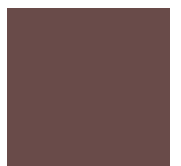

D-70 Digital Audio Console



TECHNICAL MANUAL
April 2000



D-70 Digital Audio Console Technical Manual - 1st Edition

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*a division of Wheatstone Corporation

Attention!

Federal Communications Commission (FCC) Compliance Notice: Radio Frequency Notice

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment, generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



This is Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take appropriate measures.

This equipment must be installed and wired properly in order to assure compliance with FCC regulations.

Caution! Any modifications not expressly approved in writing by Audioarts could void the user's authority to operate this equipment.

Attention!

This console contains static sensitive devices:

Normal precautions against static discharge should be observed when handling individual modules. In particular, modules being packed for shipping for return or repair must be packed in special static protection bags before packaging. Damage caused by static discharge may not be covered under warranty.

Replacing Modules in a Powered-up Console:

While in an emergency situation it is possible to remove and insert modules on a powered-up console, Wheatstone does not recommend this procedure. Whenever possible it is best to power down the console first before removing or replacing modules.

However, if you find you must proceed with this operation, then be sure to take the following precaution:



When re-inserting a module, take care to replug it squarely into its mainframe connector socket, so all edgecard fingers make contact simultaneously. In other words, the gold-plated bus connector fingers on the bottom edge of the module's printed circuit board must be inserted squarely (i.e., perpendicular) to the mating socket on the bottom pan of the console mainframe. **The intent is to prevent a situation where one of the module's power pins makes significant contact before the others.** (Naturally, this same precaution must be taken when using extenders.)

If the above instructions are followed the procedure should be routine; if they are not, you could run the risk of damaging the console's logic chips.

Again, to avoid ANY possibility of this damage, whenever possible we strongly recommend powering down the console *before* replacing any modules.

IMPORTANT!

D-70 Audio Levels

General

All professional digital audio broadcast consoles manufactured by Wheatstone are hybrid in nature. That is, they allow the user to connect both analog and digital domain sources and provide both analog and digital outputs. While this approach allows for greater flexibility when interconnecting source and destination equipment, the user must be aware of what levels to expect when applying, say a digital input and measuring at a analog output.

Gain Structure

Broadcast consoles by design have various electronic stages at which the signal level may be amplified or attenuated. The primary stages are the A-D converter input, channel fader, DSP mixing and the bus output D-A converters. The sum of these gain stages is commonly referred to as the console's "gain structure". Wheatstone consoles are factory calibrated for 0dB or "unity gain" when the input channel fader is set to nominal (-12dB).

The following is a stage by stage breakdown of a typical console's gain stages:

Analog Input (A-D Converter)

- trim pots located on the ADC input circuit cards are trimmed so that a +4dBu input signal will yield a -20dBFS digital output with the channel fader at nominal. Trim pot gain range at this stage allows for interfacing unbalanced equipment. Mic level ADC circuit cards have trim pots for matching various microphone source levels to the console's operating level.

Digital Fader Gain

- is set via CPU jumpers for 12dB of gain with the fader all the way up. Other fader gain settings are possible, consult with the factory for recommendations.

DSP Gain

- set in firmware for unity gain, digital *attenuation* may be applied on a channel by channel basis from the supplied Windows™ software application, VDip™.

Analog Bus Output Gain (D-A Converter)

- trim pots located on the corresponding analog output DAC circuit card are factory trimmed so that a -20dBFS digital input signal will yield a +4dBu analog output with the channel fader at nominal. These may be adjusted over a range of -26 to -10dBFS = +4dBu.

Audio Reference Levels

All consoles are fully factory calibrated and will comply with the following reference level:

-20dBFS digital = +4dBu analog = 0VU

Note: 0dBu = .775v rms

+4dBu = 1.23v rms

These settings will provide a headroom of 20dB over the nominal input signal of +4dBu analog, or -20dBFS digital. Should your facility require a different A-D - D-A reference level please consult the factory for calibration details and/or alternate solutions.

Note that due to the lack of level standards in the digital domain, headroom available for digital sources will be entirely dependant on the source. In fact, CD's are frequently made with less than 1dB of digital headroom, and any boosting of digital CD levels in the console by moving the fader up above the nominal can result in overload distortion for that channel. For this reason, the VDip set-up program allows for digital *attenuation* on a fader by fader basis; digital sources can be conveniently attenuated this way to guard against digital overload caused by not enough headroom on the digital source. Since the D-70 console meters are true digital reading meters, they will always show the console's digital levels, and whether there are any "overs" in the signal. By pressing a channel's "CUE" button, the switched meters will show the digital level of that channel's source, as configured with the VDip program. By using the program and watching these meters, the amount of attenuation can be adjusted to meet your headroom requirements.

Typical Input Levels

Mic Inputs Nominal	= -50dBm, 150	Maximum = -26dBm
Analog Inputs Nominal	= +4dBu	Maximum = +24dBu
Digital Inputs Nominal	= -20dBFS	Maximum = 0dBFS

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Installation and Power

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Installation and Power

Unpacking the Console

The D-70 console is shipped as three packages. One carton contains the console and documentation, second carton contains the Power Supply and connecting cable, and third carton contains input daughter cards.

Countertop Mounting

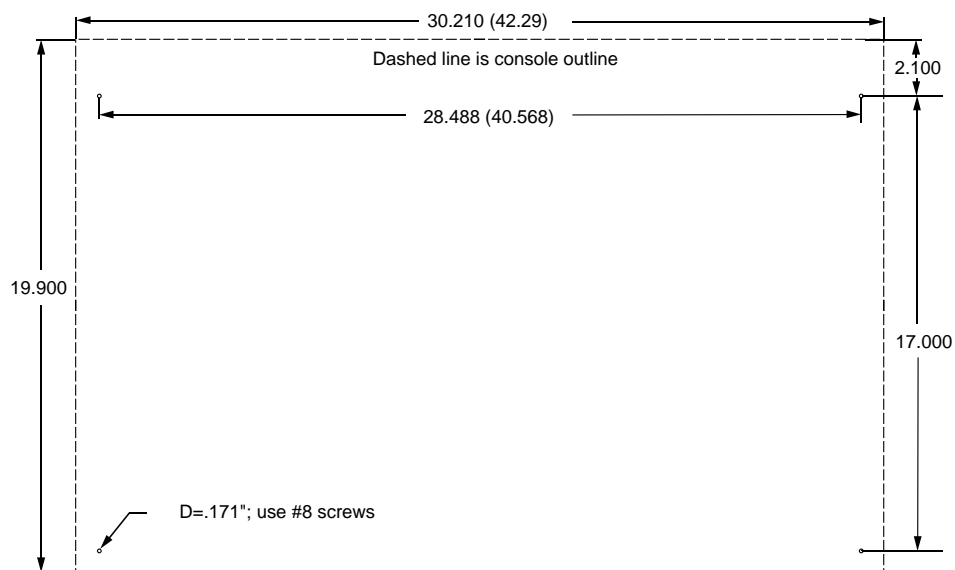
The D-70 digital audio console is designed for countertop mounting. Console placement should avoid proximity to any electromagnetic fields, such as large power transformers, motors, and fluorescent lighting fixtures. If you will be securing the console to the counter top, you may want to pre-drill the mounting holes (see sketch for 20 and 28 position frames below).

Set the console in place on the counter, and remove the screws that hold down the first and the last modules in place (two per module). Carefully remove those modules from the frame. Attach the console mainframe to the counter top, using the holes provided in the bottom of the chassis and screws appropriate to the counter material, and reinstall the removed modules.

The console extends approximately 7 3/4" above the countertop at the meterbridge. Also, the rear panel requires 3 1/2" of clearance behind the console to open fully.

Do not connect the D-70 console to its power supply (and do not connect the power supply to the AC power line) until instructed to do so.

NOTE: This console contains static-sensitive devices. Normal precautions against static discharge should be observed when handling individual modules.



NOTE: Dimensions shown are for 20 position mainframes; 28 position frames dimensions are shown in parentheses().

Modules and Rear Panels Layout

The D-70 console's mainframe comes supplied with 12 or 20 input modules, a control room module, a studio control module, and single and dual blank modules. There can be optional modules: a superphone module, the two line select modules, and a tape remote module. Each module type has its assigned slot (see drawing on page 1-4).

The D-70 console also comes supplied with rear panels that are installed in the following order (from right to left as viewed from the rear of the console): 12 or 20 any variation of MIC IN, LINE IN or DIG IN input panels, DIG IN or LINE IN panel for EXT IN for switched meters, BLANK or optional CALLER panel, DIGITAL OUT, ANALOG OUT, MONITOR1, MONITOR2, four BLANKS or optional LINE SELECT panels, BLANK or TAPE REMOTE, and BLANK or optional EXT SYNC panel. Rear panels layout see on the page 1-5.

Rear Panels Installation

To remove or install console's rear panels you must follow this procedure:

- Make sure the console is powered down.
- Open the meterbridge cover by removing the two retaining screws on its rear lip.
- Open the meterbridge rear by removing the two retaining screws on the upper lip. Then swing it toward you until it rests in a fully opened position.
- Remove the shield panel's tape (Figure 1), being careful to avoid damage to the shield tape.
- Swing the shield panel to open (Figure 2).
- Disconnect the rear panel's connectors.
- Remove the two phillips-head screws that hold the rear panel in place (Figure 3).
- Unplug the rear panel's card from the edge connector by carefully pulling it up.
- Replace the rear panel, plugging in its edgecard fingers to the appropriate motherboard edge connector (Figure 2), and tighten down the two retaining screws.

Make sure that you plug in the rear panel in its appropriate slot!

- Replace the shield panel back reusing the shielding tape.
- Close and secure the meterbridge rear and cover.

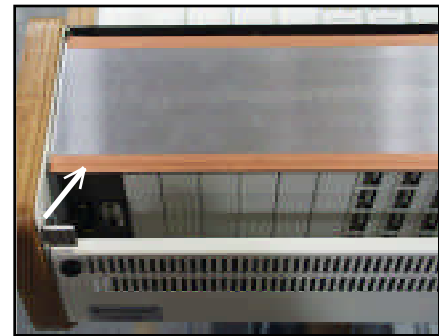


Figure 1. Shield Panel.

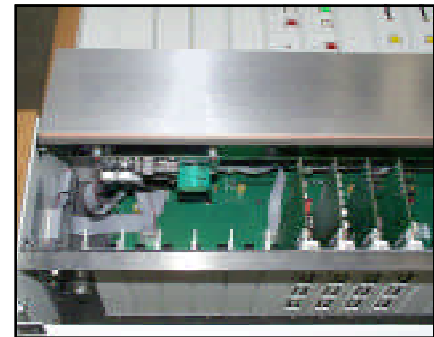


Figure 2. Open Shield Panel.

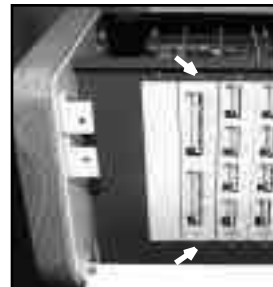


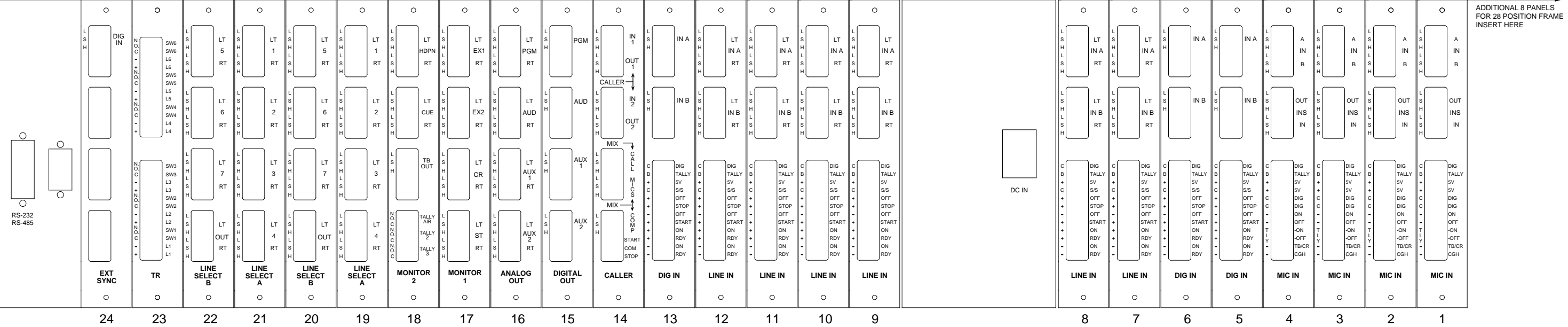
Figure 3.
Rear Panels—Rear View.



Figure 4.
Rear Panels—Upper View

NOTE: 28 POSITION FRAME CONSOLE
CONTAINS 8 MORE INPUT BLOCKS
THAT INSERT AT THE LEFT END OF
FRAME

D-70 CONSOLE MODULES LAYOUT FOR 20 POSITION FRAME



NOTES:
1. SLOTS 1 THROUGH 12 CAN BE ANY VARIATIONS OF DIG IN, LINE IN OR MIC IN PANELS.
2. SLOT 13 CAN BE DIG IN OR LINE IN PANELS. THIS SLOT IS EXTERNAL INPUT FOR SWITCHED METERS.
3. SLOT 24 - OPTIONAL ESYN PANEL.
4. 28 POSITION FRAME CONTAINS 8 ADDITIONAL INPUT PANELS.

D-70 REAR PANELS LAYOUT FOR 20 POSITION FRAME

System Ground

The first step is to ground the console.

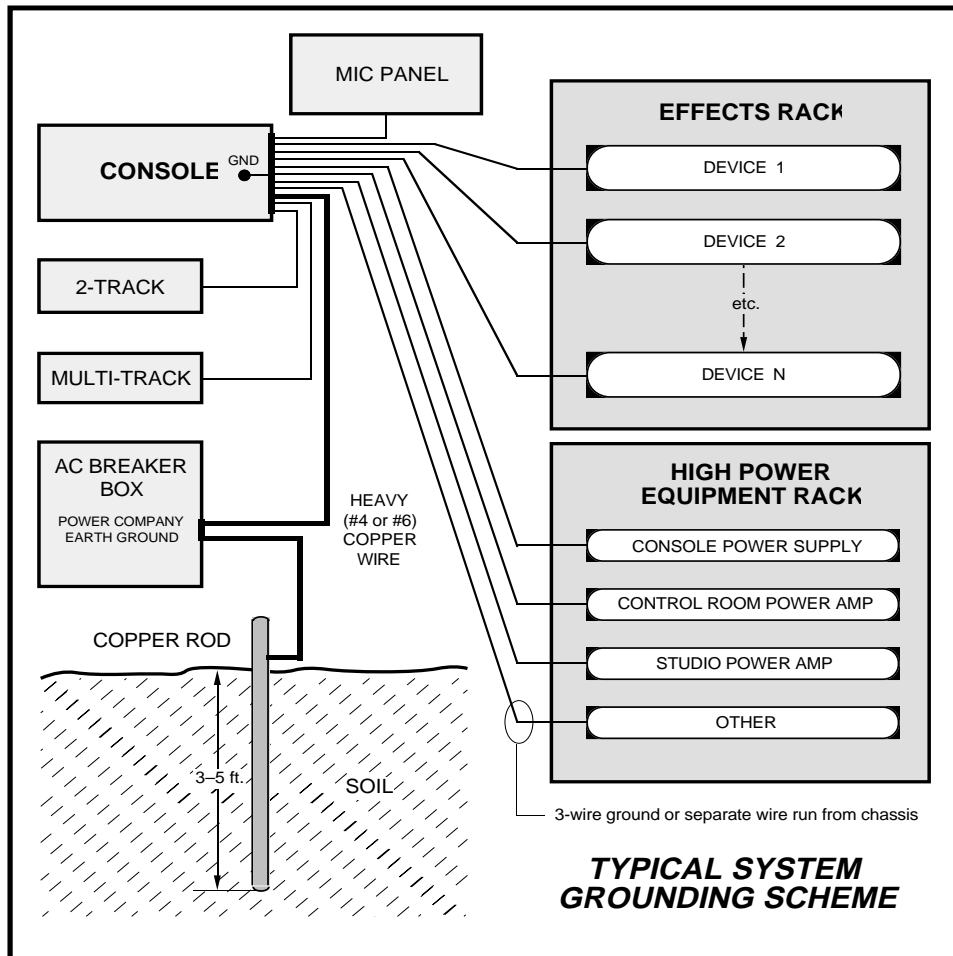
Note that as supplied from the factory, console rackmount power supply common, audio ground, and the D-70 mainframe are connected together at the console, but are NOT connected to electrical ground and the chassis of the power supply. Safety requirements dictate that a positive connection from the console mainframe to electrical ground be made in the completed installation. Use one of the grounding lugs on the rear of the mainframe to establish your system ground. The grounding lug terminal strip may be found at the rear of the console, on the rear frame panel, to the right if you are looking at the rear of the console.

The system ground serves two important purposes:

- (1) It provides a zero signal reference point for the entire audio system;
- (2) It assures safety from electrical shock.

There exist two terms that one encounters in a discussion of ground:

(A) EARTH GROUND, which is usually a heavy copper rod driven into the soil adjacent to the building (around 6 feet down) or a connection to the copper water pipes leading into the building. Either is acceptable (unless, of course, the water pipe is made of plastic).



Tie the console ground lug terminal strip to the system earth ground. Tie every piece of equipment in the entire audio system to the console ground lug terminal strip.

(B) THE POWER COMPANY EARTH CONDUCTOR that enters the building at the power line breaker box; this conductor should be (and is often by code) tied to the above-mentioned earth ground at one point. This point is the SYSTEM EARTH GROUND.

TIE THE CONSOLE GROUND LUG TERMINAL STRIP TO THE SYSTEM EARTH GROUND. TIE EVERY PIECE OF EQUIPMENT IN THE ENTIRE AUDIO SYSTEM TO THE CONSOLE GROUND LUG TERMINAL STRIP. If the system earth ground point is inaccessible, tie the console ground terminal strip to the power company earth conductor at the main breaker box (see drawing "Typical Grounding Scheme" on previous page).

Each piece of equipment should be connected by its own ground wire (usually the round third pin on the AC cord). This means that every AC outlet must have a separate conductor run to the console ground lug terminal strip; the outlets cannot be daisy-chained as is normally encountered in commercial and residential AC systems. Any equipment not supplied with 3-wire AC cables must have individual ground wires (16 gauge or larger) connected to their chassis grounds and then run to the console ground lug terminal strip.

Further Grounding Details

Check all equipment to be absolutely certain that each unit is power transformer isolated from the AC mains to prevent safety hazards.

It is assumed that in each piece of audio equipment the audio ground and the chassis are tied together at some point. Any piece of equipment lacking a grounded chassis is likely to be prone to interference problems.

Locate all unbalanced audio equipment in the same rack if possible, to minimize chassis ground potential differences. It may also be helpful to insulate each piece of unbalanced equipment from its mounting rails in the rack by means of nylon 10-32 screws and insulating washers between rails and faceplates.

Once the system is properly grounded, proceed with the console power supply installation and connection (next section).

Power Supply

The D-70 console is powered by a Audioarts Model SPS-16 rackmount power supply. This unit occupies two 19" wide rack spaces (total height 3-1/2"). Convection cooled, it requires ample ventilation space above and below it. The SPS-16 generates a lot of heat in the course of normal operation — do *not* mount heat sensitive devices in the same rack cabinet.

Note the power supply should be mounted in an equipment rack within fifteen feet of the console (but no closer than 3 feet). Avoid locating any high gain equipment (such as phono preamps, tape recorders, etc.) too near the rackmount supplies, to avoid magnetic interference into that equipment.



Front view of the SPS-16 rackmount power supply

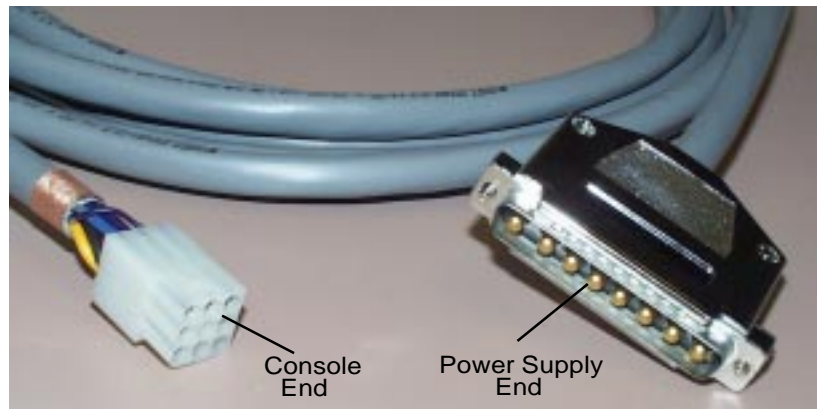


Rear view of the SPS-16 rackmount power supply

This power supply contains high voltage circuits that are hazardous and potentially harmful. ***Under no circumstances should the metal cover be removed!*** If you have a problem with the power supply, the SPS-16 unit must be returned to Audioarts for repair.

Once the supply is rackmounted, it should be connected to the console using the factory supplied cable. The cable is already attached and clamped in place at the console end. The free end has an 8-pin male connector; you just need to connect this end of the cable to the rear of the rackmount SPS-16 power supply.

Note each power supply is fitted with a 3-wire grounded AC cord that should be plugged into a "clean" AC power source. That is, an AC source that feeds only the control room audio gear. This source should be a separate feed from those powering lighting, air-conditioning, or any other non-audio machinery. The third pin ground wire of the AC source should be tied to the central system ground point. *Note that while the AC power cord ground wire terminates at the power supply chassis, it does NOT connect to the D-70 console common; the console itself must be grounded separately. (See previous section, "System Ground".)*



PS Cable Pinout									
	PIN						PIN		
	BLK 1	← Audio Common →					6 BLK		
	RED 2	← +V →					8 RED		
	BLU 3	← -V →					7 BLU		
	YEL 4	← + Digital →					4 YEL		
Console End	GRN 6	← Digital Common →					2 GRN	Power Supply End	
9-pin Connector	ORG 7	← + Digital →					5 ORG	8-pin Connector	
Female	BRN 8	← Digital Common →					3 BRN	Male	
(Pin 5 - N/C)	VIO 9	← Phantom →					1 VIO		

The power feed recommended in the text is often installed and referred to in studios as an "isolated AC ground" outlet. It is usually orange in color.

Energizing

Assuming the D-70 console mainframe is properly placed and grounded, and its SPS-16 power supply correctly rackmounted and connected to the console, you may now energize the SPS-16 rackmount power supply by plugging it into the AC mains. The five LEDs on the power supply front panel should light up to indicate the presence of their respective voltages. The console's LED meters will illuminate and individual module switches will assume factory default settings.

Note: To de-energize the console, unplug the rackmount power supply's AC cord from the AC mains. ***Never de-energize the console by disconnecting the cable that connects the console and power supply together.***

Once you have verified proper power-up, unplug the rackmount power supply to de-energize the console. You may now proceed to wire up audio and control connections.

Audio and Control Wiring

Every input and every output has its own dedicated six- or twelve-conductor connector (mating plugs supplied). Now in-field wiring changes are fast and easy, and of course rapid troubleshooting is an obvious benefit. This system also avoids the conductor pinching and stray strand shorting that plague screw terminals. Reliability and maintenance are the keys here.

Connection Procedures

As supplied from the factory, the console requires no logic connections to function. Therefore an orderly installation begins with the audio wiring. Note this manual is organized by module type (inputs, outputs, monitor modules, etc.); each chapter contains detailed wiring instructions for its module type. Proceed through the manual, chapter by chapter, until all modules have been wired to suit your particular installation requirements. Once proper audio operation is verified, go back to each individual chapter and proceed with control wiring.

Digital Audio Connections

CABLE - All AES/EBU input and output digital audio connections are balanced and should be made using a high quality digital audio cable. Be sure to select a digital audio cable with an integral drain wire of the same wire gauge (AWG) as the twisted pair. Typical AES/EBU digital audio cable has a very low characteristic capacitance per ft (pF/ft), and a nominal impedance of 110Ω. High quality digital audio cable offers better signal transmission performance versus typical analog audio cable, especially over long cable runs. Check the cable manufacturer's data sheet to be sure the cable you plan to use will work in your application.

CONNECTORS - All AES/EBU connections are made with the supplied six-conductor connectors. These crimp style connectors will accept wire gauge 24 - 22AWG.

SPDIF INPUTS - The SPDIF (Sony/Philips Digital Interface) or “consumer” digital audio interface is a two wire unbalanced signal typically on a single RCA style connector. To connect SPDIF devices to the D-70 console simply wire the SPDIF center conductor (HOT) to the IND-70 “HI” input pin and SPDIF shell (ground) to the IND-70 “LO” input. Connect the IND-70 “SH” at the console end only.

Analog Insert Points

Certain module signals have insert patch points in their signal chains to allow outboard audio processing. These include MONO MIC INPUTS (IND-70).

Normally these points are internally bridged at the factory (via PCB-mounted programming jumpers) prior to shipment. If you intend to use outboard signal loops at these points, you must reprogram these jumpers. See pages 2-3 (mic inputs).

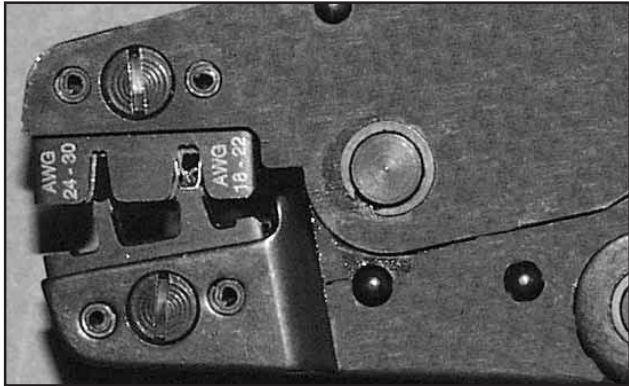
Unbalanced Connections (analog audio)

ANALOG INPUTS — Wire to the console with typical shielded two conductor cable (like Belden 9451), just as if you were connecting a balanced source. At the unbalanced source machine’s output, connect the black wire (LOW) to the shield. If the machine has a -10 dBu output, don’t hesitate to turn module input gain as high as is needed.

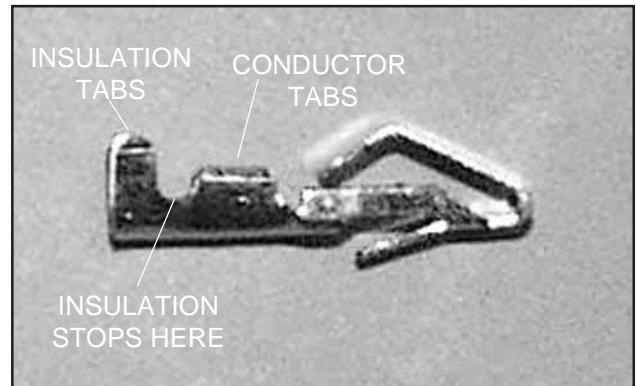
ANALOG OUTPUTS — D-70 consoles use a balanced output circuit which behaves exactly like the secondary of a high-quality transformer, with no center tap—this output is both balanced and floating. Either the HIGH or LOW side of the output should be strapped to ground, with the output taken from the other side. (Normally you’d strap LOW to ground, and take HIGH to feed your unbalanced equipment.)

HAND CRIMP TOOL WIRING INSTRUCTIONS

The supplied hand crimping tool (PALADIN model PA1645, W/S#850067) is used for all I/O wiring connections to and from the console. It is to be used with the supplied loose pin (figure 1) intended for 18"-24" gauge wire.



(2) The terminal conductor tabs (pointing UP) are placed in anvil 18-22; the terminal's insulation tabs extend in front towards the camera.



(1) Pin crimp terminal



(3) The stripped wire is placed into the terminal and crimped. Note the wire's insulation must stop just short of the conductor tabs (detail)



(4) Final step: jaws fully closed; the insulation tabs have been crimped.

1) Strip wire approximately 3/16" (insert in proper wire stripper, rotate one half turn, and pull insulation off wire).

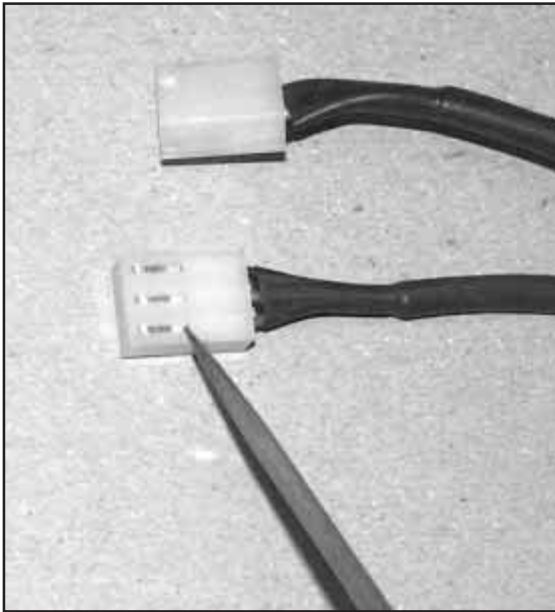
2) Leaving wire aside for the moment, with Paladin tool fully open (engraved side toward you) bring a terminal into position from the unmarked side of the tool. Place the conductor tabs (inner set as shown in figure 1) on the "18-22" or "24-30" (depending on the wire) anvil (slightly curved surface) so that the circular portion of the tabs rests in the curved surface of the anvil and the two tabs face up into the walls of the female jaw. The insulation tabs will be flush with the top of the tool (figure 2).

3) Close tool very slightly, only to the point of holding the terminal in position (figure 2).

4) Insert wire into terminal until wire insulation is stopped by conductor tabs (figure 3). **CRIMP** by squeezing handles until jaws are fully closed.

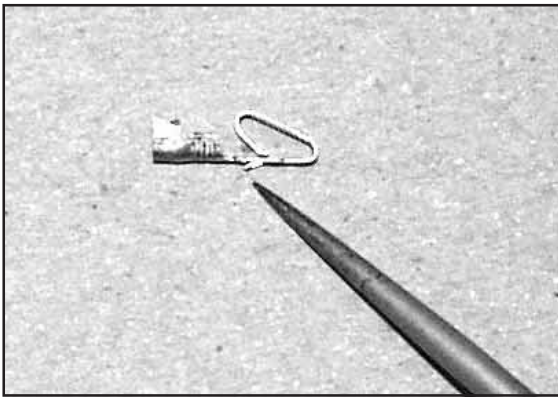
5) If there is an insertion error or if a circuit change is needed, you'll need to use an extractor tool to remove terminals (next section).

