USI AUDIO™

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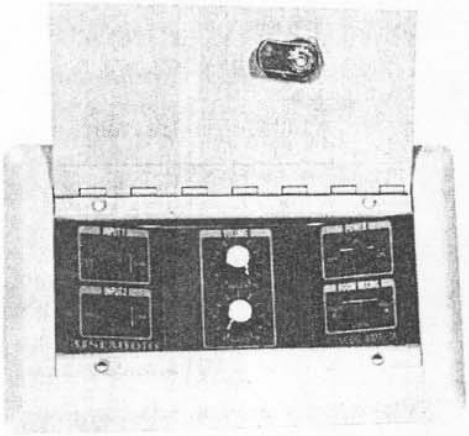
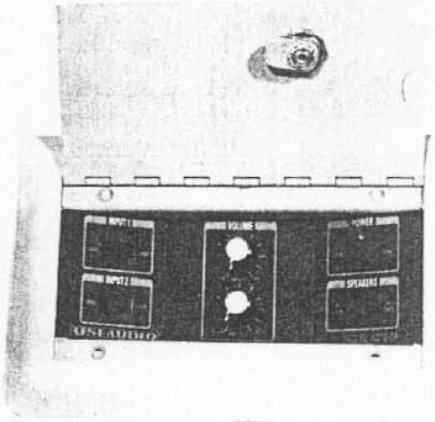
4022-CA / 4022-ZA

In-wall Mixer/Amplifiers for the ACE-4000 System

Owner's Manual





Specifications

Power Output	20 Watts RMS @ 8Ω
	25 Watts RMS @ 4Ω
Frequency Response	35 Hz - 20 kHz +0/-2 dB
Distortion	less than 0.2%, 40Hz - 20kHz
	@ rated power output
Signal-to-Noise Ratio	68 dB volume max
	81 dB volume min
Measured Input Impedance/Sensitivity	
MIC	2 KΩ / 1.5 mV
LINE	36 KΩ / 100 mV
POWER AMP IN	47 KΩ / 620 mV
Measured Output Impedance	
PREAMP OUT	100 Ω
Speaker outputs	4Ω to 16Ω continuous
	25V / 70.7V w/ optional xfrmr
Amplifier Protection	Thermal & short circuit protect
Power Requirements	24 - 30 VDC, 1.5 Amps min.
Dimensions: Height	6.0" (15.3 cm)
Width	9.25" (23.5 cm)
Depth	2.25" (5.7 cm)
Net Weight	1.5 lbs. (0.68 kg)
Shipping Weight	2 lbs. (0.9 kg)
Color	Tan

Description

The Model 4022-CA and 4022-ZA are two input, 20 Watt mixer/amplifiers designed for mounting into a readily available 4-gang deep masonry type electrical wall box (RACO 698 or equivalent). They feature a removable, locking front cover to prevent unauthorized access, and even the mounting screws are concealed under the cover. They utilize a separate 24 Volt DC power supply to simplify connections at the amplifier. There are two input channels. Each of these inputs has a switch to select between balanced Lo-Z microphone and balanced line levels. This allows for simultaneous connection of up to four input sources. Each of the MIC inputs provide 24 VDC phantom power. The front panel features two input level controls, two input selector switches, a power switch and power-on LED indicator, and either a ROOM MIXING switch (Model 4022-CA) or a SPEAKERS switch (Model 4022-ZA). The Model 4022-CA can be used in room combining applications by connecting the ROOM MIXING switch directly to USI Models 4042-CM or 4082-CM combining matrices. Model 4022-ZA has a SPEAKERS switch that can be used to selectively turn off speakers in different zones in a room by using a unique "bridged" speaker connection scheme. An insertion point between the preamplifier and the power ampli-

fier sections is available for linking multiple units or connection to external signal processing equipment.

Unpacking

The unit should be removed carefully from the carton and inspected for any possible damage in transit. If there is any evidence of damage which might have occurred in shipment, immediately notify your supplier or the transportation company which delivered it. Claims for damage sustained in transit must be made upon the carrier. Save all packing material for the claim agent who will supply you with the proper forms and give you the necessary instructions for filling out a claim.

Installation

The 4022-CA and 4022-ZA enclosures have been specifically designed for installation in a RACO 698 (or equivalent) four-gang, deep electrical wall box. Of course, the installer may choose to install these models in a different manner, but installation in an electrical box will often ease coordination with other aspects a new building's construction, and will help to satisfy electrical code requirements in most areas. If electrical conduit is used to run power supply and audio signal wires to such a box, use the conduit knock-outs on the back end of the box. Keep in mind that since the power supply to the units is DC voltage, the power supply lines and the audio signal lines can be run in the same conduit. Four 6-32 x 1" philips-head screws are supplied with the units for mounting to the wall box, each finished in the same tan color as the unit's enclosure.

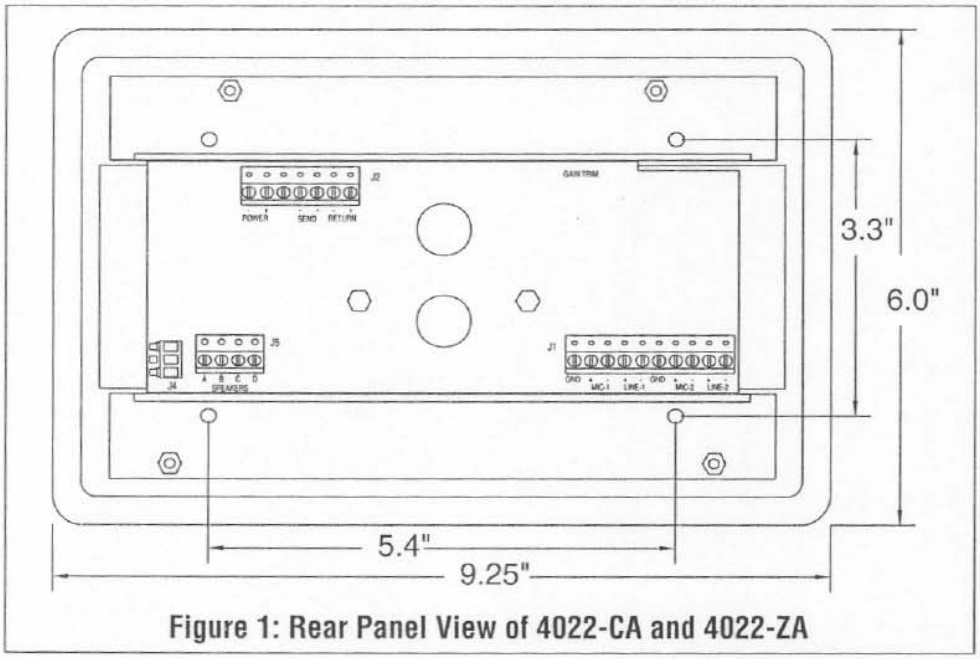


Figure 1: Rear Panel View of 4022-CA and 4022-ZA

Power Connections

The 24 VDC power source should be connected to the terminals marked POWER SUPPLY, adjacent to the SEND and RETURN terminals, on the rear of the units (shown in figure 1). The information that follows applies mainly to the USI Audio 4000PS Series of power supplies. If the installation is to be powered from a different 24 VDC power supply, bear in mind that the mounting and wiring instructions below may differ slightly for that particular installation.

