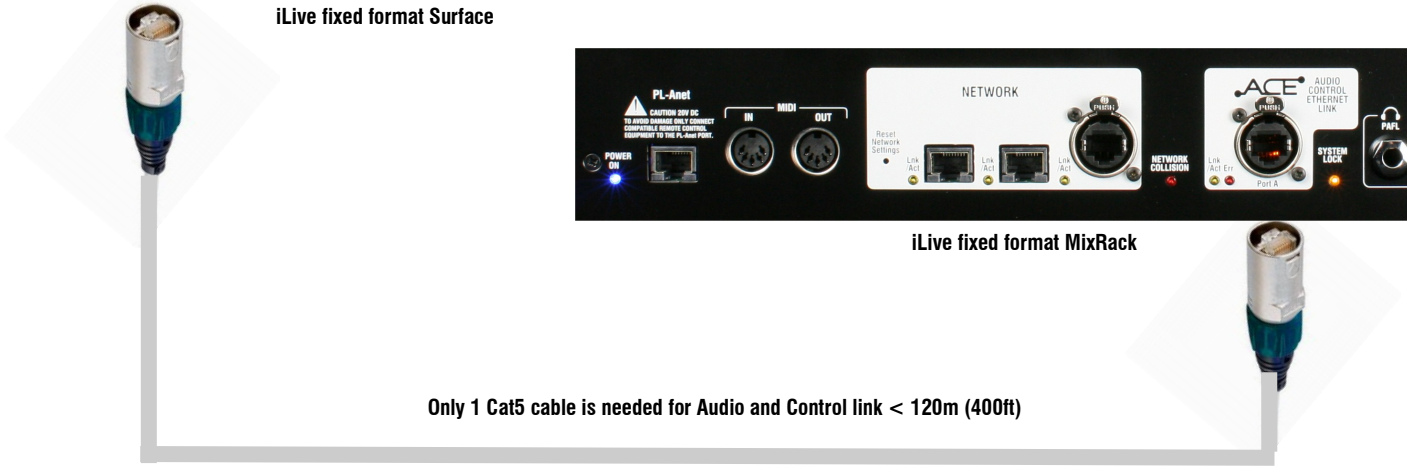
UNDERSTANDING ACE™

ACE stands for 'Audio & Control over Ethernet' and is a point to point link, created and developed by Allen & Heath.
ACE can be used as a link between iLive MixRack and Surface and also for expansion to other iLive or GLD systems.
iLive fixed format systems are shipped with a built in ACE single connection which allows the mixing surfaces (T112, T80, R72) to be linked to iDR-16/32/48/64 MixRacks using standard Cat5e cable. This link provides two things:
1) Network connection from the surface (with its built-in touchscreen computer), to the MixRack, where the DSP mix-engine is located.
2) Two-way audio link, so that inputs and outputs (analogue & digital) at the rear of the mixing surface can be patched to the processing input channels and mixes, or used as insert points. The console's monitoring section (PAFL) and Talkback also uses channels in the ACE link.

iLive fixed format Surface

The ACE connection is an RJ45 (standard network port) and also takes the rugged Neutrik 'Ethercon' which provides additional strain -relief and protection for the touring environment.
Systems are shipped with one 3m (10ft) Cat5 cable fitted with 'Ethercon' housings.

iLive fixed format MixRack



Only 1 Cat5 cable is needed for Audio and Control link < 120m (400ft)

If a traditional copper multicore 'snake' and returns system for 'Front of House' is to be used, then the MixRack can be located near to the mixing surface, and only a short Cat5 ACE link is needed. Alternatively, a longer Cat5 cable can be used to allow the MixRack to be located on stage, where it can function as the 'stage-box' (Mic inputs) and 'returns' system (PA, and stage monitor outputs). Surface controls can be used to adjust the processing system in the MixRack. 'Local' input and outputs which can be patched to the MixRack's 64 DSP input and 32 mix channels are located on the rear of the surface. PAFL monitoring with local and headphones outputs, plus talkback feature are provided and use the ACE link to carry the audio signals between the MixRack and the console surface. Midi is available at the MixRack and the Surface, being 'tunnelled' over the ACE network bridge.

