

StudioComm for Surround

Model 68 Central Controller and Model 69 Control Console

User Guide

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This User Guide is applicable for serial numbers:
Model 68 M68-00151 to 00260
Model 69 M69-00151 and later,
with software version 1.04 and higher

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Foreword

Simply stated: I had a blast working on the StudioComm for Surround components! It was very rewarding to develop a set of products for a market that's actually receptive to new ideas and supportive of innovation.

A big thanks to Jeff Levison, formerly of Warner Hollywood Studios. He patiently answered my questions over a period of many months, helping to guide me in the right direction. I recently read an interesting book on the history of the Warner Brothers and their movie empire. One of the things that stood out was their long-term commitment to audio. From the *Jazz Singer* to the current DVD releases, they haven't been afraid of staying on the forefront of sound for picture. Good going guys!

Additional thanks to a couple of smart audio dudes. Thierry Jeandroz of LTRT in Paris encouraged me to add several features to improve our audio-post support. Rob James, formerly of the BBC and now a consultant and writer, suggested how the operator interface could be improved. The software now reflects the sage advice of these gentlemen.

Mitch Budniak designed much of the hardware and kept us out of "digital trouble." Carrie Loving provided engineering support and designed the product graphics. Larry Leviton wrote the software that makes the hardware "come to life." Fred Roeck performed the mechanical design. Al "PCB PRO" Lux designed the...you guessed it! Joe Urbanczyk coordinated the safety testing and created the automated test routes for our Audio Precision System Ones.

Our plans are to continue with other StudioComm for Surround components. To help keep us going in the right direction, your praise, comments, or complaints are encouraged. Please contact me via E-mail at gkapes@studio-tech.com.

Sincerely,

Gordon K. Kapes
President

Introduction

What This User Guide Covers

This User Guide is designed to assist you when installing and using the Model 68 Central Controller and the Model 69 Control Console.

Model 69 Software Version

It is important to note that this User Guide documents the performance of Model 69 Control Consoles containing software versions 1.04 and higher. There is a simple means of identifying if you have version 1.04 or higher: Using the mute/solo button, place the Model 69 in the mute mode. If the output channel LEDs are not lit, you're all set. If the output channel LEDs are lit, your software needs to be upgraded. Note that the software is permanently loaded into a microcontroller integrated circuit, which is installed in a socket, located on the Model 69's printed circuit board. A software upgrade entails simply changing this 52-pin "chip."

If you require an upgrade or are unsure of your software version, please E-mail the Technical Support department (techsupport@studio-tech.com). Please include the serial numbers of both your Model 68 and Model 69 units. If necessary, the factory can check its data base and determine the software versions that were originally shipped with the units.

StudioComm for Surround

As the production of multi-channel "surround sound" audio material becomes more prevalent, the need to monitor these sources becomes imperative for more and more facilities. Studio Technologies has

addressed the needs of smaller facilities with the StudioComm Model 68 Central Controller and Model 69 Control Console. Together they provide the means to select input sources, control the level of monitor loudspeakers, and provide mute and solo functions, along with many other features.

A StudioComm for Surround system starts with a Model 69 Control Console, a compact but comfortable "command center" that is designed to reside at the operator's location. Using a single 9-conductor cable, it connects to a Model 68 Central Controller. The Model 68 supports two 6-channel inputs, two stereo inputs, and six monitor output channels in a single rack space. Special features are also supported, including interfacing with remote control signals and "tight" integration with stereo mix consoles.

The Models 68 and 69 were developed in conjunction with experts in the post-production and music-only audio fields. The overall goal turned out to be very straightforward: Provide the necessary technical performance and features, while keeping it simple to operate! Be certain that operators won't have to go through a long "learning curve" before they become efficient. The end result achieves these goals, providing the required resources in a simple-to-operate format.

Model 68 Central Controller

The Model 68 Central Controller is a single rack-space unit containing analog audio and digital control circuitry. Audio input and output connections are made using three 25-pin D-subminiature ("D-sub") connectors. The connectors follow an industry-standard multi-channel wiring scheme. A 9-pin D-sub connector is used

to connect the Model 68 to a Model 69 Control Console. A second 9-pin D-sub connector provides access to the remote control inputs.

The surround and stereo inputs, as well as the monitor outputs, are electronically balanced. Fifteen-turn trim potentiometers are used to precisely calibrate the input and monitor output signals. Using electro-mechanical relays, the 6-channel monitor output provides power-up and power-down protection for the loudspeakers.

The L/R Bypass function allows a stereo line-level audio source to be passively routed to the Model 68's left and right monitor output channels, while muting the center, left surround, right surround, and subwoofer monitor outputs. The L/R Bypass audio source is normally the monitor output of a stereo audio console. The L/R Bypass function, along with associated

remote control functions, make it simple for an existing facility to add surround monitoring capability.

An 8-bit microcontroller provides the logic "horsepower" for the Model 68. AC mains power is connected directly to the Model 68, which is factory selected for 100, 120, 220/240V operation. The internal power supply utilizes a toroidal mains transformer for quiet audio operation.

Model 69 Control Console

The Model 69 Control Console is a compact, self-contained unit designed to be located at the operator's position. It allows fingertip control of all monitoring parameters. Numerous LEDs provide complete status information. The Model 69 supports two 6-channel (surround) and two 2-channel (stereo) input sources, along with one 6-channel monitor output.

Figure 1. Model 68 Central Controller Front Panel

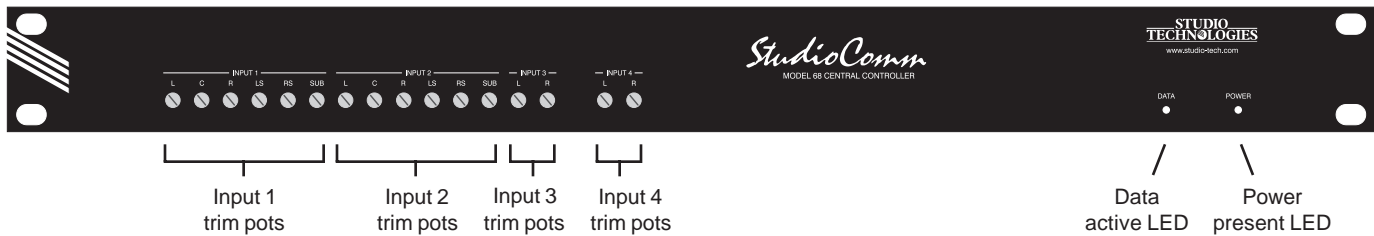
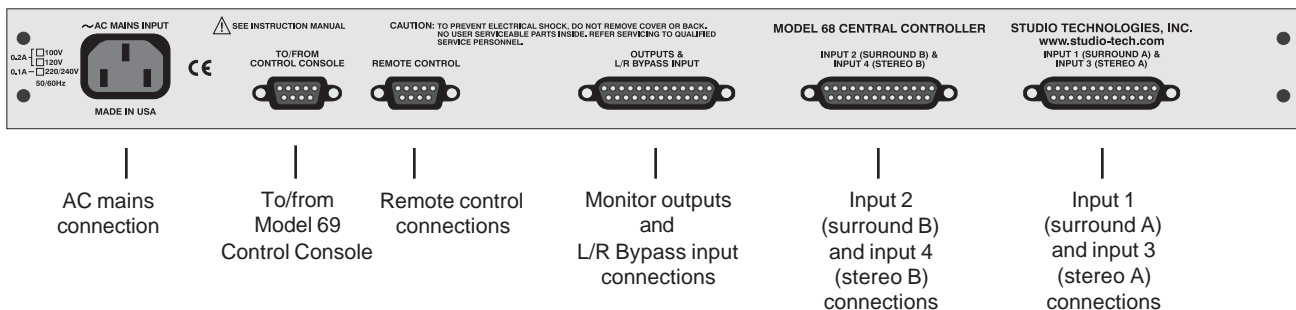


Figure 2. Model 68 Central Controller Back Panel



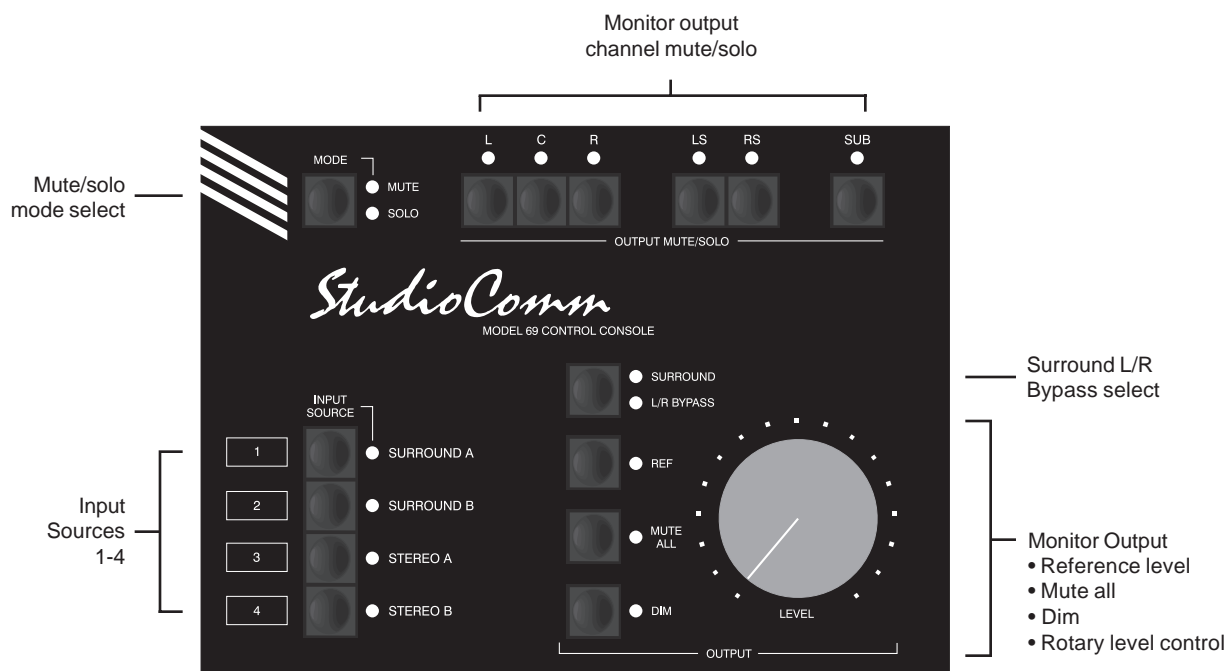


Figure 3. Model 69 Control Console Front Panel

The Model 69 provides four buttons and associated LEDs for selection of the input source to be monitored. While in most cases only one input source will be monitored at a time, multiple inputs can be selected for simultaneous monitoring. This allows two, three, or all four of the inputs to be combined (“summed”). While there is no independent control of the input levels, this feature can be useful for creating rough mixes from the source signals. It is also a fast, effective means of making a “seat-of-the-pants” check on the phase relationship between synchronized signals.