EXTRACTOR PIN INSTRUCTIONS



(5) Press down pin's spring

If you should accidentally insert a crimp terminal pin into the wrong socket, you can easily correct your mistake without having to sacrifice a connector. Simple press down the pin's spring (see Figure 5 and 6) with a pointed object, and pin terminal will extract from Nylon Housing.



(6) Detail - Pin's spring

Input Module (IND-70)

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Input Module (IND-70)

Module Overview

The IND-70 is an input module for microphone input signals and for stereo line input signals. Depending on the type of input signals the module will handle, it will have an input card for mono microphone (-50dBu nominal), stereo line analog, or stereo line digital inputs. Each module accepts two sources, A and B, switched at the top of the module.

The mono version uses an MMADC-70 input card at the input stage of the module. Phantom power is available at both input ports; it may be selectively activated by an internal jumper (the factory default is OFF). PCB-mounted multi-turn trimpots (range 38dB) adjust the level of the A and B inputs independently.

Example: with a microphone input of -60dBm @ 150Ω at the port, gain trim can set levels from -22dBu to +16dBu (note maximum preamp gain is +76dB).

An insert point (+4dBu balanced) is provided: it is post-trim and may be internally bypassed, which is the factory default setting.

The ADC (analog-to-digital converter) version uses SLADC-70 input card at the input stage of the module, and accepts +4dBu balanced analog input signals. PCB-mounted multi-turn trimpots adjust the left and right levels.

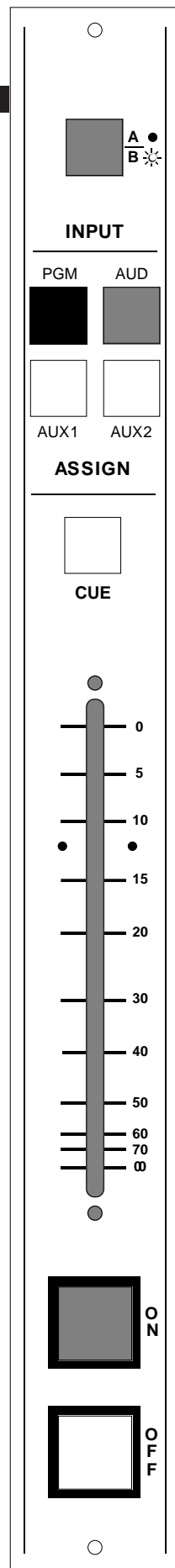
The SRC (sample rate converter) version uses an SRC-70 input card at the input stage of the module, and accepts digital (AES is factory default) input signals.

Output switches assign the selected source signal to any combination of the console's four stereo outputs: PGM (program), AUD (audition), AUX1 (auxiliary) and/or AUX2.

Level is set by a long-throw fader.

The channel ON and OFF switches are at the bottom of the module. In addition to being controlled remotely, these can also be programmed (via VDIP program) to perform a variety of console control functions, including activating control room and studio mutes, talkbacks, external tallies, and timer restart.

All audio and control input and output signals are made via a six-conductor connector (audio) and a twelve-conductor connector (control), mounted on the modules' rear panel.



Internal Programming Options

Internal programming for the mono mic module is made via printed circuit board (PCB) mounted jumpers on the module's MMADC-70 input card.

For the purposes of this manual, we will assume you are holding the removed module upright, component side towards you, with gold-plated card fingers to the left and the module faceplate to the right. This will enable you to read the control legends silkscreened next to each programming jumper.

Insert Bypass

Jumper J1 (located at the center of the MMADC input card) will bypass the module's insert point in and out of the audio signal chain. Note again that the factory default is "insert bypassed". In other words, when shipped from the factory J1 is installed.

Phantom Power

Jumpers J3 and J4 (located on the MMADC input card next to CT2 connector) turn phantom power on and off for the module's two microphone input ports.

J3 activates phantom power for microphone A

J4 activates phantom power for microphone B

Note the factory default setting for phantom power is OFF.

Talkback

Typically, one of the D-70 console's input modules will be used for the control room (CR) console operator's microphone. The jumper J2 (located in the center of the MMADC input card) allows that microphone to also function as a talkback mic. It places the signal (pre-insert, pre-fader, pre-on/off) onto the console's talkback bus. When the console operator presses a TB switch on the console's SCD-70 Studio Control module, the talkback bus (which is carrying his microphone signal) will interrupt the regular monitor signal being fed to the studio and talent will hear his voice through the studio monitor speakers.

In order for the studio to reply to the console operator, the IND-70 module controlling the studio's microphone signal must be routed to the console's cue bus, where it can interrupt the regular control room monitor feed and be heard by the operator. This is accomplished by a user-supplied TB switch in the studio. The switch provides a momentary closure between the module's twelve-conductor connector "TB to CR" control pin (Pin 2) and Digital Ground (Pin 12). As long as this closure is maintained (i.e., as long as talent holds down the studio TB button) the module's (pre-insert, pre-fader, pre-on/off) signal will be placed on the console's Cue bus. Simultaneously, the module's regular output will be muted (i.e., Cough will be activated) so the talkback signal doesn't go out over the air.

VDT Programming Options

Mutes, timer restart, cue dropout, local/ready, tallies, and auxiliary 2 bus pre-fader programming are made via Virtual Dip Switch Software (see Chapter 6).

Hook-Ups

As stated before, all user wiring to and from IND-70 modules takes place at six- and twelve-conductor connectors mounted on the module's rear panel. There are three connectors per module: two six-conductor connectors handle audio signals; one twelve-conductor connector handles control signals.

Microphone Inputs

Audio Connections

These include A and B mic inputs, and insert in and out. The mic input level is nominally -50dBu. Insert points are +4dBu balanced in and out. All signals are analog mono.

Pin 6 – Mic A In LO
Pin 5 – Mic A In SH
Pin 4 – Mic A In HI
Pin 3 – Mic B In LO
Pin 2 – Mic B In SH
Pin 1 – Mic B In HI

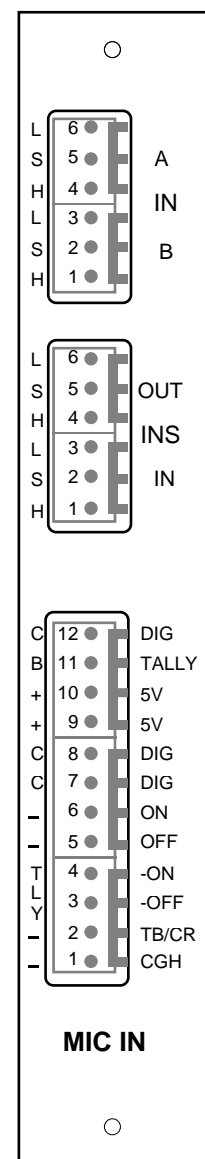
Pin 6 – Insert Out LO
Pin 5 – Insert Out SH
Pin 4 – Insert Out HI
Pin 3 – Insert In LO
Pin 2 – Insert In SH
Pin 1 – Insert In HI

Note the insert points are normally bypassed by PCB-mounted jumper J1 (see page 2-3). The Insert Out pins may be used as a channel direct output if desired.

Control Connections

These include remote on and off, cough, talkback and tally functions. Note each function is available for A source port, allowing it to follow the module's A mic selector switch.

Pin 1 – Cough
Pin 2 – TB to CR
Pin 3 – Off Tally
Pin 4 – On Tally



MMADC-70
Rear Panel

VDT Programming Options

Mutes, timer restart, cue dropout, local/ready, tallies, and auxiliary 2 bus pre-fader programming are made via Virtual Dip Switch Software (see Chapter 7).

Hook-Ups

As stated before, all user wiring to and from IND-70 modules takes place at six- and twelve-conductor connectors mounted on the module's rear panel. There are three connectors per module: two six-conductor connectors handle audio signals; one twelve-conductor connector handles control signals.

Microphone Inputs

Audio Connections

These include A and B mic inputs, and insert in and out. The mic input level is nominally -50dBu. Insert points are +4dBu balanced in and out. All signals are analog mono.

Pin 6 – Mic A In LO
Pin 5 – Mic A In SH
Pin 4 – Mic A In HI
Pin 3 – Mic B In LO
Pin 2 – Mic B In SH
Pin 1 – Mic B In HI

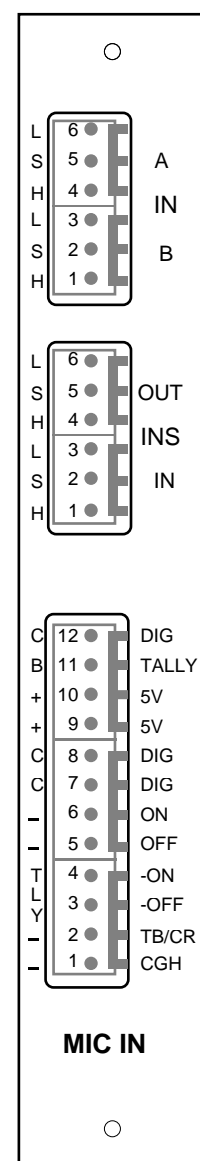
Pin 6 – Insert Out LO
Pin 5 – Insert Out SH
Pin 4 – Insert Out HI
Pin 3 – Insert In LO
Pin 2 – Insert In SH
Pin 1 – Insert In HI

Note the insert points are normally bypassed by PCB-mounted jumper J1 (see page 2-3). The Insert Out pins may be used as a channel direct output if desired.

Control Connections

These include remote on and off, cough, talkback and tally functions. Note each function is available for A source port, allowing it to follow the module's A mic selector switch.

Pin 1 – Cough
Pin 2 – TB to CR
Pin 3 – Off Tally
Pin 4 – On Tally



Pin 5 - Off
 Pin 6 - On
 Pin 7 – Digital Ground
 Pin 8 – Digital Ground
 Pin 9 – +5V Digital
 Pin 10 – +5V Digital
 Pin 11 – Tally B
 Pin 12 - Digital Ground

To Turn the Module ON & OFF from a Remote Location

ON — Activates the module's channel ON switch. Provide a momentary closure between Pin 6 (On) and Digital Ground (Pins 7, 8 or 12). This will latch the module ON. (User-supplied momentary contact switch required.)

OFF — Activates the module's channel OFF switch. Provide a momentary closure between Pin 5 (Off) and Digital Ground (Pins 7, 8 or 12). This will latch the module OFF. (User-supplied momentary contact switch required.)

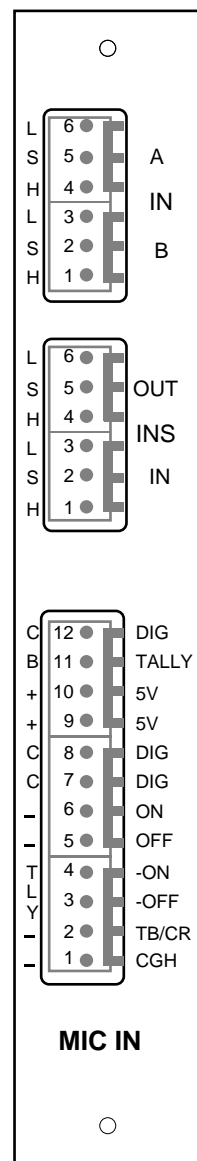
COUGH — Temporarily Mutes the module. Provide a closure between Pin 1 (Cough) and Digital Ground (Pins 7, 8 or 12). This will turn the module OFF. Note this is a non-latching mode; the module will turn ON again as soon as the closure stops. (User-supplied momentary contact switch required.)

Talkback to Control Room

If an IND-70 module is being used for a studio microphone, this connection allows talkback from that studio to the console operator. Provide a closure between Pin 2 (TB to CR) and Digital Ground (Pins 7, 8 or 12). This will cause two things to happen: (1) the module's pre fader signal is sent to the console's Cue bus, where it may be heard by the console operator, and (2) the module's Cough function is activated, muting the module's post fader signal and preventing the TB signal from going out over other assigned busses (i.e., "live"). This non-latching condition continues until the closure is released. (Requires user-supplied momentary action TALKBACK switch at the studio microphone location.)

On Tally

Lets the module's channel ON switch control an on-air light or other "microphone on" indicator at a remote location. This control function provides a continuous closure (open collector) between Pin 4 (On Tally) and Digital Ground (Pins 7, 8 or 12) whenever the module is ON.



MMADC-70
Rear Panel

This closure can be used to control an externally powered tally light that requires a continuous closure to function. Or an external tally light (i.e., LED) can be powered from the input module by connecting the external LED to +5V Digital (Pin 9 or Pin 10) and the On Tally port. In either case, current should not exceed 30 milliamps.

We recommend a series resistor between the LED and +5V digital when you are powering the external tally from the console; a value of 220Ω (1/4W 5%) is suggested.

Off Tally

Identical to “On Tally” (preceding), only this tally is active when the module is OFF. Off Tally A is Pin 3.

Tally B

Provides a remote indication that the module’s B source has been selected. This control function provides a continuous closure (open collector) between Pin 11 (Tally B) and Digital Ground (Pins 7, 8 or 12) whenever the B source is selected.

This closure can be used to control an externally powered tally light that requires a continuous closure to function. An external tally light (i.e., LED) can be powered from the input module by connecting the external LED to +5V Digital (Pin 9 or Pin 10) and the B Tally port. In either case, current should not exceed 30 milliamps.

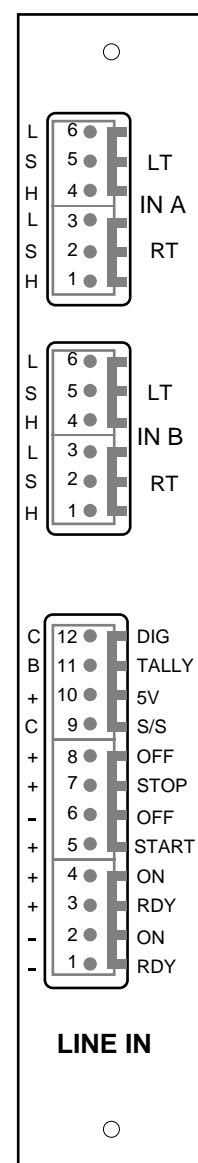
Stereo Line Analog Inputs

Audio Connections

These include A and B source inputs; level is +4dBu balanced.

Pin 6 – Line A In Lt LO
Pin 5 – Line A In Lt SH
Pin 4 – Line A In Lt HI
Pin 3 – Line A In Rt LO
Pin 2 – Line A In Rt SH
Pin 1 – Line A In Rt HI

Pin 6 – Line B In Lt LO
Pin 5 – Line B In Lt SH
Pin 4 – Line B In Lt HI
Pin 3 – Line B In Rt LO
Pin 2 – Line B In Rt SH
Pin 1 – Line B In Rt HI



SLADC-70
Rear Panel

Stereo Line Digital Inputs

Audio Connections

These A and B sample rate converter inputs accept AES-3 or SPDIF formatted digital audio.

Pin 6 – Line A AES LO
Pin 5 – Line A AES SH
Pin 4 – Line A AES HI

Pin 6 – Line B AES LO
Pin 5 – Line B AES SH
Pin 4 – Line B AES HI

Control Connections

These are identical for stereo line analog and digital versions of the IND-70 module.

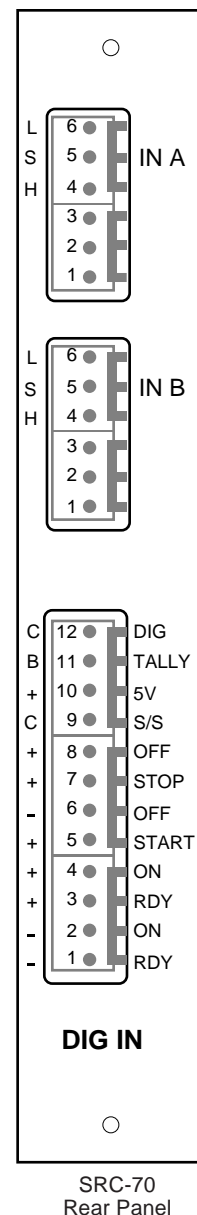
All control ports (except Tally B) are opto-isolated. Functions include remote on and off, on tally, ready, and start/stop for remote source machines. Each function is available for the A source port, allowing it to follow the module's A source selector switch.

Pin 1 – Ready-
Pin 2 – On-
Pin 3 – Ready+
Pin 4 – On+
Pin 5 – Start+
Pin 6 – Off-
Pin 7 – Stop+
Pin 8 – Off+
Pin 9 – Start/Stop Common
Pin 10 – +5V Digital
Pin 11 – B Tally
Pin 12 – Digital Ground

To Turn the Module ON & OFF from a Remote Location

In the case of stereo line input modules, “remote location” can also refer to a remote source machine that is feeding its audio to the module in question. A 5VDC signal, as indicated below, will activate the module’s channel ON and OFF switches.

REMOTE ON — Activates the module’s channel ON switch. Provide a momentary 5VDC signal between Pins 2 and 4 (On). This will latch the module ON. Be sure to observe the polarity as indicated above.



REMOTE OFF — Activates the module's channel OFF switch. Provide a momentary 5VDC signal between Pins 6 and 8 (Off). This will latch the module OFF. Be sure to observe the polarity as indicated above.

To START and STOP Remote Source Machines Using Module ON/OFF Switches

EXTERNAL START — Hook up the remote machine's "start" control pins to the module's twelve-conductor connector control pins: for START wire to pins 5 and 9.

EXTERNAL STOP — Hook up the remote machine's "stop" control pins to the module's twelve-conductor connector control pins: for STOP A wire to pins 7 and 9.

Note that these are opto isolated outputs. START/STOP COM (pin 9) connects to the opto emitters, while the remaining connections (START, pin 5 and STOP, pin 7) connects to the opto collectors. Correct polarity must be observed in wiring to these connections.

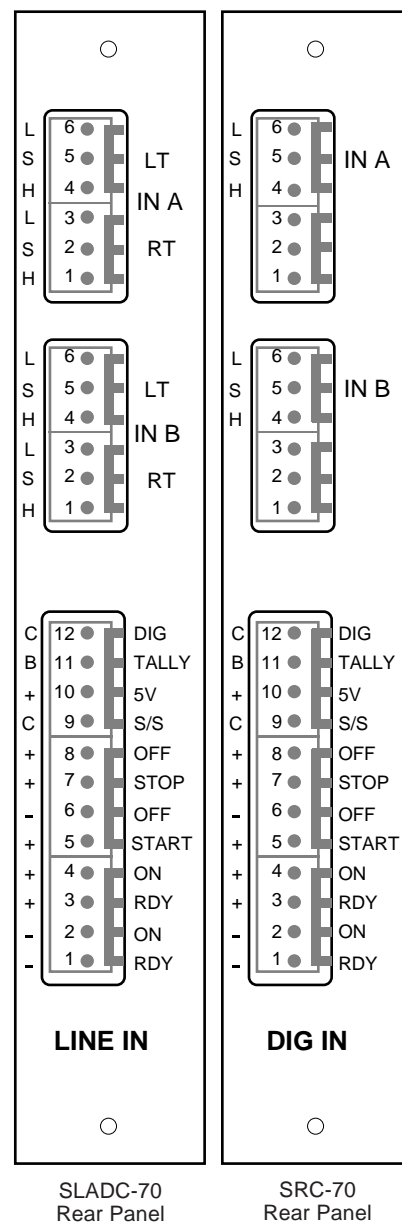
To Control the Module's OFF Switch LED with an External Source Machine

READY — Hook up the remote machine's "ready" control pins to the module's twelve-conductor connector control pins: for READY wire to pins 1 and 3. The module's Ready port is looking for a 5VDC signal with pin 3 positive with respect to pin 1 (READY). As long as the voltage is present in the correct polarity, the OFF switch LED will be illuminated.

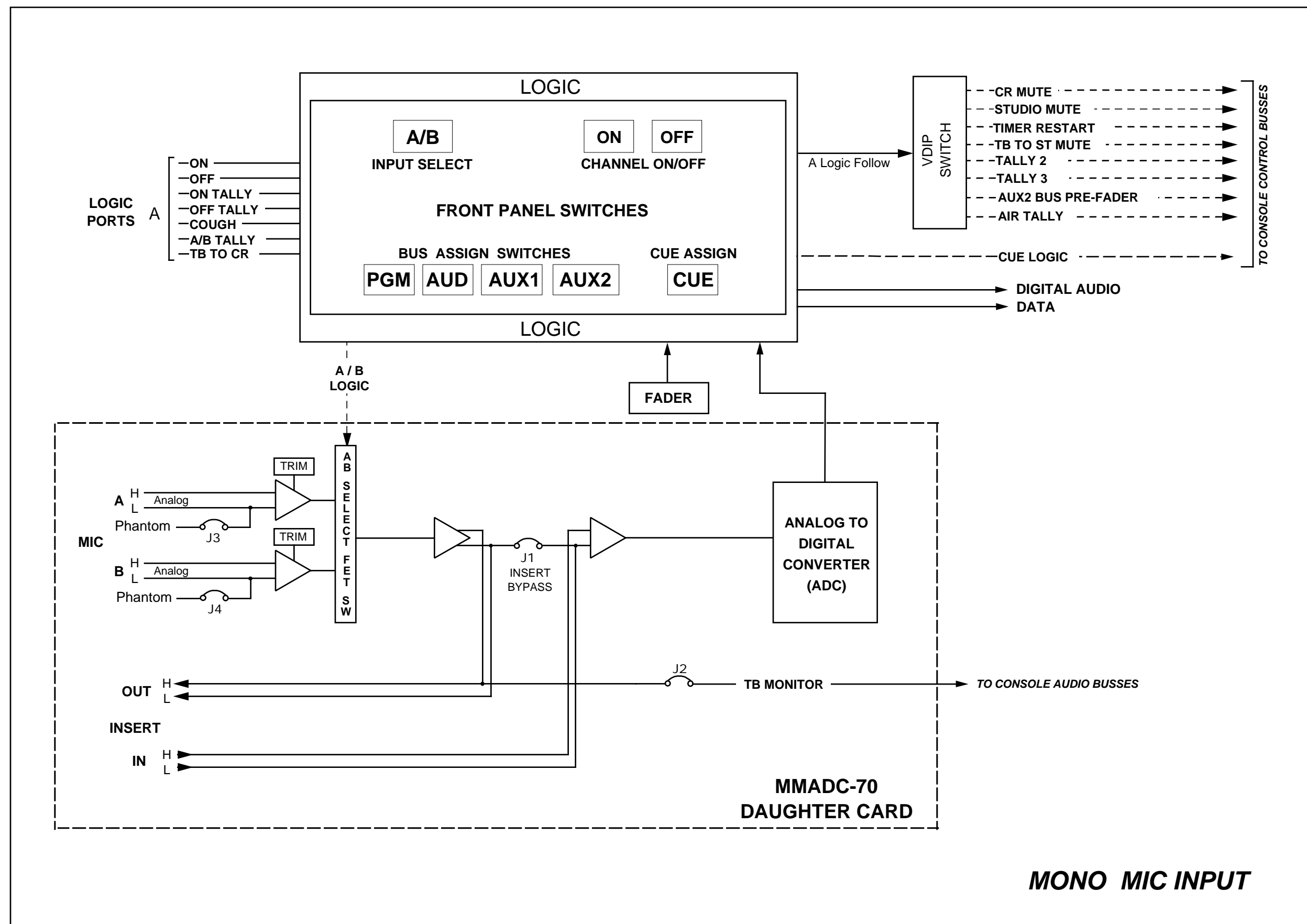
Tally B

Provides a remote indication that the module's B source has been selected. This control function provides a continuous closure (open collector) between Pin 11 (Tally B) and Digital Ground (Pin 12) whenever the B source is selected.

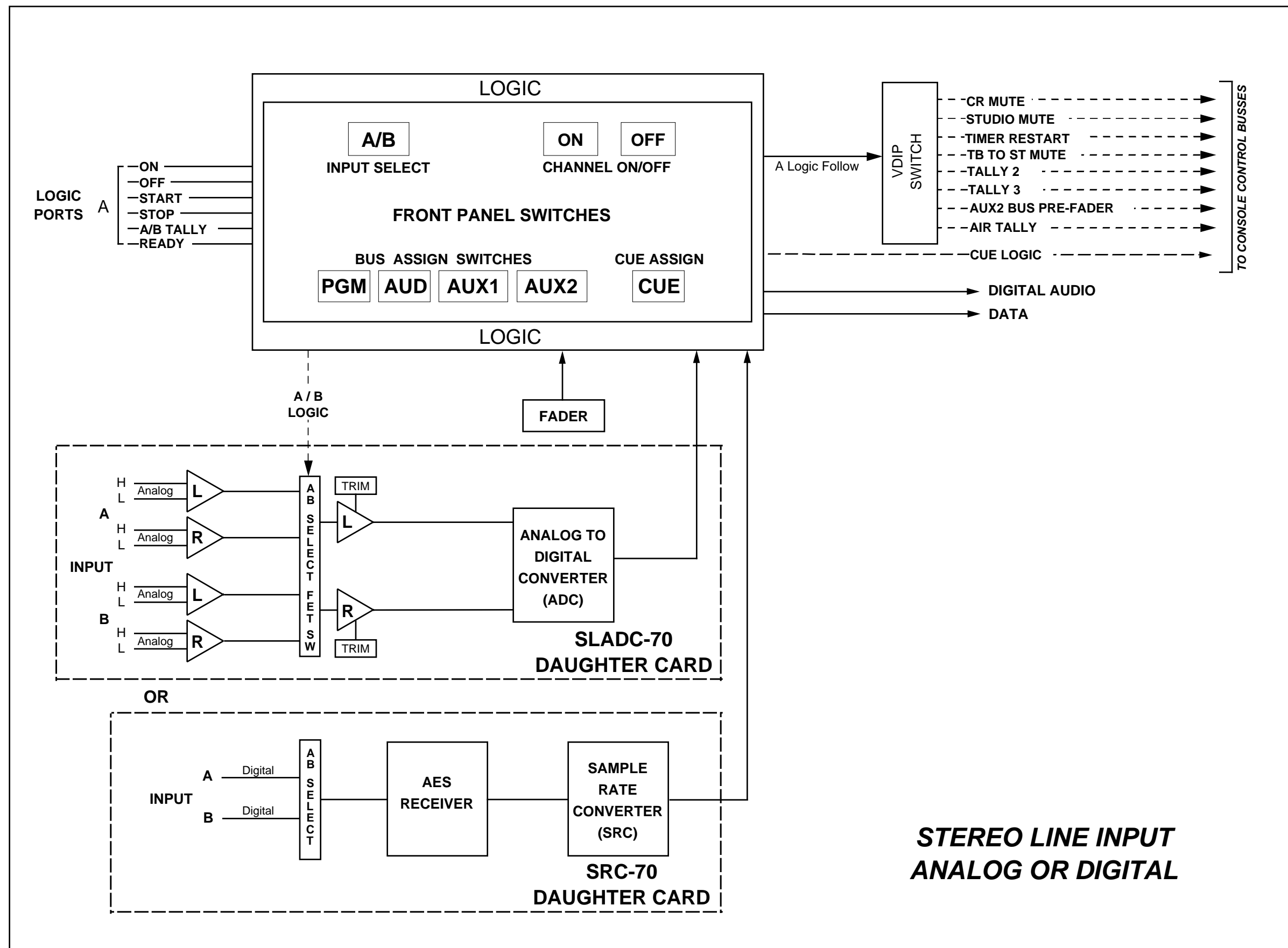
This closure can be used to control an externally powered tally light that requires a continuous closure to function. An external tally light (i.e., LED) can be powered from the input module by connecting the external LED to +5V Digital (Pin 10) and the B Tally ports. In either case, current should not exceed 30 milliamps.



We recommend a series resistor between the LED and +5V digital when you are powering the external tally from the console; a value of 220Ω (1/4W 5%) is suggested.



IND-70 Input Module - Signal Flow Diagram



IND-70 Input Module - Signal Flow Diagram

Master Outputs

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Master Outputs

Overview

Each D-70 console has four master analog and digital outputs: Program, Audition, Auxiliary 1, and Auxiliary 2.

The D-70 console has two rear panels: OMA-70 outputs the console's analog signals and OMD-70 outputs the console's digital signals.

All user wiring takes place at six-conductor connectors mounted on the rear panels: OMA-70 and OMD-70. There are four connectors on each panel. Connectors on the OMA-70 panel handle analog outputs; connectors on the OMD-70 panel handle digital output (AES format). All analog audio is +4dBu balanced.

Master outputs also generate the console's monitor signals, which feed the Control Room and Studio.

Internal Programming Options

Internal programming for outputs is made via printed circuit board (PCB) mounted jumpers on the OMD-70 digital output card.

Sampling Frequency for Console Outputs

For stand alone operation, the console output sample rate is determined by crystal Y1, which is installed at the factory for 48 kHz sample rate. An additional crystal oscillator is provided with the console for 44.1 kHz sample rate. Crystals for 32 KHz sample rate are available from the factory as a special order item.

To switch to a different output sample rate, replace crystal Y1 with one of the appropriate frequency as shown in Figure 1 and Table 1.

TABLE 1		
SAMPLE RATE	CRYSTAL OSCILLATOR FREQUENCY	WS PART#
48 kHz	24.576 mHz	370012
44.1 kHz	22.579 mHz	370011
32 kHz	16.384 mHz	370010

Note that to replace the crystal Y1 you need to remove last input module (slot 12 for 20 position frame or slot 20 for 28 position frame).

The console must be powered down before changing the sample rate crystal Y1 or damage not covered by warranty may result. Changing the crystal Y1 will change the console output sample rate, however some external digital devices also need the correct sample rate information to be embedded in the AES output data or they will not operate correctly. Therefore, after changing the sample rate crystal Y1, be sure to reset jumpers J1 and J2 to correctly embed the sample rate information in the output AES data stream. Table 2 shows the jumper settings that are located at the right corner of the OMD-70 rear panel digital output card (see Figure 2).