The distances between the power supply and each 4022-CA or 4022-ZA unit should be kept to a minimum. The larger the separation, the greater the power that will be dissipated in the connecting wire and the smaller the gauge of wire that will have to be used to compensate for this effect. The following are general guidelines for wire gauge use at various distances:

Gauge of Wire	Distance
18 AWG	0 to 50 feet
16 AWG	50 to 200 feet
14 AWG	200 to 300 feet

Be sure that your particular installation adheres to local building codes. If the 4022-CA/4022-ZA is to be used with the optional 25V/70V transformer and the 70V tap is used, local electrical codes may require metal conduit for the speaker lines. Proper grounding of the unit is essential to minimize the possibility of noise pickup, ground loops, and oscillation (feedback) within the system.

Circuit Protection: The 4022-CA and 4022-ZA are both protected from hazardous overload conditions by a 2 Amp fuse. If this fuse should blow, check for short-circuits or other electrical faults before replacing the fuse. Replace with same type and rating of fuse. The amplifier's output device is also protected against short circuit and thermal overload conditions. If an overload condition persists over a set length of time, the device will automatically shut itself down, and resume when the overload ceases.

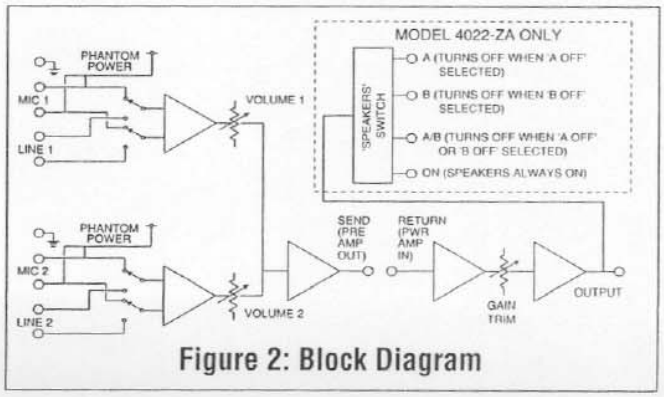


Figure 2: Block Diagram

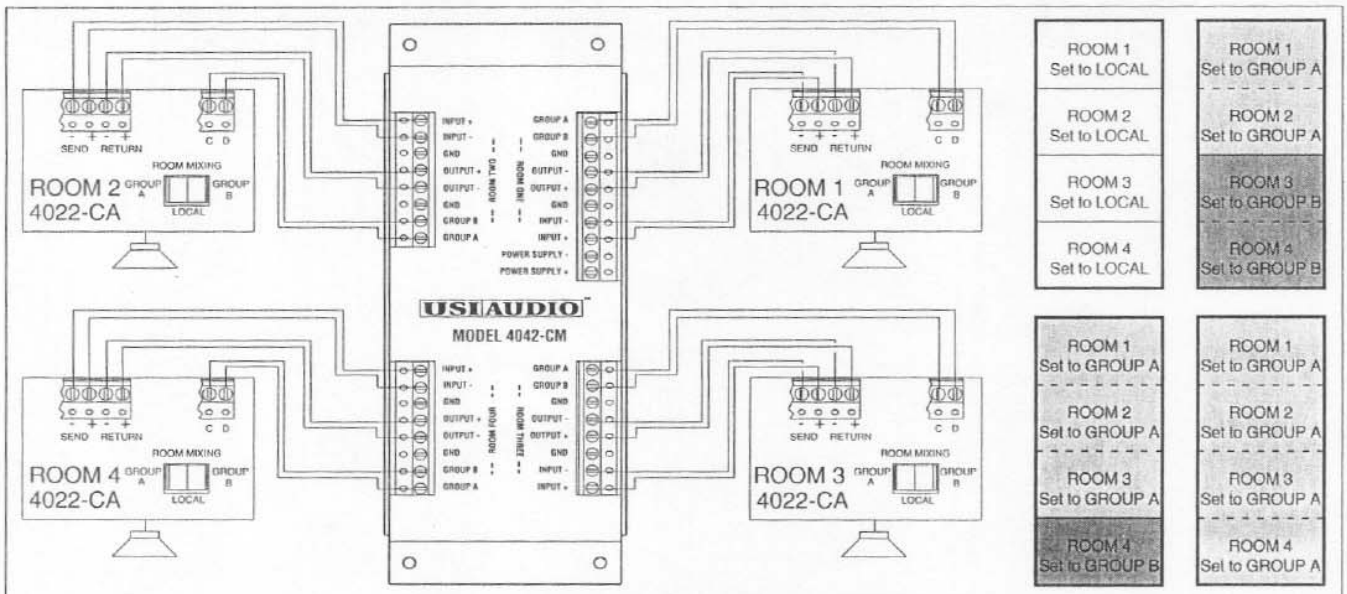


Figure 3: Room Combining Using 4022-CAs

Input Connections

The input connection terminals are shown in Figure 1; on both the 4022-CA and 4022-ZA, the input connection terminals are in the lower right corner of the rear circuit board. Note that two input signals, one Lo-Z microphone level and one line level, can be connected to each of the two input channels. The front panel MIC/LINE switches determine which of the two input signals is used on each input channel. Both the MIC and LINE inputs of each channel accept balanced signals, and so require the use of two-conductor, shielded cable. The shield of the cable should be connected to the GND terminal of the input, and the "+" and "—" terminals connected accordingly to the inside conductors of the cable. When connecting an unbalanced input, connect the center connector to the "+" terminal and the cable shield to the "-" and GND terminals. Two front panel VOLUME controls can be used to adjust the overall output and the mix.