The monitor output level is controlled either through the use of a large, easy-to-use rotary control, or by enabling the preset reference level. For operator convenience, the dim function allows the monitor output level to be reduced by a fixed dB amount. The mute all function

disables all monitor outputs by activating the mute relays on the Model 68 Central Controller.

Control of the individual monitor output channels is provided by the mute/solo section. One push-button switch sets the operating mode for either mute or solo. The flexibility of having both mute and solo available allows an operator to quickly select the most comfortable and productive operating mode. In the mute mode, individual channels can be muted or unmuted as required. In the solo mode, one channel can be monitored while the others are automatically muted. Of course, multiple channels can be simultaneously selected for “soloing.”

A major strength of the Model 69 is the ability to configure, under software control, many operating parameters. During initial installation the Model 69 is “taught”

the number of monitor output channels to be controlled, as well as the number of channels associated with the two surround and two stereo inputs. The monitor output reference level is set by taking an electronic “snapshot” of the position of the rotary level control. The dim level is selected from among four choices. A number of other operating parameters can also be configured, including how the four remote control inputs will function. All configuration parameters are stored in non-volatile memory.

A Model 69 Control Console connects to the Model 68 Central Controller using a standard 9-pin D-sub cable. Power for the Model 69 is provided by the Model 68. The Model 69 generates MIDI system-exclusive messages to control the Model 68. Remote control signals, while physically connected to the Model 68, route to the Model 69 via conductors in the 9-pin D-sub interconnecting cable.

Limitations on Signal Routing

While a StudioComm system for multi-channel monitoring will do many wonderful things, it is not designed to selectively route input signals to the different monitor output channels. An input-channel-to-output-channel relationship is maintained. A signal on the subwoofer channel of input 2 will, when selected, output only on the subwoofer channel of the monitor output. Any rerouting of the input signals must be done prior to connection to the StudioComm system. This should not be an impairment in most facilities, but it's important to highlight this fact.

Audio Channel Assignment

The designers of the StudioComm Models 68 and 69 made the decision to assign the

audio channels in the order of left, center, right, left surround, right surround, and subwoofer. It was felt that this was a nice, rational arrangement, common to many “5.1” installations, that would fit the needs of most operators. However, not all formats follow this convention, or even use the same nomenclature. Major audio companies such as Dolby Laboratories and DTS may use different channel assignment schemes in their release formats. It is hoped that careful interconnection of audio signals during installation, or incorporating routing flexibility using a patch bay, will mitigate any big inconveniences.

SUB Versus LFE

The term SUB was selected because of its general popularity, but we understand that some people prefer the term LFE (low-frequency-enhancement). If you're someone who can't live with our choice, please feel free to relabel your StudioComm system. Our feelings won't be hurt—at least not much!

Applications

Remote Control Capability

Four remote control functions are available: Mute all, dim, L/R Bypass, and input select. Remote mute all and remote dim are provided so that communications systems, machine control systems, or communication functions associated with audio consoles can easily be interfaced. Remote L/R Bypass allows an audio console's solo or PFL functions to remain viable while mixing and monitoring in surround. Remote input select allows a machine control system, or audio storage

device, to control which input source is selected for monitoring. Audio-post professionals will know this as PEC-Direct switching, which can be easily implemented.

L/R Bypass

The L/R Bypass function was expressly provided so that surround monitoring capability could be added to a facility while maintaining compatibility with existing stereo monitoring systems. The L/R Bypass signal source would normally be the stereo monitor output of an audio console. During normal surround mode operation of the Model 68 and Model 69, the left and right monitor outputs are connected, via electromechanical relays, to the Model 68's output circuitry. When the L/R Bypass function is enabled, the left and right monitor outputs disconnect from the Model 68's output circuits, and connect to the L/R Bypass Inputs; the other four monitor output channels mute. Activation of the L/R Bypass function can be by means of a button on the Model 69 Control Console, or via a signal connected to the remote L/R Bypass input.

Installation

In this section you will be installing the Model 68 Central Controller in an equipment rack. Audio input and monitor output connections will be made. A location will be selected for the Model 69 Control Console and it will be connected to the Model 68. If required, external equipment will be interfaced to the remote control inputs. AC mains power will be connected to the Model 68.

System Components

The shipping carton contains one each of the following: Model 68 Central Controller, Model 69 Control Console, 20-foot (6.1m) 9-pin D-sub interconnecting cable, user guide, and warranty card. Units destined for North America also include an AC mains cord. Your dealer or distributor will provide an AC mains cord for non-North American destination.

Mounting the Model 68

The Model 68 Central Controller requires one space in a standard 19-inch (48.3cm) equipment rack. Select a location that is convenient to both the analog audio signals and the Model 69 Control Console. A 20-foot (6.1m) cable is supplied to connect the Model 68 to the Model 69. You can supply your own interconnecting cable, however 50 feet (15.3m) is the recommended maximum length. Secure the Model 68 into the equipment rack using two mounting screws per side.

Cable Harnesses

Three 25-pin D-sub connectors are utilized for audio input and output interconnections. The 16 line-input channels, designated input 1 (Surround A), input 2 (Surround B), input 3 (Stereo A), and input 4 (Stereo B), can interface using two standard DA-88-style input cable harnesses. The 25-pin D-sub harness used for the six monitor output channels and the L/R Bypass input uses a wiring scheme slightly different from the "DA-88 standard;" the L/R Bypass input connections make it different. In a standard DA-88 output cable harness, all eight channels would use, for example, XLR-type plugs (males). A harness for the Model 68 would

have the first six channels using XLR-type plugs (males) and the last two channels XLR-type connectors (females).

Audio Connections

Audio signal connections are made by way of three 25-pin D-sub connectors, located on the Model 68's back panel. Three cable harnesses, each with a 25-pin D-sub plug (male) on one end and the desired connectors on the other end, are necessary. These cable harnesses are not supplied by Studio Technologies. (Note that our friends in some locations may use the term "loom" instead of harness.)

The wiring scheme used by the D-sub connectors comply with that made familiar by TASCAM with their DA-88 product. Wiring harnesses prepared for connecting to the

surround and stereo input channels are identical to that of a DA-88 input harness. A wiring harness prepared for the monitor output channels and L/R Bypass input are wired in a slightly different fashion. Please refer to Figures 4 and 5 for the exact connection details. Note that the Model 68's D-sub connectors use 4-40 threads.

Unless there's a special need, it may be cost and time effective for you to purchase commercially made cable assemblies. Let the large market for DA-88-style cabling help you painlessly install your system! When it came time for Studio Technologies to test the first Model 68 Central Controller, standard DA-88 harnesses were purchased. They turned out to be of very good quality, and the cost was very reasonable. Needing to change the sex of

Connections	Signal High (+)	Signal Low (-)	Shield
SURROUND A-L	24	12	25
SURROUND A-C	10	23	11
SURROUND A-R	21	9	22
SURROUND A-LS	7	20	8
SURROUND A-RS	18	6	19
SURROUND A-SUB	4	17	5
STEREO A-L	15	3	16
STEREO A-R	1	14	2

Notes: 1) Connector type on Model 68 is 25-pin D-subminiature female. Installer must provide plug (male). Connector uses 4-40 threaded inserts for locking with mating plug.

2) Wiring scheme follows Tascam DA-88 convention. Standard DA-88-type wiring harnesses are directly compatible, with the exception of 4-40 screw threads being required.

Figure 4. Connections for Inputs Surround A and Stereo A

Connections	Signal High (+)	Signal Low (-)	Shield
SURROUND B-L	24	12	25
SURROUND B-C	10	23	11
SURROUND B-R	21	9	22
SURROUND B-LS	7	20	8
SURROUND B-RS	18	6	19
SURROUND B-SUB	4	17	5
STEREO B-L	15	3	16
STEREO B-R	1	14	2

Notes: 1) Connector type on Model 68 is 25-pin D-subminiature female. Installer must provide plug (male). Connector uses 4-40 threaded inserts for locking with mating plug.

2) Wiring scheme follows Tascam DA-88 convention. Standard DA-88-type wiring harnesses are directly compatible, with the exception of 4-40 screw threads being required.

Figure 5. Connections for Inputs Surround B and Stereo B

the last two connectors on the output harness (to support the L/R Bypass input) was a trivial matter.

Surround and Stereo Audio Inputs

The connectors labeled INPUT 1 (SURROUND A) & INPUT 3 (STEREO A) and INPUT 2 (SURROUND B) & INPUT 4 (STEREO B) are used to interface with the 16 line input circuits. Each input circuit is electronically balanced, and is intended for connection to balanced or unbalanced sources with a nominal signal level of +4dBu. A trim potentiometer is associated with each input, allowing the input sensitivity to be adjusted over a ± 2 dB range. The configuration section of this guide provides details on using the trim pots.

Balanced sources should be wired so that signal high is connected to + on the D-sub, signal low to – on the D-sub, and shield to the D-sub’s shield connection. With an unbalanced source, connect signal high to the + connection on the D-sub, and shield to both the – and the shield connection on the D-sub. If connecting to an unbalanced source in this manner results in hum or noise, try connecting signal high to + on the D-sub, and shield to – on the D-sub; leave the shield connection on the D-sub unterminated.

It is highly recommended that at least one of the surround inputs be wired by way of an audio patch bay. This will allow the channels associated with that input source to be easily rerouted. While signals generated within a facility will normally follow a specific format, such as left, center, right, left surround, right surround, subwoofer, it is possible that media provided by an outside facility will follow a different one.