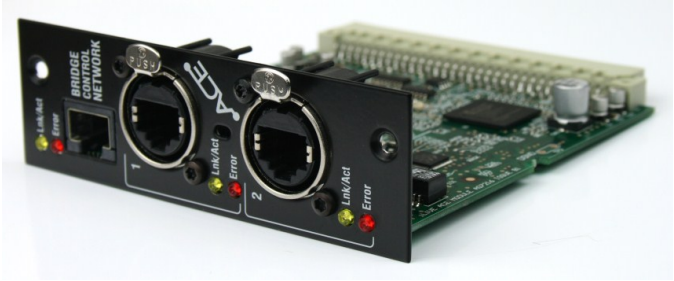
Cables up to 120m (400ft) in length can be used, but see our recommended & tested cables as published on our website.
Allen & Heath cannot guarantee the performance & reliability of the iLive 'ACE' system using Cat5 cables which we have not tested or recommended. Premium touring-grade flexible cables are preferable for live PA work . This includes the short 'Network Bridge' jumper cable if used with M-ACE option. Allen & Heath can supply an 80m Neutrik 'Etherflex' cable on a drum (AH7000), and a 120m Klotz cable drum (AH8721).
Once the ACE link is connected and the system is powered up, then LEDs near the ACE ports will show **Link Act**ive and **Err**or status. Providing the network addresses of the system (MixRack, Surface, & Touch-screen computer) are compatible, then the touch-screen screen will show additional system information. Once the Net Bridge is established over the ACE link then there will be a green tick √ shown on the surface link area of the touch-screen status window. A red cross X indicates bridge connection errors. A 'traffic light' system of coloured dots is provided to display detected errors. System Lock refers to the selected digital audio clock sync source, by default the MixRack internal master.

ACE protocol information

Point to point.
Cable: Cat5e T568A & T568B twisted pair, length up to 120m (400ft). Not all cables reliable at max length - see FAQ & website.
ACE is Ethernet 802.3 IEEE Layer 2 compliant (can use Layer 2 network switches or managed switches).
Note: maximum cable length is 100m(333ft) when connecting over a switch, but this could act as a repeater giving max 100m (333ft) x 2.
48kHz sample rate, 24-bit depth.
64 channels bi-directional PCM audio + 9.6 Mbit/s network control.
ACE network latency <105uS (5 samples).
Redundancy with no audio dropout switchover (zero packet loss) with M-ACE option module.

M-ACE MODULE

An optional ACE card is available to link iLive and/or GLD systems together. Typically this may be desired for front of house / monitor systems where digital splits of the mic preamps in system A are sent over a Cat5 cable to system B, where independent trim, EQ, processing, FX, and mix-bus structure can be used for the stage musician's foldback.



M-ACE gives access to 64 input and 64 output channels and can be fitted to:

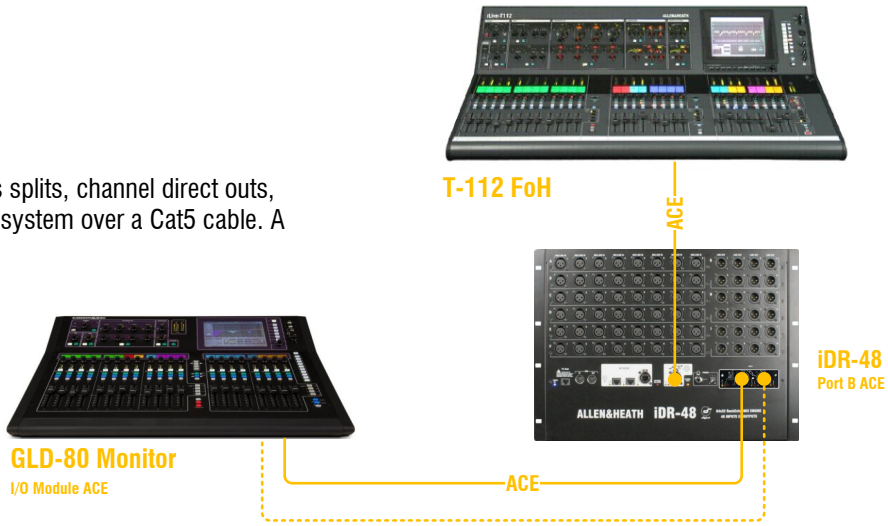
- Port B expansion slot in iLive fixed format MixRacks (iDR-16, iDR-32, iDR-48 & iDR-64) or expander (xDR-16)
- Port B and/or Port A of iLive modular MixRacks (iDR0, iDR10) if fitted with the RAB-2 standard.
- Port A of iLive modular Surfaces 80/112/144/176 if they are fitted with the new RAB-2 standard.
- I/O Module slot in GLD-80.

