

Life Safety Applications for the Crown PIP-USP4 Processor

How the PIP-USP4 adapts CTs Series amplifiers for use in emergency warning systems

Sound reinforcement systems are increasingly being called upon to deliver emergency warning messages, providing potentially life-saving information to occupants of stadiums, performance halls, and other venues. This application makes both practical and economic sense. The fidelity of a typical sound reinforcement system far exceeds that of a standard fire warning system, and having only one system reduces equipment cost as well as installation and maintenance expenses.

However, emergency warning systems must meet stringent standards, and these standards vary from location to location. These standards assure that these systems will be in operating order whenever emergencies occur, and that they will deliver fidelity sufficient for building occupants to understand announcements even in the presence of loud environmental noise.

The addition of the PIP-USP4 family of programmable DSP input modules allows Crown's two-channel CTs Series amplifiers to meet international safety standards like IEC 60849 and EN 54-16.

The USP4 fits into the expansion slot on the rear of any two-channel CTs amplifier. In addition to typical DSP functions such as filters and delays, the USP4 provides various connections not found on a typical amplifier. These include a 100MB Ethernet interface used for the digital audio network, either CobraNet or Ethernet AVB, and HiQnet control network technologies, both of which are compatible with equipment from other Harman International professional audio brands such as BSS, JBL, and Soundcraft. The USP4 also has analog inputs and outputs, an AES3 input, and a contact closure connection through an RJ-11 jack. The function of these connections can be programmed and controlled from a central computer through the use of Harman's System Architect software.

The network connection allows the USP4 to provide far more advanced monitoring and control capabilities than traditional amplifier controls can offer. Here's how the PIP-USP4 complements life safety applications.

Failure/Error Reporting

IEC 60849 specifies that an emergency warning system must report errors and component failures to a central control station within 100 seconds, even when the system is not in use. The monitoring capabilities of the USP4 allow Crown CTs amplifiers to meet and in some ways exceed this standard.

The USP4 can be programmed to warn the system operator of various failures and errors that might impair operation of the warning system. Failure/error messages can be sent via HiQnet, through the USP4's contact closure connection, or both. These messages include:

- Line voltage above or below limit
- Power supply temperature above limit
- Channel temperature above limit
- Channel clipped
- Channel load impedance above or below limit
- Impedance test failure
- Loss of communication with the Amplifier

The USP4 monitors the amplifier for error conditions, and relays error messages to a central computer within 30 seconds—well within the 100-second requirement of IEC 60849.

The USP4's internal sine wave generation and amplifier current and voltage monitoring allow it to check system operation continuously, even when the system is not being utilized. Whenever the system is not reproducing conventional audio signals such as announcements or music, the USP4 can be configured to produce an inaudible pilot tone through its sine wave generator. This tone provides enough information to allow for accurate reporting of the status of the load. When the host amplifier is used in a high-impedance system, an end-of-line box should be used to tune the speaker system to a specific impedance at the pilot tone frequency for more accurate reporting.

The result is that the sound system is always operating at a low level that can be monitored electronically even though it cannot be detected by ear. If the impedance of the system changes through, failure of a speaker, accidental disconnection of a speaker, or short in the speaker cable, the output current of the amplifier also changes, and the USP4 reports the error to the central control computer or any warning device connected through its contact closure.

System backup

In order to assure proper emergency warning system operation despite an accidental signal disconnection or failure, IEC 60849 requires multiple pathways for a signal to travel from the announcer to the amplifier. The USP4 provides three possible signal pathways: digital audio through Ethernet AVB or CobraNet, analog audio through removable barrier connectors, or AES3 digital audio through a removable barrier connector. Any of these inputs can be selected through the control computer, and a backup input can be specified. The USP4 retains the input and backup input selections even if the network connection is lost. See the System Redundancy document for even more information about the configuration.

In a typical application, the USP4 (and the amplifier in which it is installed) receives a digital audio signal through Ethernet AVB or CobraNet, with an analog connection as backup. If the network audio connection fails, the USP4 switches automatically to the analog connection. See *Diagram 1*.

Any USP4 can be used as a backup for a second USP4 in another amplifier if the two units' analog inputs and outputs are cross-connected. If one USP4 stops receiving Digital Audio for any reason, it automatically defaults to analog input, receiving signal from the analog output of the other USP4. See *Diagram 2*.

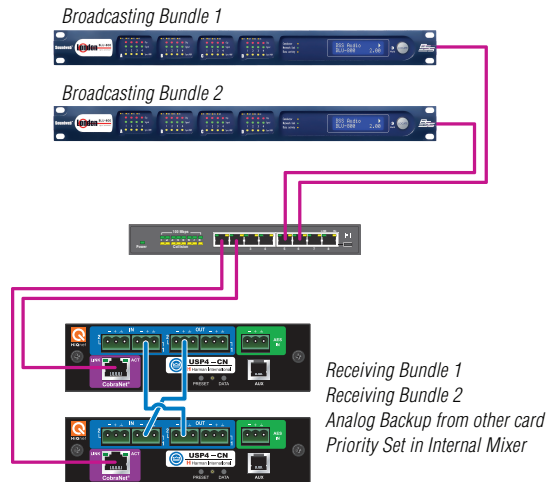


Diagram 2

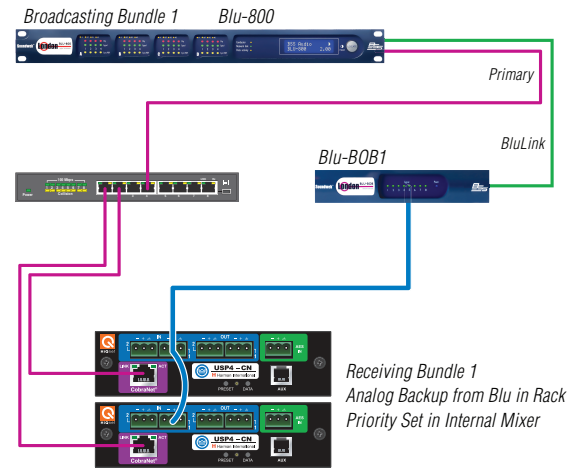


Diagram 3

The power of networking

Thanks to the USP4 and the HiQnet system and System Architect software, Crown CTs Series amplifiers can meet the needs of practically any sound reinforcement and/or emergency warning applications.

System designers can create custom user interfaces tailored to meet the needs of specific applications and users. Systems can be monitored locally through HiQnet or remotely through an Internet connection. Changes to a system can even be made remotely, reducing the need for service calls and minimizing system downtime.

Consult your Crown dealer for more information about how the CTs Series amplifiers and the PIP-USP4 processor can become a mainstay of your sound reinforcement and emergency warning system applications.

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