L/R Bypass Input

The connector labeled OUTPUTS & L/R BYPASS INPUT provides access to the L/R Bypass input. Please refer to Figure 6 for details on the exact “pin out” of the D-sub connector. It is usual for the source connected to the L/R Bypass Input to be from the stereo monitor output of an audio console, or other monitoring system.

Warning: It is very important that signals connected to the L/R Bypass input be “post” a level control, i.e., attenuated from line level. Connecting a standard line level audio signal can result in damage to monitor loudspeaker systems and, more importantly, to the ears of listeners.

Connections	Signal High (+)	Signal Low (-)	Shield
OUTPUT-L	24	12	25
OUTPUT-C	10	23	11
OUTPUT-R	21	9	22
OUTPUT-LS	7	20	8
OUTPUT-RS	18	6	19
OUTPUT-SUB	4	17	5
L/R BYPASS INPUT-L	15	3	16
L/R BYPASS INPUT-R	1	14	2

Notes: 1) Connector type on Model 68 is 25-pin D-subminiature female. Installer must provide plug (male). Connector uses 4-40 threaded inserts for locking with mating plug.

2) Wiring scheme loosely follows Tascam DA-88 convention. Modified DA-88-type wiring harnesses are required, along with 4-40 screw threads.

Figure 6. Connections for Monitor Outputs and L/R Bypass Input

Balanced sources should be wired so that signal high is connected to + on the D-sub, signal low to – on the D-sub, and shield to the D-sub’s shield connection. With an unbalanced source the connection method depends on the requirements of the monitor speaker system’s input. This is because routing of the L/R Bypass input to the left and right monitor outputs does not involve any active circuitry. Whenever the L/R Bypass feature is active, the signal connected to the L/R Bypass input is simply passed through to the left and right monitor output channels by means of electromechanical relay contacts.

If the L/R Bypass function is not going to be used, it is important to disable the L/R Bypass inputs by jumpering (shorting) the input connections. The best method of doing this is to simply install jumper wires across the signal high (+) and signal low (–) of the left and right inputs. This ensures that should the L/R Bypass function be enabled, noise or hum will not be induced into the left and right monitor outputs.

Pin	Signal
1	Shield
5	Remote Mute All
6	Remote Dim
7	Remote L/R Bypass
8	Remote Input Select
9	Remote Control Common

Notes: 1) Connector type on Model 68 is 9-pin D-subminiature female. Connector uses 4-40 threaded inserts for locking with mating plug.

Figure 7. Connector Pin Out for Remote Control Inputs

Monitor Outputs

The connector labeled OUTPUTS & L/R BYPASS INPUT provides access to the six monitor output channels. Please refer to Figure 6 for details on the exact “pin out” of the D-sub connector.

The monitor output channels are intended for connection to audio amplifiers associated with monitor loudspeakers, or to the inputs of loudspeakers with integrated amplifiers. The monitor outputs are electronically balanced and capable of driving balanced or unbalanced loads of 600 ohms or greater. While balanced operation is preferred, unbalanced operation does not pose a problem. To connect to an unbalanced load connect the + terminal of the D-sub as signal high, and both the – and shield as the signal low/shield. For optimal unbalanced operation, it is important to connect both – and shield together directly on the D-sub, and not at the other end of the harness.

Note that while the Model 68’s electronically balanced output circuits are capable of driving loads of 600 ohms or greater, the output level will drop slightly as the load impedance approaches 600 ohms. A 0.5dB difference in output level can be expected as the load impedance changes from 10k ohms to 600 ohms.

Be aware that whenever the L/R Bypass function is enabled, the Model 68’s left and right output circuitry is disabled, and the L/R Bypass inputs are routed directly to the left and right monitor output connections. Ensure that the source of the L/R Bypass signal is capable of correct operation with the wiring scheme selected.

Remote Control Inputs

Support is provided for four remote control functions: Remote Mute All, Remote Dim, Remote L/R Bypass, and Remote Input Select. The four inputs use logic gates, “pulled up” to +5V by way of resistors, which are active when brought to the logic low state. (Inputs of this type are commonly referred to as GPI inputs.) While the input circuitry is protected from over-current and static (ESD) discharge, care should be taken to prevent nasty signals from reaching them. The inputs are active only when held in the low state; they can’t be configured to change state (“latch”) in response to a logic pulse.

The connector labeled REMOTE CONTROL on the back panel of the Model 68 is used to interface the four remote control inputs. Refer to Figure 7 for exact connection details. Note that pin 1 (shield) and pin 9 (remote control common) are electrically identical. In addition to connecting to system common, they connect to the Model 68’s chassis and mains earth connections. For convenience, the shield of the interconnecting cable should be connected to pin 1 (shield), while the return signals of the remote control sources should connect to pin 9 (remote control common).

Note that although the remote control connections are physically made to the D-sub on the Model 68’s back panel, the remote control input circuitry is actually located in the Model 69 Control Console. Four conductors in the cable linking the Model 68 to the Model 69 route the remote control signals to the actual input circuitry.

Connecting the Model 69 to a Model 68

A cable with 9-pin D-sub plugs (males) on each end is used to interconnect the Model 69 Control Console with the Model 68 Central Controller. A 20-foot (6.1-meter) cable is provided with each system. The connector labeled TO/FROM CONTROL CONSOLE on the back panel of the Model 68 is used to connect to the Model 69.

Should a cable of different length be required, it should be wired in a one-to-one fashion for all 9 pins. Pin 1 carries signal common, and must be connected at both ends. A shield connection for the cable should be connected to pin 1 at one end. For best performance the cable generally should not exceed 50 feet (15.3 meter) in length. The reality is that a cable much longer in length should work, as long as an excellent-quality cable is utilized. We define “excellent” as extensive shielding along with very low capacitance. The low cable capacitance limits the amount of data-signal waveform distortion. As far as an actual maximum length, just test and see how far away you can go—if it works, it works!

AC Mains Power

The Model 68 is internally configured to operate from either nominal 100, 120, or 220/240V, 50/60Hz. Units shipped to North America are factory selected for 120V operation. Units bound for Japan are selected for 100V, while our friends “down under” and in Europe receive units set for 220/240V. Before connecting the Model 68 to AC mains power, check that it is configured to match the local mains voltage. Look on the back panel (adjacent to the

power entry connector) for the factory-configured voltage. Note that an incorrect configuration could seriously damage the unit. Should it be necessary to change the unit's operating voltage it must be performed only at the factory or by an authorized service technician.

The Model 68 uses an IEC-standard connector to mate with the AC mains cord. The wire colors in the AC mains cord should conform to the internationally recognized CEE color code and must be wired accordingly:

<u>Connection</u>	<u>Wire Color</u>
Neutral (N)	Light Blue
Line (L)	Brown
Protective Earth (E)	Green/Yellow

Safety Warning: The Model 68 does not contain an AC mains disconnect switch. As such, the AC mains cord plug serves as the disconnection device. Safety considerations require that the plug and associated outlet be easily accessible to allow rapid disconnection of AC mains power should it prove necessary.

As soon as AC mains power is applied, the Model 68's power present LED will light. The Model 69 will go through a power-up sequence, lighting each LED in succession. The data active LED on the Model 68 will briefly light upon completion of the Model 69's power-up sequence.

Configuration

After the physical installation has been completed, several configuration issues must be addressed. On the Model 68 the surround and stereo input signal levels must be calibrated using the trim potentiometers. The operating parameters of the system should be set using the Model 69 Control Console's configuration mode.

Level Calibration

Sixteen multi-turn trim potentiometers grace the front panel of the Model 68 Central Controller. Taking time to carefully adjust the trim pots will ensure that accurate monitoring can take place. Each trim pot allows an adjustment range of nominally ± 2 dB, which is spread over the trim pot's 15 turns. Calibrating the surround and stereo input levels to within one-tenth of a dB of the desired point is easily performed.

The monitor outputs are used as the measuring point when adjusting the trim pots. A laboratory-grade audio level meter, or equivalent, is required for accurate calibration. In addition, the audio sources connected to the inputs must be set to generate audio signals at their nominal operating level.

Procedure

This procedure will ensure that the surround and stereo inputs are level matched against each other. The trim pots will be adjusted in groups corresponding to their associated input sources.

1. Begin by turning the audio amplifiers or amplified speakers to their off state. This will protect the operator's ears from possible damage.

2. Rotate the level control on the Model 69 to the fully clockwise (maximum) position.
3. On the Model 68, connect the audio level meter to the left channel of the monitor output.
4. Using the Model 69 Control console, select input 1 (Surround A) as the audio source.
5. Confirm that the audio source's left channel is generating a steady signal at precisely its reference level. (For this procedure, it is assumed to be +4dBu.)
6. Observing the level meter, adjust input 1, trim pot L, to give a precise +4dBu level at monitor output L.
7. Disconnect the level meter from the left channel of the monitor output.
8. Repeat steps 3-7 for the center, right, left surround, right surround, and subwoofer channels of input 1 (Surround A).
9. Repeat steps 3-8 for inputs 2-4 (Surround B, Stereo A, and Stereo B). Obviously, the stereo inputs have only left and right inputs, requiring only that two trim pots be adjusted for each.
10. Rotate the level control on the Model 69 to the fully counterclockwise (minimum) position.
11. After ensuring that the Model 69's level control is set to minimum, return the AC mains switches on the power amps or amplified speakers to their on position.

Model 69 Operating Parameters

Many StudioComm functions can be configured to meet the exact needs of your installation. Here's an overview of what you can configure:

- Input channels active for each of the four inputs
- Monitor output channels active
- Local L/R Bypass
- Reference level
- Monitor output muting
- Dim level
- Remote controls

The Model 69 Configuration Charts, located at the end of this section, give details on how each parameter is set. An overview of each configurable parameter is provided in the following paragraphs.

Entering and Exiting the Configuration Mode

A small button is located on the back of the Model 69 Control Console, adjacent to the 9-pin D-sub connector. Pressing and holding this button for two seconds places the Model 69 into the configuration mode. In the configuration mode the Model 69's array of buttons and LEDs no longer perform their normal functions, but instead allow you to observe and change many of the operating parameters. The mute/solo mode LEDs light alternately to indicate that the configuration mode is active.