The M-ACE option module can be fitted easily; it is installed (front-mounted) with the power off, and has two screws to secure it in place. Two ACE links are provided offering a 'zero-packet loss' changeover in a two-cable system.

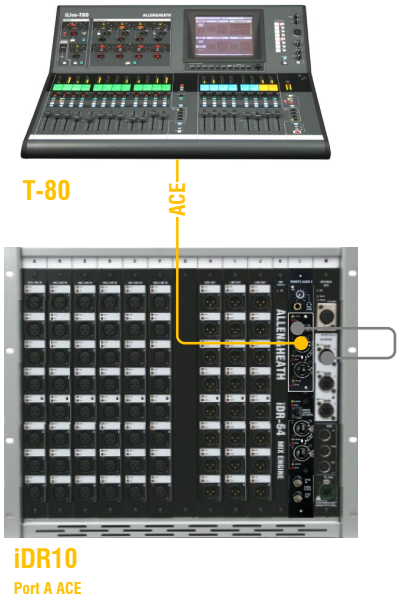
APPLICATION EXAMPLES

64 channel digital split

ACE bi-directional link carries digital mic preamps splits, channel direct outs, and mix signals to be made available to the other system over a Cat5 cable. A second cable can be used for redundancy.



Mix n Match fixed format and modular iLive

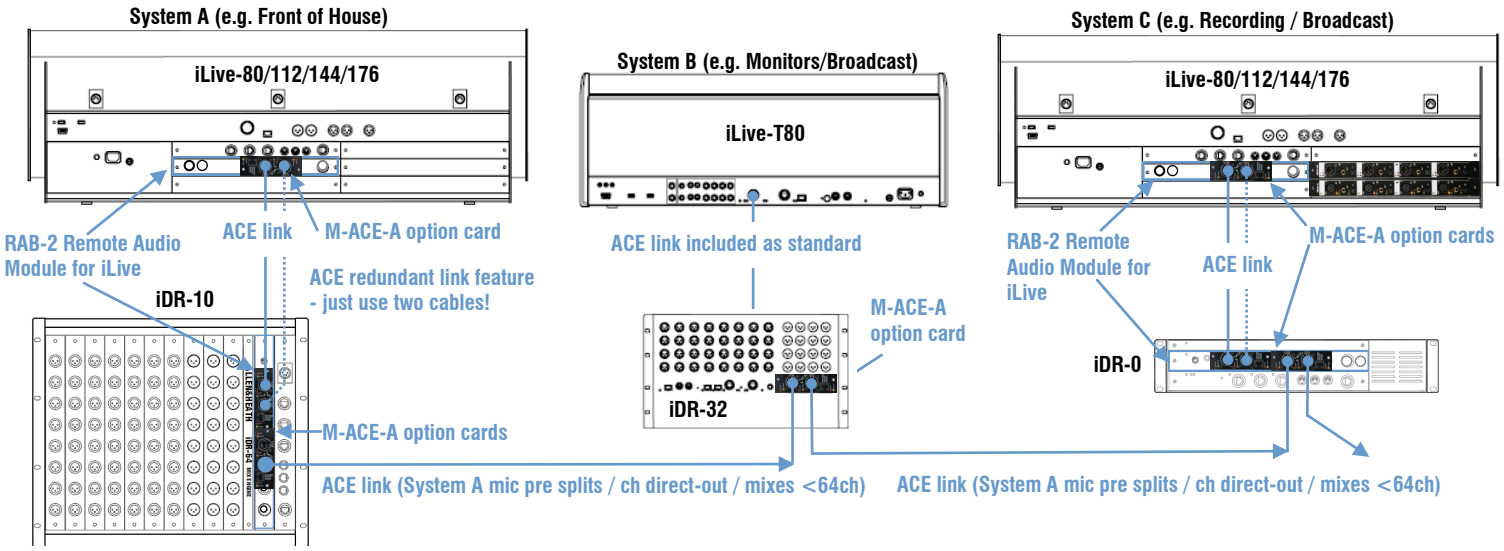


Equipped with RAB-2, an iDR-10 MixRack can be fitted with M-ACE allowing iLive fixed format link for flexible, hybrid systems.

