

# StudioComm for Surround

## Model 760-03 Central Controller / Model 77 Control Console

### Overview

As creating and distributing multi-channel surround (5.1) and stereo audio material has become a day-to-day reality, the ability to simply and effectively monitor these sources is imperative for recording, post-production, and broadcast facilities. And with audio-with-picture applications becoming so prevalent, additional monitoring challenges have arisen. Studio Technologies has addressed these needs with the StudioComm for Surround Model 760-03 Central Controller and the Model 77 and Model 71 Control Consoles. With digital audio inputs, digital and analog monitor outputs, support for multiple user control surfaces, and an extensive set of operating resources it's a simple task to integrate a monitoring system into virtually any facility. The carefully selected group of features, including surround and stereo inputs, configurable input-signal time delay, multiple pre- and post-fader outputs, configurable downmix and mute/solo functions, and bass management, along with a multi-format sync input, make the system powerful yet simple to operate. And by using the best of contemporary technology, as well as following rigorous design practices, the system's audio quality is excellent.

A StudioComm for Surround system starts with the Model 77 Control Console. It's the system's "command center" and is designed to reside at a user's location, allowing fingertip selection of all monitoring functions. Numerous LED indicators provide complete status information. A 4-digit numeric display indicates the post-fader monitor output level in real time. A major strength of the Model 77 is its ability to configure, under software control, many important operating parameters. Intended for secondary monitoring locations, the Model 71 Control Console is a compact user control surface. It provides three of the most basic functions: a rotary level control, dim on/off button, and reference level on/off button.

Most installations will use only one Model 77 Control Console. However, up to three additional Model 77 or Model 71 Control Consoles can also be connected. This provides multiple users with full control over a facility's monitor system. And to make installation simple, the Model 760-03 provides power for all connected Model 77 or Model 71 units.

The core of this StudioComm for Surround system is the Model 760-03 Central Controller. The one-rack-space unit contains circuitry that supports balanced digital audio inputs, balanced digital and analog monitor outputs, digital audio and control processing, and interfacing for the user control surface(s). The Model 760-03 provides two surround (5.1) and three stereo digital audio inputs. These balanced digital inputs are AES3-compliant; sources of this type are ubiquitous in many post-production and audio facility environments. The inputs allow a sample rate of up to 192 kHz and a bit depth of up to 24 to be directly supported. Circuitry associated with one of the stereo inputs provides sample rate conversion (SRC) capability, allowing a wide range of digital audio sources to be monitored. Up to 340 milliseconds of input delay can be selected to compensate for processing delays in an associated video path. For flexibility, two delay values can be configured, allowing real-time selection as desired. A number of different signals can serve as the Model 760-03's digital audio timing reference. For synchronization with a master timing reference a dedicated source of word clock, DARS (AES11), bi-level video, or tri-level video can be connected. Alternately, the L/R connection of the actively



**Model 77 Control Console**

### Key Features:

- 5.1 surround and stereo balanced digital audio inputs
- 5.1 surround and stereo balanced digital and 5.1 surround and stereo analog outputs
- Balanced digital audio capability
- Allows use of multiple control consoles
- Superior audio quality



**Model 760-03 Central Controller Front Panel**



**Model 760-03 Central Controller Back Panel**

selected surround or stereo input source can serve as the timing reference.

A range of digital and analog surround (5.1) and stereo digital monitor outputs are provided. The post-fader surround and stereo digital and analog monitor outputs are intended for connection to monitor loudspeaker systems. The pre-fader surround digital monitor output can be used with metering systems that require signals that aren't impacted by level control or other monitoring functions. The stereo input C direct digital monitor output allows an installation to directly access the SRC capabilities. The digital monitor outputs are compatible with equipment that requires balanced AES3 digital audio signals with an output impedance of 110 ohms and a signal level of 5 volts peak-to-peak (Vpp).

A sophisticated bass management function is integral to the Model 760-03's design and can be enabled if desired. It can apply to both the surround and stereo digital and analog post-fader monitor output channels. Note however that the bass management function is only supported at sample rates of 44.1, 48, 88.2, and 96 kHz. The overall goal of bass management is very simple: ensure that the entire audio bandwidth of all channels can be accurately monitored. Many loudspeaker systems have inherent low-frequency limitations, preventing a true picture of the source material from being presented. To overcome this, the low-frequency energy from the five channels associated with the surround inputs and the two channels associated with the stereo inputs can be separated and routed to the subwoofer (SUB) channel of the monitor outputs. Several of the bass management functions can be configured to match the requirements of specific installations.

Great care was taken in designing the system's architecture, ensuring that the character of the audio input signals is preserved. All audio processing, including bass management, is performed in 32-bit logic using a high-speed field-programmable gate array (FPGA) integrated circuit.

The Model 760-03 occupies one space (1U) in a standard 19-inch rack. Digital audio sources are interfaced with the Model 760-03 using one 25-pin female D-subminiature connector and one 3-pin female XLR connector. A BNC connector is used to interface with an external sync source. Digital and analog monitor output signal connections are made using two 25-pin female D-subminiature connectors. One 9-pin female D-subminiature connector is used to connect the Model 760-03 with up to four Model 77 or Model 71 Control Consoles. A second 9-pin female "D-sub" connector is used to interface with remote control signals. AC mains power is connected directly to the Model 760-03, with an acceptable range of 100 to 240 V, 50/60 Hz.