To return the Model 69 to normal operation, once again press and hold the configure button for two seconds. Note that

configuration changes are stored only after the configuration mode has been exited by pressing and holding the configure button.

Our apologies to those of you who find the configure button a pain to use, but it's supposed to be that way! Seriously, the top of the button is slightly recessed from the back panel, making it harder to accidentally activate. We didn't want normal operation to cease because someone pushed the Model 69 into a "rats nest" of music scores or track sheets!

When to Use the Configuration Mode

There is no problem frequently "tweaking" the Model 69's operating parameters to achieve the desired performance. The configuration data is stored in a non-volatile memory chip, which is rated for thousands of read and write cycles, and a retention time in tens of years.

Input Channels Active

This configuration is a bit tricky to understand, but is really quite simple—if we're clear on our explanation that is! The configuration parameter for the number of channels active for each input is provided for those special cases where a source has less channels than its usual, e.g., less than six for surround input A or B.

Let's look at an example, which is essentially a 6-channel monitor system. Input 1 (Surround A) is connected to a 6-channel source, so its default configuration is fine. But the source for input 2 (Surround B) is special, having only three channels: Left, center, and right. This makes it not so "cool" for the operator to select input 2 for monitoring, as the unconnected left surround, right surround, and subwoofer input channels will get routed to their respective monitor outputs. Will the unused input

channels pick up significant noise or hum? Unlikely, but why take a chance at having a problem. Simply use the input channels active configuration to disable the three unused channels. Now when input 2 is selected, only the relevant channels are selected for monitoring.

Note that when a channel associated with an input is disabled, the input routing circuitry, under software control, no longer selects it, but the corresponding monitor output channel does not mute. With our example, when selecting input 2, our mythical L/C/R source, all six monitor output channels will remain active, but the input routing circuitry won't select the LS, RS, and SUB inputs. While to some people this might seem confusing and possibly a design fault, it was implemented this way because the StudioComm system allows multiple inputs to be simultaneously selected for monitoring; a surround source might be selected at the same time as a stereo source. Muting the outputs simply would not do!

A special mode has been included to allow an input to be disabled from being accessed by the operator. This might be useful, for example, when input 4 (Stereo B) is not connected to a source, and has no valid reason to be selected. This might also be useful when connecting a special source, such as a house "tie line" or router output, that shouldn't normally be accessible. To disable an input is simple, just disable all channels associated with it; six for inputs 1 and 2, two for inputs 3 and 4. To confirm that the input has been disabled, all LEDs associated with that input will flash on and off. Once the Model 69 is returned to the normal operating mode, the disabled input cannot be selected.

Monitor Output Channels Active

The Model 68 and Model 69 hardware and software supports up to six monitor output channels. The Model 69 is configured, from the factory, to generate commands to control all six monitor outputs. This would be correct for most applications. But there may be cases, for example, where only a 4-channel system is desired. By configuring the Model 69 to disable the unused monitor output channels, operator clarity is enhanced. Specifically, the monitor output mute/solo buttons and LEDs for the unused monitor output channels will be disabled, along with the underlying functionality. With the unused monitor output channels disabled, an operator can't accidentally select those channels for solo or mute operation.

Local L/R Bypass

A button on the Model 69 Control Console allows the system to be changed from the normal surround mode to the L/R Bypass mode. The button could be considered to allow "local" control of the L/R Bypass function. In some installations, the L/R Bypass input won't be utilized, and locally enabling the function would be meaningless, and possibly confusing to operators. In other installations, remote control of the L/R Bypass function will be implemented, possibly eliminating the need for local control. In these cases, it may be desirable to use the configuration parameter to disable local L/R Bypass operation. When disabled, pressing the L/R Bypass button on the Model 69 will result in no change taking place; surround-mode operation will be maintained.

Power-up Mute All

By default, upon application of AC mains power the monitor outputs remain muted until a power-up sequence has been performed. Then the monitor outputs are returned to their respective states as left at the time of the previous loss of AC mains power, allowing normal operation to resume. There may be special uses where having the monitor output channels remain muted until an operator manually presses the mute all button. Use the configuration button to select the desired power-up mute-all operation.

Reference Level

For audio-with-picture applications it's critical that mixing be done in reference to a known monitor loudspeaker level. This is often referred to as mixing to "85dB" on the monitors. The Model 69 Control Console allows a precise monitor output level to be stored, and then enabled by pressing the button labeled REF. Setting the reference level is very simple:

1. Set up a precision sound pressure level (SPL) measuring device at the desired listening location.
2. Place the StudioComm system in the normal operating mode, not the configuration mode. Be certain that the reference and dim functions are not active.
3. Use the Model 69 Control Console to select the desired reference signal source, e.g., pink noise, as the active input source.
4. Observing the SPL meter, adjust the Model 69's rotary level control until the desired reference output level has been reached.

5. Being careful not to touch the position of the rotary level control, enter the configuration mode by pressing and holding the configuration button located on the Model 69's back panel.
6. Once the configuration mode has been entered, the monitor output signals will mute. Press and hold the reference button until its associated LED lights. This will take approximately 5 seconds. The LED lights to indicate that a "snapshot" of the new reference level has been taken.
7. To store the new reference level in memory, exit the configuration mode by again pressing and holding the configure button.

This level is now permanently stored as the reference level. Only by repeating the procedure can the value be changed.

Once the configuration mode has been exited, the monitor output channels will again become active. Confirm that the correct level has been stored by pressing the REF button. The SPL meter should again display the desired level. If not, repeat the calibration procedure.

You might wonder why you have to press and hold the reference button for 5 seconds before the selected value is stored. This is provided specifically so that some Bozo won't accidentally change the reference level while they are playing around in the configuration mode! Only if you know the "secret" will you be able to store a new value.

Monitor Output Muting

The Monitor Output Muting configuration allows selection of the method used for muting the monitor output channels whenever the mute all or channel mute/solo

functions are active. Each of the monitor output channels contains an electromechanical relay, providing loudspeaker-protection-muting during AC mains power up and power down. These same relays can also be used to mute the output channels during operation of the mute all or channel mute/solo functions. An alternative muting method is also available, utilizing the solid-state analog switches that are part of the input circuitry. In most cases using the relays is preferred, as they provide the most complete muting. Their one downside is that they generate a slight mechanical noise upon activation or deactivation. If the Model 68 is installed in a location where this noise is objectionable, select the configuration to use the analog switches for muting.

If the L/R Bypass input function is utilized in the installation, ensure that the muting method is configured to use the analog switches. Refer to the Technical Notes section for more details.

Remote Input Select

The Remote Input Select function requires configuring two parameters: Mode and input to be selected. The mode can be selected from three choices: Disabled, exclusive, and nonexclusive. As expected, when configured for disabled, the function can not be activated. When configured for exclusive, whenever the function is activated only the specified input will be active. When configured for nonexclusive, whenever the function is activated the specified input will be added (summed) with any other input or inputs that are already active.

Selecting the input associated with the remote input select function is simple. Just choose any one of the four inputs.

Dim Level

The dim function is used to reduce the monitor output level by a preset amount. The reduction is in dB relative to the monitor output's current level. There are four dim level values available: 10, 15, 20, and 25dB.

Remote Mute All

Two configuration choices are associated with the Remote Mute All function: Disabled and enabled. To utilize the function simply configure it for enabled.

Remote Dim

Two configuration choices are associated with the Remote Dim function: Disabled and enabled. To utilize the function simply configure it for enabled.

Remote L/R Bypass

Two configuration choices are associated with the Remote L/R Bypass function: Disabled and enabled. To utilize the function simply configure it for enabled. Note that the Remote L/R Bypass function can be enabled and activated, even if the local L/R Bypass control is disabled.

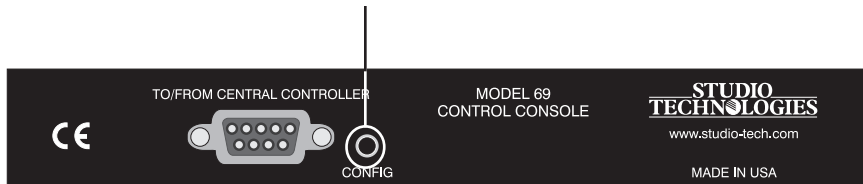
Restore Factory Defaults

The restore factory defaults function is provided primarily for factory use. In this way a system can be shipped with the default settings selected. While you are welcome to use this function, be careful so that your configuration efforts aren't wasted. Specifically, be aware that the reference level is reset to minimum level. All the other parameters are fairly easy to set up, but resetting the reference level would require getting out the SPL meter and a calibrated signal source. This is a hassle you may not need!

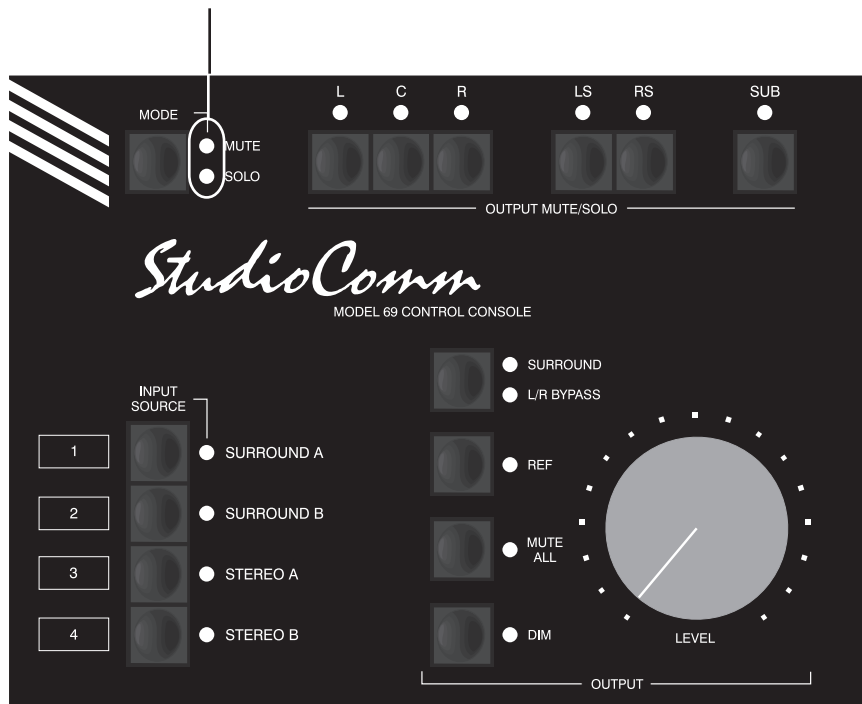
Model 69 Configuration—Entering and Exiting Configuration Mode



Press and hold the configuration button for 2 seconds to enter or exit the configuration mode.