The 4022-CA and 4022-ZA both have SEND output and RETURN input terminals on the rear of the units. This input/output pair provides a line output, auxiliary-level input, or an insertion point between the preamplifier and power amplifier for use with equalizers or other external signal processing equipment. The 4022-CA and 4022-ZA can both use this input/output pair in conjunction with the USI Audio Model 4042-CM or 4082-CM room combining matrices to provide a room combining system. The 4022-CA has a ROOM MIXING switch that can be used directly with the 4042-CM or 4082-CM, instead of using a separate, external switch. For more information on using the 4022-CA with the 4042-CM and 4082-CM combining matrices, see below.

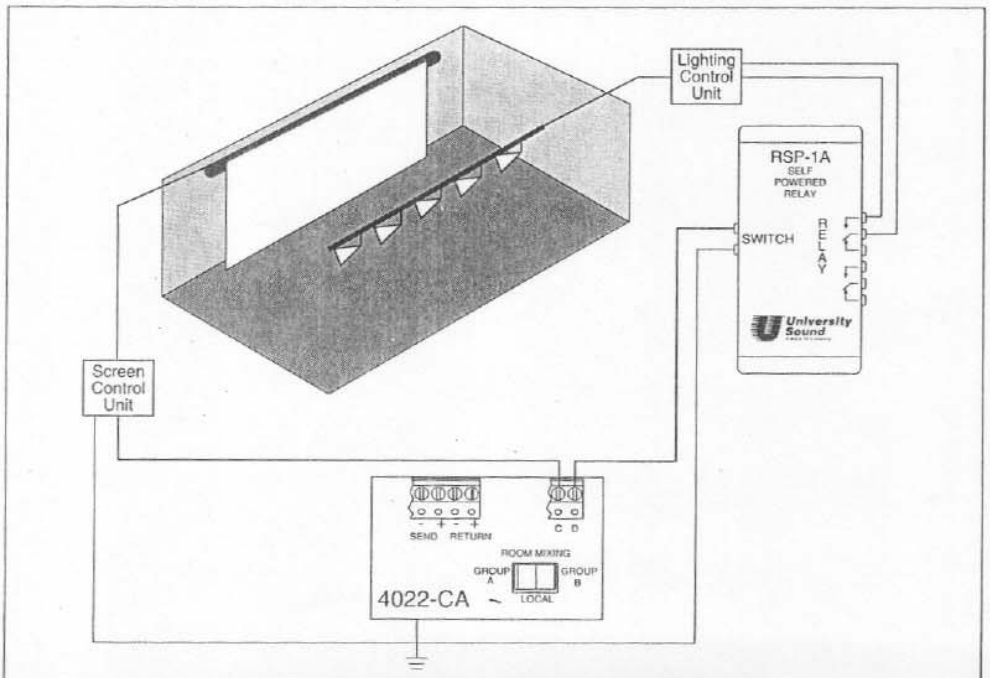


Figure 4: Remote Control Using the 4022-CA

Output Connections

The 4022-CA and 4022-ZA both feature a power amplifier rated at 20 Watts RMS continuous output power, with the speaker outputs capable of driving any speaker line impedance from 16 Ohms down to 4 Ohms. The optional USI Audio Model 4000-25/70V transformer mounts directly to the rear of the unit and connects to the circuit with a solderless plug, and provides 25 Volt or 70.7V levels for speaker distribution lines. The connection plug is shown in Figure 1, and is labeled as J4.

For more information on the use of this transformer, consult the 4000-25/70V Owner's Manual. Using this transformer, one can greatly extend the length of speaker wire used in an installation without compromising the sound quality or loudness. Both models feature an output gain trim control on the rear of the unit that can be used to prevent overload of the speaker system or excessive sound levels. For installations using multiple 4022-CAs, this control enables the installer to balance the loudness of the units in room combining situations.

The 4022-CA provides a single pair of output terminals and two control signal terminals tied to the ROOM MIXING switch on the front panel of the unit. The 4022-ZA has four speaker output terminals for switching.

4022-CA: The speaker output terminals for this unit are shown in Figure 1, and are labeled J5. The terminals A and B on the SPEAKERS terminal block provide the positive and negative connections for the speaker system.

When the 4022-CA is interfaced with a 4042-CM or 4082-CM room combining matrix, the C terminal should be connected to the GROUP B terminal, and the D terminal connected to the GROUP A terminal, of a given "ROOM" on the matrix. When the ROOM MIXING switch on the 4022-CA is in the GROUP A position, the D terminal will be internally connected to ground, providing the proper signal to activate the GROUP A control terminal on a 4042-CM or 4082-CM. When ROOM MIXING is set to the GROUP B position, the C terminal will be connected to ground. When the ROOM MIXING switch is set to LOCAL, neither the C nor the D terminal will be shorted to ground. The SEND and RETURN connections of the 4022-CA must be used with the INPUT and OUTPUT connections, respectively, of the same room on the matrix for the 4022-CA to deliver the combined output to the speakers.

4022-ZA: The 4022-ZA features a unique output control scheme. The speakers connected to the 4022-ZA can be divided into four groups: those that are always on, those that are off when the SPEAKERS switch on the front panel of the 4022-ZA is set to A OFF, those that are off when SPEAKERS is set to B OFF, and those that are off when SPEAKERS is set to A OFF or B OFF. These four groups can be achieved using just four speaker lines connected to the 4022-ZA as shown in Figure 5. Note that the SEND and RETURN connections are still available for use with other equipment.
Note: When making output connections to either the 4022-CA or the 4022-ZA, never connect the "-" speaker terminal to any electrical or chassis ground. Doing so could permanently damage the amplifier, or at least decrease the effective output.

Block Diagram

Figure 2 shows a block diagram for the 4022-CA and 4022-ZA.

Applications

With their room combining and speaker zone switching capabilities, the 4022-CA and 4022-ZA lend themselves to a wide variety of applications. Those shown here are only a few of the possibilities, but they do illustrate the basic concepts behind the units. Each can be expanded upon to meet more demanding installations.