TABLE 2
J1 installed - frequency is 48 kHz
J2 installed - frequency is 44.1 kHz
J1 and J2 installed - frequency is 32 kHz

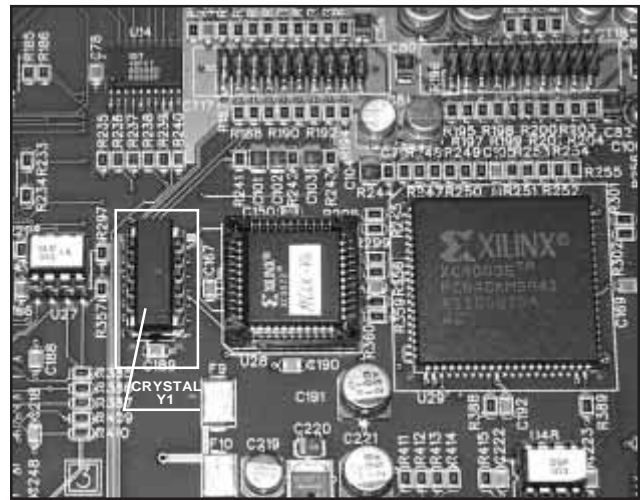


Figure 1. Section of the PR-70 PCB

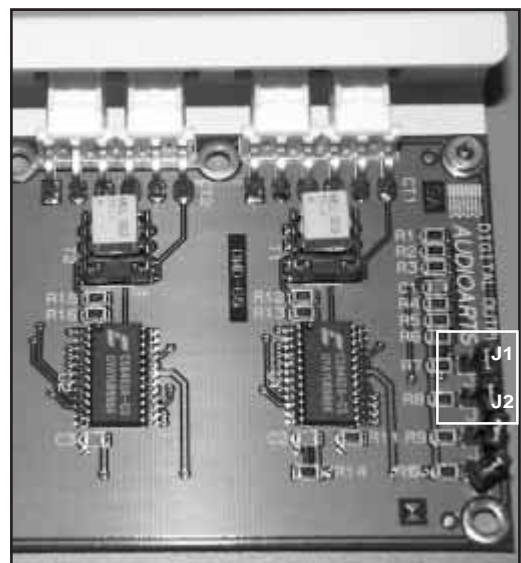


Figure 2. OMD-70 Rear Panel Digital Output Card.

Hook-Ups

As stated before, all user wiring takes place at six-conductor connectors mounted on the rear panels (OMA-70 and OMD-70).

OMA-70 Connections – Analog Audio Outputs

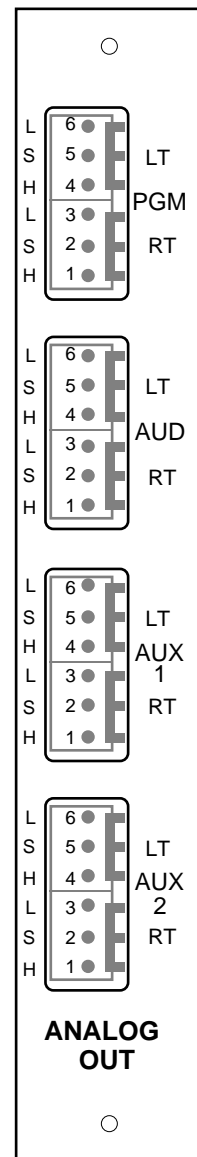
Includes Program, Audition, Auxiliary 1, and Auxiliary 2 outputs. All signals are +4dBu balanced.

Pin 6 – PGM Lt Out LO
 Pin 5 – PGM Lt Out SH
 Pin 4 – PGM Lt Out HI
 Pin 3 – PGM Rt Out LO
 Pin 2 – PGM Rt Out SH
 Pin 1 – PGM Rt Out HI

Pin 6 – AUD Lt Out LO
 Pin 5 – AUD Lt Out SH
 Pin 4 – AUD Lt Out HI
 Pin 3 – AUD Rt Out LO
 Pin 2 – AUD Rt Out SH
 Pin 1 – AUD Rt Out HI

Pin 6 – AUX1 Lt Out LO
 Pin 5 – AUX1 Lt Out SH
 Pin 4 – AUX1 Lt Out HI
 Pin 3 – AUX1 Rt Out LO
 Pin 2 – AUX1 Rt Out SH
 Pin 1 – AUX1 Rt Out HI

Pin 6 – AUX2 Lt Out LO
 Pin 5 – AUX2 Lt Out SH
 Pin 4 – AUX2 Lt Out HI
 Pin 3 – AUX2 Rt Out LO
 Pin 2 – AUX2 Rt Out SH
 Pin 1 – AUX2 Rt Out HI



OMA-70
Rear Panel

OMD-70 Connections – Digital Outputs

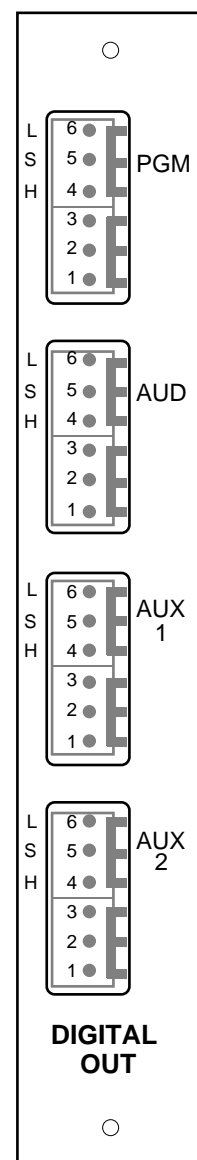
Handles digital Program, Audition, Auxiliary 1, and Auxiliary 2 outputs (AES format).

Pin 6 – PGM AES Out LO
Pin 5 – PGM AES Out SH
Pin 4 – PGM AES Out HI

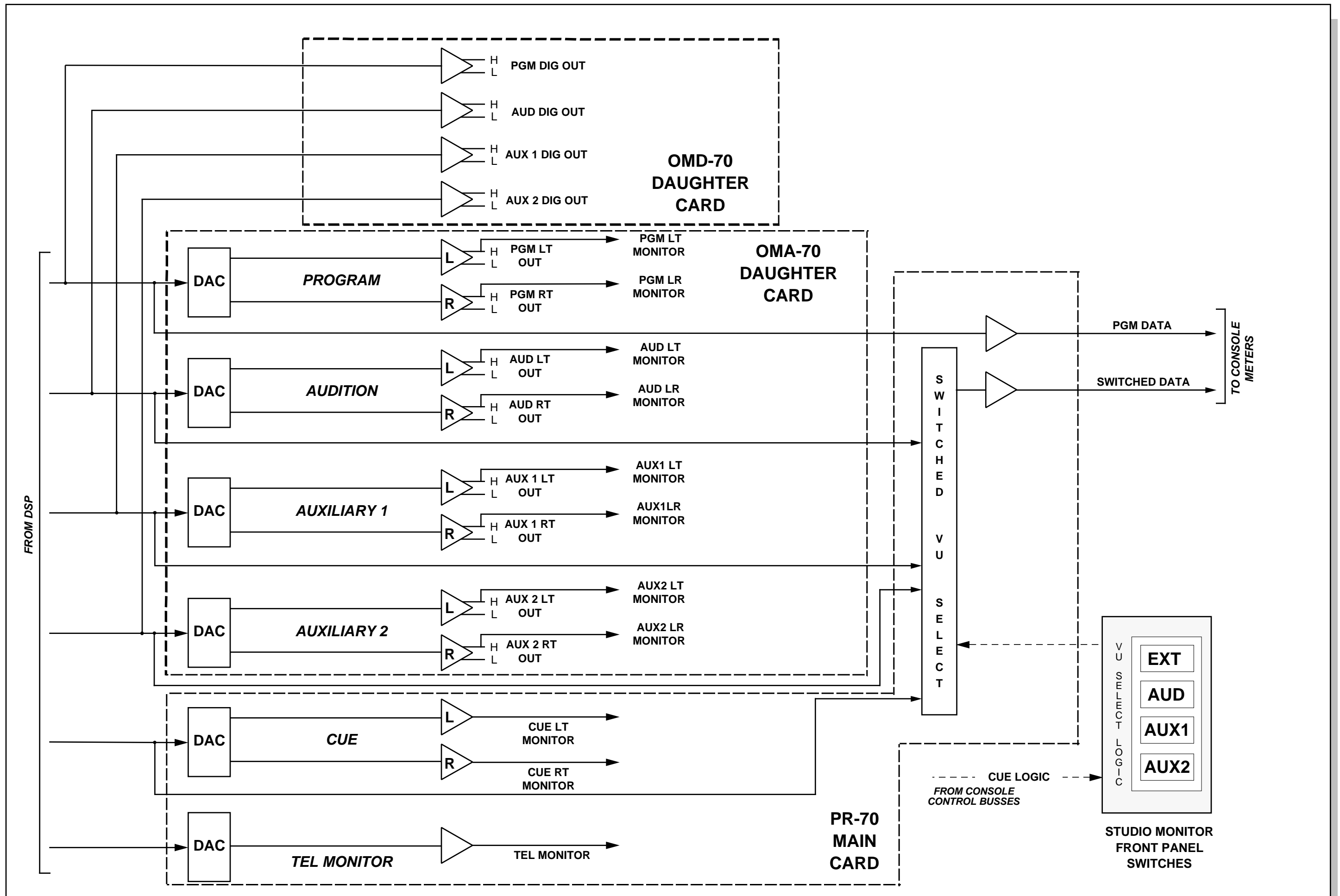
Pin 6 – AUD AES Out LO
Pin 5 – AUD AES Out SH
Pin 4 – AUD AES Out HI

Pin 6 – AUX1 AES Out LO
Pin 5 – AUX1 AES Out SH
Pin 4 – AUX1 AES Out HI

Pin 6 – AUX2 AES Out LO
Pin 5 – AUX2 AES Out SH
Pin 4 – AUX2 AES Out HI



OMD-70
Rear Panel



Control Room Module

(CRD-70)

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Control Room Module

(CRD-70)

Module Overview

The CRD-70 module is the D-70 console operator's monitor module. It allows him to listen to the console's four stereo outputs (PGM, AUD, AUX1 & AUX2) as well as two external stereo line level inputs brought directly into the module via the CRD-70/1 rear panel.

The CRD-70 also houses console HEADPHONE and CONTROL ROOM circuits, which follow the source selection switches.

There are two types of headphone output: the +4dBu balanced output at the module's rear panel (CRD-70/2) six-conductor connector (pre-level control), and the headphone jack mounted right on the front of the lower mainframe pan, which is actually the output from a built-in headphone amplifier. It is this built-in amp that is controlled by the module's front panel HEADPHONE level control.

The CUE master level control sets the level of the console's cue signal.

Whenever CUE is activated elsewhere on the console (stereo line inputs, the superphone module, or for studio talkback) its signal will appear at the console's built-in cue speaker mounted in the meterbridge. Depending on how the CRD-70 module has been programmed, cue can also interrupt the control room monitor speaker and/or the console operator's headphone. The way Cue interrupts the module's headphone and CR outputs is determined by internal PCB-mounted jumpers. See "Cue Interrupt" on next page.

The D-70 digital audio console is provided with a serial interface port. Activating the pushbutton LOC/REM switch will enable the remote serial interface to the console, and deactivating the switch will disable the remote serial interface. (For more details see Chapter 6.)

At the center of the module are the timer control buttons (the timer display is mounted in the righthand end of the console meterbridge):

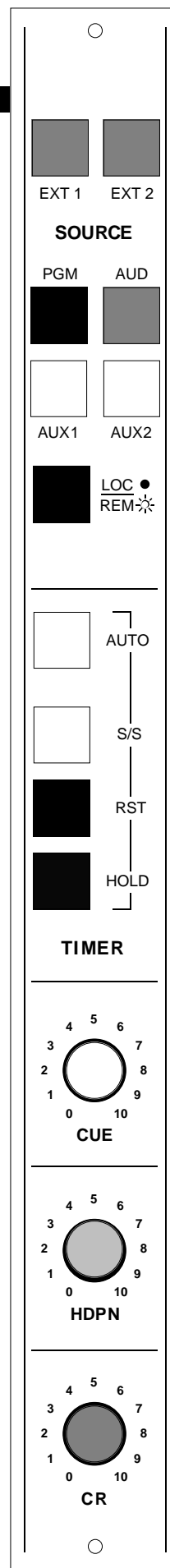
AUTO – enables timer restart functions from programmed input modules

S/S – Start/Stop

RESET - return to zero (if the timer is stopped it will hold at zero; if it is running it will reset to zero and immediately begin counting up).

HOLD – when held down freezes the timer *display* (the counter keeps on going); when released the display catches up to the current count.

All user wiring to and from the CRD-70 module takes place at six-conductor connectors mounted on the module's rear panels. The two rear panels, MONITOR 1 and MONITOR 2, are shared by the CRD-70 and SCD-70 modules. All audio connections are stereo line level analog signals (+4dBu balanced).



Internal Programming Options

There are five user-programmable jumpers for CRD-70 located on the lower center of the Processor Board PR-70 PCB to set various cue interrupt modes and cue mute (see below).

Cue Interrupt

Jumpers J10-J13 determines how the console's Cue function will interrupt regular monitor signals:

J10 sends cue to CR left

J11 sends cue to CR right

J12 sends cue to HDPN left*

*factory default settings

J13 sends cue to HDPN right*

Cue Mute

As Cue is also fed to the console's built-in meterbridge speakers, where it can easily be picked up by the console operator's microphone, there is provision to mute Cue whenever that mic is live (i.e., whenever the control room mute function is activated).

Jumpers J14 will mute cue whenever CR is muted (this is the factory default setting)

Hook-Ups

As stated before, all user wiring to and from the CRD-70 module takes place at six-conductor connectors mounted on the module's rear panels. The two panels, MONITOR 1 and MONITOR 2, are shared with the SCD-70 module.

CRD-70/1 Rear Panel Audio Connections:

Includes external stereo inputs and control room outputs. All audio signals are +4dBu balanced, analog stereo.

Pin 6 – Lt Ext 1 In LO

Pin 5 – Lt Ext 1 In SH

Pin 4 – Lt Ext 1 In HI

Pin 3 – Rt Ext 1 In LO

Pin 2 – Rt Ext 1 In SH

Pin 1 – Rt Ext 1 In HI

Pin 6 – Lt Ext 2 In LO

Pin 5 – Lt Ext 2 In SH

Pin 4 – Lt Ext 2 In HI

Pin 3 – Rt Ext 2 In LO

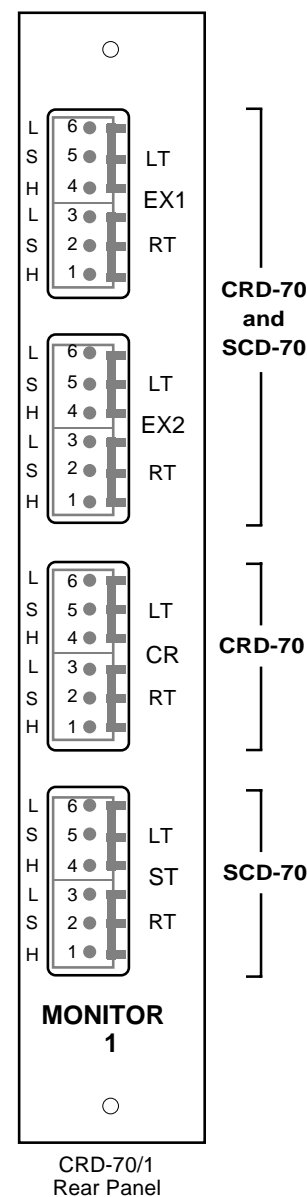
Pin 2 – Rt Ext 2 In SH

Pin 1 – Rt Ext 2 In HI

Pin 6 – Lt CR Out LO

Pin 5 – Lt CR Out SH

Pin 4 – Lt CR Out HI



Pin 3 – Rt CR Out LO
 Pin 2 – Rt CR Out SH
 Pin 1 – Rt CR Out HI

CRD-70/2 Rear Panel Audio Connections:

Includes headphone and cue outputs. All audio signals are +4dBu balanced, analog stereo.

Pin 6 – Lt HDPN Out LO
 Pin 5 – Lt HDPN Out SH
 Pin 4 – Lt HDPN Out HI
 Pin 3 – Rt HDPN Out LO
 Pin 2 – Rt HDPN Out SH
 Pin 1 – Rt HDPN Out HI

Pin 6 – Lt Cue Out LO
 Pin 5 – Lt Cue Out SH
 Pin 4 – Lt Cue Out HI
 Pin 3 – Rt Cue Out LO
 Pin 2 – Rt Cue Out SH
 Pin 1 – Rt Cue Out HI

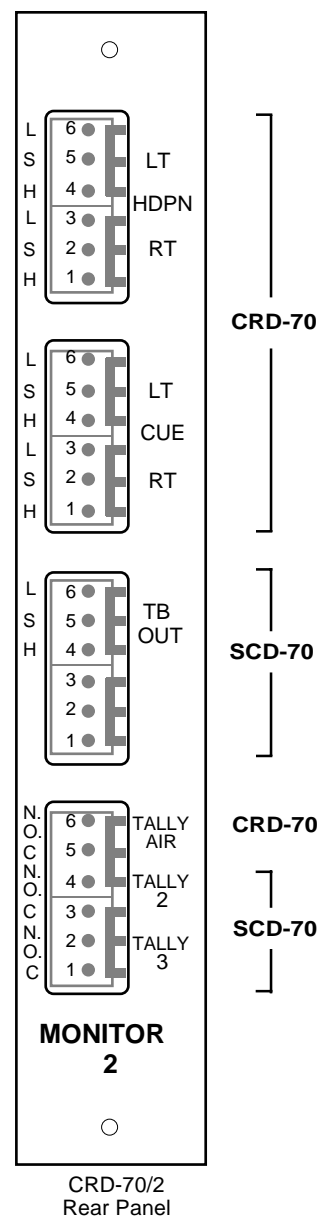
CRD-70/2 Rear Panel Control Connections:

The console's on-air tally port is on the CRD-70/2 lower six-conductor connector. This is a simple relay closure that activates whenever programmed input modules are turned ON (see page 2-4). The port can be used to control an externally powered tally light that requires a continuous closure to function.

Pin 6 – On-Air Tally Relay N.O.
 Pin 5 – On-Air Tally Relay COM



Maximum current through the on-air tally relay closure is 2 amps @30VDC.



Studio Control Module

(SCD-70)

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Studio Control Module

(SCD-70)

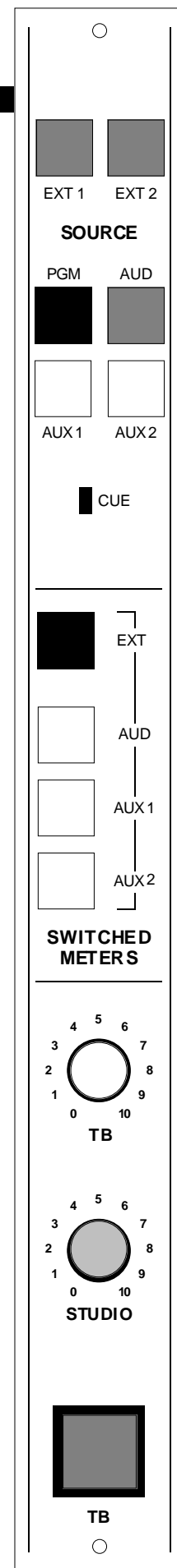
Module Overview

The SCD-70 module is similar to the CRD-70 control room module, only it controls monitor audio and talkback to an additional (“non-control room”) studio. The monitor signal being sent to this studio follows the source select switching. This switching is identical to the control room module’s and includes the console’s four stereo outputs (PGM, AUD, AUX1 & AUX2) as well as the same two external stereo line level inputs that feed the CR monitor.

The studio has a level control and talkback switch. When the talkback switch is pressed (it is momentary action) the console operator’s microphone signal (see page 2-3) will interrupt the regular monitor signals being sent to the studio. The TALKBACK master level control sets the level of this talkback interrupt signal.

Each D-70 console has two pairs of left-right digital LED meters: PGM and SWT (switched) located on the console’s meterbridge. The switched meter follows the SELECT switching, allowing the console operator to meter AUD, AUX1, AUX2 and external stereo line signal. When EXT is selected, the switched meter will display the level of the signal that is input to a digital or analog line input panel installed in input panel slot 13 (20 position frame) or slot 21 (28 position frame). See the rear panel layout on page 1-5.

All user wiring to and from the SCD-70 module takes place at six-conductor connectors mounted on the module’s rear panels. The two rear panels, MONITOR 1 and MONITOR 2, are shared by the CRD-70 and SCD-70 modules. All audio connections are (+4dBu balanced) analog signals.



Internal Programming Options

There are three user-programmable jumpers (J16-J18) for the SCD-70 that are located on the lower center of the Processing Board PR-70 PCB.

External Talkback Mute/Dim

There is an independent talkback output from the SCD-70 module. By installing jumper J16, you can make this external talkback output MUTE whenever the studio is muted. You also have the option of making the output DIM (drop -20dB in level) instead of MUTE by installing jumper J18 in addition to jumper J16.

Jumper 16 mutes external TB whenever Studio is muted* *factory default settings

Jumper 18 makes external TB DIM instead of MUTE

Studio Dim

Input modules controlling studio microphones can be programmed to MUTE the studio whenever the module is turned on (i.e., it's microphone is live). If you wish, you can have the studio DIM (drop -20dB in level) instead of MUTE:

Jumper 17 causes Studio to DIM instead of MUTE

Note the DIM functions do not affect talkback interrupts, which always completely replace the studio's regular monitor feed with the console operator's TB signal. Note also if a studio is muted, talkback cannot be heard. However, if a studio is programmed to DIM instead of MUTE, talkback audio could presumably make it from the studio monitor speakers to the open studio mic.

Hook-Ups

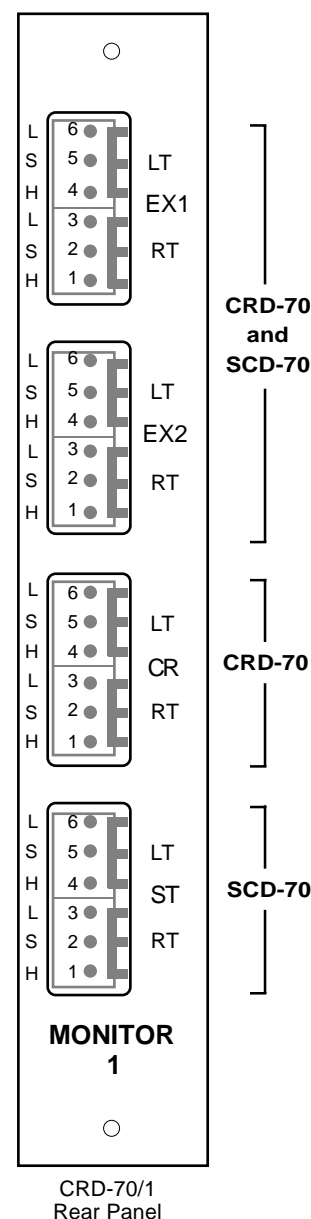
As stated before, all user wiring to and from the SCD-70 module takes place at the six-conductor connectors mounted on the module's rear panels. The two panels, MONITOR 1 and MONITOR 2, are shared with the CRD-70 module.

CRD-70/1 Connections — Audio

Includes external stereo inputs and studio outputs. All audio signals are analog, +4dBu balanced.

Pin 6 – Lt Ext 1 In LO
Pin 5 – Lt Ext 1 In SH
Pin 4 – Lt Ext 1 In HI
Pin 3 – Rt Ext 1 In LO
Pin 2 – Rt Ext 1 In SH
Pin 1 – Rt Ext 1 In HI

Pin 6 – Lt Ext 2 In LO
Pin 5 – Lt Ext 2 In SH
Pin 4 – Lt Ext 2 In HI
Pin 3 – Rt Ext 2 In LO
Pin 2 – Rt Ext 2 In SH
Pin 1 – Rt Ext 2 In HI



Pin 6 – Lt Studio Out LO
 Pin 5 – Lt Studio Out SH
 Pin 4 – Lt Studio Out HI
 Pin 3 – Rt Studio Out LO
 Pin 2 – Rt Studio Out SH
 Pin 1 – Rt Studio Out HI

CRD-70/2 Connections — Audio

Includes talkback (mono) outputs. All audio signals are analog, +4dBu balanced.

Pin 6 – TB Out LO
 Pin 5 – TB Out SH
 Pin 4 – TB Out HI

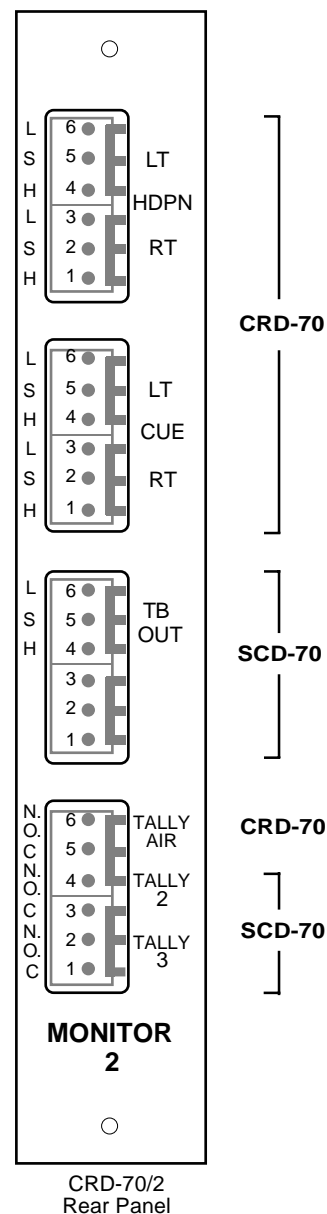
CRD-70/2 Connections— Control

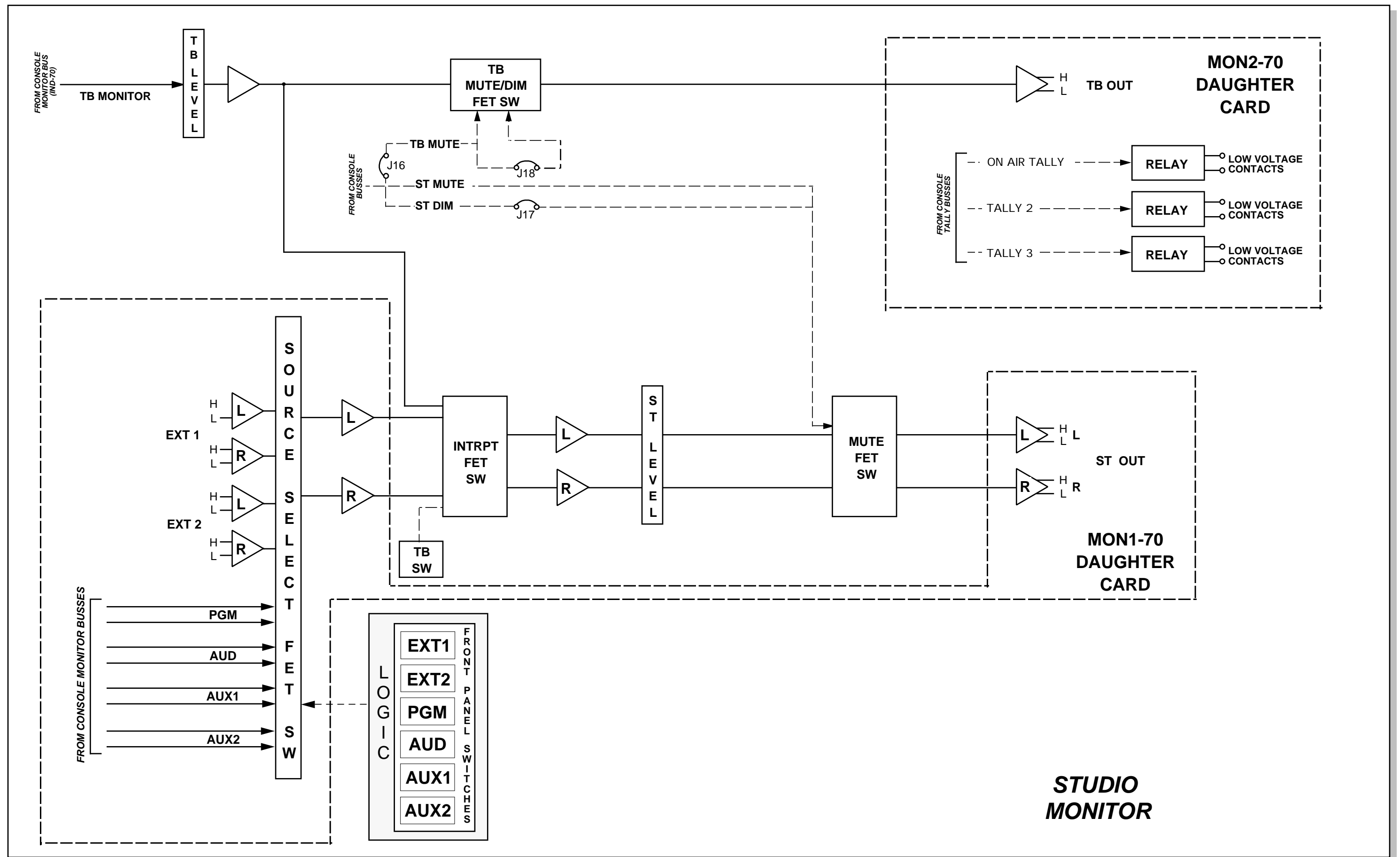
The console's Tally 2 and Tally 3 control ports are on the CRD-70/2 lower six-conductor connector. These are simple relay closures that activate whenever programmed input modules are turned ON (see page 2-4). The ports can be used to control externally powered tally lights that requires a continuous closure to function.

Pin 4 – Tally 2 Relay N.O.
 Pin 3 – Tally 2 Relay COM
 Pin 2 – Tally 3 Relay N.O.
 Pin 1 – Tally 3 Relay COM



Maximum current through the tally relay closures is 2 amps @30VDC.





SCD-70 Studio Monitor - Signal Flow Diagram

CPU Central Processor

DSP Digital Processor

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CPU Central Processor

DSP Digital Processor

Overview

Every D-70 console has a central controller and a digital signal processor.

The D-70 Digital Audio console is provided with a serial interface port, which is located on the DB-15 connector of the rear panel (see connection diagrams for pinouts on the page 6-8). This serial interface is designed to provide a number of functions including external control and set-up, software updates, system interface, etc. Through this serial interface, the D-70 control protocol is available, allowing visibility and control of the console switches, displays, and other functions. The “Virtual Dip Switch” application program (supplied with the D-70 console) communicates set up information through this serial interface (see Chapter 7).