These LEDs will light alternately when configuration mode is active.

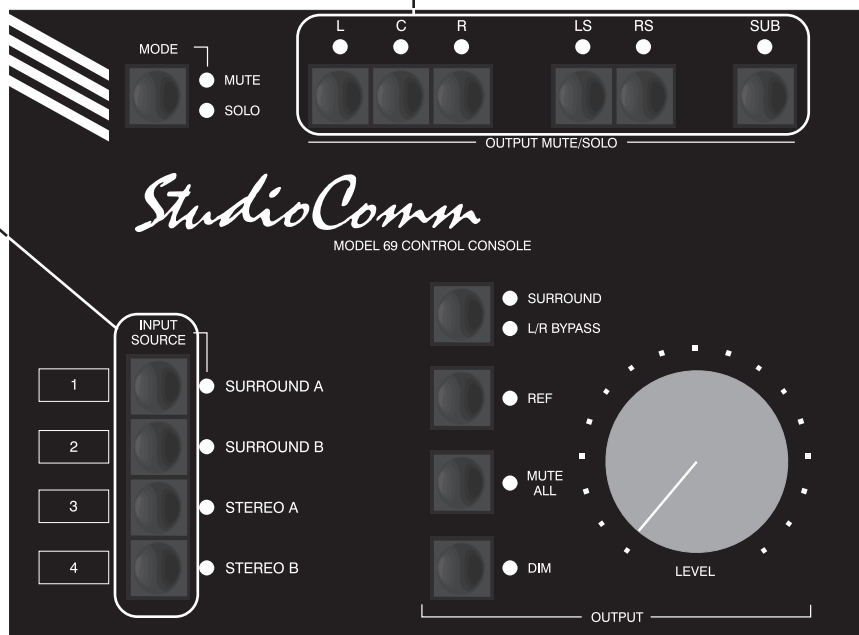


Model 69 Configuration—Input Channels Active



Press and hold an input button (one at a time) to display and select which channels associated with that input are active.


When an input button is pressed, these LEDs display which input channels are active for that input. A lit LED indicates that the channel is active. Use the buttons to change the configuration.



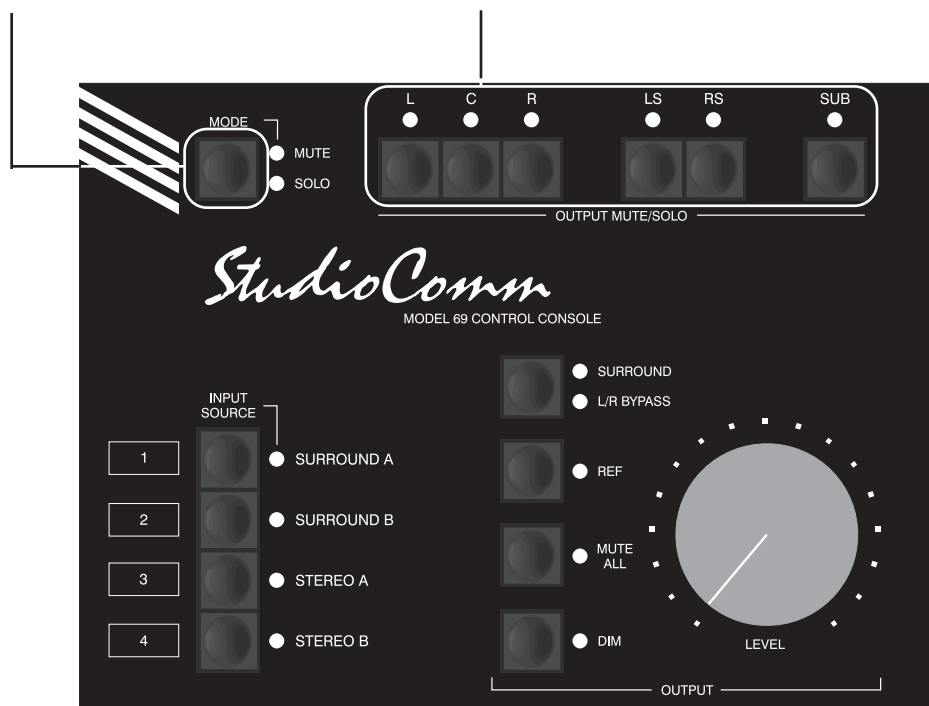
Default: For inputs 1 and 2, all six channels (L, C, R, LS, RS, SUB) are active. For inputs 3 and 4, both channels (L, R) are active.

Note: A special input disable function is available. By disabling all channels associated with a specific input, that input will no longer be available during normal operation. While in the configuration mode, all LEDs associated with an input will flash to indicate that the input has been disabled. This function is useful if an input is not going to have a source associated with it. Then during normal operation this input cannot be selected, minimizing any confusion caused by selecting an invalid input source.

Model 69 Configuration—Monitor Output Channels Active

 Press and hold the mode button to display and configure which monitor output channels are active.

When the mode button is pressed, these LEDs display which monitor output channels are to be active. A lit LED indicates that the channel is active. Use the buttons to change the configuration.



Default: All six monitor output channels active.

Note: When no monitor output channels are selected to be active, all the LEDs flash to indicate an error condition.

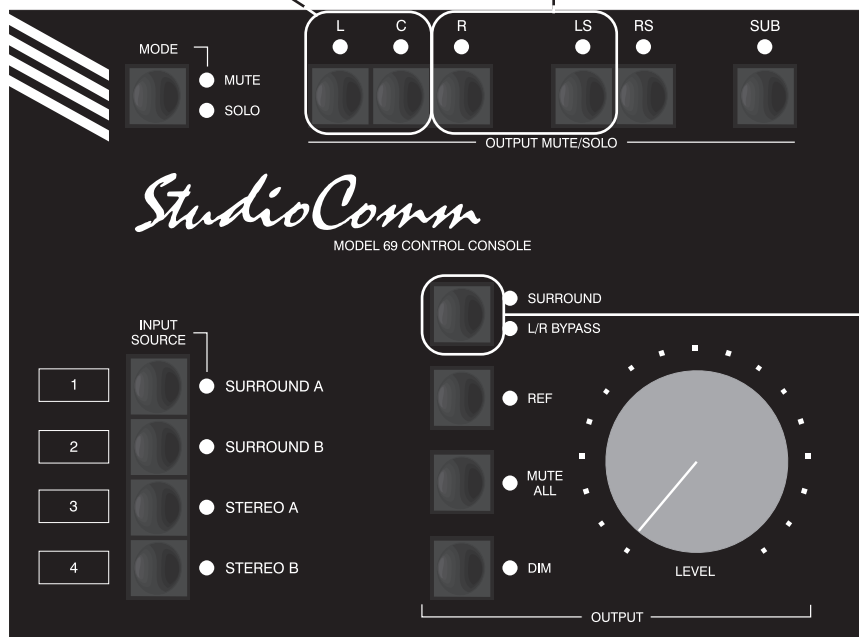
Model 69 Configuration—Local L/R Bypass and Power-Up Mute All

When the L/R bypass button is pressed, these LEDs display the status of the local L/R bypass function. When LED L is lit local L/R bypass function is disabled; when LED C is lit the function can be enabled. Use the buttons to change the configuration.

When the L/R Bypass button is pressed, these LEDs display the status of the power-up mute all function. When LED R is lit the state of mute all is saved at power down and followed upon power up; when LED LS is lit the system is always in mute all upon power up. Use the buttons to change the configuration.




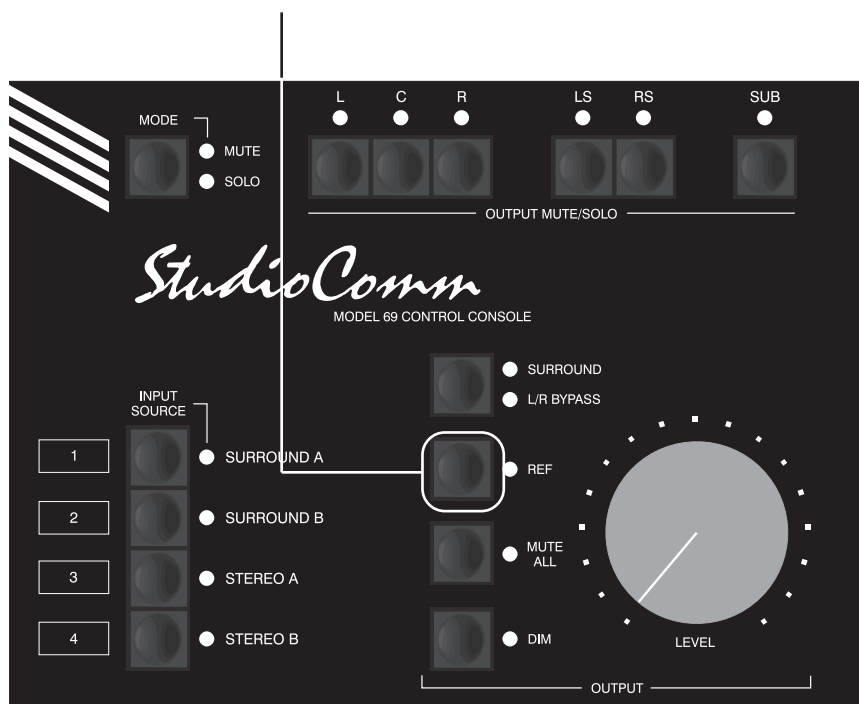
Press and hold the L/R bypass button to display and select the status of local L/R bypass and power-up mute all functions.