Room Combining: Figure 3 shows a system using four 4022-CAs and a 4042-CM that provides basic room combining features. As shown in the diagram, the two combining groups provide many possible room arrangements. In an actual installation, the rooms

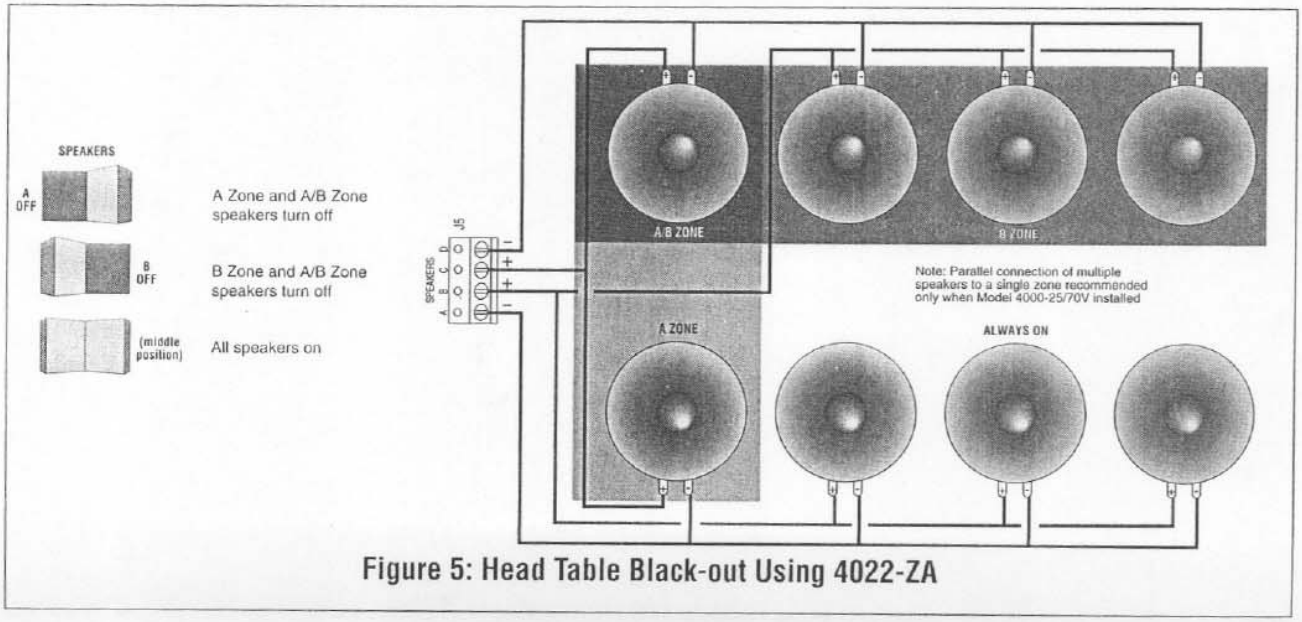


Figure 5: Head Table Black-out Using 4022-ZA

involved will often be of different size, in which case the gain trim control on the rear circuit board can be used to balance the volume levels of the 4022-CAs in combined rooms.

Remote Control: Many presentation devices, such as motorized projection screens, are ideally controlled from a central area. Since the ROOM MIXING switch on the 4022-CA is only connected to the chassis ground, it can be used to control some of these devices either directly or indirectly through an intermediate power-switching relay. This sort of application is illustrated in Figure 4. Two cautions should be observed when using the switch in this way: (1) No electrical current should be passed through the switch; doing so can cause ground potentials, damage to the 4022-CA, or even electrical shock to the user. The University Sound RSP-1A uses a simple contact closure to ground, and is compatible with this type of application. (2) If hum or noise is present in the speaker output when this application is used, make certain that all connections to ground are connected to the same ground. If not, noise and hum-causing ground potentials and loops can be introduced into the system.

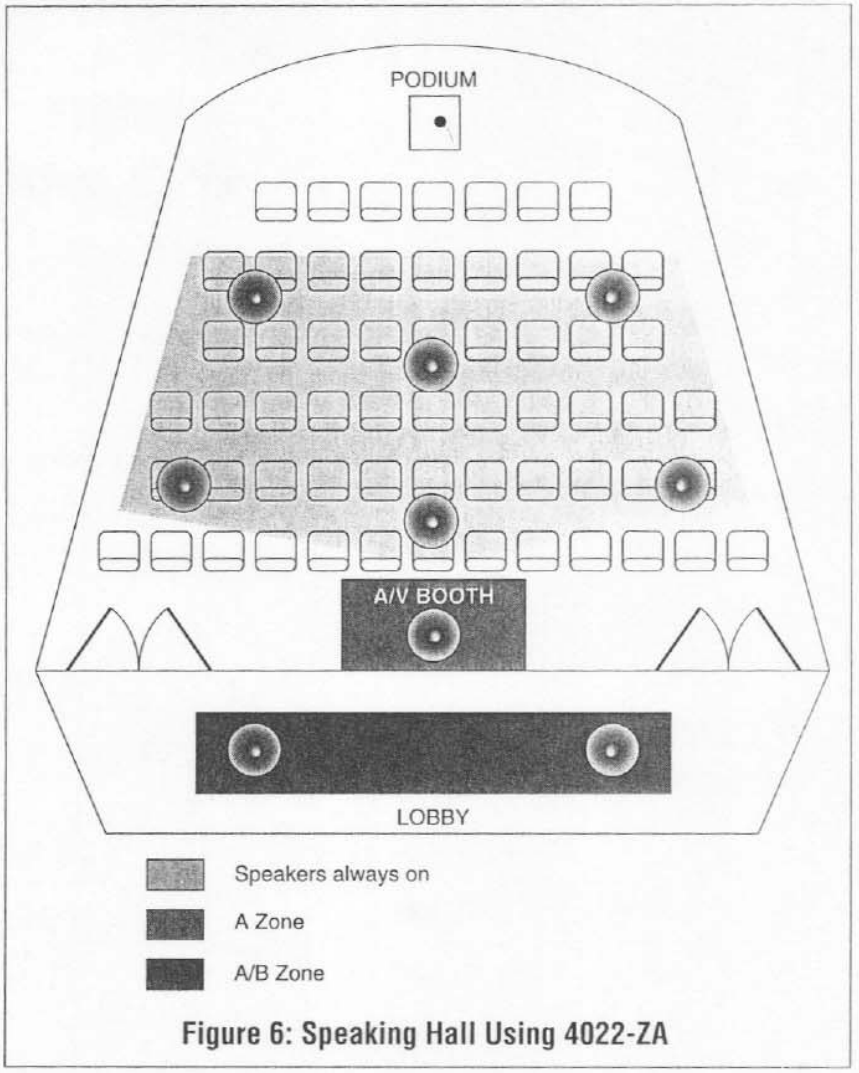


Figure 6: Speaking Hall Using 4022-ZA

Head Table Black-out: Most everyone is familiar with the ear-piercing whine of a sound system in feedback between the microphone and the speakers. This effect can be reduced substantially if the speakers nearest the person addressing the audience are silenced. Many meeting rooms, however, must allow different orientations of the podium or head table. The 4022-ZA can accommodate this situation admirably. A basic layout for this type of system is shown in Figure 5. From the SPEAKERS switch on the 4022-ZA, the A group can be turned off when the podium/head table is under those speakers, while the B group can be turned off when the podium/head table is under those speakers. The speaker in the upper left-hand corner will be turned off if either of the groups is turned off.