Equipped with RAB-2, an iLive modular Surface can be fitted with M-ACE allowing iLive fixed format link for flexible, hybrid systems.

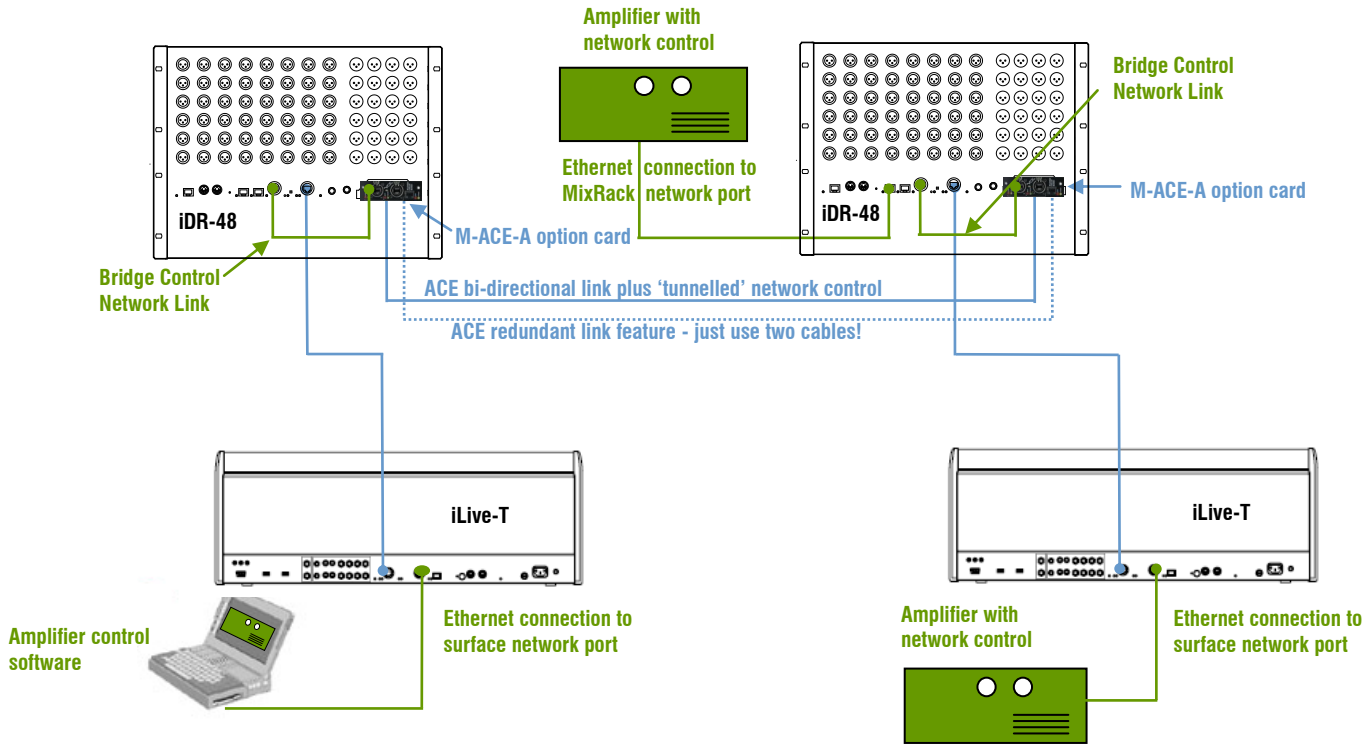
Cost effective audio distribution

Systems can be mixed and matched with a choice of audio link and networking options. Up to 64 mic pre split & other signals from System A can be independently processed by the other iLive digital mixing systems (B,C) on the network using M-ACE option cards fitted to MixRacks.



Tunnelling control data over ACE

For useful distribution of control on site, Ethernet devices can be plugged into iLive Surface / MixRack network ports connected to the ACE 'Bridge Control Network'.



Note - Network bandwidth for third party data is limited to 10Mbit/s. All IP addresses on the network must be unique.

ACE FAQs

Q: Can I use ACE over network routers or WiFi?
A: ACE is not compatible with network routers or WiFi.