Default: L/R bypass function can be enabled.
Upon power up, mute all function follows the state saved at last power down.

Model 69 Configuration—Reference Level

 Press and hold the REF button for 5 seconds to take a “snapshot” of the rotary level control’s present setting. The REF LED will light when the “snapshot” has been taken.



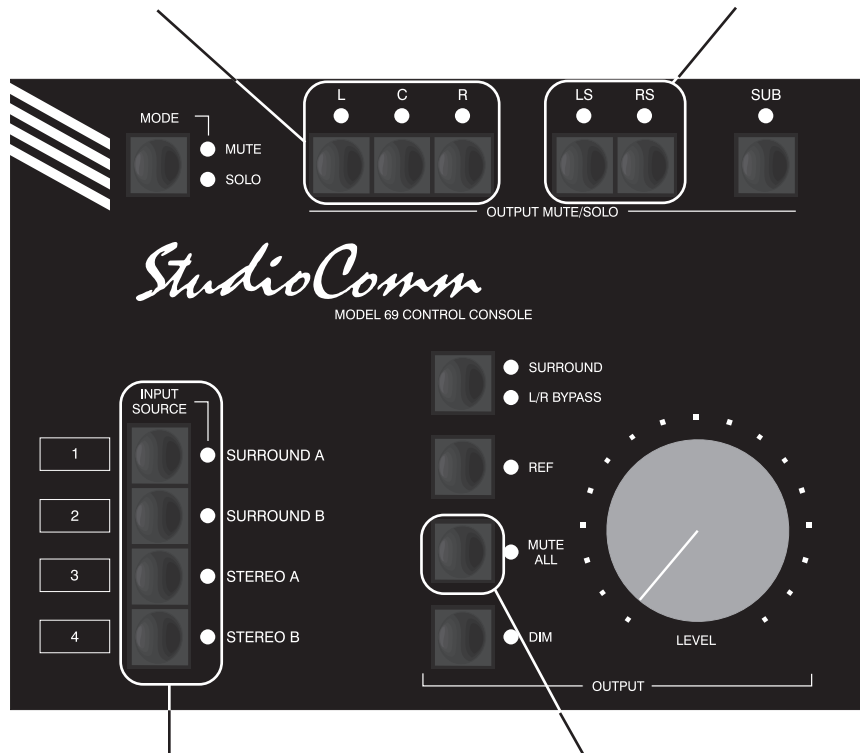
Default: Fully attenuated (minimum) monitor output level.

Note: The 5-second delay is a safety feature, ensuring that the reference level will not be accidentally changed. To permanently store the new value, you must still exit the configuration mode.

Model 69 Configuration—Monitor Output Muting and Remote Input Select

These LEDs display the mode of the remote input select function. LED L lit means that the function is disabled. LED C lit means that the function provides exclusive input select. LED R lit means that the function provides nonexclusive input select. Use the buttons to change the configuration.

These LEDs display the status of monitor output muting. LED LS lit means that muting is by means of the relays. LED RS lit means that muting is by means of the input analog switches. Use the buttons to change the configuration.



When the mute all button is pressed, these LEDs display the input associated with the remote input select function:

LED 1 lit means input 1 (surround A);
LED 2 lit means input 2 (surround B);
LED 3 lit means input 3 (stereo A);
LED 4 lit means input 4 (stereo B).

Use these buttons to select the input.



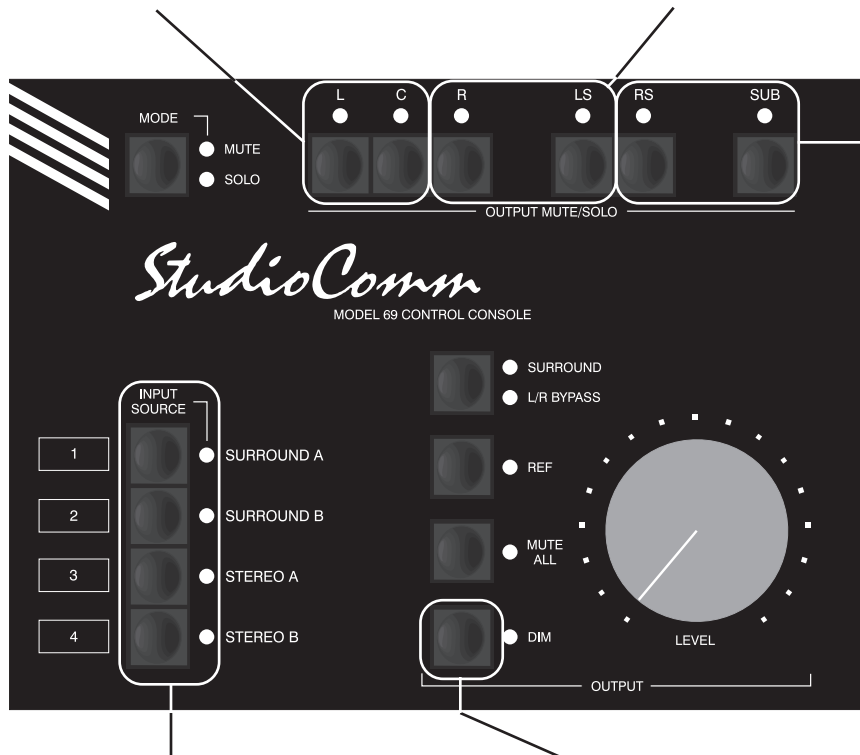
Press and hold the mute all button to display and configure the monitor output muting and remote input select functions.

Default: Remote input select function disabled.
Input 1 (surround A) associated with remote input select function.
Monitor output muting by means of the relays.

Model 69 Configuration—Dim Level, Remote Mute All, Remote Dim, and Remote L/R Bypass

These LEDs display the configuration of remote mute all. LED L lit means that remote mute all is disabled; LED C lit means enabled. Use the buttons to change the configuration.

These LEDs display the configuration of remote dim. LED R lit means that remote dim is disabled; LED LS lit means enabled. Use the buttons to change the configuration.



These LEDs display the status of remote L/R bypass. LED RS lit means that remote L/R bypass is disabled; LED SUB lit means enabled. Use the buttons to change the configuration.

When the dim button is pressed, these LEDs display the selected dim level:

LED 1 lit means 25dB dim;
LED 2 lit means 20dB dim;
LED 3 lit means 15dB dim;
LED 4 lit means 10dB dim.


Use the buttons to select the dim level.

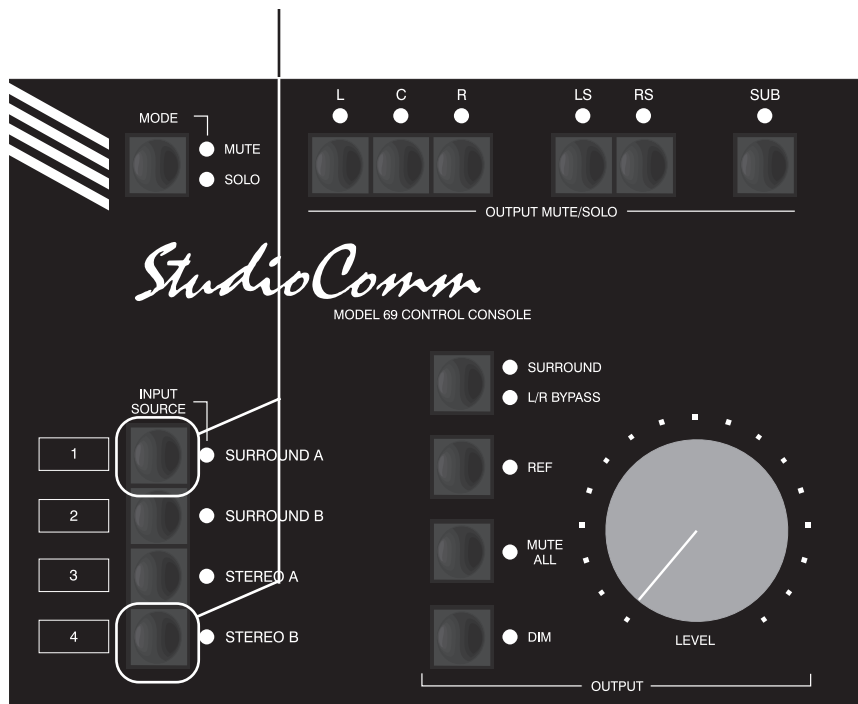


Press and hold the dim button to display and select the dim level, remote mute all, remote dim, and remote L/R bypass configurations.

Default: 20dB dim level.
Remote mute all disabled.
Remote dim disabled.
Remote L/R bypass disabled.

Model 69 Configuration—Restore Factory Defaults

 Press and hold both input 1 and input 4 buttons for 5 seconds to restore Model 69 factory defaults. Once defaults have been restored, the LEDs will light. After buttons are released, configuration mode will be exited and normal operation will resume.



Factory Defaults: All channels associated with each input are active.
All six monitor output channels active.
Local L/R bypass function disabled.
Upon power up, mute all function follows the state saved at last power down.
Reference level is set for fully attenuated (minimum) monitor output level.
Monitor output channels C, LS, RS, and SUB mute by means of the relays.
Remote input select function disabled.
Input 1 associated with remote input select function.
20dB dim level.
Remote mute all disabled.
Remote dim disabled.
Remote L/R bypass disabled.

Note: The 5-second delay is a safety feature, ensuring that the factory defaults will not be accidentally restored.

Operation

Now that you've installed and configured the system, you're ready to go. You should find operation very easy.

Model 68 Central Controller

The Model 68 front panel contains two LEDs. The power LED should be lit whenever AC mains power is connected. The data LED will light whenever a MIDI system-exclusive message is received from the Model 69.

Model 69 Control Console

StudioComm operation is controlled using the Model 69 Control Console and, if installed, the remote control inputs. To make things easy to describe, we've divided the StudioComm functions into four main groups: Input source selection, monitor output general functions, mute/solo, and remote controls.

Input Source Selection

Input source selection is simple. To select an input source for routing to the monitor outputs, press one of the four input source buttons. The corresponding LED will light to let you know that the input has been selected. You can select more than one input source simultaneously; up to all four. The selected inputs will be summed (combined). Start by pressing and holding the button associated with your first input source. While the button is still pressed, add the extra inputs by momentarily pressing the buttons associated with them. The LEDs will light to tell you which inputs have been selected. Note that an input LED will flash if the input has been selected using the remote input select function.