Speaking Hall with Lobby and A/V Room: Figure 6 shows a small speaking or lecture hall with adjoining lobby using a 4022-ZA that can be configured to best handle the type and size of an audience for a particular event. The speakers over the main audience are always on. The speaker in the A/V booth can be turned off by setting the SPEAKERS switch to A OFF The A/V booth speaker will be on, and the lobby speakers off, when the B OFF SPEAKERs switch position is selected. This might be useful if someone in the booth needed to hear the audio from the podium mic.

USI AUDIO™

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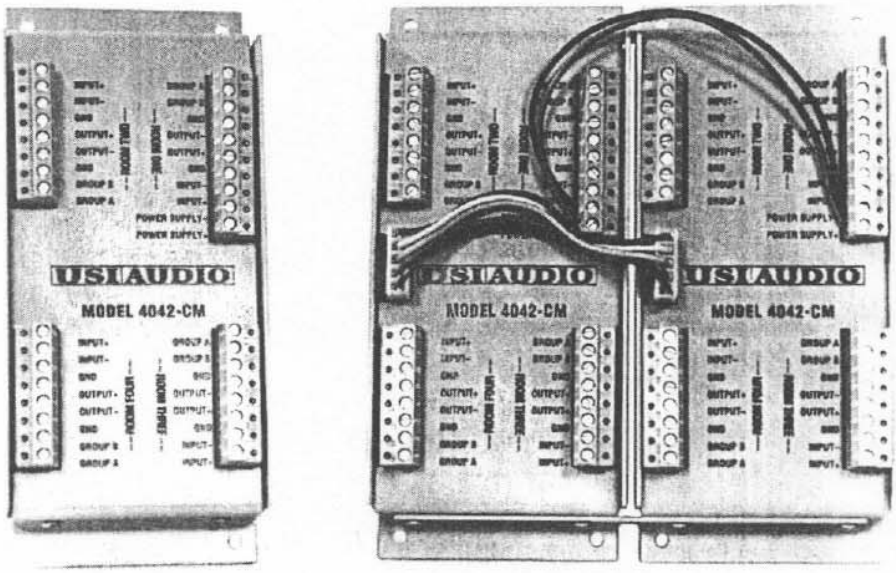
4042-CM / 4082-CM

Room Combining Matrices for the ACE-4000 System

Owner's Manual



Specifications

Inputs/Outputs	4 (4042-CM) 8 (4082-CM)
Frequency Response	20Hz - 20kHz +0/-1dB
Gain	0 dB
Distortion	< 0.1%
Crosstalk	-87 dB (ref 1 V_{RMS} input)
Power requirement	24VDC, 30mA (4042-CM)
	24VDC, 60mA (4082-CM)
Input Impedance	36 KΩ (measured)
Output Impedance	100Ω (measured)
Dimensions:	
Height	6.64" (16.9 cm)
Width	2.9" (7.4 cm) (4042-CM)
	5.9" (15.0 cm) (4082-CM)
Depth	1.2" (3.0 cm)
Net Weight	0.52 lbs. (0.24 kg) (4042-CM)
	1.1 lbs. (0.50 kg) (4082-CM)
Shipping Weight	1 lbs. (0.45 kg)
Color	Tan

Description

The USI Audio 4042-CM & 4082-CM audio combining matrices are designed to functionally combine two to eight rooms in either of two groups. The 4042-CM can be used to combine the audio of up to four rooms, while the 4082-CM can be used for up to eight rooms. Each unit is powered by 24VDC, and both feature removable input/output screw terminal connector blocks to facilitate installation and wiring.

Each room connected to a 4042-CM or 4082-CM may be used independently or in combination with other rooms connected to the unit in either of two groups. The input channels of the matrix are normally directed back to there corresponding output. Each channel has a Group A terminal and a Group B terminal. When either of these terminals is connected to ground, the corresponding input is redirected to one of two internal mix busses. The output of the selected mix buss is then distributed back to the outputs of each channel assigned to that group. If both terminals are grounded, the input is directed back to its corresponding output without being assigned to either of the groups.

The two independent combining groups allow for two separate room combinations simultaneously. Each group may have any number of rooms assigned to it. This allows you to accommodate a large variety of room combinations.

(continued on inside)

(Description continued:)
The matrices utilize solid state analog switches which eliminate switching pops or clicks. Signal level remains constant as rooms are switched in or out of a group. The balanced inputs and DC logic buss combining controls allow long input and control lines to the unit. The small size of the units provides many mounting options.

While the 4042-CM & 4082-CM are primarily designed to work in conjunction with USI Audio's series of in wall mixer/amplifiers, they can easily be used with other mixer/amplifier combinations, or as a stand alone zone control/distribution/summing unit.

Unpacking

The unit should be removed carefully from the carton and inspected for any possible damage in transit. If there is any evidence of damage which might have occurred in shipment, immediately notify your supplier or the transportation company which delivered it. Claims for damage sustained in transit must be made upon the carrier. Save all packing material for the claim agent who will supply you with the proper forms and give you the necessary instructions for filling out a claim.

Installation

The unit may be mounted to a wall or other flat surface using four #6 screws through the holes in the mounting flanges. Since all connections to the unit are made by means of removable terminal connectors, the unit can be mounted and then easily wired at a later time. Avoid installing the unit in close proximity to large power transformers or power lines, as AC current hum and noise may be introduced into the audio chain.

Power Connections

The unit can be powered from any 15-30VDC external source rated for least 30 mA. The 4000PS Series of power supplies, available from USI Audio, each provide more than enough current to supply the 4042-CM or 4082-CM in addition to other system components such as a USI Audio in-wall mixer/amplifier. The power supply terminals of the 4042-CM are shown in figure 1. The input circuitry utilizes an input protection diode, but the input voltage should not exceed 30 VDC. Damage to the unit may result if this maximum voltage is exceeded.

