

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 MixRack and Surface and also for expansion to other iLive / iLive-T systems.

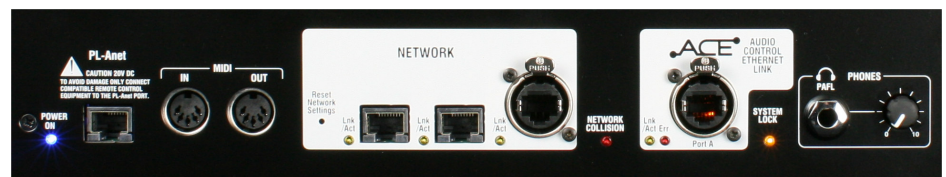
iLive-T systems are shipped with a built in ACE single connection which allows the mixing surfaces, iLive-T112 or iLive-T80 to be linked to iDR-32 or iDR-48 MixRacks using standard Cat5e twisted pair cable. This link provides two things:

- 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.

The ACE connection is a 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.



T-Surface connections



T-MixRack connections

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 in the FAQ, and 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).

Once the ACE link is connected and the system is powered up, then LEDs near the ACE ports will show **Link Active** and **Error** 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

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 (so 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.

ACE network latency < 105uS (5 samples).

MixRack analogue input to surface analogue output is 1.1mS

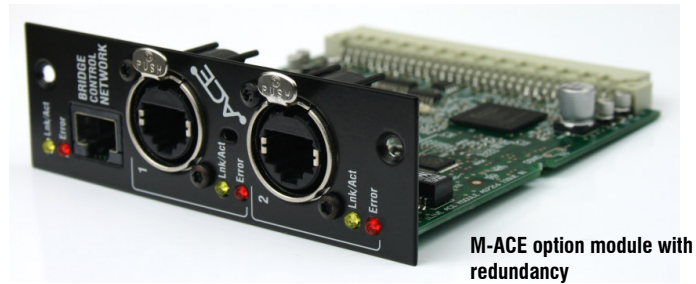
64 channels bi-directional PCM audio + 9.6 Mbit/s network control.

Redundancy with no audio dropout switchover (zero packet loss) option module for T-MixRacks Port B and iLive RAB2 MixRack & Surfaces.

M-ACE MODULE

An optional ACE card is available to link iLive 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. The 'M-ACE' option module can be fitted to the expansion slot in iLive-T MixRacks (iDR-32 & iDR-48) It can also be fitted to iLive MixRacks (iDR-0, iDR10), and iLive surfaces 80/112/144/176 if they are fitted with the new RAB-2 standard with appropriate firmware version installed (from V1_50).

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. This may be desirable for the Surface MixRack link in iLive Pro-Touring systems equipped with the new RAB-2.



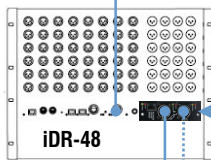
M-ACE option module with redundancy

System A (e.g. Front of House)



ACE provides bi-directional audio link to allow inputs / outputs at the surface to be patched to processing input channels and mixes in the iDR MixRack DSP. Surface PAFL busses, and TB are carried in one Cat5 cable. This Surface controls one MixRack

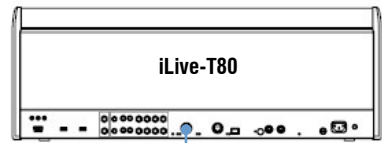
ACE Surface link included as standard



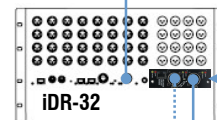
M-ACE-A option card

ACE redundant link feature - just use two cables!

System B (e.g. Monitors, Broadcast, Recording)



ACE Surface link included as standard



M-ACE-A option card

ACE 64 channel 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.

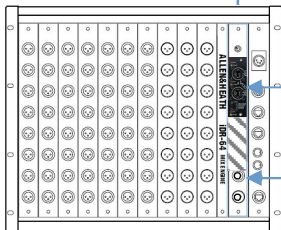
T-SERIES ACE APPLICATION



ACE Surface link

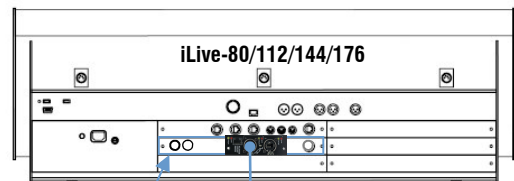
Equipped with the new RAB-2, and V1_50 firmware, an iDR-10 MixRack can be fitted with M-ACE option card allowing iLive-T ACE link for flexible, hybrid systems

iDR-10



M-ACE-A option card

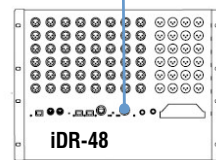
RAB-2 Remote Audio Module for iLive



ACE Surface link

RAB-2 Remote Audio

MIX n MATCH
iLive + iLive-T



iDR-48

Equipped with the new RAB-2, and V1_50 firmware, an iLive surface can be fitted with M-ACE option card allowing iLive-T ACE link for flexible, hybrid systems

ACE FAQs

Q: Can I use ACE over network hubs or WiFi?

A: ACE is not compatible with network hubs or WiFi.

Q: Can I record from ACE ?

A: Not directly; ACE is 'point to point' so is used to transport audio from the "mixer" - the iDR MixRack DSP brain, to another MixRack or control surface which could provide analogue, digital or ADAT outputs depending on the type and 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. However some IEEE standards applicable to some switches can interrupt ACE data. Some layer 3 & 4 protocols could cause audible clicks, so 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. Suitable managed switches are:

Netgear FSM726S.

Level One GSW-0841 Web Smart switch (with fibre optic option).

We suggest you try an EtherNet switch & check for errors / cable-length before you buy it, please let us know details of any proven hardware.

Q: Can the surface to rack ACE link connection have redundant auto-back-up?

A: With iLive surfaces (iLive80/122/144/176) and MixRacks (iDR-0 and iDR10) equipped with RAB-2, the M-ACE-A option module can be fitted which has two ACE links with 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. iLive-T surfaces and the iDR-32 and iDR-48 MixRacks have a single ACE MixRack to Surface (port A) connection, if you require redundancy for this cable link, then managed switches should provide this capability.

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 Bridge Control Network in ACE. In the case of the iDR32/48, and T-112/80, the sockets are already connected internally to the on-board Ethernet switch in each of the units. In the case of a RAB-2 M-ACE module, the 'Bridge Control Network' port will typically be connected to the iDR MixRack CPU 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 by plugging into a network port on the iDR or iLive CPU. Network control bandwidth is limited to about 10Mbit/s. Minus about 2Mbit/s for the iLive control traffic.

Q: What cables would you recommend for a touring iLive system using ACE digital snake?

A: The following CAT5 cable types have been tested and approved by Allen & Heath to meet the required EMC standards and connect ACE up to 120 meters:

| Manufacturer | Part no | Cable type | Comments |
|-------------------|---------------------------------|---------------------------------------|------------------|
| Lapp Kabel | Etherline P flex 2170300 | Stranded with a foil & braided screen | Available in USA |
| Klotz | RC5VI | Stranded with a foil & braided screen | |
| Proplex | PCCAT5EP | Stranded with a foil & braided screen | Available in USA |
| Klotz | RC5BSW | Solid with a foil & braided screen | |
| Neutrik | Etherflex | Stranded with a foil & braided screen | |

Allen & Heath can supply 80m touring grade reel of Neutrik Etherflex cat5e (AH7000). Allen & Heath cannot guarantee the performance & reliability of the iLive 'ACE' system using Cat5 cables which we have not tested or recommended