A recall feature is an integral part of the input selection process. It's a bit confusing to explain, but simple once you experience it in "real time." A one sentence explanation would describe the input recall feature as allowing the system to return to the previously selected input (or inputs) by simply pressing one button. It was included specifically for film-post applications where it's important to be able to change quickly between a combination of inputs, such as two "stems," and a single input.

Let's begin the explanation with an example: A film-post facility where the usual monitoring setup has both input 1 and input 2 simultaneously selected, while input 3 is occasionally selected to monitor a cue track. To select both inputs, press and hold the button associated with input 1, then press input 2's button, then release both buttons. Inputs 1 and 2 are now selected for monitoring. To monitor input 3 press the button associated with it. To return to monitoring inputs 1 and 2, simply press input 3's button again. The recall feature returns the system to the previously selected inputs. That's all there is to it!

A special configuration mode allows an input to be disabled. This would be appropriate if an input has not been connected to an audio source. If you press an input source button and the previously selected input source does not change, the newly selected input has been disabled.

Monitor Output General Functions

Four buttons and one rotary control are associated with the monitor output functions. The buttons control operation of

local L/R Bypass, reference level, mute all, and dim. The rotary level control is used to manually set the monitor output level.

Local L/R Bypass

Using the L/R Bypass function is quite simple, just press the local L/R Bypass button to enable it. Signals connected to the left and right bypass inputs will be routed to the left and right monitor outputs, respectively; the center, left surround, right surround, and subwoofer outputs will mute. The local L/R Bypass button is always set to “latch” the function on and off. There are two LEDs associated with the local L/R Bypass button. During normal operation the surround LED will be lit. Whenever L/R Bypass is active the surround LED will go out, and the L/R Bypass LED will light. Note that if L/R Bypass is enabled via the remote L/R Bypass function, the L/R Bypass LED will flash.

Remember that the Model 69 Control Console can be configured to disable the L/R Bypass button. If the button is pressed and nothing happens, this must be the case!

Reference Level

The reference level button, labeled REF, sets the monitor output to a preset level. This level is normally set by a technician, using a sound-pressure-level (SPL) meter, at the time of system installation. The LED associated with the reference level function lights whenever the function is active. When reference level mode is active the rotary level control is disabled.

The reference LED also serves as a calibration aid. If the reference level mode is not active, and the rotary level control is set at precisely the same level as that

stored for the reference value, the reference LED will flash.

Mute All

The mute all function is highly complicated to operate—not! Pressing the mute all button causes the monitor outputs to mute. The mute all button is always set to “latch” the function on and off. The LED associated with the mute all button will light whenever mute all is active. Note that if mute all is enabled via the remote mute all function, the mute all LED will flash.

Dim

The dim function is quite self-explanatory. Press the dim button to enable the dim mode, which reduces the monitor output level by a preset amount. The dim button is always set to “latch” the function on and off. Dim activity applies no matter whether the monitor output level is being set by the rotary control or the reference button. The dim level can be configured for 10, 15, 20, or 25dB, so one of those values will apply when dim is active. The LED associated with the dim button will light whenever dim is active. Note that if dim is enabled via the remote dim function, the dim LED will flash.

What’s not so self-explanatory is the auto-dim-off function. Whenever dim is enabled due to the dim button being pressed, and reference mode is not active, changing the rotary level control will automatically turn off dim. The auto dim off function is a unique attempt at protecting the aural health of audio engineers. No longer will there be a heart-stopping blast of audio when the dim button is pressed, supposedly to enable dim, but actually turning dim off because it was already enabled. It’s hard to explain unless you’ve used

an audio console and experienced this in person—trust us, this situation does happen! Auto dim off is a wonderful “real-world” feature.

Note that the auto dim off function is not active whenever dim is enabled due to the remote dim function being active. This allows remote control equipment, such as a talk-back system, to reliably dim the monitor outputs.

Rotary Level Control

The rotary level control is used to manually adjust the monitor output level. It is active any time the reference level function is not active. When the rotary level control is set to give the same output level as the preset reference level, the reference LED will flash. Note that when the level control is set to its fully counterclockwise position, maximum attenuation is achieved, but don't expect a full mute. The mute all function should be used to fully mute the monitor outputs.

Mute/Solo

The mute/solo mode button and the six monitor output channel buttons, along with associated LEDs, work together to provide excellent operating flexibility. The mute/solo mode switch allows the operator to select between industry-standard mute and solo functions. The mute and solo functions use, depending on the configuration, mute relays or input analog switches to enable or disable monitor output channels. Going from mute mode to solo mode, or vice-versa, clears all active mutes or solos. Pressing the mode switch twice is a legitimate means of quickly clearing muted or soloed channels.

In the mute mode, multiple channels can be muted simultaneously. A channel that is muted has its associated LED turned on. In the solo mode multiple channels can be soloed simultaneously. A channel that is soloed has its associated LED flash on and off, while the LEDs on the non-soloed channels are not lit.

Note that monitor output channels which have been configured to be disabled are not accessible using the monitor output channel buttons. This ensures that an operator only has access to the available output channels. Unsupported monitor output channels will have their LEDs permanently off.

Remote Control

Four remote control signals can be connected to the system and configured for the desired operating characteristics: Remote mute all, remote dim, remote L/R Bypass, and remote input select. When remote mute all is activated the LED on the Model 69 associated with mute all will flash. If mute all was already active when the remote mute all function is activated, the LED will change from being lit to flashing.

When Remote Dim is activated the LED on the Model 69 associated with the dim function will flash. If dim was already active when remote dim is activated, the LED will change from being lit to flashing.

When remote L/R Bypass is activated, the surround LED on the Model 69 will go out, and the L/R Bypass LED will flash. If L/R Bypass was already active when remote L/R Bypass is activated, the L/R Bypass LED will change from being lit to flashing.

When remote input select is activated, the LED on the Model 69 associated with the selected input will flash. If the function is set for exclusive, no other LEDs will be lit. If the function is set for nonexclusive, the LED associated with remote input select will flash, while the LEDs associated with any other active inputs will remain lit.

Technical Notes

L/R Bypass Function

There are several issues that must be taken into account when connecting and using the L/R Bypass function. A brief overview of how the function is implemented may prove useful. Each of the Model 68's six monitor outputs uses electromechanical relay contacts to connect the output circuitry to the output connector. During the transition from power-down to power-up, and vice-versa, the relays are placed in their non-energized state. For the C, LS, RS, and SUB outputs, the relay contacts, when in their non-energized state, short the outputs, providing a mute function. The L and R outputs are different in that instead of muting the outputs, they connect the outputs to the L/R Bypass inputs. So in effect, the L and R monitor outputs don't have a true mute function, but limit the amount of clicks, pops, and other noise by simply not being connected during power-up and power-down transitions. While this method is simple, it does require care in several areas. The first area of concern is to ensure that a source connected to the L/R Bypass input is "quiet" at times when the Model 68's left and right monitor outputs are in their "mute" state. This should not be an issue

as the usual audio source, the monitor output of an audio console, should have its own protection.

The second area of concern relates to the monitor output muting method. If a source is connected to the L/R Bypass input, the monitor output mute method must be set to use the solid-state analog switches. This method will ensure that the L/R Bypass inputs won't connect to the left and right monitor outputs when the mute all or mute/solo functions are active. If the L/R Bypass function is not going to be used, either monitor output muting method can be selected. Just be certain that the L/R Bypass input is wired to provide muting, as detailed in the Installation section of this guide.

Monitor Output Gain Structure

The Model 68 Central Controller's monitor outputs are configured for unity gain. When the rotary level control on the Model 69 Control Console is set for maximum level (fully clockwise) the output level is essentially the same as the input level. The input trim potentiometers allow precise adjustment of the monitor output level. This was provided so that slight level variations in input sources, the Model 68's circuitry, and the associated power amplifiers can be "trimmed out."

Audio Input and Monitor Output Levels

The audio inputs and monitor outputs were designed for +4dBu nominal operating levels. It was anticipated that signals with lower operating levels may also get connected. While it was not practical to directly support multiple operating levels, the circuitry was specifically designed so that operating level changes could easily be performed by a qualified technician.

Schematic diagrams which cover the Model 68 and Model 69 are available upon request from the factory. Checking the “fine print” on the Model 68 schematic pages, you’ll find the resistor identification numbers and corresponding values to change the input nominal level to -10dBu operation. (The Model 68’s designer is well aware that “ -10 ” signals are supposed to be referenced to dBV , but finds from experience that a nominal input level of -10dBu interfaces better!)

Definition of Level— dBu

Whenever possible, Studio Technologies has opted to use the dBu designation as it seems to be quite rational. Using dBm was fine when all audio line outputs were terminated with 600 ohm loads. In this way it was easy to say that 0dBm is 1 milliwatt dissipated in the known load (i.e., 0dBm across 600 ohms will measure 0.775V). In contemporary situations an output is rarely terminated with 600 ohms; generally 10k ohms or higher. The dBu designation is better because it refers to dB referenced to 0.775V , with no reference to load impedance. This takes into account today’s audio scene where signals have a low source impedance, and a high input impedance. The dBu designation is becoming the standard for the professional audio industry.

“Hot” Disconnection of the Model 69 Control Console

Should you need to relocate the Model 69 while your StudioComm system is operating, there is no reason why you can’t disconnect the cable, move the unit, and then connect it again. If the Model 69 is disconnected while it is operating, the current operating parameters are saved in nonvolatile memory and the Model 68

Central Controller will continue to operate as before the connection was broken. No clicks, pops, or other noises will occur when the Model 69 is again connected. The Model 69 will go through its standard power-up sequence, send a message to reset power-up defaults, then send the operating parameters as stored in its memory. You may notice a brief interval of silence while the Model 68 responds to the reset defaults and operating parameter messages.