Input Connections

The input connection terminals are shown in Figure 1. The input signal can come from any balanced or unbalanced line level source (such as the SEND connection from the USI Audio in wall mixer/amplifiers). The shield of a balanced line should be connected to the terminal marked GND on the matrix. When the source is unbalanced, strap the "—" input terminal to the GND terminal. Whether the source is balanced or unbalanced, shielded audio cable should be used for these connections to minimize noise and hum pickup.

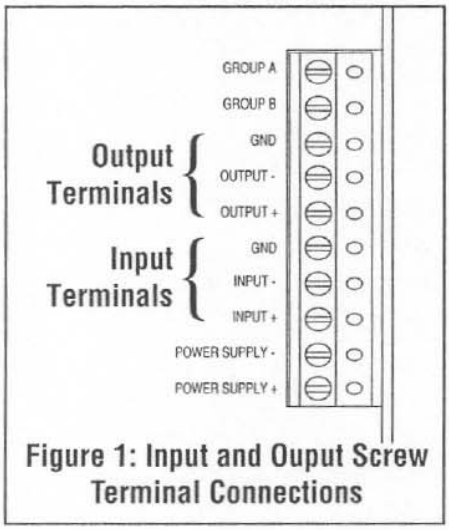


Figure 1: Input and Ouput Screw Terminal Connections

Output Connections

The output connection terminals are also shown in Figure 1. The output signal can be sent to any line level input (such as the RETURN connection on the USI Audio in wall mixer/amplifiers). As with the input connections, shielded audio cable should be used to minimize hum and noise pickup.

Logic Group Connections

The two mix buss control terminals are marked GROUP A and GROUP B, as shown on Figure 1. These two connections can be wired to remote switches; a simple closure to ground will assign that room to the corresponding

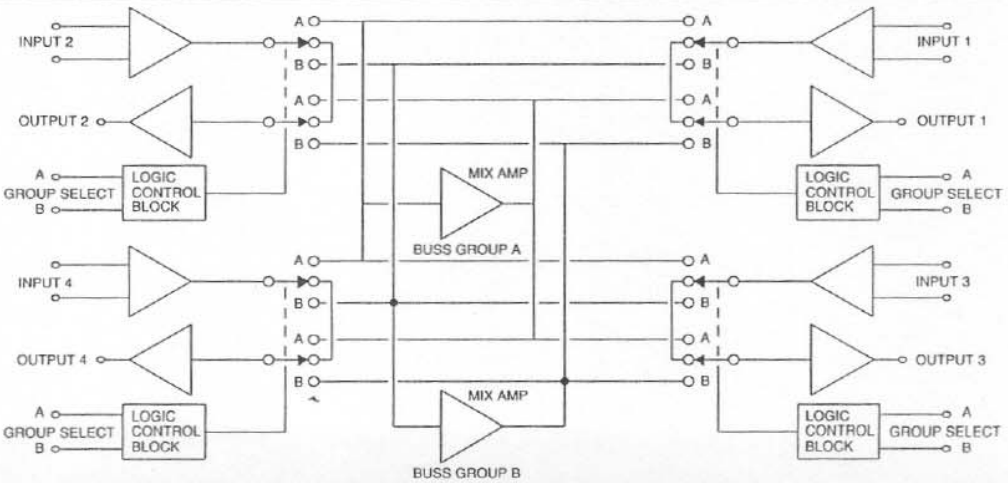


Figure 2: Block Diagram of the 4042-CM (4082-CM is identical, with eight input/output pairs)

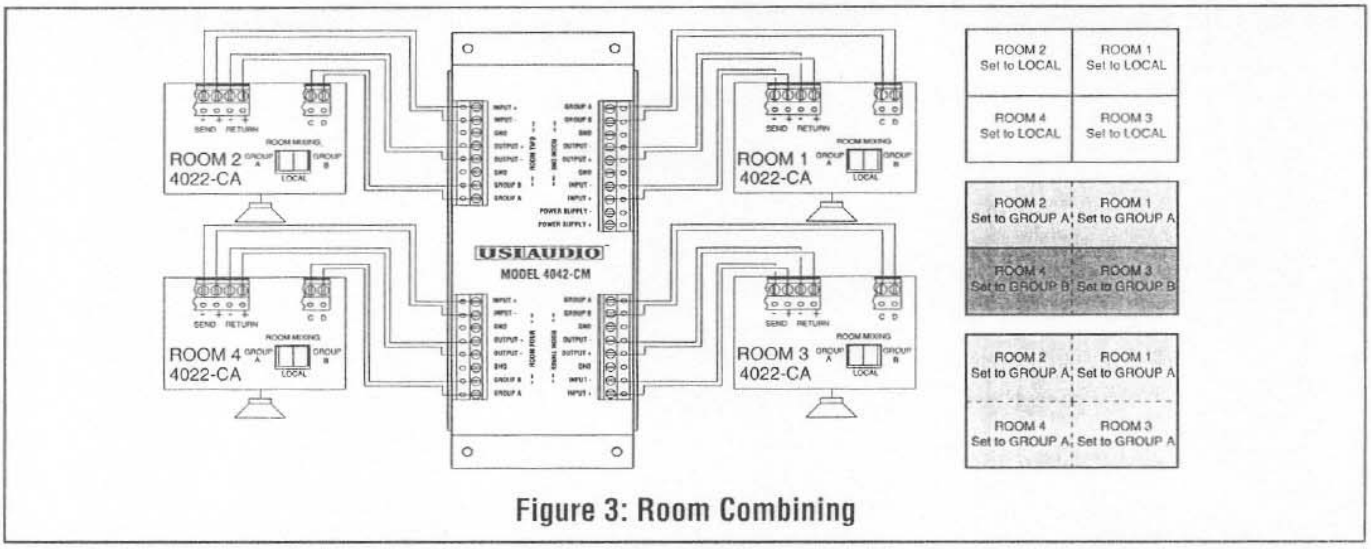
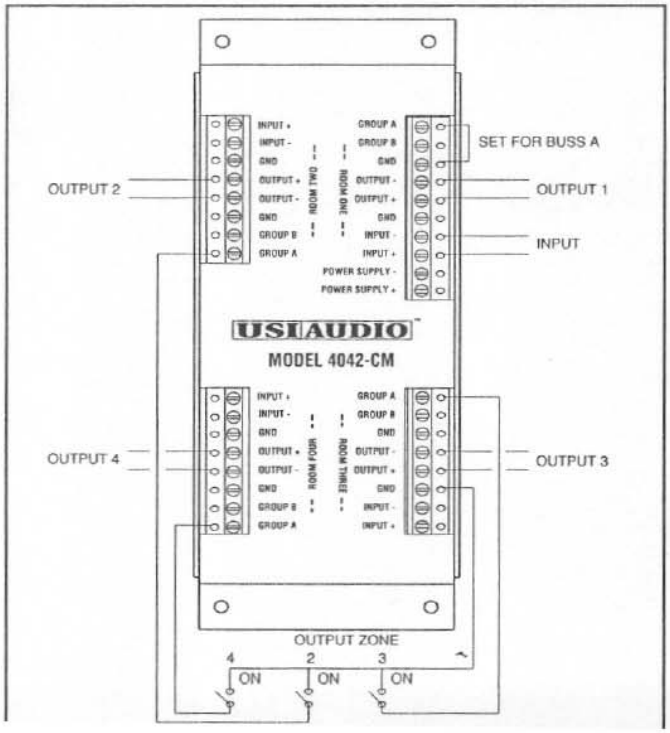