CPU

By monitoring the various console modules and serial ports, the CPU controls all of the console audio and logic functions. Because the system architecture is designed to work by communicating function and status changes, the D-70 console is very responsive and fault tolerant.

The CPU has several functions and modes that can be configured by the user. These are normally set to default values at the factory, and should not be altered casually.

1. The first function is the console ID address. This function is set using jumpers J29-J36, located on the Processing Board PR-70 PCB. This address is used to identify the console serial interface port so that external devices such as automation systems, the VDip software, and external controllers will communicate with the console correctly. Because the D-70 serial interface port can be configured as an RS-485 device, and multiple consoles can be connected to the same RS-485 bus, each console needs a unique address to identify it properly on the bus, ensuring that the right commands get passed to the correct console. The specific address set is unimportant except that any external controller must use a matching

address to communicate with the console. The address is set with the jumpers in binary format (for example with all jumpers removed the address is “0”, with the first jumper inserted, the address is “1”, with just the second jumper inserted the address is “2”, with the first and second jumpers inserted the address is “3” and so on). Consult the section “Internal Programming Options”, page 6-6, for more details. The D-70 console is normally configured with an address of “1”. Do not change the console address unless you are using the console in an RS-485 bus system.

2. The second function is serial interface configuration. Jumpers J1-J4 on the PR-70 PCB control the serial interface protocol and RS-485 termination for the serial port. This port can be configured as RS-232 or RS-485, and terminated or unterminated via these jumpers. Again, the default settings are for normal operations and should not be changed unless you are using the console in an RS-485 bus system. Consult the sections “D-70 Serial Interface”, page 6-4, and “Internal Programming Options”, page 6-6 to page 6-7, for specific configurations. Jumper J38 is also used with the serial interface; by installing it, the normal checksum in the serial protocol is disabled. This can be useful with some external control devices which are not equipped to generate a checksum in their messages.

3. The third function is nominal audio make-up gain. Jumpers J37, J39 and J43 on the PR-70 PCB are used to establish the master gain setting for the D-70 console. This allows users to configure the nominal fader setting and signal headroom to suit their specific needs or preferences. The digital audio signals entering the D-70 console are usually normalized in the recording or transmitting process for peak signals such that the absolute maximum peak signal is very close to, but does not exceed, the maximum or highest digital word in the AES bit stream. This implies that any decrease in signal caused by placing the console fader at a “normal” setting somewhat less than full up needs to be made up at the output of the console or the signal will be lower than it was at the source. Radio consoles are normally operated with their faders at less than full up to allow for some control over level and mixing (if a signal is too low or quiet, the fader can be moved up until the signal matches the normal levels as shown in the console meters.). By using the jumpers, the user can configure what the normal fader setting (and hence the output make-up gain) should be. Consult the “Global Gain” table in the “Internal Programming Options” section, page 6-6, for the gain values. The D-70 console is normally shipped with a make-up gain setting of +12dB for a nominal fader setting of -12dB from the top. Note that setting the make-up gain too high for the signals and fader settings used can result in a clipped or distorted signal, just as it could with an analog console.

4. The fourth function is serial interface control. The front panel of the CRD-70 module has a pushbutton switch. Activating this switch will enable the remote serial interface to the console, and de-activating the switch will disable the remote serial interface. When the interface is activated, any device

connected to the interface can control any of the console functions. Note that the console operator also has control of the console functions even when the remote serial interface is enabled.; the console will respond to any command regardless of where it comes from. When the interface is disabled, the console will not respond to any commands sent to the remote serial interface; it will respond only to the console switches and faders.

DSP

The DSP is the main audio mixing processor in the D-70 Digital Audio Console. It functions solely as a mix engine, combining all of the console audio signals as directed by the console faders and switches to produce the various output mixes for PROGRAM, AUDITION, AUXILIARY1 and 2, CUE, and TELEPHONE.

The DSP operates at a factory set sample rate, normally 48KHz, which dictates the output sample rate of the D-70 console digital outputs. Consult Audioarts Tech Support if you wish to use a different output sample rate. Since all of the console digital inputs are equipped with sample rate converters, the console inputs will accept any sample rate between the range of 1/2 to twice the output sample rate, and will actually track a variable sample rate as long as it remains within this range. This feature allows you to interface different types of digital sources into the console, each with different sample rates.

D-70 Serial Interface

Using the Serial Interface

The D-70 Serial Interface is designed to support serial communications under the RS-422/485 and -232 protocols. The proper serial interface protocol must be selected (via jumpers on the PR-70 PCB) or else serial communications will not function correctly. No serial interface connections are required for normal, stand alone operation of the D-70 console; in fact the console will work normally with an improper connection to the serial interface. The function of the serial interface is to enable remote operation of the D-70 console functions; local operation of the console switches and faders will always override any remote commands that may have been sent via the serial interface. In addition, the button on the CRD-70 module can be used to disable any serial communications with the D-70 console. Toggling the switch "ON" and "OFF" alternately enables and disables the serial interface port on the D-70 console. Pushbutton LOC/REM switch lights when the serial interface is active. Remember, the D-70 console can always be controlled by its faders and switches regardless of the status of the serial interface.

The most common use for the D-70 Serial Interface is to allow configuration changes (mutes, tallys, etc.) by means of the “Virtual Dip Switch” program supplied with the console and described in Chapter 7 of this manual. To do this, the “Virtual Dip Switch” program must first be installed on a suitable PC, and a serial cable connected from the COM port of your PC to the serial interface connector (DB-15). Be sure that the RS-232 mode for the console serial interface (the default setting) has been selected via the jumpers on the PR-60 PCB. Push the LOC/REM button on the CRD-70 module to enable remote operation and start the program on the PC. Use the program as described in this manual to modify the D-70 console configuration. Once the configuration has been set, the PC can be disconnected from the console.

Another use for the D-70 Serial Interface is for complete remote operation by an external control system. When used in this way, the D-70 console acts as a passive listener to the serial interface awaiting D-70 serial protocol commands. Any external system that can deliver serial text strings in the proper D-70 serial protocol format will be able to control the console. Consult Audioarts Technical Support for more details on enabling this functionality.

Internal Programming Options (CPU)

All internal programming is made via printed circuit board mounted jumpers located on the right lower corner of the Processor Board PR-70 PCB.

Global Settings

Jumpers J29 - J44 determines various console operating parameters:

		Bit	Weight
Console ID	J33	0	1
	J34	1	2
	J35	2	4
	J36	3	8
	J32	4	16
	J31	5	32
	J30	6	64
	J29	7	128

Note: Each D-70 Console ID# is set by jumpers J29-J36. These jumpers are read as an 8 bit field with Bit 0 mapped to jumper J33 and Bit 7 mapped to jumper J29. This ID# is read by the CPU at boot up and is required by serial communications software.

Example: Desired ID=17, install jumpers J32 and J33.

In multi-console, RS-485 connected system, each D-70 console **MUST** have a unique Console ID#. Default Console ID is 1 (J33 - installed).

Misc	J38 - ignore serial input checksum byte (default not installed)
	J40 - not used
	J41 - not used
	J42 - not used

Note: Some automation systems may require J38 to be installed.

Global Gain	J44 - not used
	J43 - 8dB
	J39 - 4dB
	J37 - 2 dB

Note: These jumpers set the fader scale factor that will be applied to each input module at the DSP stage. Default setting is 12dB (J39 and J43 - installed).

J4 - RS-485/RS-232 Select

Jumper J4 selects the hardware interface type (RS-485 or RS-232) for serial the Com port.

	OFF	ON
J4	RS-485	RS-232

J1 - J3 - RS-485 Termination

Jumpers J1 - J3 are used for RS-485 termination. Termination must be switched in pairs (i.e., TX and RX BOTH ON or BOTH OFF).

	OFF	ON	Serial Port
J3	Not terminated	Terminated	TX
J1, J2	Not terminated	Terminated	RX

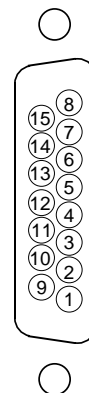
Hook-Ups

All user wiring to and from the serial interface takes place at DB-15 multi-pin connector mounted on the rear panel.

DB-15 Connector – Digital Control Ports

Handles Com 1 serial connections.

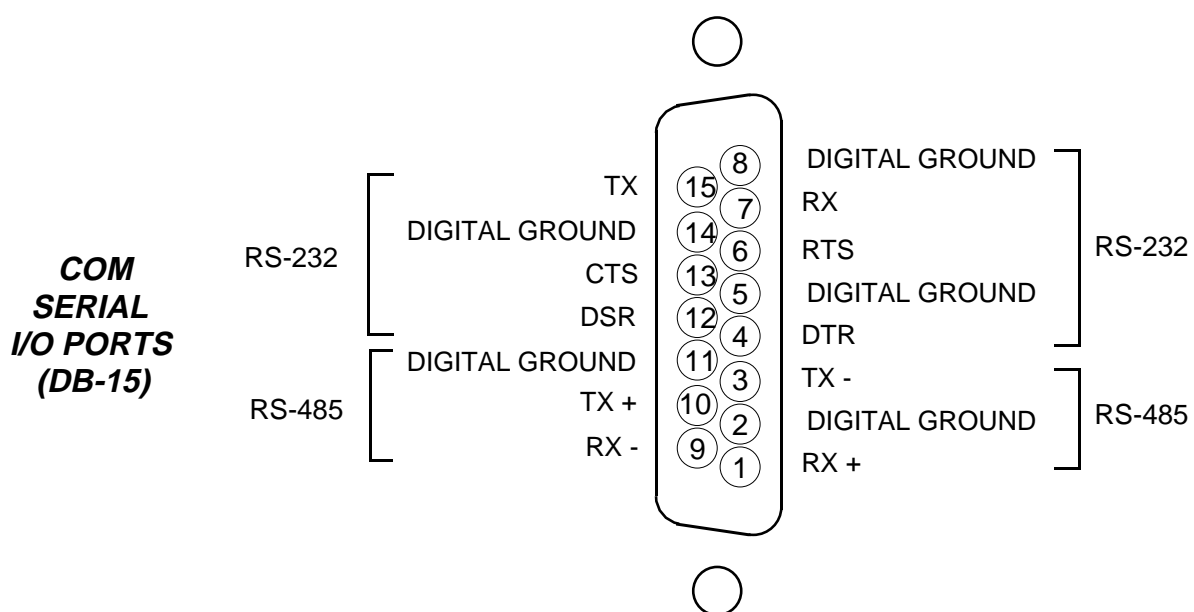
Pin 1 – RX +	}	RS-485
Pin 9 – RX -		
Pin 10 – TX +		
Pin 3 – TX -	}	RS-232
Pin 4 – DTR		
Pin 6 – RTS		
Pin 7 – RX		
Pin 12 – DSR		
Pin 13 – CTS		
Pin 15 – TX		
Pins 2, 5, 8, 11 and 14 - Digital Ground		

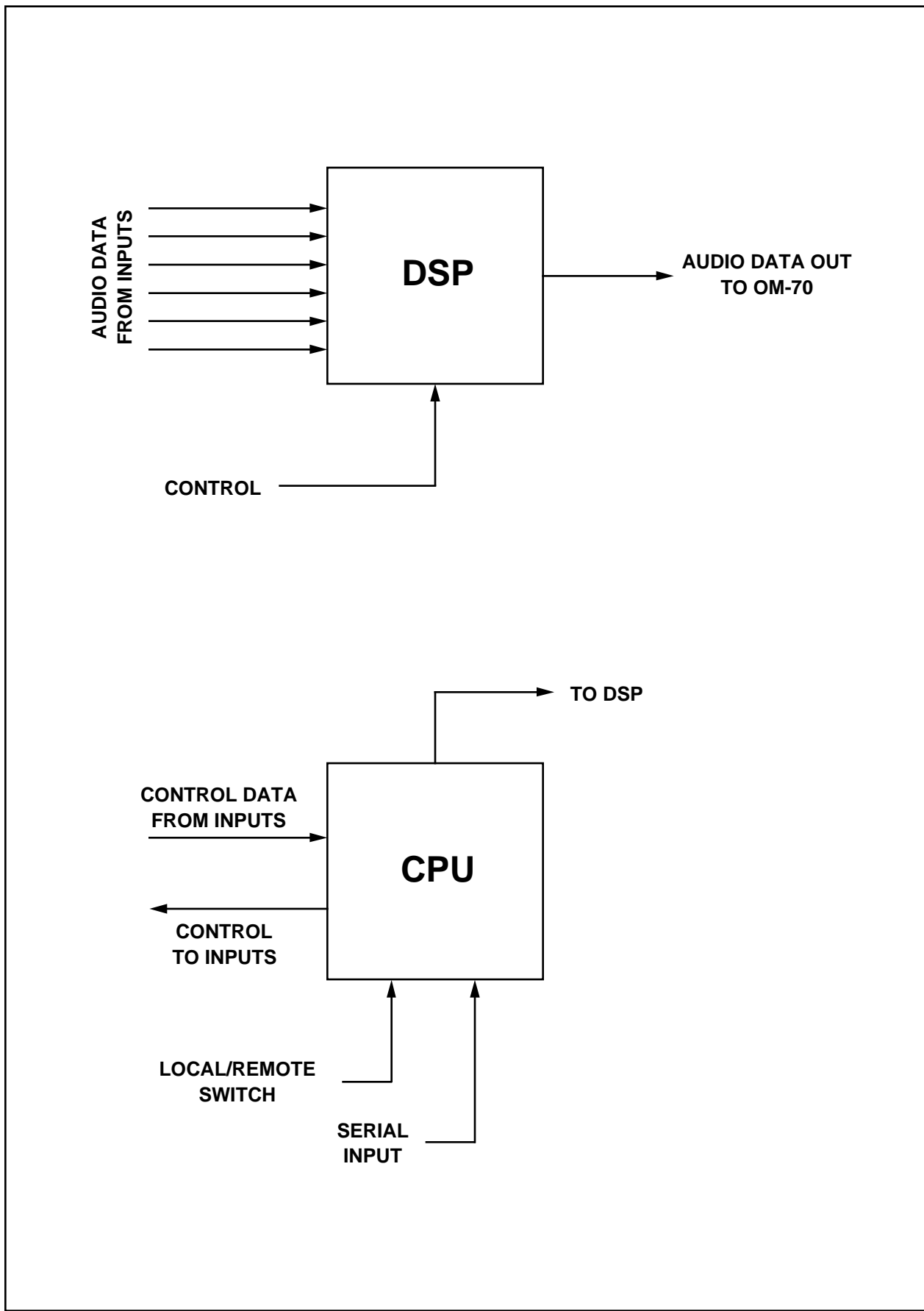


Typical DB-15 connector

Digital Control Ports

DB Connector Pinouts





CPU/DSP - Signal Flow Diagram

Virtual Dip Switch

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Hooking up the computer	7-2
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Using the program	7-5
Input attenuation	7-8
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Virtual Dip Switch

Virtual Dip Switch Application Program

The application “VDip” is included with the Audioarts D-70 Digital Audio console. It is designed to run on any Windows 95/98 compatible PC. When the correct serial port of the external PC that contains the VDip program is connected to the console’s serial interface port, the program can be used to alter certain configuration details (mutes, tallies, etc.) in the D-70 console. These details can be saved to a file and called up at a later date, thus making it easy to change console set-ups by running the VDip program and restoring a previously saved file.

Installation

To install VDip, first be sure that the PC you wish to use is Windows 95/98 compliant, has a CD ROM drive, has at least 50 Mb of hard disk storage available, and has an available serial port mapped to COM 1, COM 2, COM 3, or COM 4. Install the software on the PC by loading the VDip CD that came with the D-70 console into the drive tray and then running the install wizard on the CD by double-clicking on “Setup.exe”. Note, if your CD ROM drive is configured for Auto Play, the install program will automatically start when you insert the VDip CD in the drive. Follow the instructions on the screen to complete the installation. When finished, store the CD in a safe place in case you need to install the software on another machine in the future.

Hooking up the computer

Refer to the diagram on page 7-13 of this chapter showing the proper connections for the serial cable connecting the external PC with the D-70 serial interface port which is located on the lower DB-15 connector on the rear of the console frame. Wire and test the cable. Note that there are certain jumper settings on the PR-70 PCB which must match the serial port on your external PC. The console is shipped with the D-70 serial interface set up for a normal RS-232 connection. If your external PC has an available RS-232 connection (which most do) you do not need to modify any of the settings. If you are planning on using an RS-485 connection to the D-70 serial interface (to allow multiple consoles and/or multiple controllers to be connected on a common bus), your PC must have an available RS-485 port (most do not) and you must make changes to the settings on the PR-60 PCB to set up the proper format, addresses, and terminations for an RS-485 system. If you are planning to use RS-485,

consult the “Serial Interface” part of this manual (page 6-4) for the details on configuring for RS-485. If you are not certain which interface to use or have questions on these details, consult our Audioarts Technical Service engineers. Establishing serial communications between two different pieces of equipment can sometimes be frustrating; we can provide answers to your questions, and even pre-made cables to make the process easier.

Running the program

Be sure that the serial interface cable is plugged into DB-15 connector (located on the console’s rear panel) on one end, and the proper COM port on your PC at the other. Also be sure that the LOC/REM button on the front of the CRD-70 module has been switched to “Remote”. The VDip program will not communicate with the console unless the console has been set to “Remote”. Start the program as you would any Windows program by double-clicking on its shortcut, or choosing the program from the START/PROGRAMS menu. Once the program opens, you should see

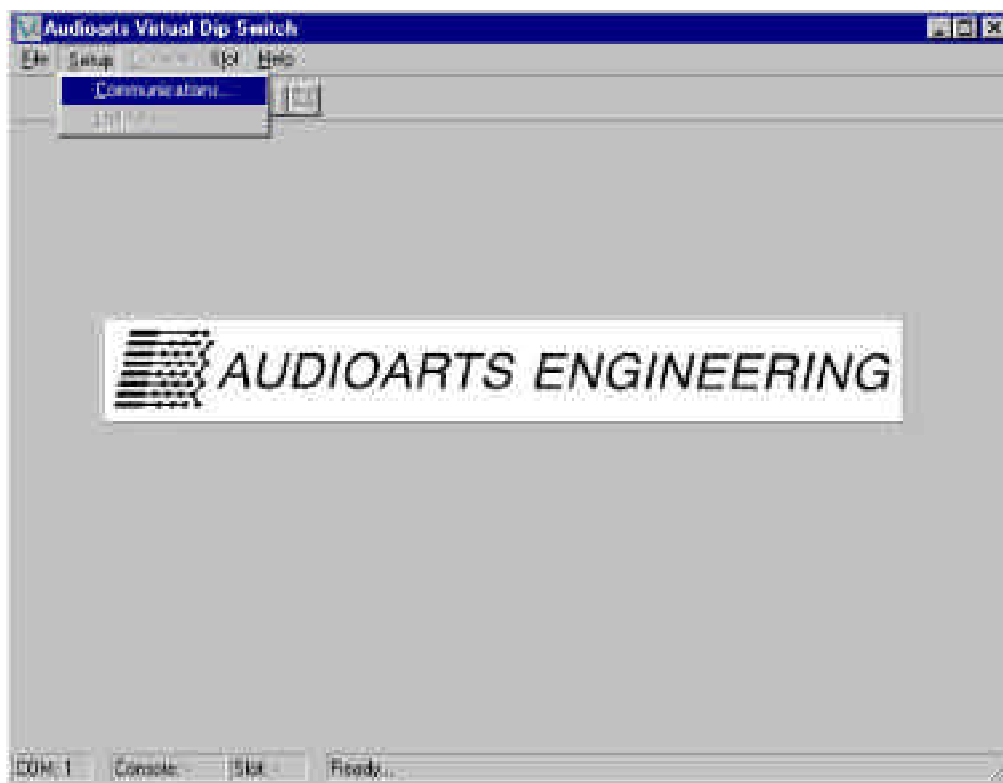


Figure 1

a screen similar to figure 1. This is the start-up screen for the program, and is used any time you wish to alter the connection status for the program. Select “Communications...” from the “Setup” menu with your mouse and then select the correct “COM” port to match your computer (figure 2). Also verify that the “Virtual Dip Switch Program ID” is set to “1”. This is

the standard setting (for networked operations this DIP switch setting must be altered; consult Audioarts technical support). Leave the settings for Baud Rate and Handshaking as shown in figure 2. Once the correct

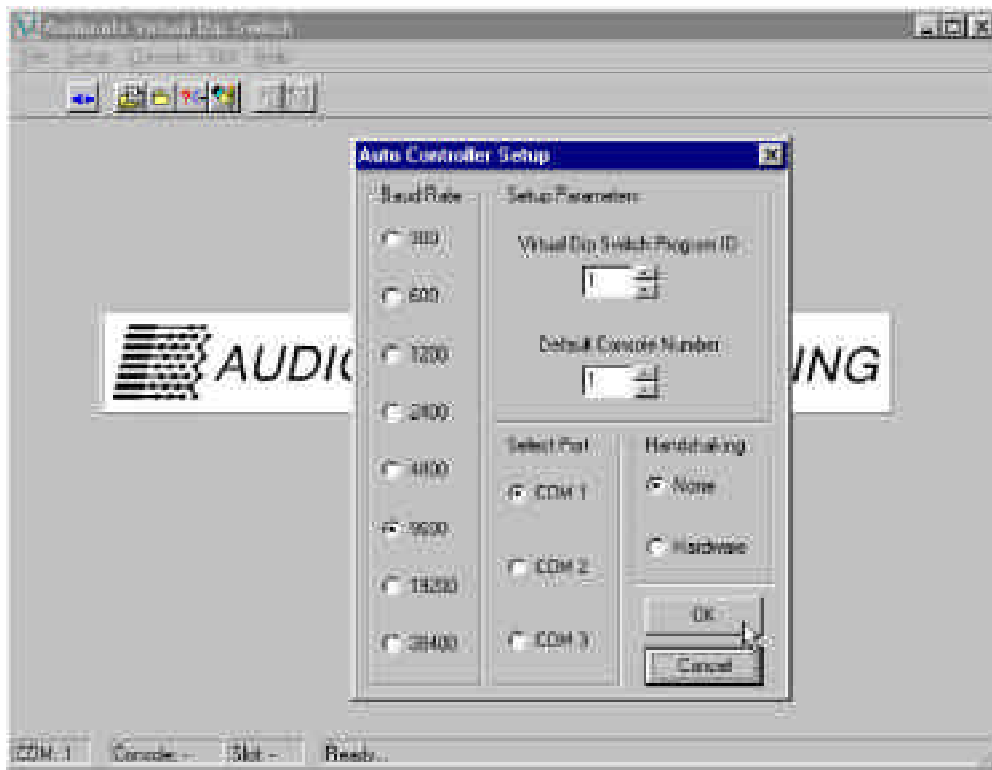


Figure 2

“COM” port is selected, click on “OK” to accept these settings. Click on “Connect” under the “File” menu to establish communications with the D-70 (figure 3). Verify that the Console ID is set to “1” (standard setting).

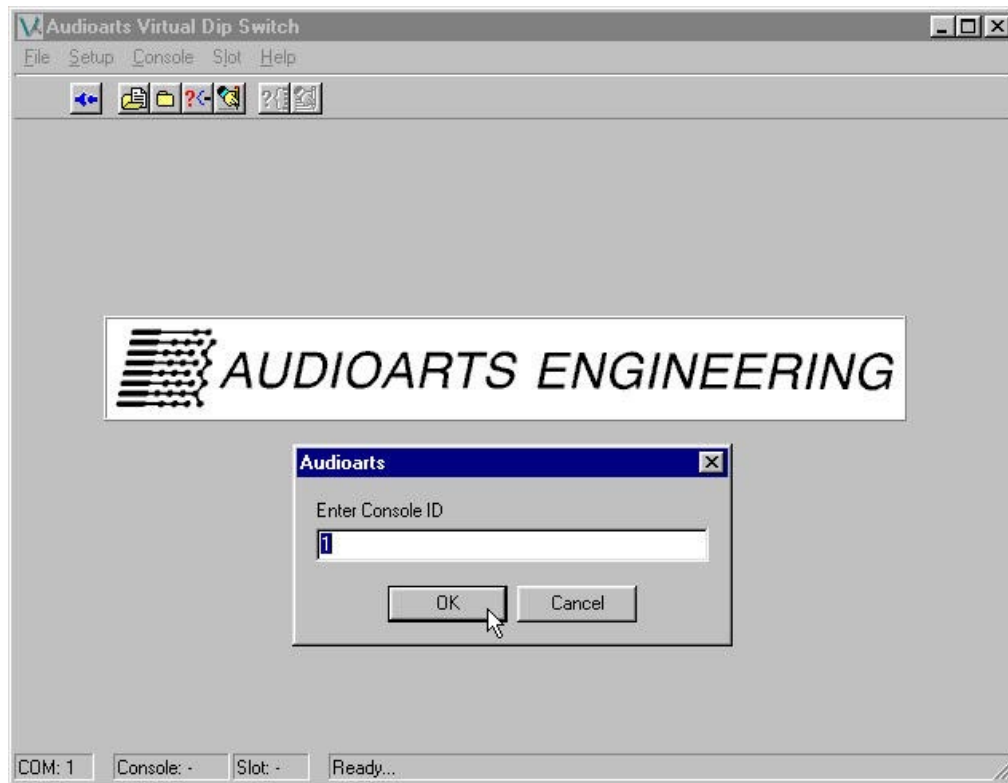


Figure 3

Using the program

Once you have established communications with the console, the various screens and menus can be used to control the console functions. The program will inquire about the current settings in the console (see Figures 4, 5). This screen shows the status of all of the input module functions, one module at a time. Functions can be changed by clicking on the function with your mouse; a selected function shows a check box, a de-selected function shows a blank box.

NOTE: For the 20 input frame, the first input position corresponds to slot 9 on the VDip screens. For the 12 input frame, the first input position corresponds to slot 17 on the VDip screens.

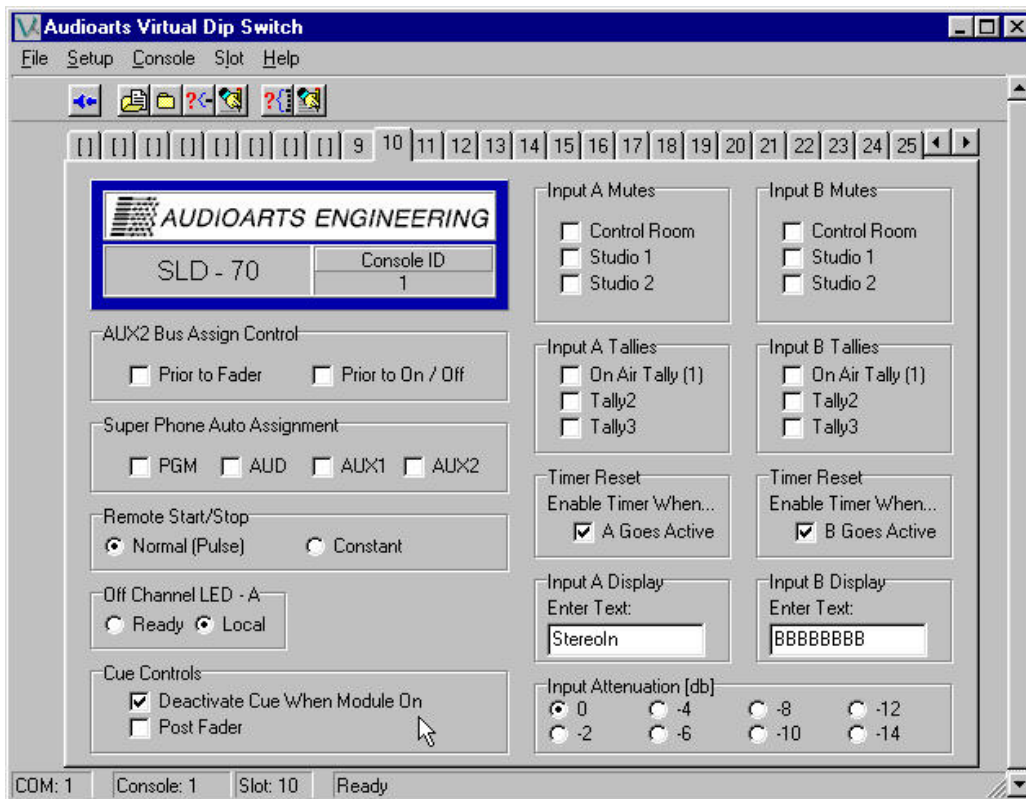


Figure 4

NOTE: The Tab numbers will start at 9 for a 20 input frame or 17 for a 12 input frame.

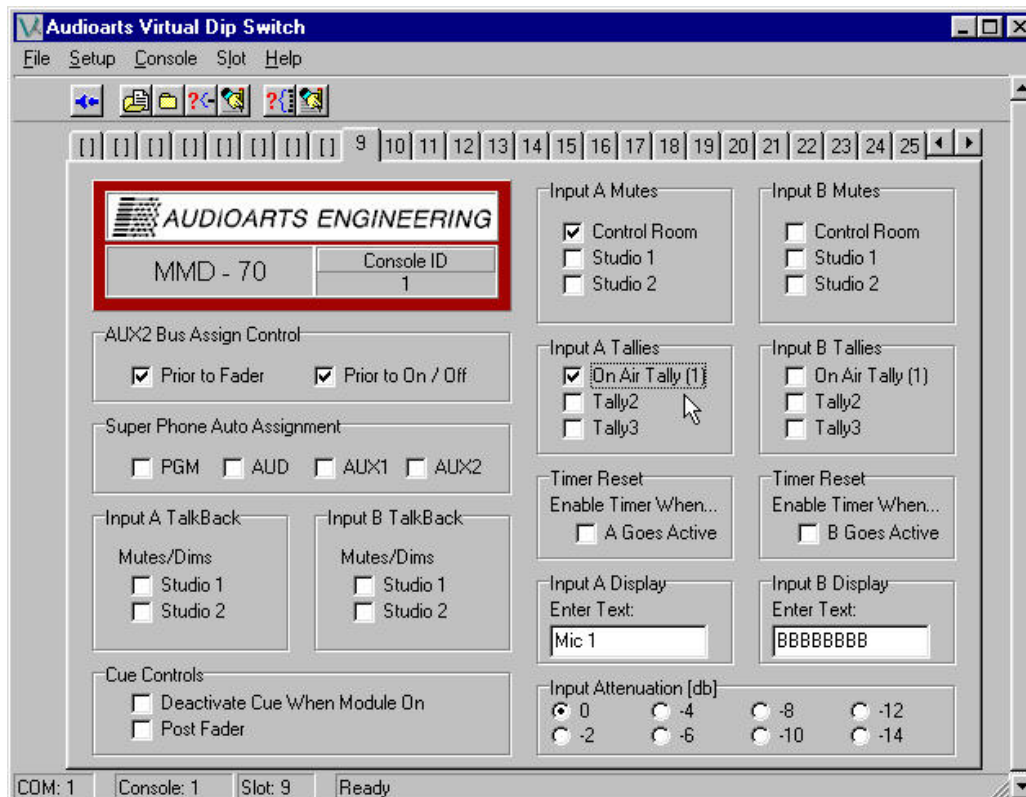


Figure 5

In a similar fashion, your mouse can be used to alter the console mutes and other settings by clicking on the function to enable it on source “A”, “B”, both, or neither. Once you have finished setting the configuration that you wish for an input channel, you send the information to the console by selecting “Write Current” under the “Slot” menu (figure 6).