Power Amplifier Input Sensitivity

Optimum StudioComm performance is obtained when the input sensitivity of the associated audio power amplifiers or amplified speakers is adjusted to match the Model 68’s monitor output level. With normal, but loud, listening levels you should find the level potentiometer on the Model 69 to be set at approximately the “2-o’clock” position. If you find that you don’t have to turn up the Model 69’s control that high, reduce the input sensitivity of the power amplifiers until you get to the 2-o’clock position. Most power amplifiers and amplified speakers have controls on their inputs to allow easy adjustment of input sensitivity.

Monitor Output Transient Protection

The Model 68 Central Controller contains a power up/power down transient protection feature. This limits the chance of damage to the monitor loudspeakers during the time when AC mains voltage is connected, disconnected, or has changed significantly from nominal. A combination of hardware and software is used to monitor one of the power supply “rails.” Until the power supply exceeds 81% of its nominal voltage, electromechanical relays maintain a short circuit

condition on the C, LS, RS, and SUB monitor outputs, while the L and R monitor outputs are maintained in the L/R Bypass mode. After a short delay the relays are allowed to function normally. Whenever the power supply drops below 79% of its nominal voltage, the relays immediately go to their protection state. During testing it was found that upon power up the monitor outputs remained very quiet; during power down a moderate “tick” was the worst that was heard.

Model 68 to Model 69 Connections

Figure 8 gives a detailed view of the signals that connect between the Model 68 Central Controller and the Model 69 Control Console. The Model 68 provides +15Vdc power for the Model 69. The Model 69 generates MIDI system-exclusive messages and sends them to the Model 68. From the outside world, the four remote control input sources connect to the Model 68. They then route, via the interface cable, from the Model 68 to the actual input circuitry, located in the Model 69.

Pin	Signal	Direction
1	Power Supply Common	68 to/from 69
2	+15Vdc	68 to 69
3	Data (MIDI System-Exclusive)	69 to 68
4	Data Common	69 to/from 68
5	Remote Mute All	68 to 69 (Note 2)
6	Remote Dim	68 to 69 (Note 2)
7	Remote L/R Bypass	68 to 69 (Note 2)
8	Remote Input Select	68 to 69 (Note 2)
9	Remote Control Common	68 to/from 69

Notes: 1) Connector types on Model 68 and Model 69 are 9-pin D-subminiature female. Connectors use 4-40 threaded inserts for locking with mating plug.

2) Remote control sources connect to D-sub on Model 68, then passively route to 68/69 interface D-sub.

Figure 8. Connections between Model 68 and Model 69

Specifications

Model 68 Central Controller

General Audio:

Frequency Response: 20Hz-20kHz ± 0.1 dB
(down 0.5dB @ 85kHz), monitor out

Distortion (THD+N): 0.05%, measured at 1kHz,
+4dBu, monitor out

S/N Ratio: 92dB, ref +4dBu out

Crosstalk: 78dB, ref +4dBu in

Audio Line Inputs: 16, organized at two
6-channel inputs and two 2-channel inputs

Type: electronically balanced

Impedance: 24k ohms

Nominal Level: +4dBu, adjustable ± 2 dB

L/R Bypass Input: 1, 2-channel

Type: balanced, passive, no circuitry associated
with input

Switching: left and right bypass inputs switched
to left and right monitor outputs using sealed,
bifurcated relay contacts

Monitor Outputs: 1, 6-channel

Type: electronically balanced

Nominal Level: unity gain, audio line inputs to
monitor outputs

Maximum Output Level: +27dBu into 10k ohms,
+26dBu into 600 ohms

Level Control Method: laser-trimmed voltage-
controlled-amplifier integrated circuits manufac-
tured by THAT Corporation

Attenuation Range: 72dB, nominal, using rotary
level control

Connectors:

Audio: 3, 25-pin D-subminiature female

Control: 2, 9-pin D-subminiature female

AC Mains: 3-blade IEC-type

Remote Control Inputs: 4, HCMOS-type logic,
"pulled up" to +5Vdc using 10k ohm resistors,
activates on closure to system common

AC Mains Requirement:

100, 120, or 220/240V, $\pm 10\%$, factory configured,
50/60Hz

Dimensions (Overall):

19.00 inches wide (48.3cm)

1.72 inches high (4.4cm)

8.75 inches deep (22.2cm)

(1 standard rack space)

Weight: 7.9 pounds (3.6kg)

Model 69 Control Console

Application: supports Model 68 Central
Controller

Power: provided by Model 68 Central Controller

Output Data: generates MIDI system-exclusive
messages

Connector: 1, 9-pin D-subminiature female

Dimensions (Overall):

7.2 inches wide (18.3cm)

2.2 inches high (5.6cm)

5.4 inches deep (13.7cm)

Weight: 2.0 pounds (0.9kg)

Specifications subject to change without notice.

Appendix A

Controlling the Model 68

The Model 68 Central Controller uses MIDI system-exclusive messages to control all functions. The Model 69 Control Console is programmed to generate a subset of what the Model 68 is capable of doing. By using standard MIDI messages, the Model 68 can be used for a wide range of special applications. Any device that can be programmed to send system-exclusive MIDI messages can be used to control the Model 68.

General Notes:

All MIDI messages to be acted upon are system-exclusive type (F0H). No channel mode, system common, or system real time messages are utilized.

Studio Technologies, Inc. manufacturer's ID number is 00H 00H 56H

The Model 68's product device ID number is 04H.

Function: Reset to Power Up Default Configuration

Byte	Value	Description
1	F0H	System-Exclusive Message
2	00H	1 st Byte of Studio Tech ID
3	00H	2 nd Byte of Studio Tech ID
4	56H	3 rd Byte of Studio Tech ID
5	04H	Product ID (Model 68)
6	00H	Function, Restore Power Up Default Configuration
7	F7H	EOX, End of System-Exclusive Message

Notes: Action taken after message is received:
Set all input sources to off.
Set all monitor output channels to off.
Set monitor output level to minimum.
Set L/R bypass to normal.

Function: Input Source and Associated Channels

Byte	Value	Description
1	F0H	System-Exclusive Message
2	00H	1 st Byte of Studio Tech ID
3	00H	2 nd Byte of Studio Tech ID
4	56H	3 rd Byte of Studio Tech ID
5	04H	Product ID (Model 68)
6	01H	Function, Input Source and Associated Channels
7	0nH	Input Source, range 1-4: 1=surround A 2=surround B 3=stereo A 4=stereo B
8	nnH	Input Channel Status Bit Map (sum values from all six channels): Channel 1 (L): off=00; on=01 Channel 2 (C): off=00; on=02 Channel 3 (R): off=00; on=04 Channel 4 (LS): off=00; on=08 Channel 5 (RS): off=00; on=10 Channel 6 (SUB): off=00; on=20
9	F7H	EOX, End of System-Exclusive Message

Note: Inputs 3 and 4 only have input channels 1 (L) and 3 (R) associated with them. Channels 2 (C), 4 (LS), 5 (RS), and 6 (SUB) are not physically present on inputs 3 and 4.

Function: Monitor Output Channel Status

Byte	Value	Description
1	F0H	System-Exclusive Message
2	00H	1 st Byte of Studio Tech ID
3	00H	2 nd Byte of Studio Tech ID
4	56H	3 rd Byte of Studio Tech ID
5	04H	Product ID (Model 68)
6	02H	Function, Monitor Output Channel Status
7	nnH	Monitor Output Channel Status using Monitor Output Relays Bit Map (sum values from all six channels): Channel 1 (L): off=00; on=01 Channel 2 (C): off=00; on=02 Channel 3 (R): off=00; on=04 Channel 4 (LS): off=00; on=08 Channel 5 (RS): off=00; on=10 Channel 6 (SUB): off=00; on=20
8	nnH	Monitor Output Channel Status using Input Analog Switches Bit Map (sum values from all six channels): Channel 1 (L): normal=00; mute=01 Channel 2 (C): normal=00; mute=02 Channel 3 (R): normal=00; mute=04 Channel 4 (LS): normal=00; mute=08 Channel 5 (RS): normal=00; mute=10 Channel 6 (SUB): normal=00; mute=20
9	F7H	EOX, End of System-Exclusive Message

Function: Monitor Output Level - Normal

Byte	Value	Description
1	F0H	System-Exclusive Message
2	00H	1 st Byte of Studio Tech ID
3	00H	2 nd Byte of Studio Tech ID
4	56H	3 rd Byte of Studio Tech ID
5	04H	Product ID (Model 68)
6	03H	Function, Monitor Output Level - Normal
7	nnH	Monitor Output Level, MSB, range 00-7F
8	0nH	Monitor Output Level, LSB, range 0-1
9	F7H	EOX, End of System-Exclusive Message

Notes: Control console sends new value each time monitor output level is changed.

Monitor output level is 8-bit precision, spread over two MIDI bytes: 00H 00H lowest; 7FH 01H highest. MIDI byte 7 is monitor output level bits 2-8; MIDI byte 8 is monitor output level bit 1.

Dim function is performed by control console and is sent using monitor output level command.

Function: Monitor Output Level - Reverse

Byte	Value	Description
1	F0H	System-Exclusive Message
2	00H	1 st Byte of Studio Tech ID
3	00H	2 nd Byte of Studio Tech ID
4	56H	3 rd Byte of Studio Tech ID
5	04H	Product ID (Model 68)
6	04H	Function, Monitor Output Level - Reverse
7	nnH	Monitor Output Level, MSB, range 00-7F
8	0nH	Monitor Output Level, LSB, range 0-1
9	F7H	EOX, End of System-Exclusive Message

Notes: Not sent by control console. Provided for special applications.

Monitor output level is 8-bit precision, spread over two MIDI bytes: 00H 00H highest; 7FH 01H lowest. MIDI byte 7 is monitor output level bits 2-8; MIDI byte 8 is monitor output level bit 1.

Dim function is performed by control console and is sent using monitor output level command.

Function: L/R Bypass

Byte	Value	Description
1	F0H	System-Exclusive Message
2	00H	1 st Byte of Studio Tech ID
3	00H	2 nd Byte of Studio Tech ID
4	56H	3 rd Byte of Studio Tech ID
5	04H	Product ID (Model 68)
6	05H	Function, L/R Bypass
7	0nH	L/R Bypass Status, range 0-1: 0=normal 1=L/R bypass
8	F7H	EOX, End of System-Exclusive Message