Figure 3: Room Combining

combining group. When neither of an input's Group A or B terminals are connected to ground, the input signal is simply routed back to its corresponding room output. If a given input's Group A (or B) terminal is grounded, however, that input will be mixed with all other room inputs whose Group A (or B) terminal is grounded, and the mixed signal will be routed back to each of the outputs whose corresponding inputs are assigned to that group. A room cannot be assigned to both Group A and Group B simultaneously; if both the Group A and B terminals on a room are grounded, the input signal is routed directly back to the input.

Block Diagram

Figure 2, on the previous page, shows the internal switching operation of the 4042-CM and 4082-CM.



Applications

Room combining: Figure 3 shows a typical room combining system utilizing four USI Audio 4022-CA in wall combining amplifiers and a single 4042-CM.

Smart distribution amp: Figure 4 shows how a 4042-CM can be used as a "smart" distribution amp. A simple switch bank allows remote selection of active outputs. Using a 4082-CM, up to eight outputs can be distributed.

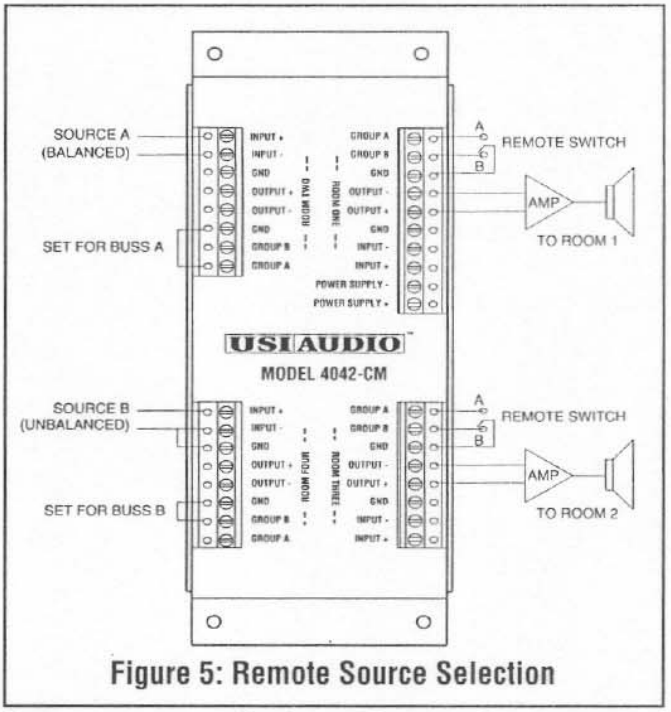


Figure 5: Remote Source Selection

Remote source selection: Figure 5 shows a way of remotely selecting one of two program sources to feed a number of rooms. Rooms 1 and 2 can select between music source A or B. Using a 4082-CM, six rooms can have independant remote selection of two program sources.

AUDIO

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for 4022-CA/4022-ZA

Owner's Manual

Specifications

Frequency Response	90 Hz - 15 kHz, +0/-3 dB
Output Power	20 Watts RMS
Outputs	25 Volts, 70.7 Volts
Net Weight	0.5 lbs. (0.23 kg)
Shipping Weight	1 lbs. (0.45 kg)

Description

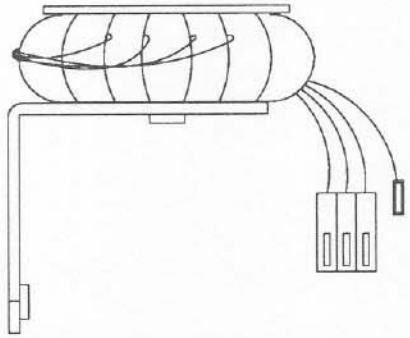
The 4000-T25/70 is a 25 Volt / 70 Volt transformer for use with the USI Audio ACE-Series Models 4022-CA and 4022-ZA mixer/amplifiers, converting the 4Ω-16Ω speaker outputs of these two units to the 25V or 70V level for use with distributed speaker systems. The 4000-T25/70 installs easily on the rear panel of the mixer/amplifier, requiring only a philips-head screwdriver to tighten the mounting screws. The flat toridal design will not interfere with mounting the mixer/amplifier in a standard 4-gang deep electrical box.

Unpacking

The unit should be removed carefully from the carton and inspected for any possible damage in transit. If there is any evidence of damage which might have occurred in shipment, immediately notify your supplier or the transportation company which delivered it. Claims for damage sustained in transit must be made upon the carrier. Save all packing material for the claim agent who will supply you with the proper forms and give you the necessary instructions for filling out a claim.

Selection of 25 or 70.7V Operation

The 4000-T25/70 as shipped is configured for 70.7 Volt operation. For 25 Volt operation, the red wire and terminal must be removed from the plastic three-hole connector, and the blue wire and terminal inserted in its place.



Installation

The 4000-T25/70 mounts directly to the chassis of the 4022-CA or 4022-ZA. Refer to figure 1 for the location of the transformer over the rear circuit board of the mixer/amplifier. The metal bracket of the 4000-T25/70 will reach over the circuit board to attach just under the two pre-drilled holes in the mixer/amplifier chassis. Using a philips-head screwdriver, attach the 4000-T25/70 to the mixer/amplifier chassis with the two screws provided with the 4000-T25/70. To connect the transformer to the mixer/amplifier circuit, remove the jumper located on the lower-left corner of the mixer/amplifier's circuit board. Place the transformer's plug over the three bare posts, taking care to orient the wedge on the plug to the same side as the clip on the posts.