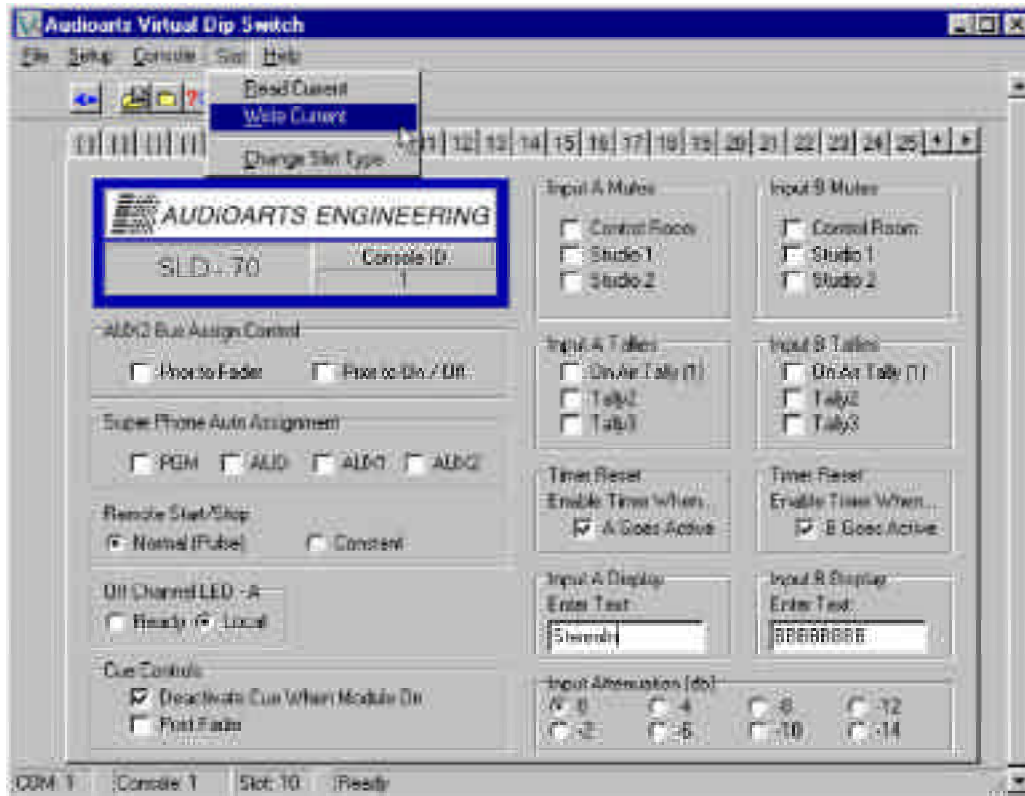


Figure 6

The information is then sent to the console. To select another input channel to modify, choose its corresponding slot number from the selection bar near the top of the status display screen. The status screen will change to show the type and settings of the module in the slot you have selected.

If you choose a slot number that has no module installed, the status screen will show “NO CARD” (figure 7). By selecting each slot and changing

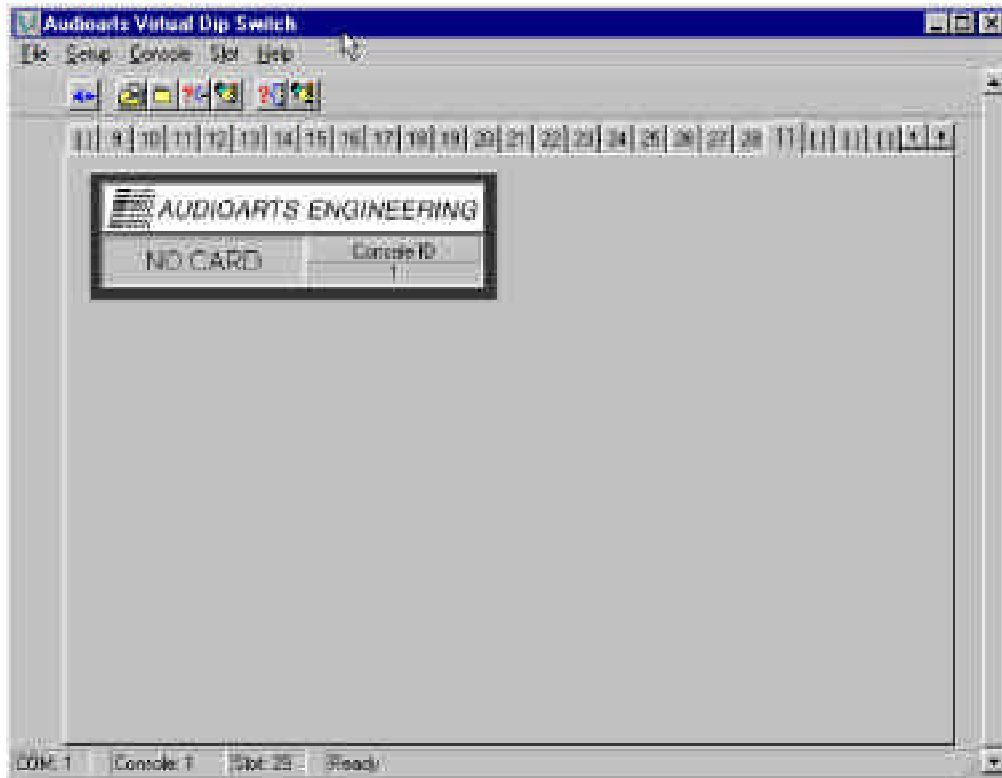


Figure 7

settings, the entire D-70 can be configured to suit your application. Remember, you must select a channel to be modified before you can make changes, and you must “Write Current” after making the changes to pass them on to the console.

Input attenuation

This exclusive Wheatstone digital console feature allows the user to digitally “trim” the gain back on any input module. While this feature is most useful for reigning in “hot” digital domain sources on SRC input modules, digital attenuation may also be applied to any analog microphone or line level source. Note that the digital attenuation occurs after the analog pre-amp stages, therefore, clipping in those stages can not be corrected with this feature (use analog trim pots located on the input module).

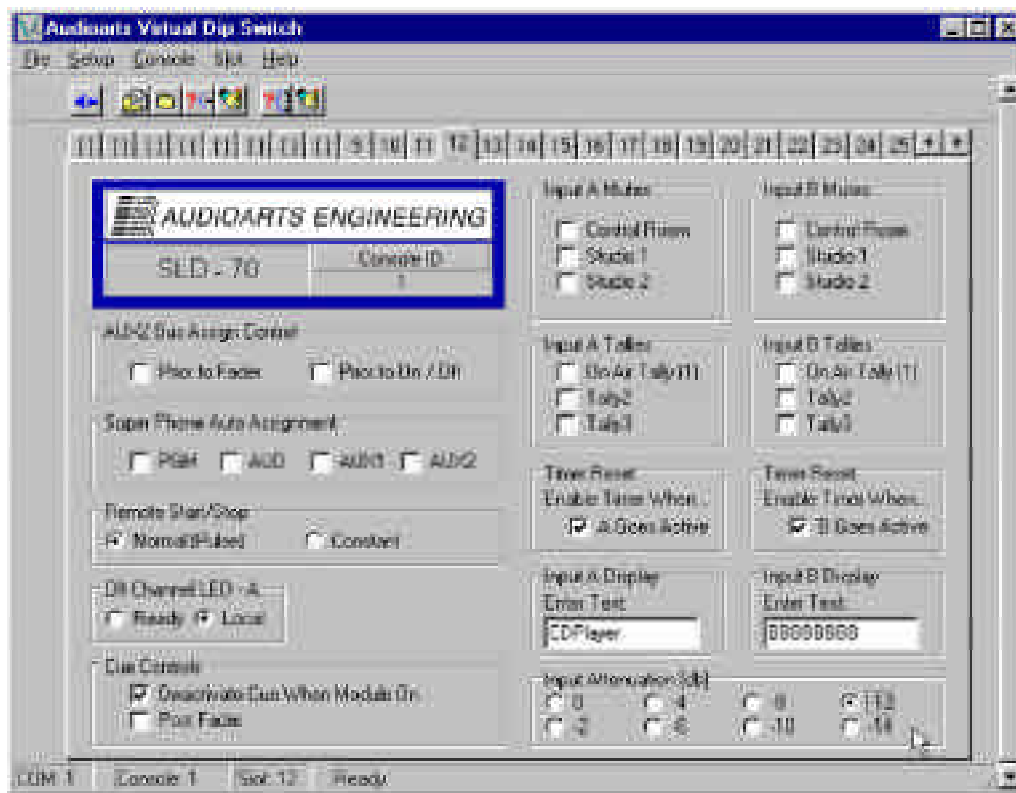


Figure 8

In the lower right corner of the VDip screen (figure 8) there are eight mutually exclusive radio buttons for selecting the desired input attenuation. The attenuation choices are 0db to -14dB in 2 dB steps. Simply click on the appropriate radio button to select the attenuation value and then “WRITE” the selected change to the module. You can use the “Write Slot” toolbar icon or the “Slot” menu item to write the current attenuation setting along with any other module settings. The attenuation setting is immediately written to the corresponding channel.

Why use digital attenuation?

Many of today’s digital audio sources (especially modern rock, rap, etc.) are produced to take full advantage of the available maximum digital output level (0dBFS). Playback of these tracks from a CD player’s digital output result in *average* digital domain levels -6 to -3dBFS or higher! That translates to average analog levels of +18 to +21 dBu; very close to the console’s clipping point of +24dBu. Connecting the digital output from a CD player to a console input with gain on the fader can put the operator in a position of potentially clipping the CD playback. In this case, adding -12dB of attenuation will re-calibrate the input module so that digital clipping of CD source material will be impossible even if the operator pushes the fader all the way to the top.

Advanced operation

After using the VDip program for a while, its operation becomes routine. There are some advanced features to make it easier to do repetitious tasks. Underneath the top menu bar of the status screen is a row

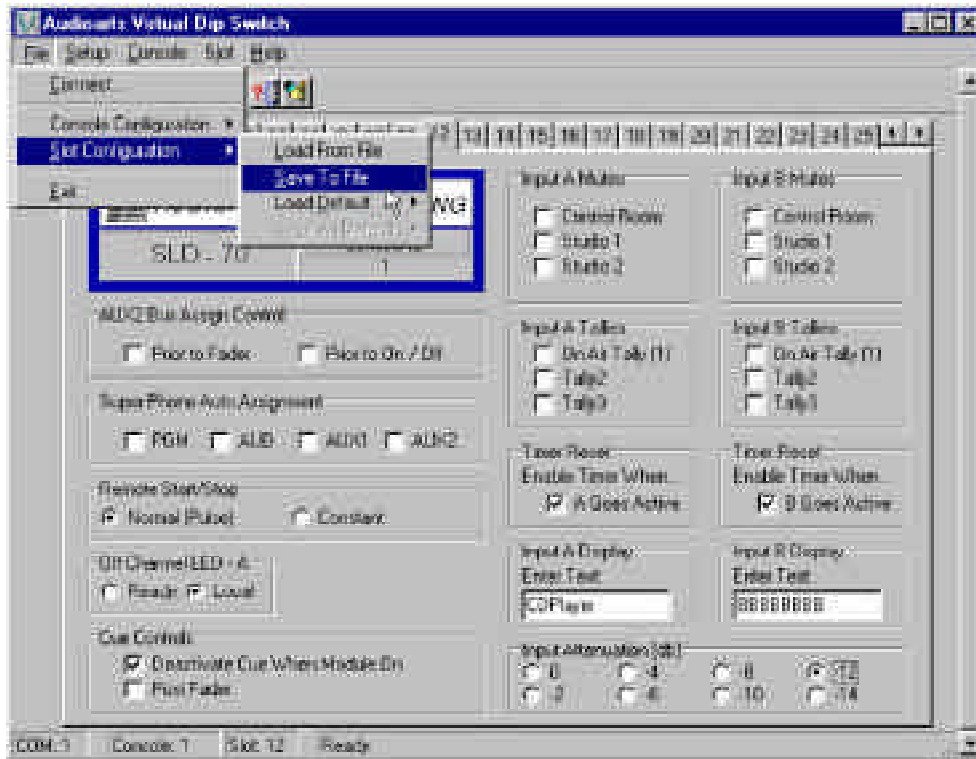


Figure 9

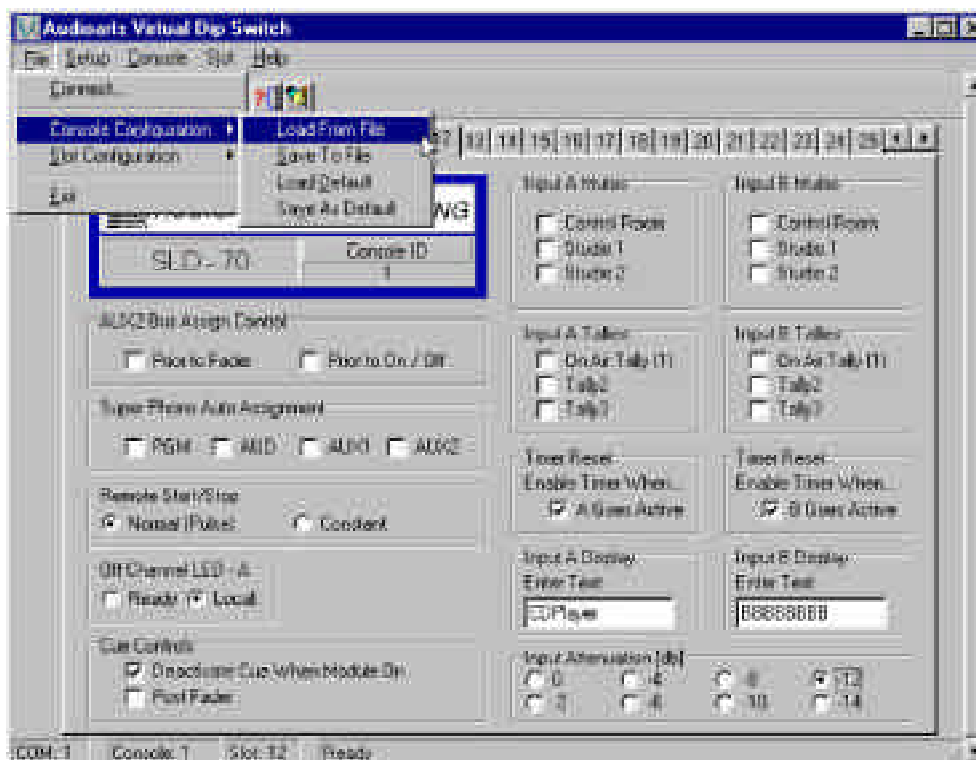


Figure 10

of “buttons” designed to perform routine tasks like “Write Current” and “Read Current”. Moving your mouse pointer over a button and leaving it there for a moment will bring up a short “hint” message on screen that explains the button’s function. Also, under the “Console Configuration” and “Slot Configuration” menus (under “File”) are functions called “Save To File” (figure 9) and “Load From File” (figures 10). Choosing “Save To File” allows you to save all of the console settings under a filename which you can retrieve later using the “Load From File” function. This makes it easy to recall complex but repeatable text and settings information into the console, especially if you name the file something obvious like “7am”, etc. (figure 11).

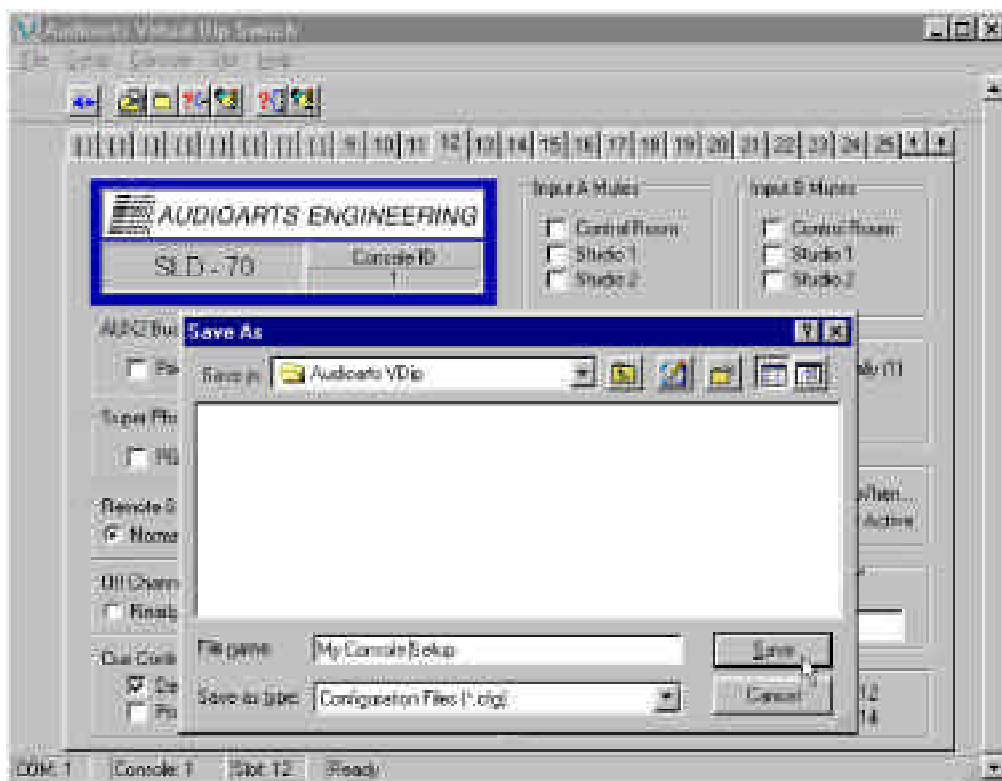


Figure 11

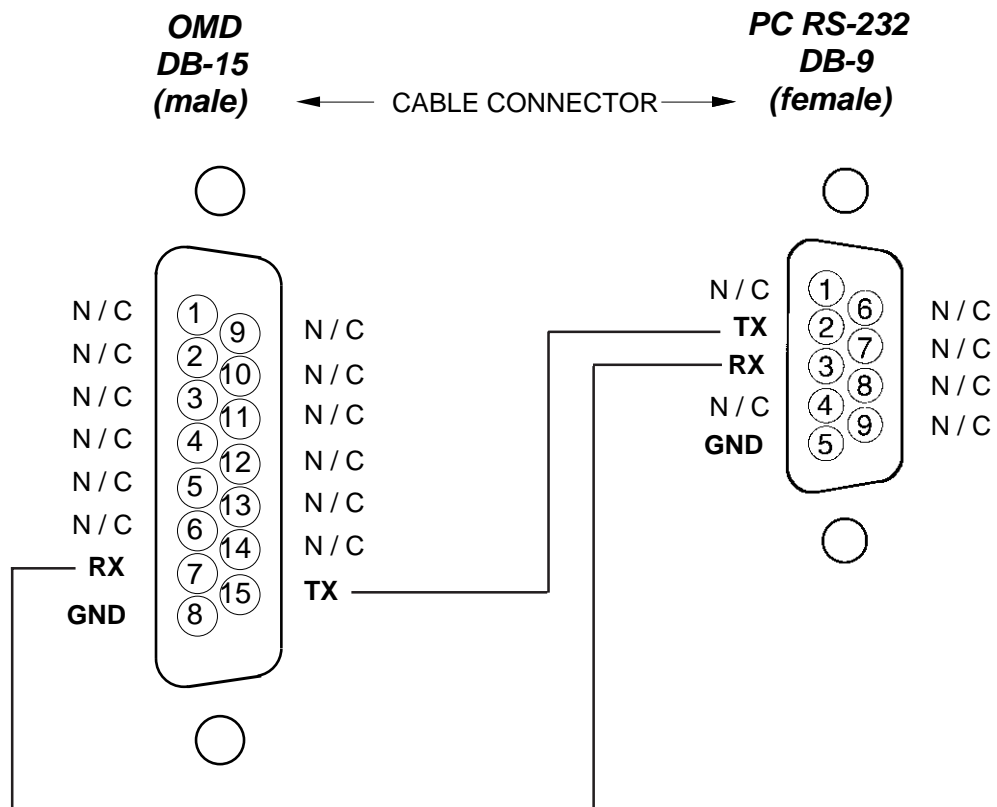
You can have a large number of files saved, limited only by your ability to give them suitable names.

Ending the program

Once the settings are to your liking, and have been written to the console, and saved to a file if desired, the VDip program can be ended by selecting “Exit” from the “File” menu. The console settings will remain as you have set them until the next time the VDip program is run. You can remove the computer connection or leave it hooked up, as you desire. Note that if you leave the connection to the computer in place, you should set the LOC/REM switch on the CRD-70 module to “local” in case some other program on the computer tries to write to the COM port. It is unlikely that a stray message sent out the COM port will cause any changes because it will be ignored unless it is sent in the precise D-70 serial protocol, but simply switching the console to “local” provides extra insurance.

Serial Interface Cable

(for use with Virtual Dipswitch)
DB Connector Pinouts



Superphone Input

(SPD-70; optional)

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Module Overview	8-2
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Audio and Control Connections	8-5
Superphone Module Signal Flow Diagram	8-6

Superphone Input (SPD-70; optional)

Module Overview

The SPD-70 input module is used for telephone call-ins, and can handle two callers. Caller signals enter the module from your station hybrid; each caller has its own fader.

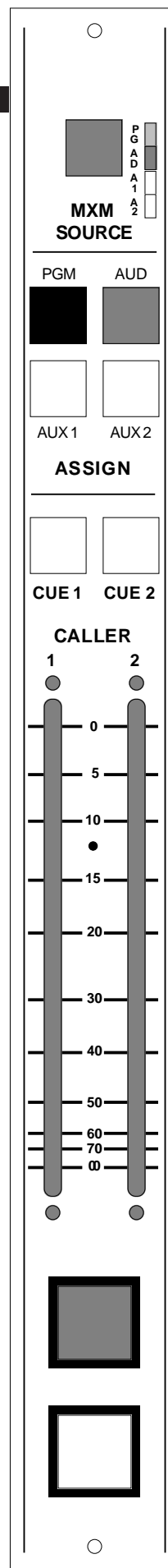
Output switches assign callers to any combination of the console's four stereo outputs: PGM (program), AUD (audition), AUX1 and/or AUX2 (auxiliary).

Caller Set-Ups

Pre-air segment communication between the console operator (DJ) and callers is via CUE buttons (2) which place the caller's voice on the console's cue speakers (or control room speakers/operator's headphone if the CRD-70 module's cue interrupt function has been so programmed). These cue signals can be internally programmed pre or post fader.

The DJ can assign his microphone input module to an unused output bus—say AUX2—and the DJ then selects the AUX2 input with the MXM SOURCE switch. This sends a dedicated (digitally generated) version of the AUX2 bus signal to the SPD-70 module's hybrid output, where it is ultimately heard by the caller through his telephone. This mix minus source select method can also be used to preplay a musical segment (or any other program content) for the caller off-air. Take the IND-70 input module handling the desired music cut and assign it to an unused output bus; select the same bus as the caller's mix minus source input and he will hear it off-air.

Microphone input modules can be internally programmed to have their AUX2 bus feed tapped pre-fader, pre-ON/OFF, making this a logical set-up for the DJ's mic input if you do a lot of call-in work, since the DJ's voice will always be present on the console's AUX2 output bus regardless of fader or ON/OFF settings on his mic module (which must still be assigned to AUX2, however).



Automatic Features

The channel ON (red) and OFF (amber) switches are at the bottom of the module. These can be programmed (via internal PCB-mounted dipswitches) to activate control room and studio mutes, tallies, and timer restart.

Automatic cue dropout can also be programmed internally (page 8-5), making it unnecessary to de-activate caller setup buttons before going live; simply pressing the module's ON switch will automatically do this for you.

Inputs and Outputs

All audio and control signals hook-ups are made via four six-conductor connectors mounted on the module's rear panel. The upper two connectors handles hybrid input signals (i.e., caller input) and the caller 1 and 2 feeds to your station hybrid (the phone signals going to your callers). The lower two connectors handle outputs that are generally used for recording purposes:

Composite Out – This includes everything: DJ, callers, music beds, etc. Generally used to record phone segments in advance of actual airplay.

Composite Minus Callers – This includes everything but the callers.

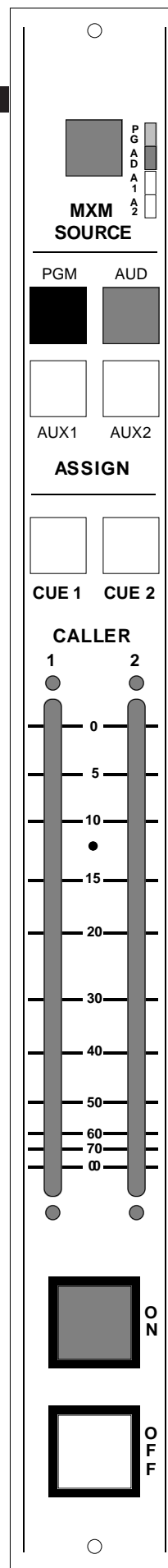
Callers Only – No talent, no DJs, no music; just caller voices.

Internal Programming Options

Internal programming is accomplished via seven printed circuit board (PCB) mounted jumpers (J21, J22, J24, J25-J28), located on the lower center of the Processing Board PR-70 PCB, and one PCB-mounted slide switch (SW1), located on the upper center of PR-70 PCB. The SPIO-70 PCB card contains PCB-mounted trimpots which may be used to set the module's various output feed levels.

Cue Pre/Post

The module's CUE signals (caller setup buttons 1 & 2) can tap pre or post fader. When slide switch SW1 (upper center) is UP they are PRE, when DOWN they are POST. (Factory default setting is PRE.)



Mutes

When the SPD-70 phone channel ON switch is pressed, it can activate console mute functions. Jumpers J21 and J22, mounted on the PR-70 PCB, determines which of the console's two mute lines will be activated:

J21 mutes the control room when the phone module is ON*

*factory default setting

J22 mutes studio when the phone module is ON

Timer Restart

When the module is turned ON, the console's digital timer can be programmed to automatically reset to zero and begin counting up.

J24 activates timer restart when the phone module's ON/START switch is pressed*

*factory default setting

Tallies

Turning the module ON can activate a remote tally indicator. There are three tally control lines: on-air, tally 2 and tally 3. Jumpers J25-J27 program these functions:

J25 activates the on-air tally control line

J26 activates tally 2

J27 activates tally 3

Remote tallies are hooked-up to the console at the Control Room module (CRD-70)

Cue Dropout

Jumper J28 will cause CUE (i.e., caller set-up buttons 1 & 2) to turn off when the module's ON/START switch is pressed. This is the factory default setting.

Gain Trimpots

There are seven PCB-mounted trimpots, located on the SPIO-70 PCB. They are used as follows:

CR1 - sets Callers 1 In port input gain

CR2 - sets Callers 2 In port input gain

CR3 - sets the module's output level to Hybrid 1

CR4 - sets the module's output level to Hybrid 2

CR5 - sets the module's "callers only" output level

CR6 - sets the module's "composite minus callers" ("talent") output level

CR7 - sets the module's "composite" output level

Factory default settings for these trimpots is UNITY GAIN.

Hook-Ups

As stated before, all user wiring to and from SPD-70 modules takes place at six-conductor connectors mounted on the module's rear panel. There are four connectors per module: the two upper ones handle audio input and output signals; the two lower ones audio outputs and control signals.

Audio Connections (two upper connectors)

These include station Hybrid 1 & 2 inputs and outputs. All are +4dBu balanced analog mono.