**Model 71 Control Console**

## Additional Details

The Model 77 provides five buttons and associated LEDs for selection of the surround and stereo input sources to be monitored. While in most cases only one input source will be monitored at a time, stereo input C can be selected for simultaneous monitoring with one of the two surround or other two stereo inputs. This allows the two selected inputs to be combined ("summed").

It's interesting to note that while each of the two surround inputs has an LFE channel associated with it, the ".1" post-fader digital and analog surround monitor outputs are designated as SUB (subwoofer), rather than LFE. This terminology was carefully selected to highlight the fact that this output channel may include more than just LFE content. The bass management function, if enabled, will redirect low-frequency energy from the main input channels, combining it with the LFE content before routing the sum to the digital and analog subwoofer outputs.

The post-fader surround and stereo digital and analog monitor output levels can be controlled by way of a large, easy-to-use rotary control. The control, actually a digital encoder, allows level selection in precise 0.5-dB steps. The auto mute all function causes the post-fader surround and stereo monitor output channels to automatically mute whenever the output level control reaches maximum attenuation. Using the reference level function, the post-fader surround and stereo monitor output levels can be set to a pre-configured value. This is provided for audio-with-picture applications that require a specific monitor output level. The

reference level is easily configured by taking an electronic “snapshot” of the desired monitor output level. For user confirmation a 4-digit LED readout can display the level of the post-fader surround and stereo monitor output channels. To match the needs of a facility, it can be configured to display either the attenuation level or the sound pressure level (SPL).

The dim function allows the post-fader surround and stereo digital and analog monitor output levels to be reduced by a fixed dB amount. The dim level is configured from among four available values. A mute all function allows the post-fader surround and stereo monitor output channels to be simultaneously muted. The channel mute/solo section provides post-fader surround and stereo channel monitoring control, allowing a single channel to be muted or monitored. Multiple channels can also be simultaneously selected for muting or “soloing.”

A special solo mode is also provided, called channel pop solo, which offers a unique aid when monitoring audio material. Channel pop solo allows the level of a single post-fader digital and analog monitor output channel to be raised while the level of the other channels is reduced. This helps to emphasize the content on one channel without fully muting the others. Broadcast applications can benefit from the channel pop solo mode by allowing, for example, the center channel to be highlighted while still maintaining some level on the other channels. The amount of level increase—the “pop”—as well as the amount of attenuation can be configured to meet the needs of specific applications or users.

Two functions allow the input sources to be checked for level or phase inconsistencies. The surround to stereo downmix function is used to create a stereo signal from the selected surround (5.1) source. Key operating parameters in the surround to stereo downmix function can be configured to meet the requirements of an application. This can be especially useful when support for specific international broadcast standards is required. The stereo to mono downmix function allows audio on the left and right input channels to be added (summed) and monitored on the center output channel. The two downmix functions can be simultaneously enabled, allowing a surround source to be checked for mono compatibility. The downmix functions always impact the post-fader surround and stereo monitor outputs. A configuration setting allows the pre-fader surround monitor output to be selected for pre- or post-downmix operation.

For flexibility, the StudioComm for Surround system is designed to easily integrate with equipment such as production intercom

