StudioComm
for Surround

STUDIO TECHNOLOGIES INC.

Model 76DA Central Controller / Model 77 Control Console

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 76DA 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.

Model 77 Control Console

Model 77 Control Console

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 an operator'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.

While many installations will use only one Model 77 Control Console, 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 76DA provides power for all connected Model 77 or Model 71 units.

Model 76DA Central Controller

The core of this StudioComm for Surround system is the Model 76DA Central Controller. The one-rack-space unit contains circuitry that supports digital audio inputs, digital and analog monitor outputs, processing, and the user interface. The Model 76DA provides two surround (5.1) and three stereo digital audio inputs. These unbalanced digital inputs are AES3id/SMPTE 276M-compliant; sources of this type are ubiquitous in most post-production and broadcast 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
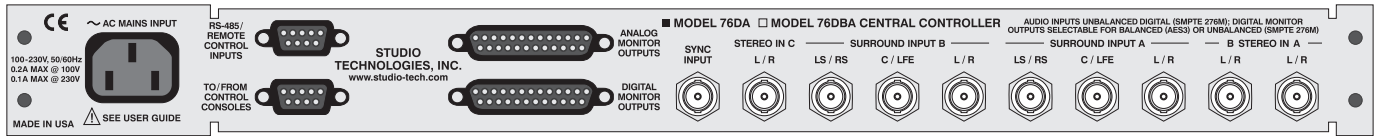
Key Features:

- Digital audio inputs
- Digital and analog audio outputs
- Bass management capability
- Configurable downmix
- Channel mute/solo
- Level adjustment, reference level, and dim

Model 76DA Central Controller Front Panel

Model 76DA Central Controller Back Panel

76DA'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 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.

For installation flexibility the digital monitor outputs can be configured for compatibility with equipment that requires AES3 ("balanced") or AES3id ("unbalanced") digital audio signals. When selected for AES3 compatibility the output impedance is 110 ohms with a signal level of 5 volts peak-to-peak (Vpp). For AES3id operation the impedance is 75 ohms and the level is 1 Vpp.

A sophisticated bass management function is integral to the Model 76DA'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 surround and two stereo channels can be separated and then routed to the subwoofer loudspeaker. 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 bits using a high-speed field-programmable gate array (FPGA) integrated circuit.

The Model 76DA occupies one space (1U) in a standard 19-inch rack. Digital audio sources are interfaced with the Model 76DA using nine BNC connectors. A tenth BNC connector is used by the sync source. Digital and analog monitor output signal connections are made using two 25-pin D-subminiature connectors. One 9-pin D-subminiature connector

Model 71 Control Console

is used to connect the Model 76DA with up to four Model 77 or Model 71 Control Consoles. A second 9-pin "D-sub" connector is used to interface with remote control signals. AC mains power is connected directly to the Model 76DA, with an acceptable range of 100 to 230 volts, 50/60 Hz.

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, combing 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 operator 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 in 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 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 systems, on-air or recording tally signals, and audio consoles. Two remote-control inputs provide access to the mute all and dim functions. By providing access to these functions, talkback or slate activity from an audio console or other communications system can control the level of the post-fader surround and stereo monitor outputs.

Specifications

Model 76DA 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: five (18 audio channels)
Configuration: two surround (5.1) and three stereo
Type: AES3id-2001/SMPTE 276M (unbalanced 75 ohms/1 Vpp)
Connectors: BNC (per IEC 60169-8 Amendment 2)

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: AES3 (110 ohms/5 Vpp) or AES3id/SMPTE 276M (75 ohms/1 Vpp), selectable
Connector: 25-pin D-subminiature female (DB-25F)

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): 0.004%, ref 1 kHz, +4 dBu output
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 D-subminiature female (DB-25F)

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.)

<u>Bass Management:</u>

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 or 24 dB/octave

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

<u>Downmix:</u>

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 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.

<u>Control Console Interface:</u>

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

Polling Interval: 50 milliseconds

Power: 12 volts DC, 500 milliamperes maximum

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

<u>Remote Control Inputs:</u> 2

Functions: remote mute all, remote dim

Type: +5 V logic, activates on closure to system common

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

<u>AC Mains:</u>

Requirement: 100 to 230 V, +10/–15%, 50/60 Hz, 15 W maximum

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

<u>Dimensions:</u>

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: 6.2 pounds (2.8 kg)

Model 77 Control Console

<u>Application:</u> up to four Model 77 Control Consoles can be connected to a Model 76DA Central Controller

<u>Power:</u> 12 volts DC nominal (9 volts DC minimum), maximum current 100 milliamperes, provided by Model 76DA Central Controller

<u>Control Data:</u>

Type: RS-485

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

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

<u>Dimensions (Overall):</u>

7.20 inches wide (18.3 cm)
2.20 inches high (5.6 cm)
5.40 inches deep (13.7 cm)

<u>Weight:</u> 1.7 pounds (0.8 kg)

Model 71 Control Console

<u>Application:</u> up to three Model 71 Control Consoles can be connected to a Model 76DA Central Controller

<u>Power:</u> 12 volts DC nominal (9 volts DC minimum), maximum current 35 milliamperes, provided by Model 76DA Central Controller

<u>Control Data:</u>

Type: RS-485

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

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

<u>Dimensions (Overall):</u>

3.20 inches wide (8.1 cm)
2.20 inches high (5.6 cm)
4.10 inches deep (10.4 cm)

<u>Weight:</u> 0.8 pounds (0.4 kg)

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