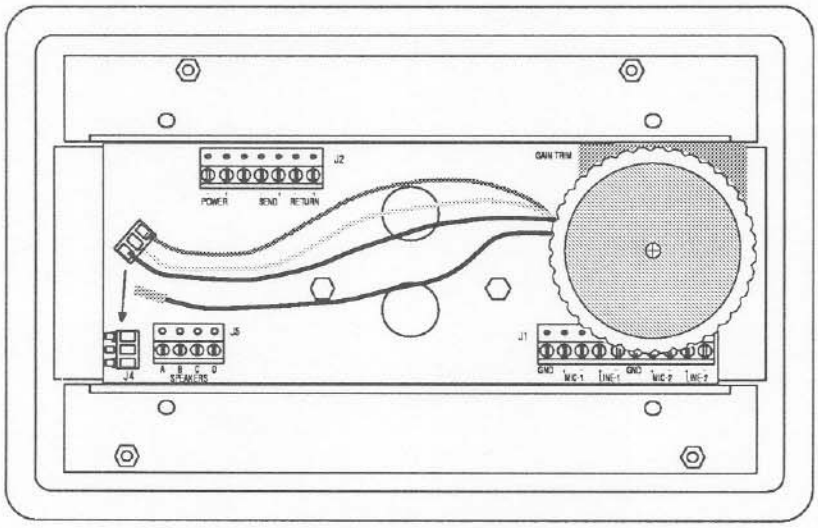


Figure 1: Installation of the 4000-T25/70

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Part #201-4002-00

13278 Ralston Avenue
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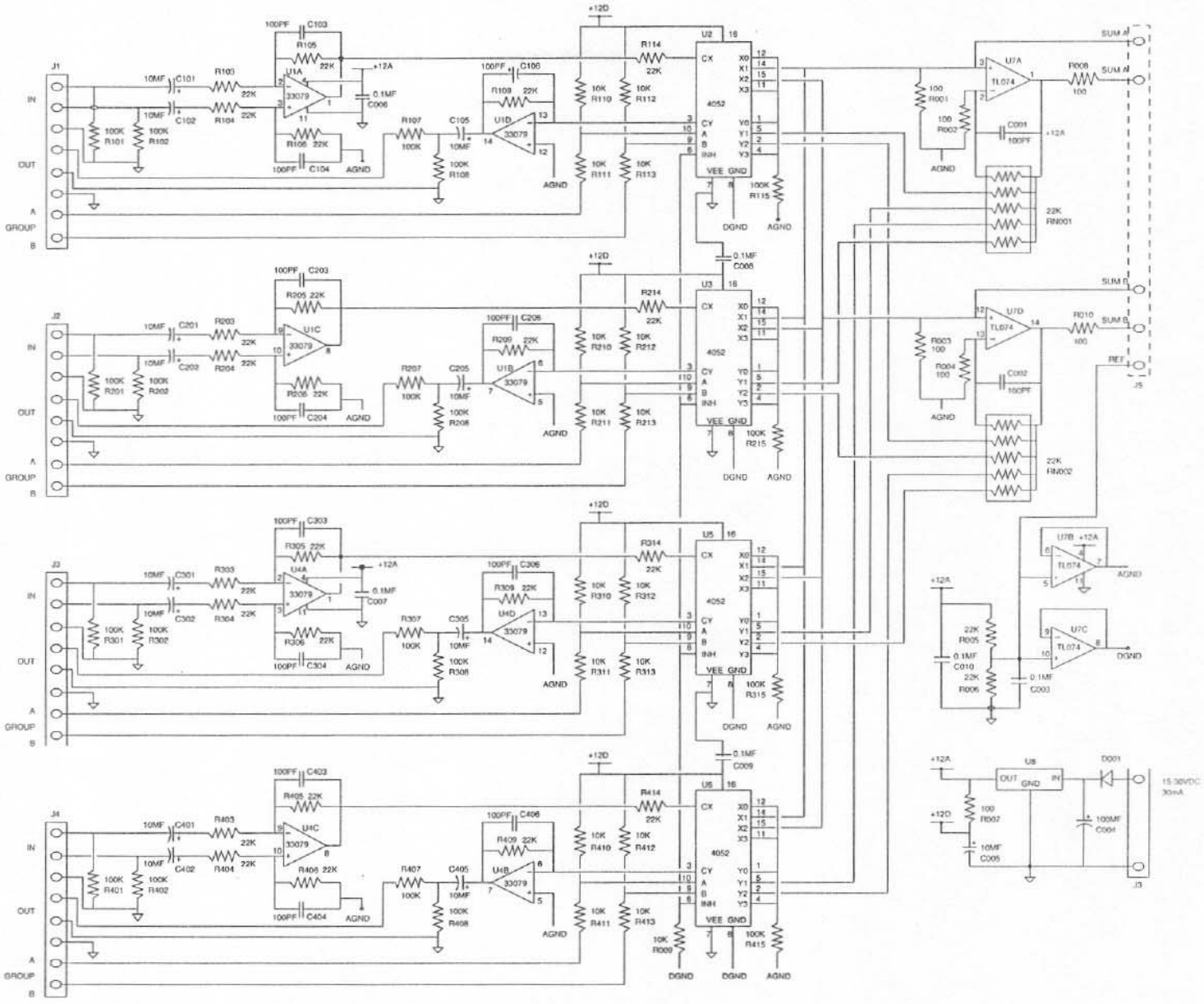

Circuit Diagram for the 4042-CM and 4082-CM

Warranty: These units have been very carefully inspected and are warranted to be free from defects in material and workmanship under normal use and service for a period of three years from sale to original purchaser. This warranty does not extend to any unit that has been subject to abuse, misuse, neglect, accident, improper installation, or alterations. The obligation of USI Audio under this warranty is limited to the repair of any defect in material or workmanship and/or the replacement of any defective part, provided the unit is returned transportation paid within three years. It is recommended that any unit on which service is required be processed through your local installation company wherever possible. This Warranty is expressly in lieu of all other Warranties, expressed or implied, and of all other obligations or liabilities on our part. We neither assume nor authorize any other person to assume for us any other liability in connection with the products manufactured by USI Audio.

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