Pin 6 – Hybrid 1 In LO
 Pin 5 – Hybrid 1 In SH
 Pin 4 – Hybrid 1 In HI
 Pin 3 – Hybrid 1 Out LO
 Pin 2 – Hybrid 1 Out SH
 Pin 1 – Hybrid 1 Out HI

Pin 6 – Hybrid 2 In LO
 Pin 5 – Hybrid 2 In SH
 Pin 4 – Hybrid 2 In HI
 Pin 3 – Hybrid 2 Out LO
 Pin 2 – Hybrid 2 Out SH
 Pin 1 – Hybrid 2 Out HI

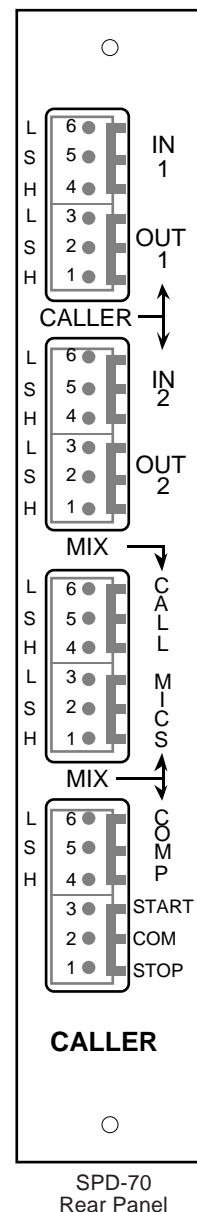
Audio and Control Connections (two lower connectors)

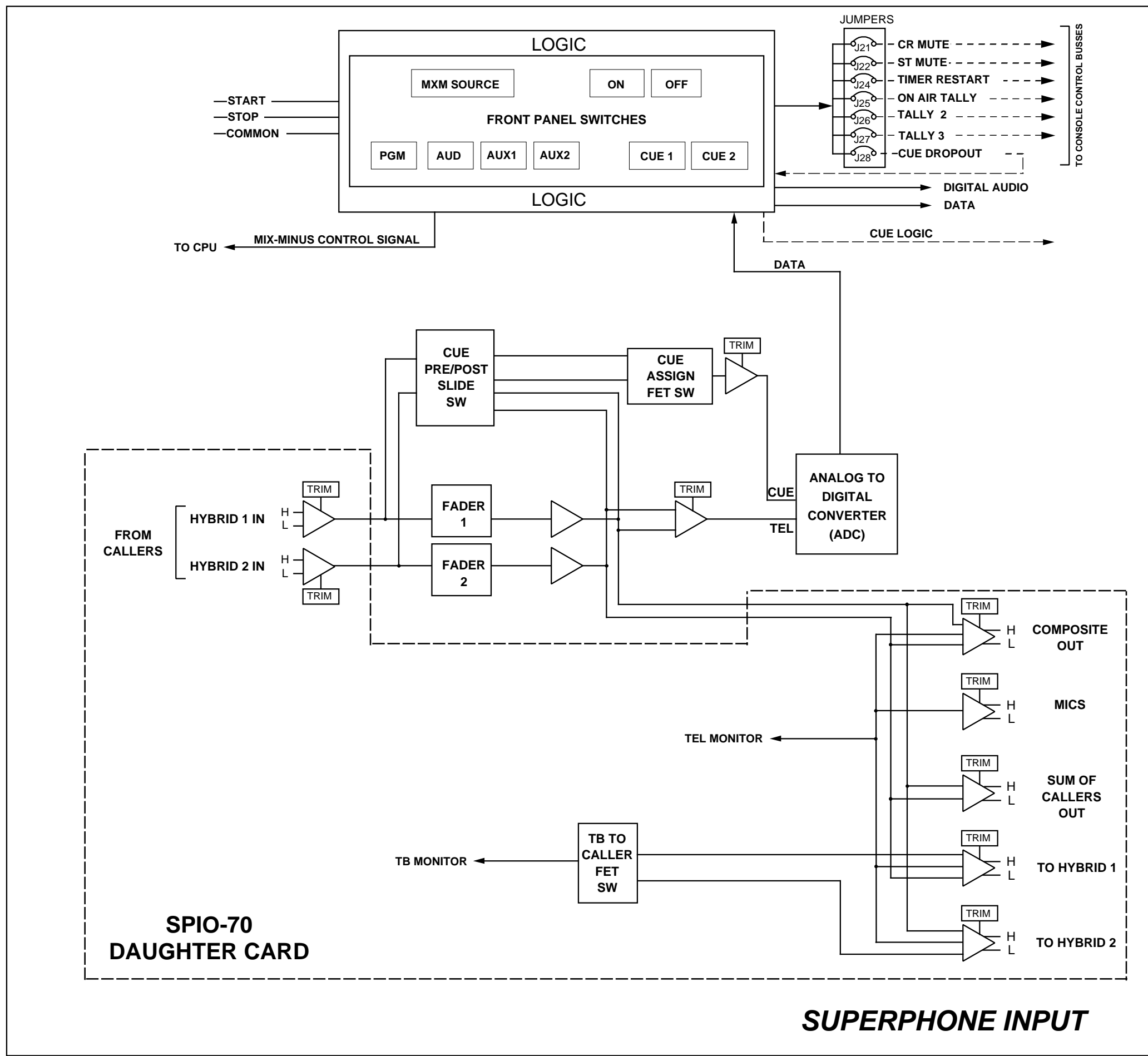
These include module output composite feeds (for recording) and remote tape machine START/STOP ports.

Pin 6 – Callers Only Out LO
 Pin 5 – Callers Only Out SH
 Pin 4 – Callers Only Out HI
 Pin 3 – Composite Minus Callers Out LO
 Pin 2 – Composite Minus Callers Out SH
 Pin 1 – Composite Minus Callers Out HI

Pin 6 – Composite Out LO
 Pin 5 – Composite Out SH
 Pin 4 – Composite Out HI
 Pin 3 – Start
 Pin 2 – Start/Stop Common
 Pin 1 – Stop

When the module's ON/START switch is pressed, a closure takes place between start/stop common and START; when the module's OFF switch is pressed, a closure takes place between start/stop common and STOP. These may be used to control a remote tape machine for recording phone segments. These are opto isolated outputs. The Start/Stop Common connects to the opto emitters, while Stop and Start connect to the opto collectors. Observe correct polarity when using these outputs.





Line Select Module-Analog

(LSR-70; optional)

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Audio Inputs (5-7) and Outputs	9-4
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Line Select Module-Analog

(LSR-70; optional)

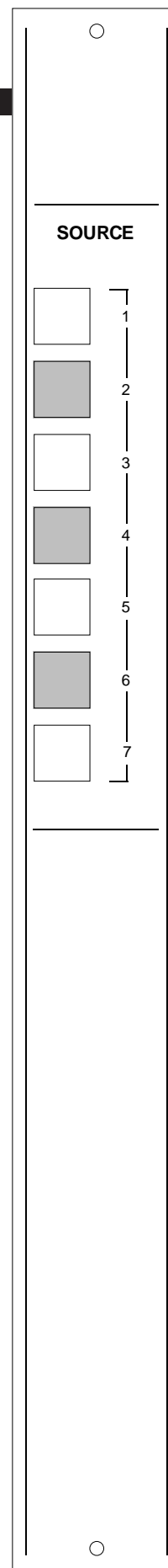
Overview

This optional module electronically selects one of seven stereo line sources and routes it to one stereo output, allowing you to expand the source capability of an input channel or monitor module.

All audio input and output signals are made via eight six-conductor connectors mounted on the module's rear panels (LSR-70/1 and LSR-70/2.)

Internal Programming Options

There are no internal programming options on the LSR-70 module.



Hook-Ups

Rear panel LSR-70/A

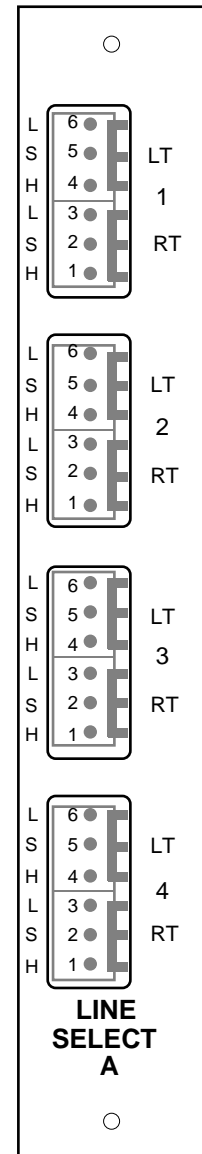
Audio Inputs 1-4

Pin 6 – Line 1 Lt In LO
 Pin 5 – Line 1 Lt In SH
 Pin 4 – Line 1 Lt In HI
 Pin 3 – Line 1 Rt In LO
 Pin 2 – Line 1 Rt In SH
 Pin 1 – Line 1 Rt In HI

Pin 6 – Line 2 Lt In LO
 Pin 5 – Line 2 Lt In SH
 Pin 4 – Line 2 Lt In HI
 Pin 3 – Line 2 Rt In LO
 Pin 2 – Line 2 Rt In SH
 Pin 1 – Line 2 Rt In HI

Pin 6 – Line 3 Lt In LO
 Pin 5 – Line 3 Lt In SH
 Pin 4 – Line 3 Lt In HI
 Pin 3 – Line 3 Rt In LO
 Pin 2 – Line 3 Rt In SH
 Pin 1 – Line 3 Rt In HI

Pin 6 – Line 4 Lt In LO
 Pin 5 – Line 4 Lt In SH
 Pin 4 – Line 4 Lt In HI
 Pin 3 – Line 4 Rt In LO
 Pin 2 – Line 4 Rt In SH
 Pin 1 – Line 4 Rt In HI



LSR-70/1
Rear Panel

Rear panel LSR-70/B

Audio Inputs 5-7

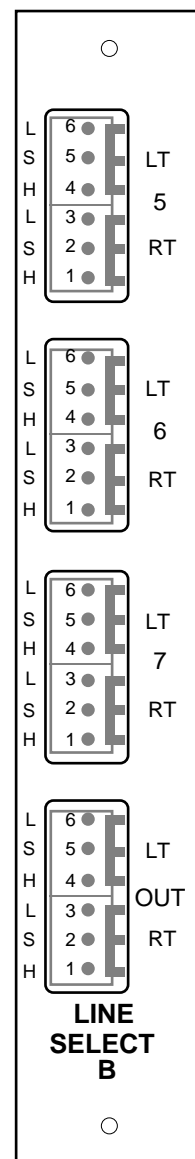
Pin 6 – Line 5 Lt In LO
 Pin 5 – Line 5 Lt In SH
 Pin 4 – Line 5 Lt In HI
 Pin 3 – Line 5 Rt In LO
 Pin 2 – Line 5 Rt In SH
 Pin 1 – Line 5 Rt In HI

Pin 6 – Line 6 Lt In LO
 Pin 5 – Line 6 Lt In SH
 Pin 4 – Line 6 Lt In HI
 Pin 3 – Line 6 Rt In LO
 Pin 2 – Line 6 Rt In SH
 Pin 1 – Line 6 Rt In HI

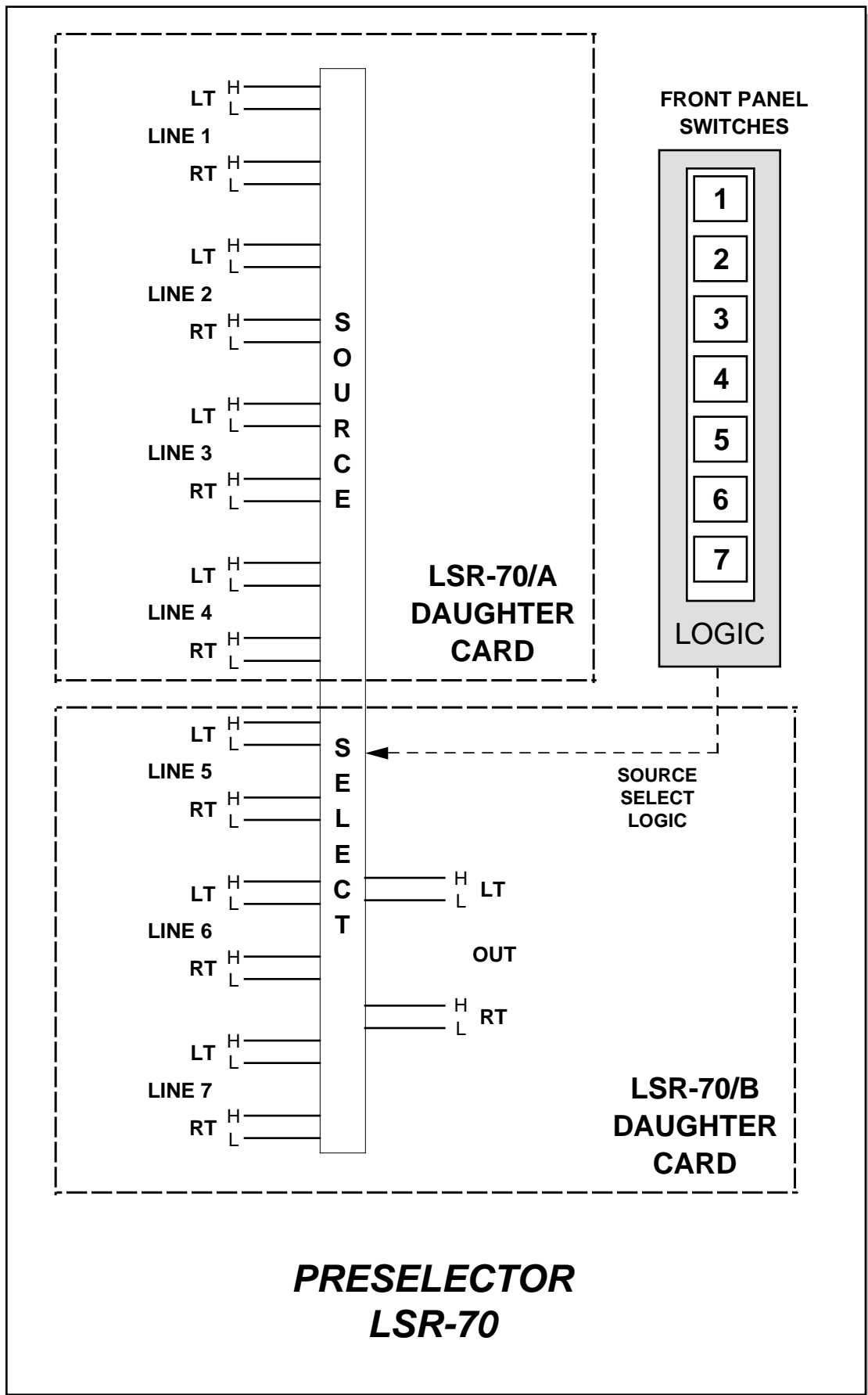
Pin 6 – Line 7 Lt In LO
 Pin 5 – Line 7 Lt In SH
 Pin 4 – Line 7 Lt In HI
 Pin 3 – Line 7 Rt In LO
 Pin 2 – Line 7 Rt In SH
 Pin 1 – Line 7 Rt In HI

Audio Outputs

Pin 6 – Line Lt Out LO
 Pin 5 – Line Lt Out SH
 Pin 4 – Line Lt Out HI
 Pin 3 – Line Rt Out LO
 Pin 2 – Line Rt Out SH
 Pin 1 – Line Rt Out HI



LSR-70/2
Rear Panel



LSR-70 Line Preselector (analog) - Signal Flow Diagram

Tape Remote Module

(TR-70; optional)

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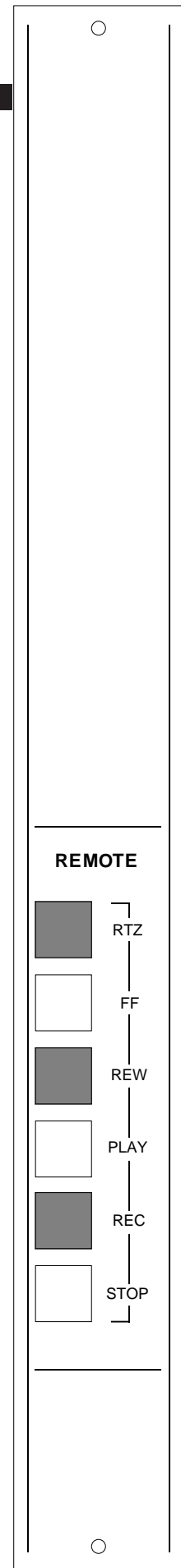
Tape Remote Module

(TR-70; optional)

Module Overview

This optional module offers full-function control of a tape machine with buttons marked as RTZ, FF, REW, PLAY, REC and STOP. LED indicators in each switch function as tallyback indicators and are powered by the source machine. There are no internal connections between the tape remote panel and the console's power rails.

All user wiring to and from the TR-70 module takes place at two twelve-conductor connectors mounted on the module's rear panel.



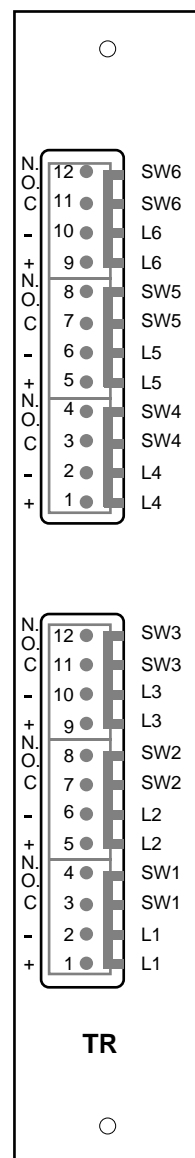
Hook-Ups

Upper Connector — Control

Pin 12 - SW6 (STOP) N.O.
 Pin 11 - SW6 (STOP) COM
 Pin 10 - SW6 (STOP) LED-
 Pin 9 - SW6 (STOP) LED+
 Pin 8 - SW5 (REC) N.O.
 Pin 7 - SW5 (REC) COM
 Pin 6 - SW5 (REC) LED-
 Pin 5 - SW5 (REC) LED+
 Pin 4 - SW4 (PLAY) N.O.
 Pin 3 - SW4 (PLAY) COM
 Pin 2 - SW4 (PLAY) LED-
 Pin 1 - SW4 (PLAY) LED+

Lower Connector — Control

Pin 12 - SW3 (REW) N.O.
 Pin 11 - SW3 (REW) COM
 Pin 10 - SW3 (REW) LED-
 Pin 9 - SW3 (REW) LED+
 Pin 8 - SW2 (FF) N.O.
 Pin 7 - SW2 (FF) COM
 Pin 6 - SW2 (FF) LED-
 Pin 5 - SW2 (FF) LED+
 Pin 4 - SW1 (RTZ) N.O.
 Pin 3 - SW1 (RTZ) COM
 Pin 2 - SW1 (RTZ) LED-
 Pin 1 - SW1 (RTZ) LED+



TR-70
Rear Panel

Meterbridge

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Capacitor Backup	11-3
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Schematic	11-5
Load Sheet	11-6
Clock/Timer Display (CLD-70)	
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Load Sheet	11-8

Meterbridge

Overview

The console's meterbridge houses two pairs of left-right LED meters (Program and Switched; see "Studio Control" Chapter 5), the digital timer, the console clock, and cue speaker (controlled by the CRD-70 Control Room Module; see page 4-2). Each LED meter column displays VU average bar, PEAK dot, OVER, and LOW signal.

The meterbridge lid is removable for easy access (analog trims, setting the clock). Simply open meterbridge cover by removing the two black #4 flathead screws along the rear bottom lip of the meterbridge cover.

Replacement Parts

Clock/timer, LED meter cards, and replacement cue speaker are available. See Appendix for specific ordering information.

Digital Timer

The console timer control buttons are located on the CRD-70 module.

The timer is provided with an AUTO-RESTART function so programmed input modules can automatically reset the timer display to zero and start a new count, allowing the announcer to easily track his own pace.

The START/STOP button halts the timer, holds the last count, and then restarts and accumulates the count when depressed again—perfect for compiling tapes of desired duration.

RESET has a dual-mode capability:

- if you depress it while the timer is counting, the display will instantly reset to zero and start a fresh count;
- if the timer is already stopped, depressing this button will reset the timer to zero, where it will hold until start is pressed.

HOLD button allows you to hold the display for a longer viewing duration, while still allowing the counter to continue in the background. Releasing the button will then display the current count.

Console Clock

The Wheatstone digital clock is a six-digit time-of-day clock with LED display. The clock is designed with CMOS circuits and an on-board crystal-controlled time base oscillator. There are two basic parts to the clock: a main PCB containing the clock circuits and clock set controls (also may include capacitor backup) and a second PCB containing displays. Clock set controls may be accessed by removing the meterbridge cover.

Controls

The clock is controlled by a trimmer and two switches; the trimmer and switches are mounted on the main clock PCB assembly.

The trimmer alters the frequency of the quartz-controlled oscillator, which in turn causes the clock to run slightly slower or faster. In order to keep accurate time, the oscillator must run at 4.096 MHz. The oscillator is set to this frequency at the factory. However, due to the nature of quartz/crystal-controlled oscillators, there may be a slight change in the frequency of the oscillator during the first few months of operation due to the aging effect of quartz crystals. A minor readjustment of the trimmer will compensate for this effect.

A divided by 4 buffered output of the oscillator is available at pin #7 of IC #U1 to assist in adjusting the oscillator.

Setting the Time

The setting controls consists of two switches: MODE and SET. To set the clock, open the meterbridge cover and stand behind the console:

- 1) The control switches (mounted inside the meterbridge bottom) are labelled "M" and "S". "M" (Mode) is used to scroll from seconds to minutes to hours; "S" is used to Set the time. The procedure is to set the clock slightly ahead of the current time, hold the second count at "00" until the current time catches up, and then release the count.
- 2) Press the MODE button until the hour digits blink. Depress the SET button until the desired hour is displayed.
- 3) Press the MODE button until the minute digits blink. Depress the SET button until the desired minute count is displayed.
- 4) Press the MODE button until the second digits blink. Depress and hold the SET button; the seconds display will hold at "00". When the current time catches up to the display, release the SET button. The clock will start counting. Hit the MODE button three more times to place the clock into working mode.

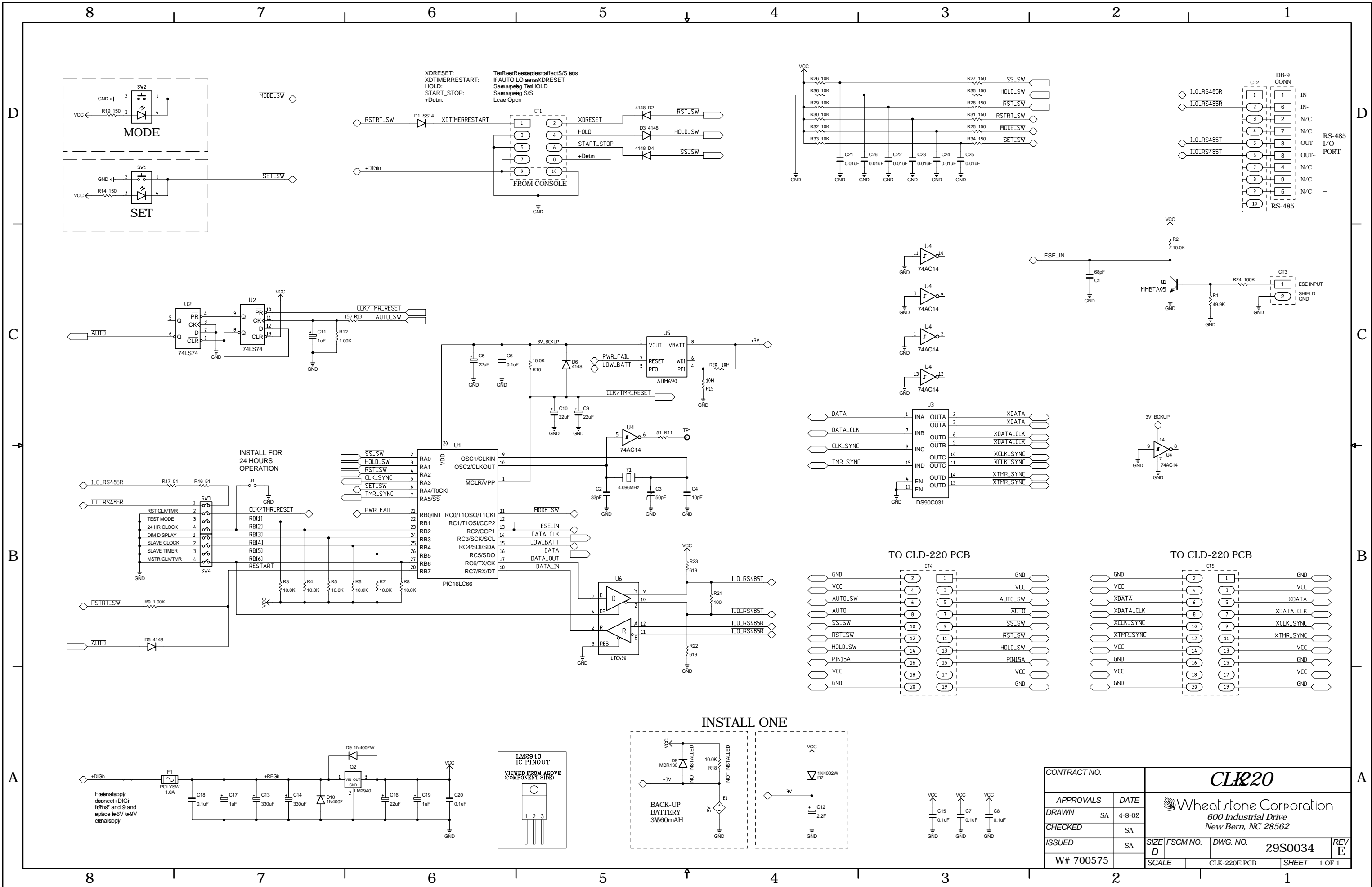
Capacitor Backup

With the meterbridge open note the super capacitor at C25. This super capacitor is self charging. Note that the super capacitor does NOT light up the clock display; it powers the clock crystal to keep it from losing count (it will do this about one hour).

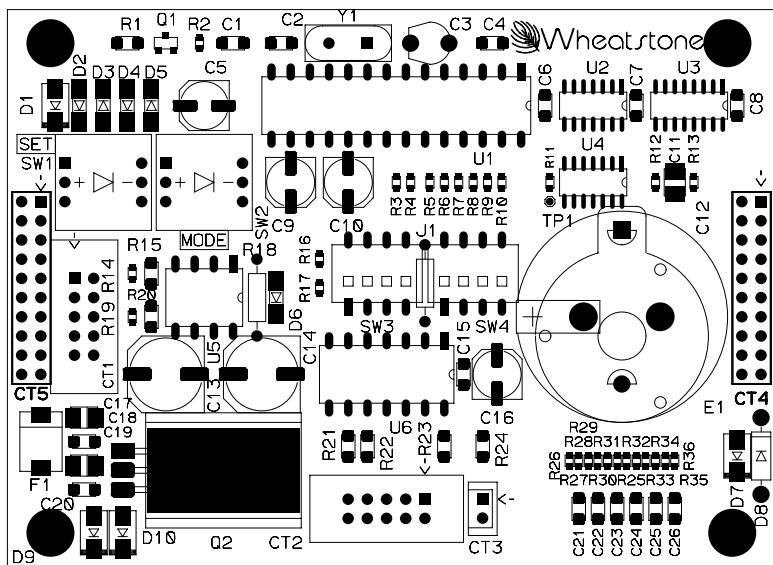
Operational Modes

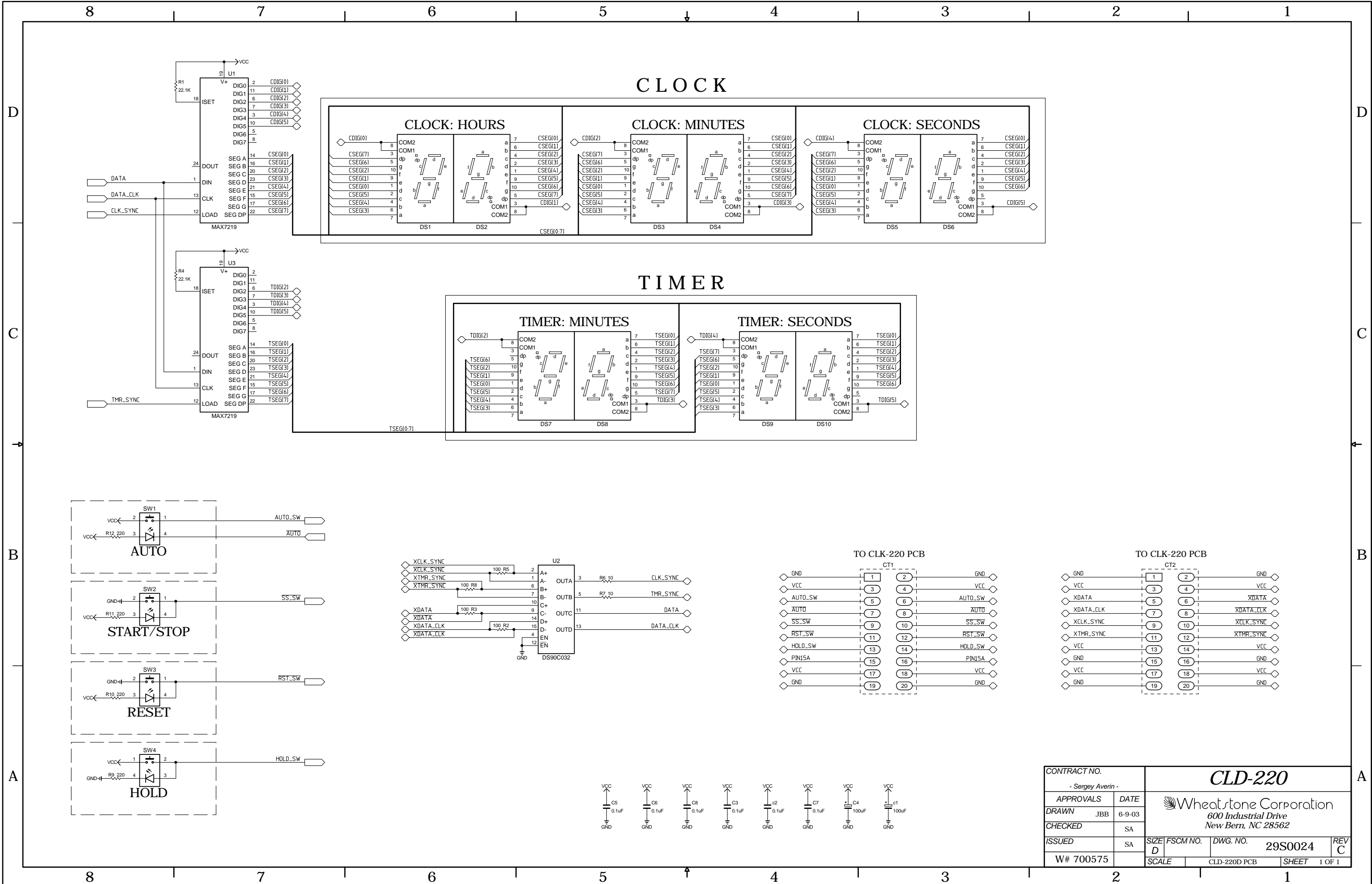
The standard factory default clock configuration is crystal-controlled, 12 hour mode, stand-alone operation. However, the clock will operate either from the internal crystal controlled time base or from an ESE master (TC-76, TC-89, TC-90, autodetect) signal. Because crystal time bases are subject to drift over time, Wheatstone recommends operating the clock in the ESE slave mode for those applications where the exact time is critical. Connect an ESE master at connector CT3 (Pin 1 - Signal, Pin 2 - Shield). Switch #4 on SW3 sets 12/24 hour mode (Off - 12 hour, On - 24 hour).

The clock can also be programmed to count in either 12 hour or 24 hour modes.