Q: Can I record from ACE?
A: Not directly; ACE is 'point to point' so is used to transport audio between two A&H ACE devices such as MixRacks, control surfaces or GLD mixers. These could provide analogue or digital outputs for recording depending on the options fitted.

Q: Can I extend the ACE connection using a network switch?
A: Network switches can be used to 'bridge' the ACE link between systems. The maximum cable run is 100m (333ft) to / from an Ethernet switch so could provide up to 200m (666ft) between racks or surface. ACE complies with 802.3 IEEE (Ethernet) Data Link Layer 2 standards and therefore works with other network devices[1]. We suggest you try an Ethernet switch and check for errors / cable-length before you buy it[2].

1. Some IEEE layer 3 & 4 protocols can interrupt ACE data or cause audible clicks. We recommend turning of layer 3 & 4 functions in a managed switch or use a layer 2 switch. The following protocols can interfere with ACE: Spanning Tree, Tagged egress packets, Broadcast storm protection. No other network devices can be plugged into a switch carrying ACE data unless a dedicated VLAN is set up exclusively for ACE.
2. Suitable managed switches are: Netgear FSM726S, Level One GSW-0841 Web Smart switch (with fibre optic option).

Q: Can the Surface to rack ACE link connection have redundant auto-back-up?
A: With iLive modular surfaces (iLive80/122/144/176) and MixRacks (iDR0 and iDR10) equipped with RAB-2, the M-ACE-A option module provides auto change-over redundant feature (zero packet-loss). This means two cables can be run between MixRack and Surface, each carrying Audio and Control. Should one cable connection be broken, the audio and control will continue to run seamlessly. Status and error information will be displayed on the surface touch-screen home page.

Q: Can 3rd party Ethernet data e.g. DMX-over-Ethernet, amplifier/speaker control systems / compressed video be 'tunnelled' down ACE?
A: Any 100 Mbit/s Ethernet device can be plugged into the network ports which form part of the AH-Net control network. In the case of fixed format surfaces and MixRacks, these sockets are already connected internally to the ACE primary link. In the case of M-ACE option modules, the 'Bridge Control Network' port will typically be connected to the MixRack network switch by a short CAT5 patch lead (included with ACE module). Either way, 3rd party devices can communicate with each other through the ACE link. Network control bandwidth is limited to about 10Mbit/s.

Q: What cables would you recommend for a touring iLive system using ACE?
A: Allen & Heath can supply 80m touring grade reel of Neutrik Etherflex cat5e (AH7000) and a 120m touring grade reel of Klotz (AH8721). Please refer to our website for a list of tested and approved cables which meet the required EMC standards and connect ACT up to 120m.

Q: How do the xDR expanders connect to the iLive system?
A: An M-ACE option card is fitted to the port-B of the master MixRack of the iLive system. A short Cat5 jumper cable is used to bridge the network on the MixRack to the M-ACE network bridge port. One xDR-16 expander can be connected using a Cat5 cable (<120m) to Link 1 of the M-ACE card. This operation is 'plug-n-play'. A second expander can be connected to Link 2 but its IP address will need to be set accordingly. MixRack port-B ACE redundancy should be set to OFF. xDR expanders have dedicated ACE ports to connect them to the M-ACE card in the master MixRack. They also have a port-B option slot for further system integration. Please consult the xDR-16 Getting Started guide AP8331 for further information.

Q: What are the ACE 'Redundancy' settings and what do they mean?
A: These are found in the MixRack Preferences on the iLive touch-screen and Editor menus, or Setup menu in GLD.

Redundancy On is used for two cable redundant backup with automatic switch between 1&2 on cable error. It is typically used for a 64ch digital mic split, iLive Dual-Rack setup or Surface to MixRack link (modular iLive only).

Redundancy Off: In1-64 from Link1 - Link 1 on the card can be used for a one-cable 64ch digital mic split, iLive Dual-Rack setup or connection of an xDR-16 with 48 inputs coming from the expander's Port B. Link 2 can be used for 64ch daisy chain to other ACE devices.

Redundancy Off: In1-32 Lnk1, 33-64 Lnk2 - Link 1 on the card can be used for a once-cable 32ch mic split, iLive Dual-Rack setup or connection of an xDR-16 with 16 inputs coming from the expander's Port B. Link 2 can be used for 64ch daisy chain to other ACE devices or connection of a second xDR-16 with 16 inputs coming from its Port B.