---

## Specifications

### Model 760-03 Central Controller

#### General Audio:

**Supported Sample Rates:** 32, 44.1, 48, 88.2, 96, 176.4, and 192 kHz

**Word Length:** 24 bits maximum

**Internal Processing:** 32 bits

**Input-to-Output Latency:** two samples (e.g., 0.042 milliseconds @ 48 kHz sample rate)

**Digital Audio Inputs:** 5 (18 audio channels)

**Configuration:** two surround (5.1) and three stereo

**Type:** balanced AES3 (110 ohms, 5 Vpp)

**Connector—Surround Inputs and Stereo Inputs A & B:** 25-pin female D-subminiature (DB-25F), AES59-2012-compliant

**Connector—Stereo Input C:** 3-pin female XLR

#### Sample Rate Conversion (SRC):

**Application:** available on Stereo Input C

**Input Sample Rate Range:** 8 to 216 kHz, limited to 1/6 to 6 times the output sample rate

**Latency:** 1 millisecond, nominal

**Sync Source:** configured to follow L/R of currently selected input or signal connected to sync input

#### Sync Input:

**Compatible Sources:** word clock, DARS (AES11), bi-level video, tri-level video

**Jitter:** 4 ns pp maximum

**Connector:** BNC (per IEC 60169-8 Amendment 2)

**Termination:** 75 ohms, selectable on/off

**Digital Monitor Outputs:** 16 (eight pairs)

**Configuration:** organized as two surround (5.1) and two stereo

**Dynamic Range:** >135 dB

**Type:** balanced AES3 (110 ohms, 5 Vpp)

**Connector:** 25-pin female D-subminiature (DB-25F), AES59-2012-compliant

**Analog Monitor Outputs:** 8

**Configuration:** organized as one surround (5.1) and one stereo (2-channel)

**Type:** electronically balanced, source impedance 200 ohms

**Nominal Level:** +4.0 dBu @ -20 dBFS input source and level control at maximum setting

**Maximum Level:** +24 dBu into 2000 (2 k) ohms or greater

**Frequency Response, Digital Inputs to Analog Monitor Outputs:**

10 Hz-20 kHz +0.0/-0.3 dB @ 48 kHz sample rate; -3 dB @ 64 kHz

**Distortion (THD+N):** <0.002%, -1 dBFS, 20-22 kHz, 22 kHz bandwidth

**S/N Ratio:** 89 dB, ref +4 dBu output

**Dynamic Range:** greater than 109 dB

**Crosstalk:** -98 dB at 1 kHz; -97 dB at 16 kHz, ref -1 dBFS input

**Connector:** 25-pin female D-subminiature (DB-25F), AES59-2012-compliant

**Configurable Input Delay:** 0 to 340 milliseconds @ 48 kHz sample rate (scales up or down depending on actual sample rate)

**Post-Fader Monitor Output Level Offsets:** each surround and stereo channel independently adjustable in 0.5-dB steps over a ±12-dB range. (Digital and analog outputs associated with a specific channel share the same setting.)

### **Bass Management:**

**Supported Sample Rates:** 44.1, 48, 88.2, and 96 kHz only

**Crossover Frequency and Type:** -6 dB @ 40, 50, 60, or 80 Hz, symmetrical for low-pass and high-pass filters, maximally flat

**Filter Slope:** 12-per-octave or 24 dB-per-octave

**Overall Operation:** independent on/off selectable for surround and stereo post-fader monitor outputs

### **Downmix:**

**Functions:** surround to stereo, stereo to mono

#### **Surround to Stereo:**

L @ 0 or -3 dB;

R @ 0 or -3 dB;

C @ -3 or -6 dB summed with L and R;

LFE @ full attenuation or -6 dB summed with L and R;

LS @ -3 or -6 dB summed with L;

RS @ -3 or -6 dB summed with R;

C, SUB, LS, and RS monitor outputs mute

#### **Stereo to Mono:**

L @ -3 dB summed with R @ -3 dB to C;

L, R, LS, RS, and SUB monitor outputs mute

For a surround input this results in the C output being the sum of

L @ -3 or -6 dB, R @ -3 or -6 dB;

C @ -3 or -6 dB, LFE @ full attenuation or -6 dB;

LS @ -6 or -9 dB, and RS @ -6 or -9 dB.

### **Control Console Interface:**

**Type:** RS-485, 115.2 kbit/s, 8-1-N

**Polling Interval:** 50 milliseconds

**Power:** 12 Vdc, 500 mA maximum

**Connector:** 9-pin female D-subminiature (DE-9F)

### **Remote Control Inputs:**

**Functions:** remote mute all, remote dim

**Type:** 3.3 Vdc logic, activates on closure to system common

**Connector:** 9-pin female D-subminiature (DE-9F)

### **AC Mains:**

**Requirement:** 100 to 240 V, +10/-15%, 50/60 Hz, 15 W maximum

**Connector:** 3-blade, IEC 320 C14-compatible (mates with IEC 320 C13)

### **Dimensions:**

19.00 inches wide (48.3 cm)

1.72 inches high (4.4 cm)

7.00 inches deep (17.8 cm)

**Mounting:** one space (1U) in a standard 19-inch rack

**Weight:** 3.6 pounds (1.6 kg)

### **Model 77 Control Console**

**Application:** up to four Model 77 Control Consoles can be connected to a Model 760-03 Central Controller

**Power:** 12 Vdc nominal (9 Vdc minimum), maximum current 100 mA, provided by Model 760-03 Central Controller

### **Control Data:**

**Type:** RS-485

**Data Rate/Format:** 115.2 kbit/s, 8-N-1

**Connector:** 9-pin female D-subminiature (DE-9F)

### **Dimensions (Overall):**

7.20 inches wide (18.3 cm)

2.20 inches high (5.6 cm)

5.40 inches deep (13.7 cm)

**Weight:** 1.7 pounds (0.8 kg)

### **Model 71 Control Console**

**Application:** up to three Model 71 Control Consoles can be connected to a Model 760-03 Central Controller

**Power:** 12 Vdc nominal (9 Vdc minimum), maximum current 35 mA, provided by Model 760-03 Central Controller

### **Control Data:**

**Type:** RS-485

**Data Rate/Format:** 115.2 kbit/s, 8-N-1

**Connector:** 9-pin female D-subminiature (DE-9F)

### **Dimensions (Overall):**

3.20 inches wide (8.1 cm)

2.20 inches high (5.6 cm)

4.10 inches deep (10.4 cm)

**Weight:** 0.8 pounds (0.4 kg)

Specifications and information contained in this Data Sheet subject to change without notice.

---

**Studio Technologies, Inc.**

Skokie, Illinois USA

© by Studio Technologies, Inc., January 2015

**www.studio-tech.com**