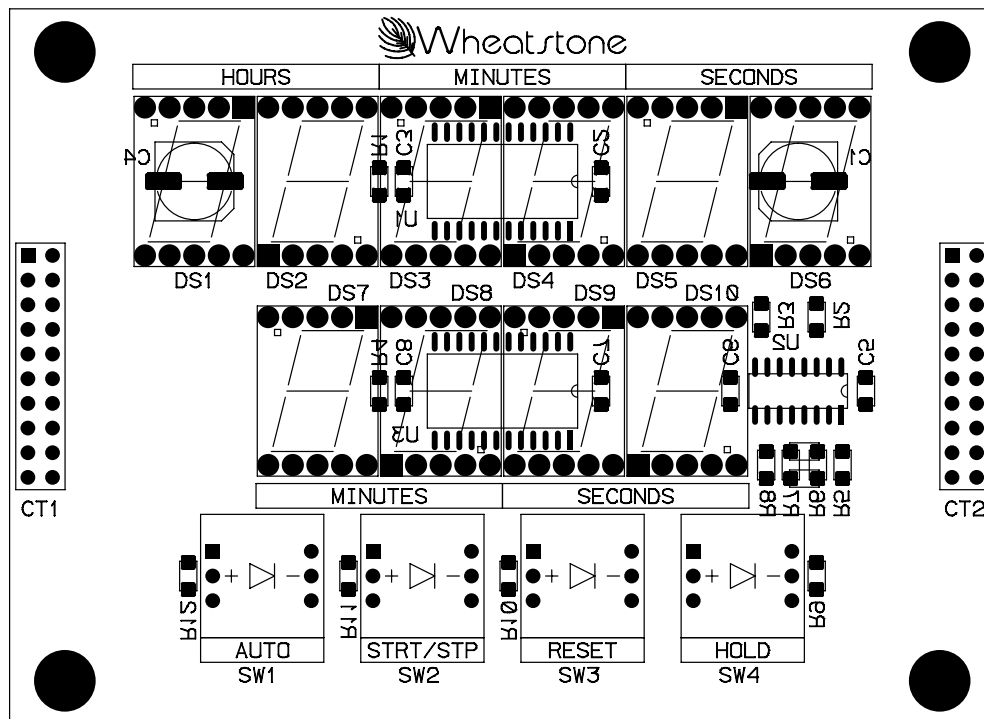


CLK-220 Clock/Timer Schematic Sheet 1 of 1





Clock/Timer Display Schematic Sheet 1 of 1

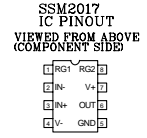
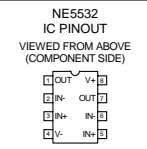
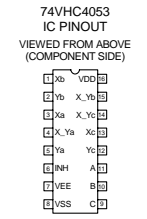
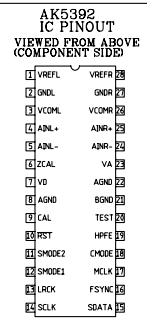


CLD-70 Clock/Timer Display Load Sheet

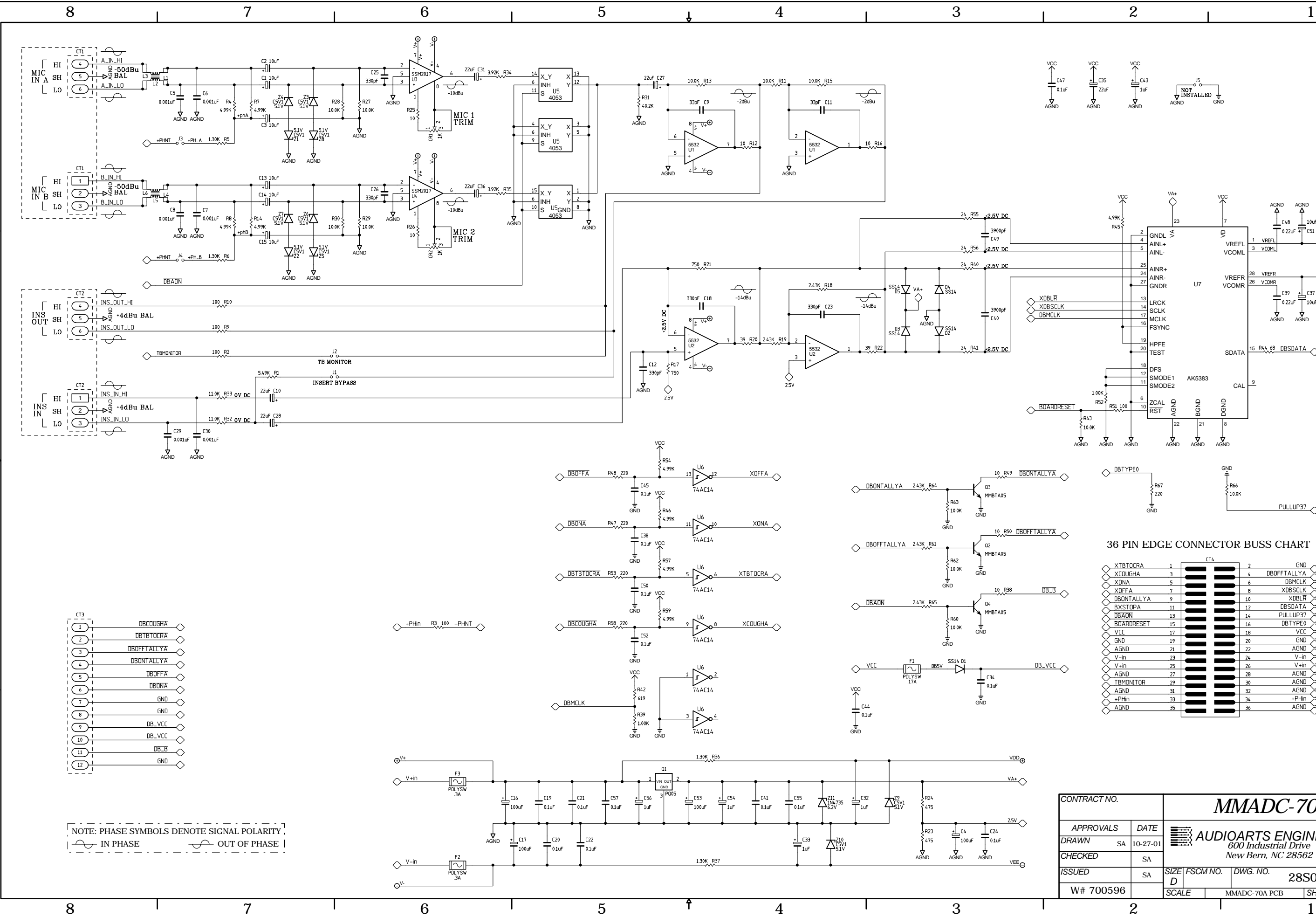
I/O Schematic Drawings & Load Sheets


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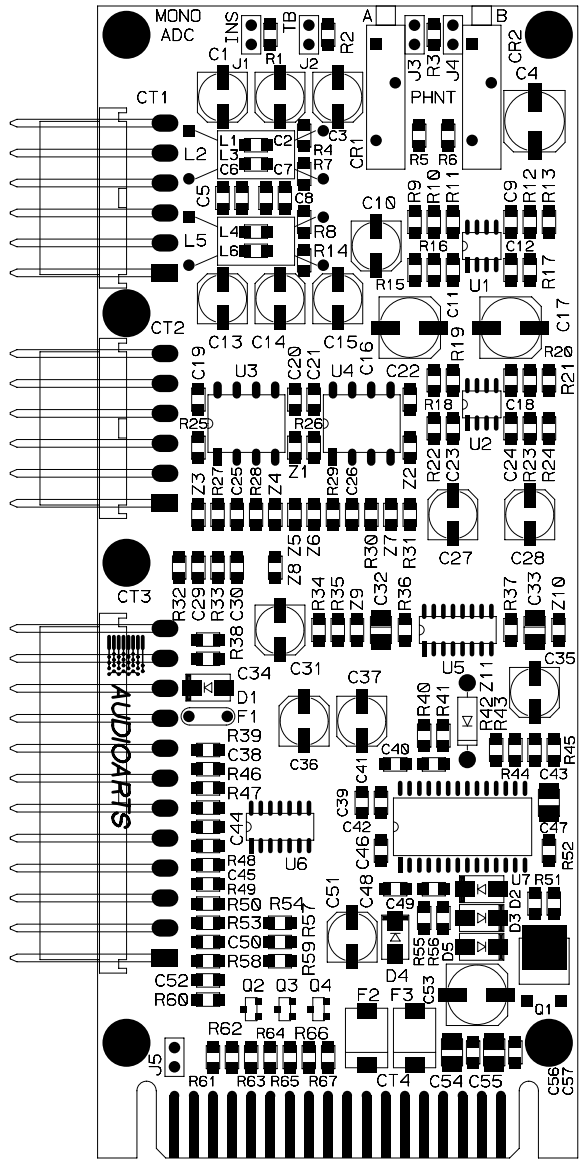


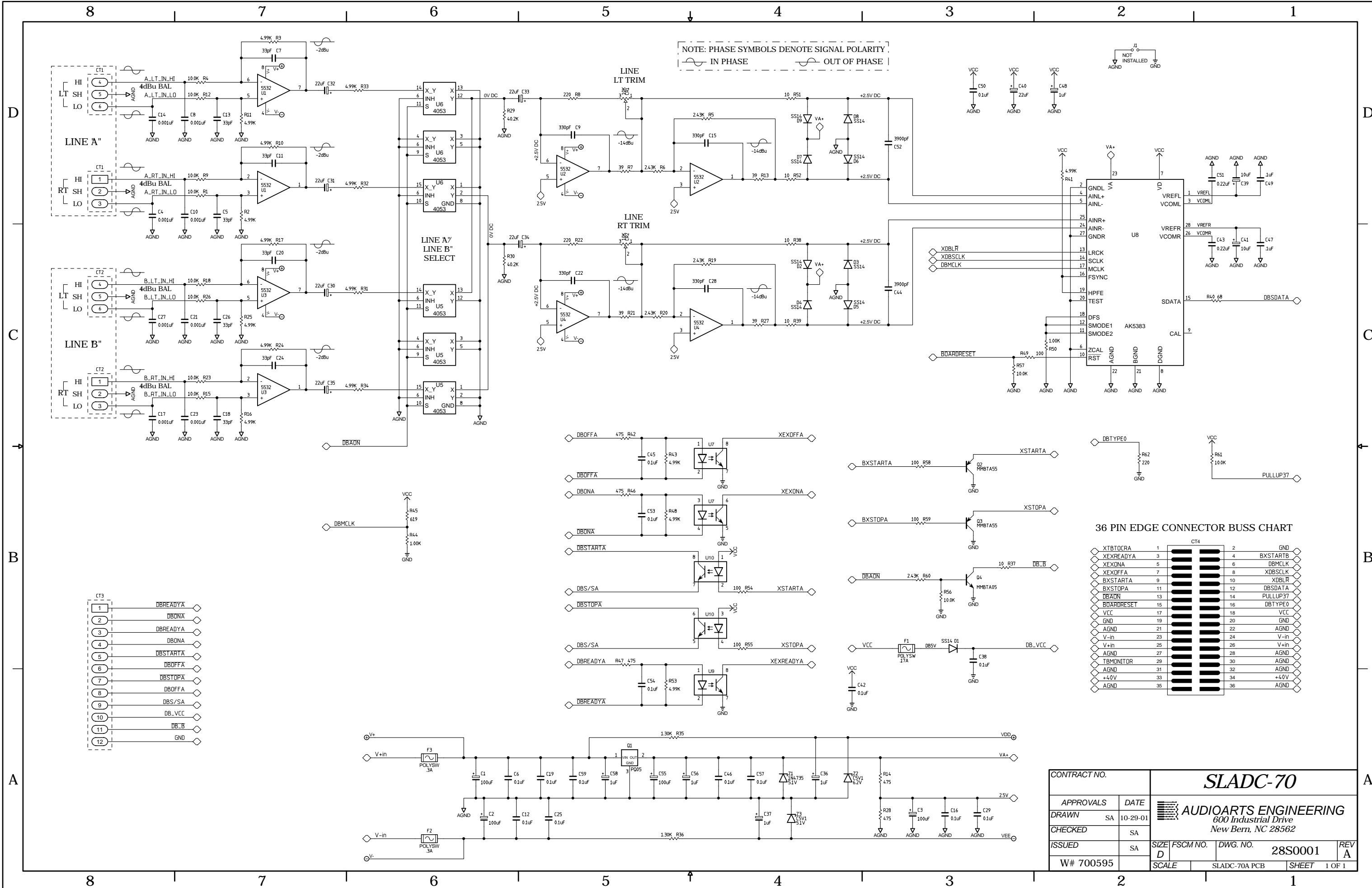
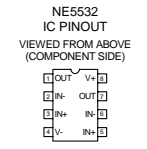
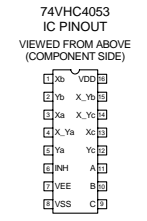
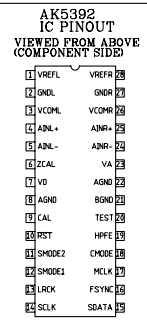
NOTE: PHASE SYMBOLS DENOTE SIGNAL POLARITY
IN PHASE OUT OF PHASE



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DRAWN	SA 10-27-01				
CHECKED	SA				
ISSUED	SA	SIZE	FSCM NO.	DWG. NO.	REV
W# 700596		D		28S0002	A
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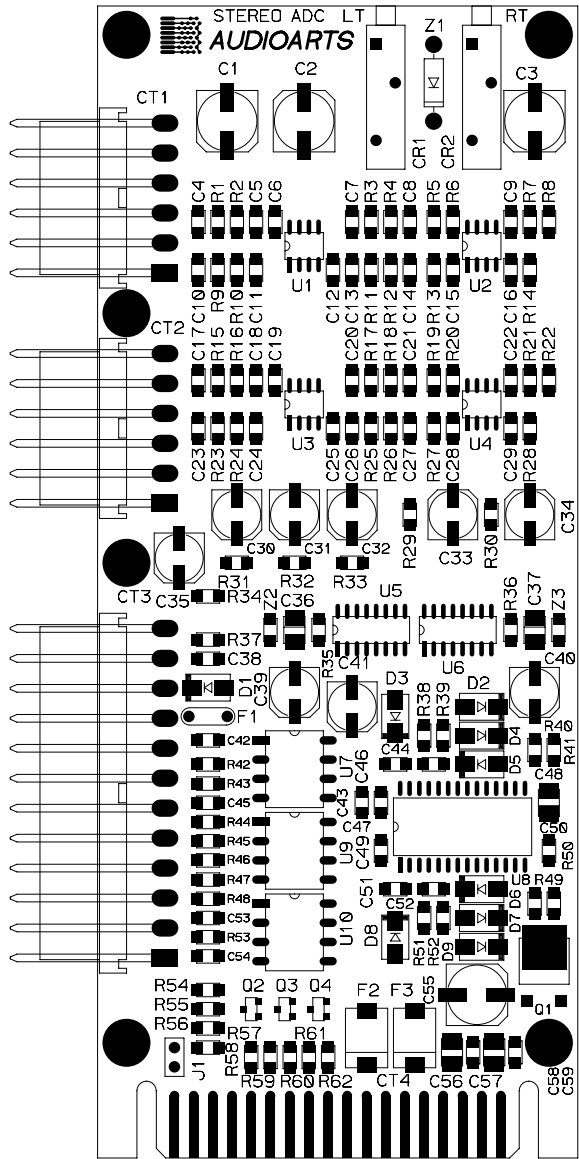
MMADC-70 Mono Mic ADC I/O Card Schematic -Sheet 1 of 1



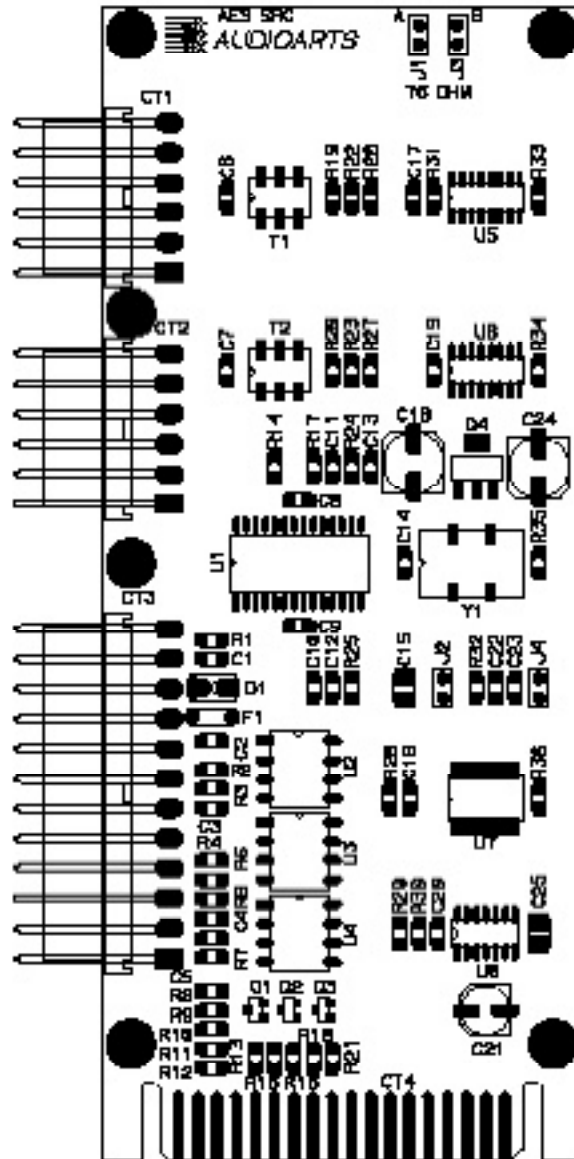


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W# 700595		SCALE	SLADC-70A PCB	SHEET	1 OF 1

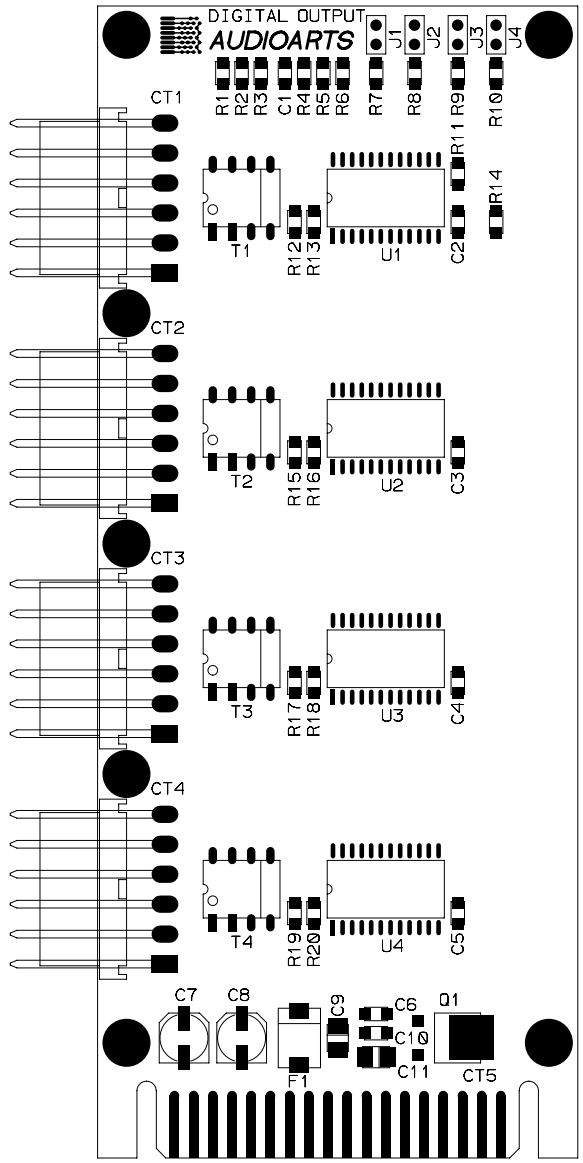
SLADC-70 Analog Stereo Line ADC I/O Schematic -Sheet 1 of 1

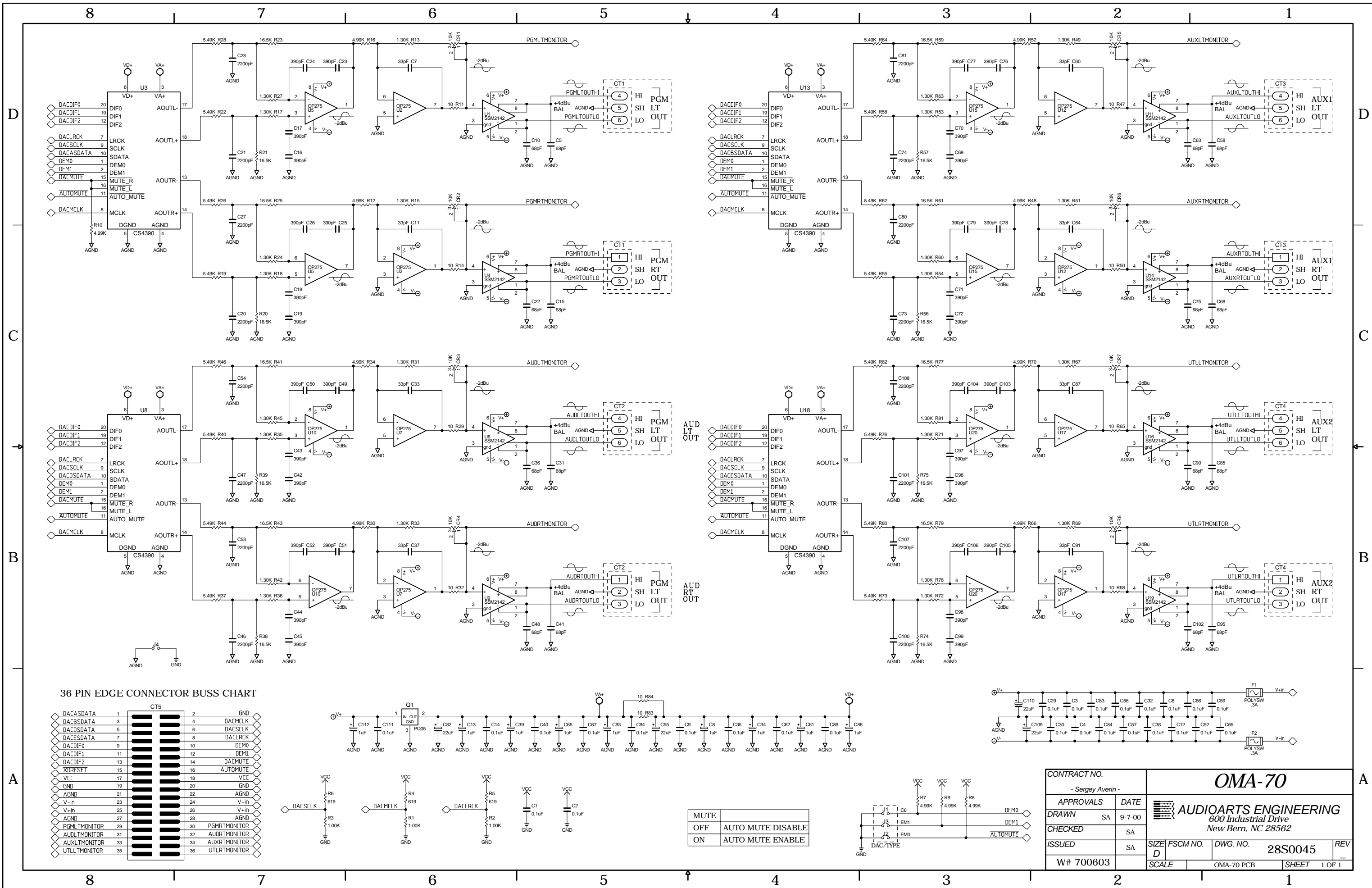




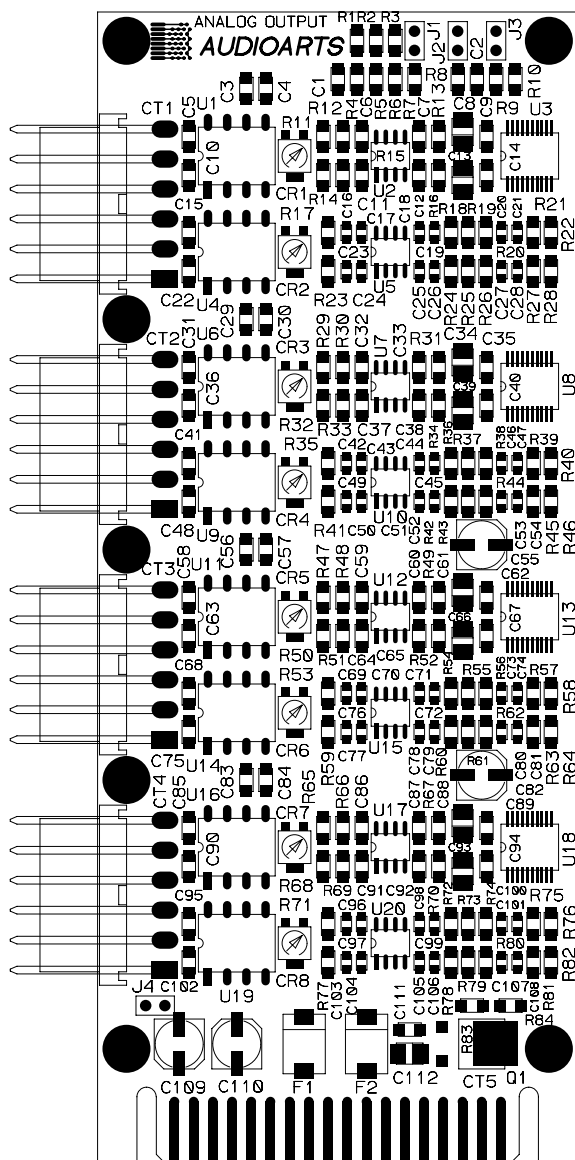


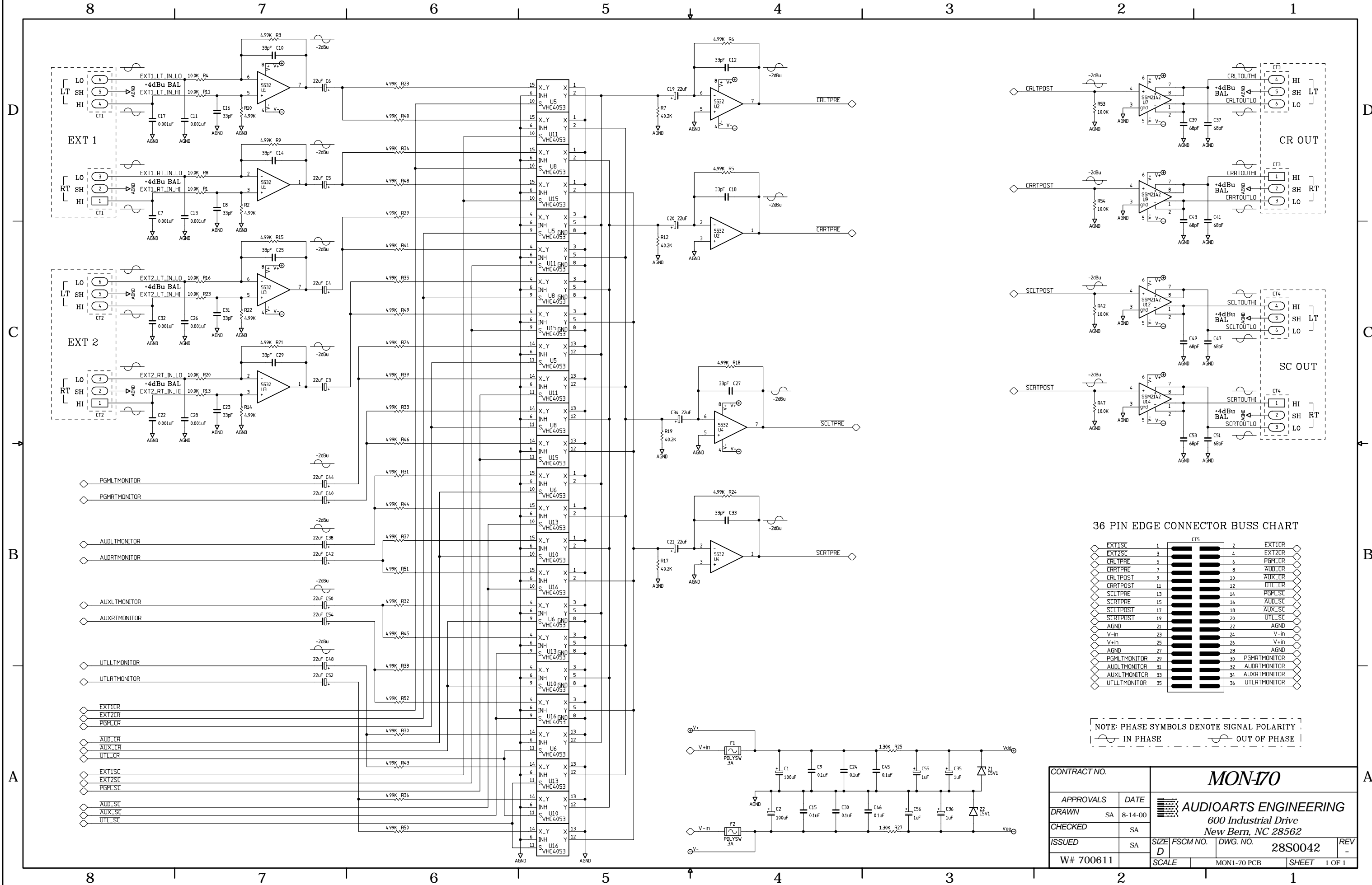
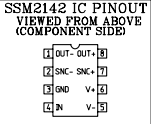
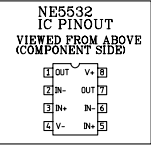
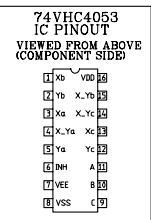
Digital Stereo Line SRC Card Load Sheet (SRC-74)





