 3
3	A (Y)	Link to pin 2
4		
5	Signal Screen	
6		
7	B (Z)	Link to pin 8
8	B (Z)	Link to pin 7
9		

Fault outputs

These provide four open collector outputs that can be used to signal various fault conditions detected by the DAI



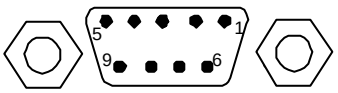
9 Pin 'D' Status Output	Description	Comment
1	Connected to 2,3,4,5	
2	Connected to 1,3,4,5	
3	Connected to 1,2,4,5	
4	Connected to 1,2,3,5	
5	Connected to 1,2,3,4	
6	Open collector O/P status 1	100ma current sink
7	Open collector O/P status 2	100ma current sink
8	Open collector O/P status 3	100ma current sink
9	Open collector O/P status 4	100ma current sink

All outputs are open collectors and are normally on when no faults are present.

The Status Output is designed to fit into a DRS input socket on Ikon AVS fault monitoring system products.

Configuration port

This is a standard RS232 port brought out on a 9 pin Dee connector on the front panel, it is used to configure the DAI's operation.



PC End Female 9 way D		**DAI End Male 9 way D**
Pin 2	-	Pin 2 Tx
Pin 3	-	Pin 3 Rx
Pin 5	-	Pin 5 Ground

Front Panel indicators

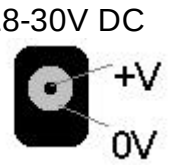
Four LED's on the front panel provide indication of the DAI's operation. The Primary/Secondary RX LED's will be illuminated when a valid signal is being received on the appropriate fibre. The Primary/Secondary TX LED's will be illuminated continuously when the DAI's is transmitting normal data. The TX LED's will flash if they are transmitting data from the other fibre when using dual fibres and one of the fibres has failed.

Mains Power inlet.

This requires 240V 50Hz. The station's mains fuse (T500mA 20mm) is mounted within this connector. The fuse carrier also contains a spare fuse. The status of the mains input can be included in the fault monitoring.

D.C. power inlet.

In the case of a mains supply failure the supply (24V+/-1V @1A) provided via this connector will be used instead. The plug is a standard D.C. connector with 2.5mm internal diameter, 5.5mm external and 14mm long. The central pin is the positive connection. The status of the D.C. input can be included in the fault monitoring.



Electromagnetic Compatibility

This equipment has been designed, manufactured and tested to conform to the European EMC directives EN55103-1 & EN55103-2 for classifications E2 and E4.

Limitations as to use:

1. The specified equipment is to be mounted into an earthed, steel equipment rack and not mounted adjacent to RF receiving equipment.

2. Only approved Screened Audio cable terminated with suitable connectors are used for Audio interconnecting .

Manufacturers Information

The DAI is manufactured in England by IKON AVS Ltd.

For service or warranty advice please initially contact your supplier. Alternatively contact the manufactures at:-

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DY10 4EU

Telephone:
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