OMA-70 Analog Stereo Output I/O Card Schematic -Sheet 1 of 1





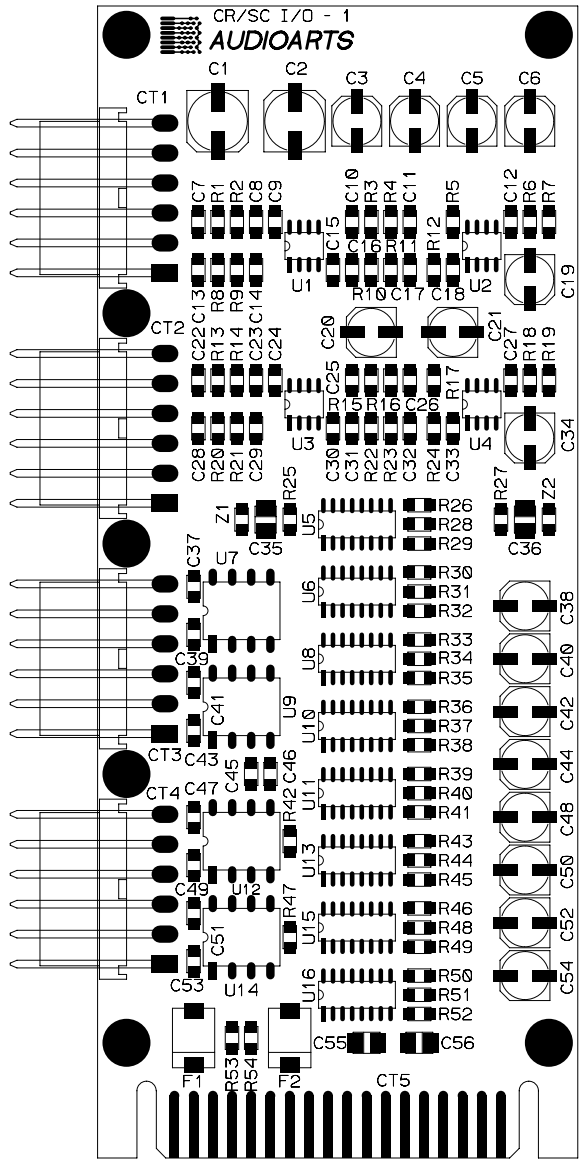
36 PIN EDGE CONNECTOR BUSS CHART

EXT1SC	1	EXT1CR	4
EXT2SC	3	EXT2CR	6
CRLTPRE	5	PGM_CR	8
CRLTPRE	7	AUD_CR	10
CRLTPRE	9	AUX_CR	12
CRLTPRE	11	UTL_CR	14
SCLTPRE	13	PGM_SC	16
SCLTPRE	15	AUD_SC	18
SCLTPOST	17	AUX_SC	20
SCLTPOST	19	UTL_SC	22
AGND	21	AGND	24
V-in	23	V-in	26
V-in	25	V-in	28
AGND	27	AGND	30
PGMLTMONITOR	29	PGMRTMONITOR	32
AUDLTMONITOR	31	AUDRTMONITOR	34
AUXLTMONITOR	33	AUXRTMONITOR	36
UTLLTMONITOR	35	UTLRTMONITOR	36

NOTE: PHASE SYMBOLS DENOTE SIGNAL POLARITY
IN PHASE OUT OF PHASE

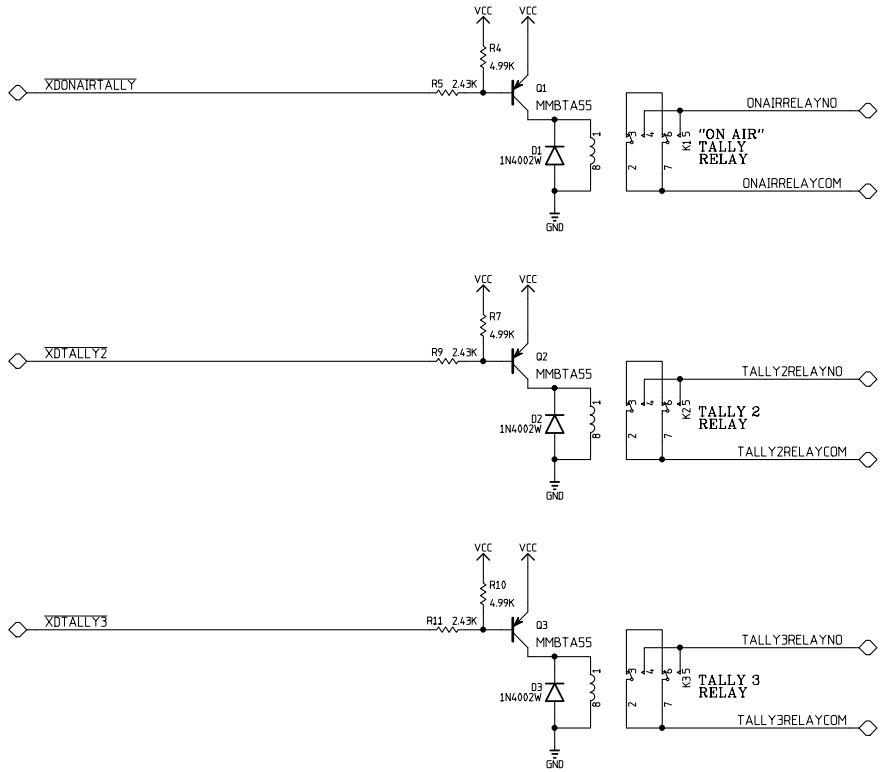
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APPROVALS	DATE	AUDIOARTS ENGINEERING	
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CHECKED	SA	New Bern, NC 28562	
ISSUED	SA	SIZE D	FSCM NO. 28S0042
W# 700611		SCALE	MON1-70 PCB
		SHEET	1 OF 1

MONITOR 1-70 Control Room/ Studio I/O Schematic -Sheet 1 of 1



SSM2142 IC PINOUT
VIEWED FROM ABOVE
(COMPONENT SIDE)

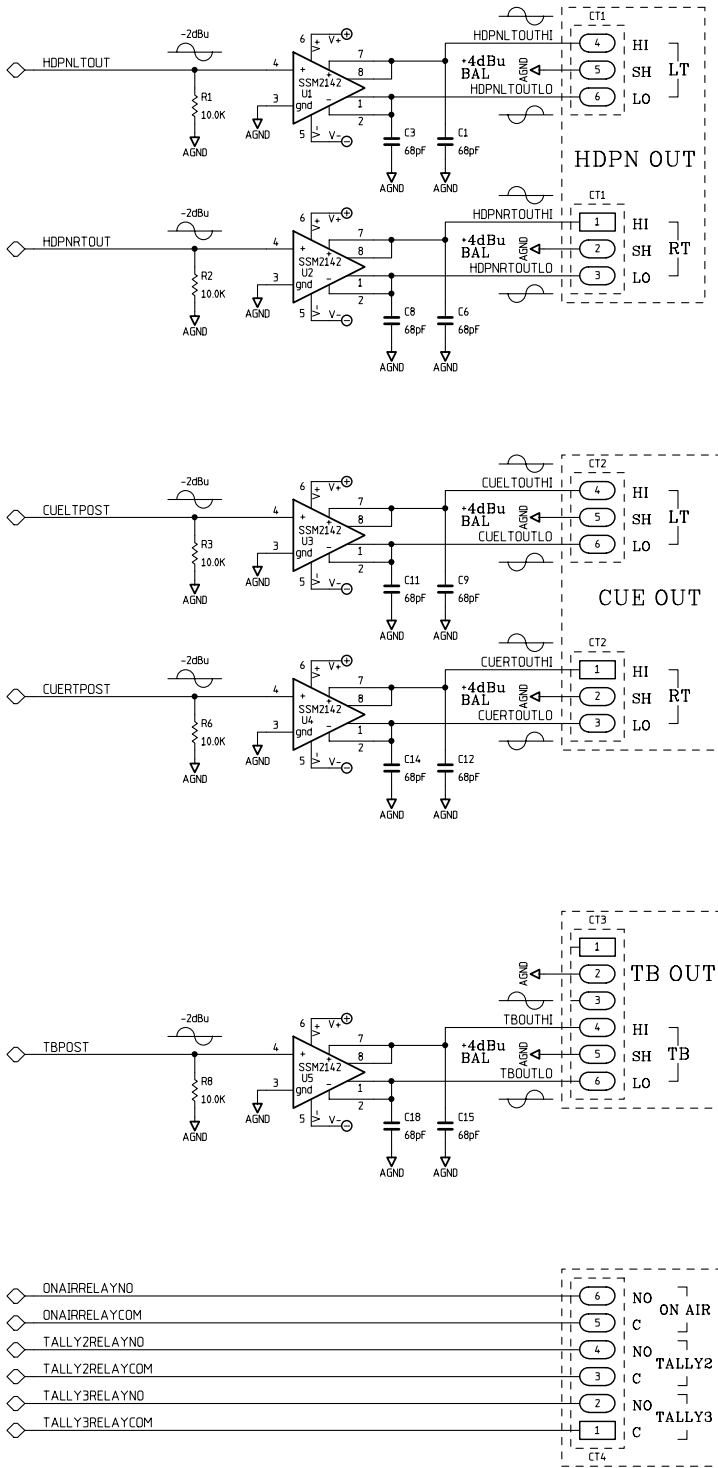
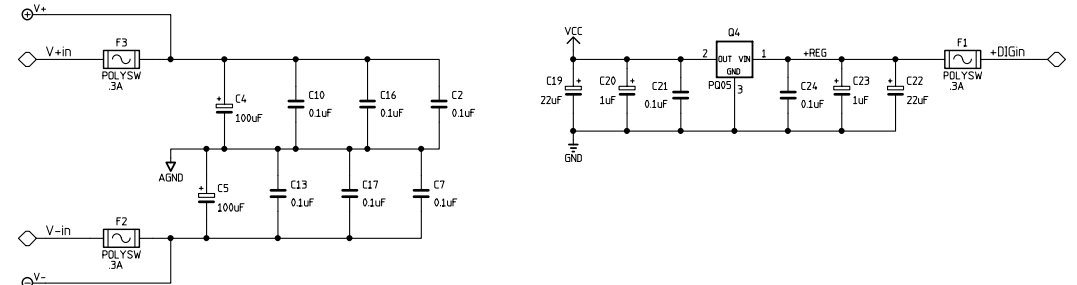
1	OUT-	OUT+
2	SNC-	SNC+
3	GND	V+
4	N	V-



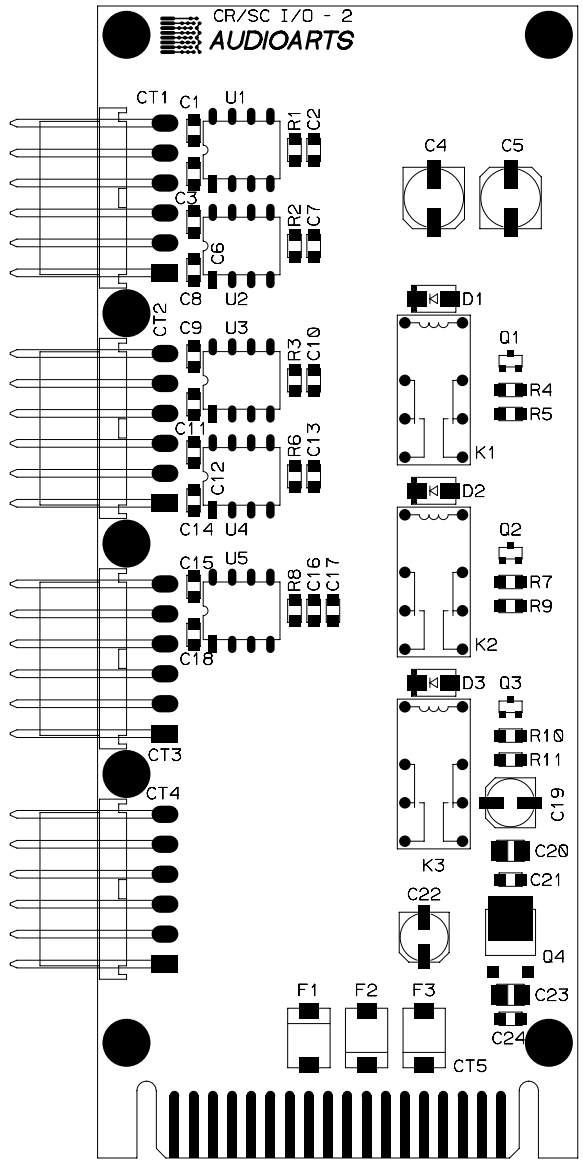
36 PIN EDGE CONNECTOR BUSS CHART

GND	1	CTS	2	GND
TBPOST	3		4	AGND
HDPNLTOUT	5		6	AGND
HDPNRTOUT	7		8	AGND
CUELTPOST	9		10	AGND
CUERTPOST	11		12	AGND
AGND	13		14	XDONAIRTALLY
XDTALLY3	15		16	XDTALLY2
+DIGin	17		18	+DIGin
GND	19		20	GND
AGND	21		22	AGND
V-in	23		24	V-in
V+in	25		26	V+in
AGND	27		28	AGND
PIN29	29		30	AGND
AGND	31		32	AGND
PIN33_34	33		34	PIN33_34
AGND	35		36	AGND

NOTE: PHASE SYMBOLS DENOTE SIGNAL POLARITY
IN PHASE OUT OF PHASE



CONTRACT NO.		MON 2-70	
APPROVALS	DATE	AUDIOARTS ENGINEERING	
DRAWN SA	9-7-00	600 Industrial Drive	
CHECKED SA		New Bern, NC 28562	
ISSUED SA		SIZE D	FSCM NO. 28S0043
W# 700612		SCALE	MON2-70 PCB
		SHEET	1 OF 1



74VHC4053
IC PINOUT
VIEWED FROM ABOVE
(COMPONENT SIDE)

1

2

3

4

5

6

7

8

NE5532
IC PINOUT
VIEWED FROM ABOVE
(COMPONENT SIDE)

1

2

3

4

AGND

AGND

AGND

AGND

AGND

AGND

AGND

AGND

AGND

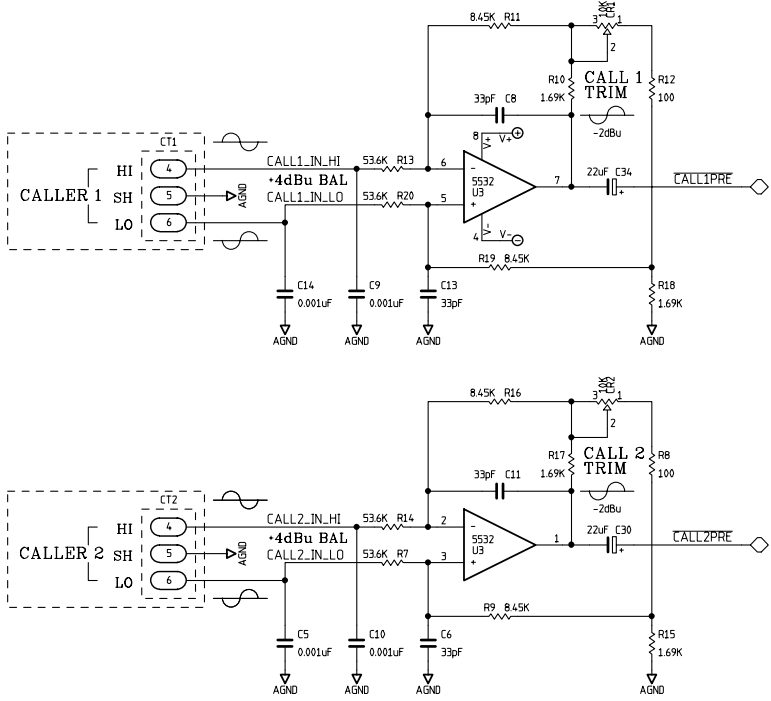
AGND

D

C

B

A



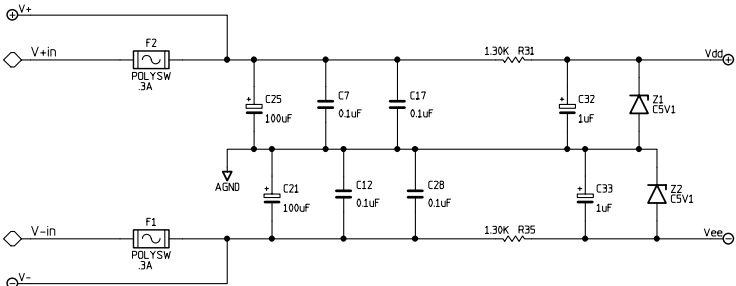
36 PIN EDGE CONNECTOR BUSS CHART

GND	1	CT5	2	GND	35
XSTART	3		4	XSTOP	36
TELMONITOR	5		6	AGND	37
CALL2POST	7		8	AGND	38
CALL2PRE	9		10	AGND	39
CALL1POST	11		12	AGND	40
CALL1PRE	13		14	AGND	41
CUZION	15		16	CUZON	42
VCC	17		18	VCC	43
GND	19		20	GND	44
AGND	21		22	AGND	45
V-in	23		24	V-in	46
V+in	25		26	V+in	47
AGND	27		28	AGND	48
TBMONITOR	29		30	AGND	49
AGND	31		32	AGND	50
PIN33_34	33		34	PIN33_34	51
AGND	35		36	AGND	52

NOTE: PHASE SYMBOLS DENOTE SIGNAL POLARITY

IN PHASE

OUT OF PHASE



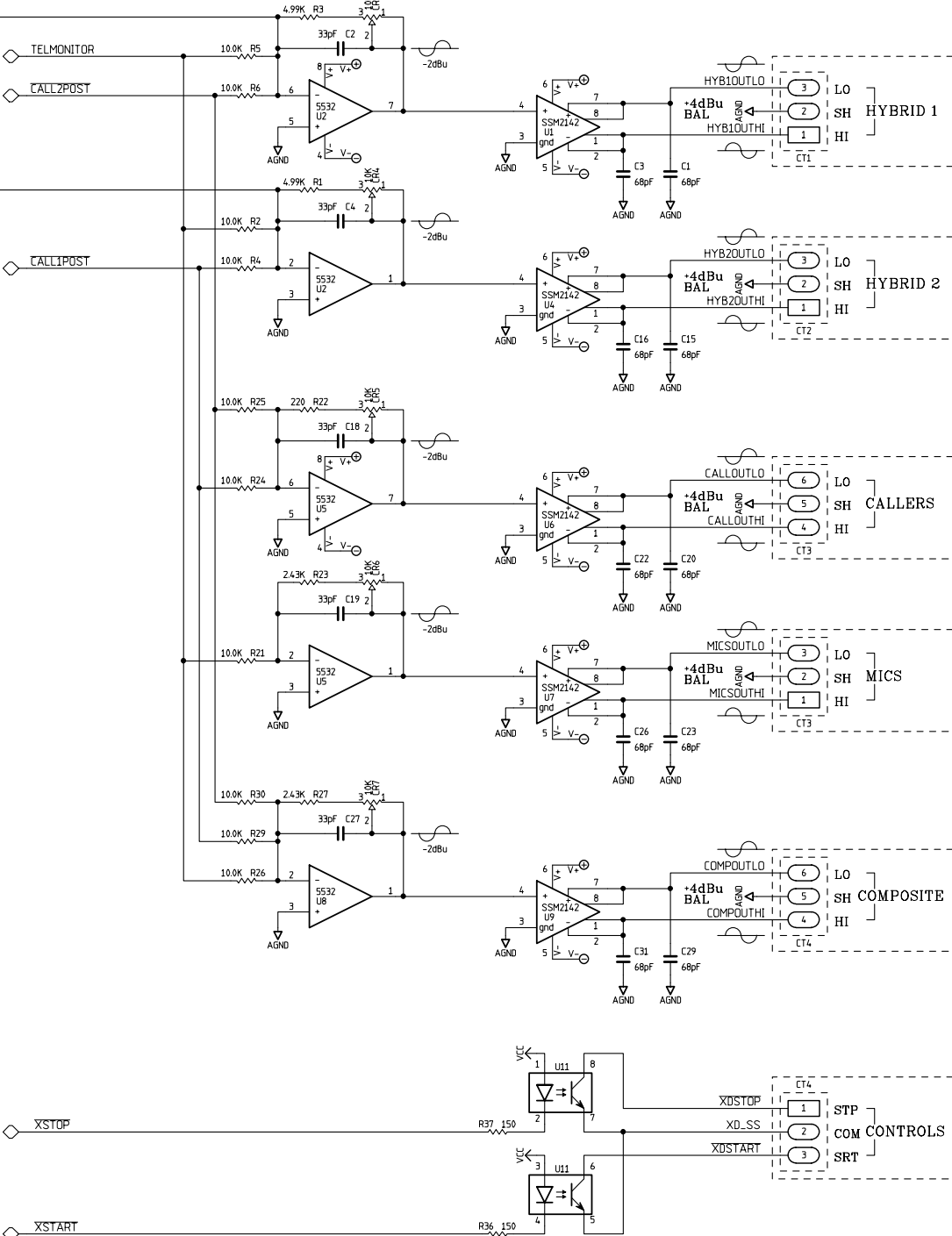
SPIO-70 Super Phone I/O Card Schematic -Sheet 1 of 1

D

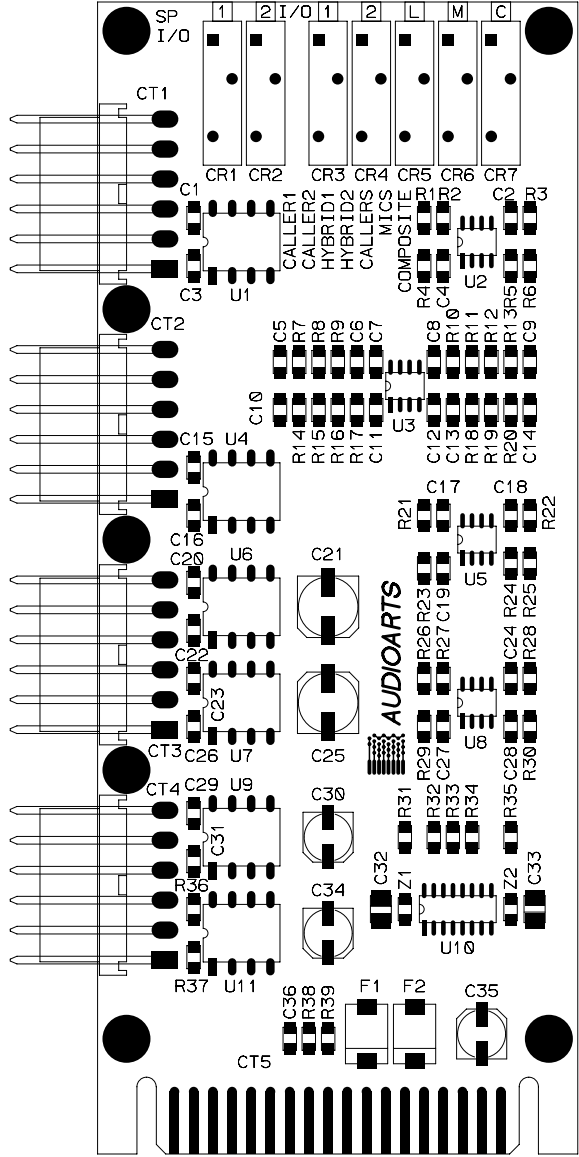
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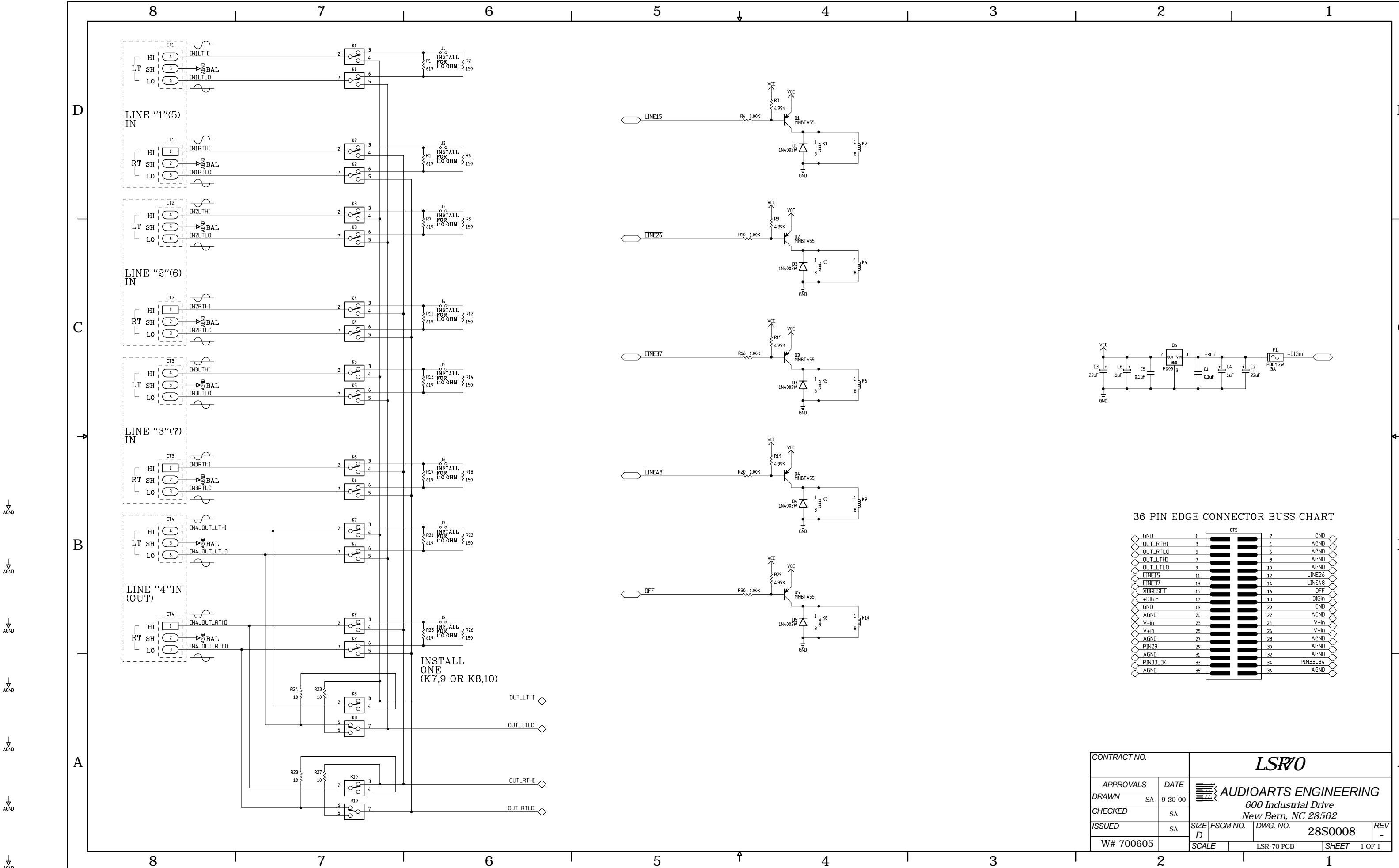
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A



CONTRACT NO.		SPIO-70	
APPROVALS	DATE	AUDIOARTS ENGINEERING 600 Industrial Drive New Bern, NC 28562	
DRAWN	SA 9-7-00		
CHECKED	SA	SIZE	D
ISSUED	SA	FSCM NO.	28S0043
W# 700615		DWG. NO.	28S0043
		SCALE	SPIO-70 PCB
		SHEET	1 OF 1





36 PIN EDGE CONNECTOR BUSS CHART

◇ GND	1	◇ GND	2
◇ OUT_RTTHI	3	◇ AGND	4
◇ OUT_RTLO	5	◇ AGND	6
◇ OUT_LTHI	7	◇ AGND	8
◇ OUT_LTLO	9	◇ AGND	10
◇ LINE15	11	◇ LINE26	12
◇ LINE37	13	◇ LINE48	14
◇ XORESET	15	◇ OFF	16
◇ +DIGin	17	◇ +DIGin	18
◇ GND	19	◇ GND	20
◇ AGND	21	◇ AGND	22
◇ V-in	23	◇ V-in	24
◇ V-in	25	◇ V-in	26
◇ AGND	27	◇ AGND	28
◇ PIN29	29	◇ AGND	30
◇ AGND	31	◇ AGND	32
◇ PIN33_34	33	◇ PIN33_34	34
◇ AGND	35	◇ AGND	36

CONTRACT NO.

APPROVALS

DRAWN

CHECKED

ISSUED

W# 700605

DATE

SA 9-20-00

SA

SA

SA

LSR70

AUDIOARTS ENGINEERING

600 Industrial Drive

New Bern, NC 28562

SIZE

D

FSCM NO.

DWG. NO.

28S0008

REV

-

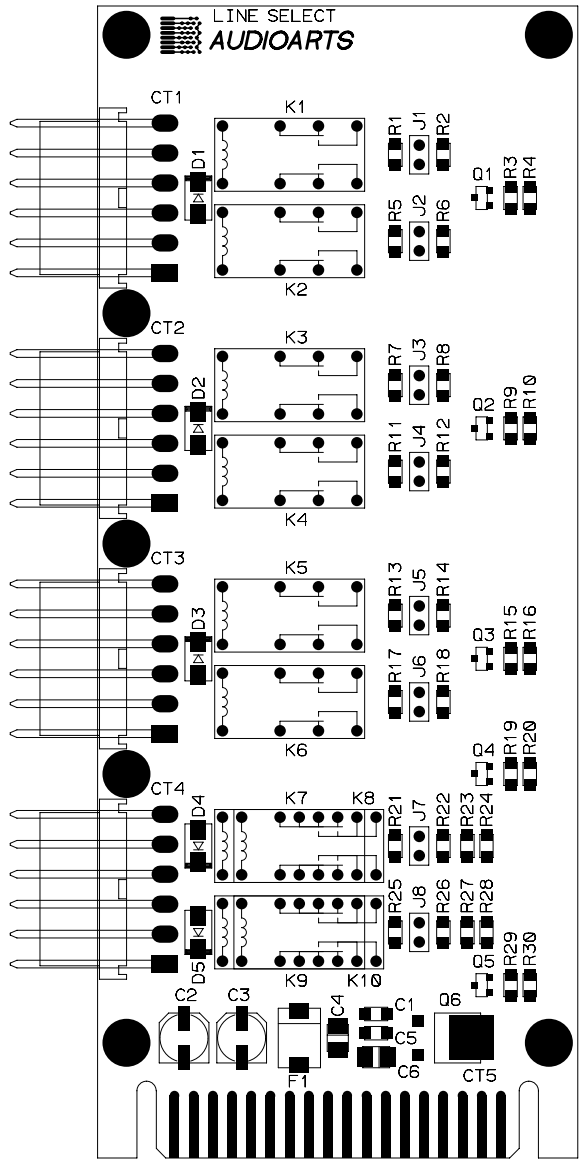
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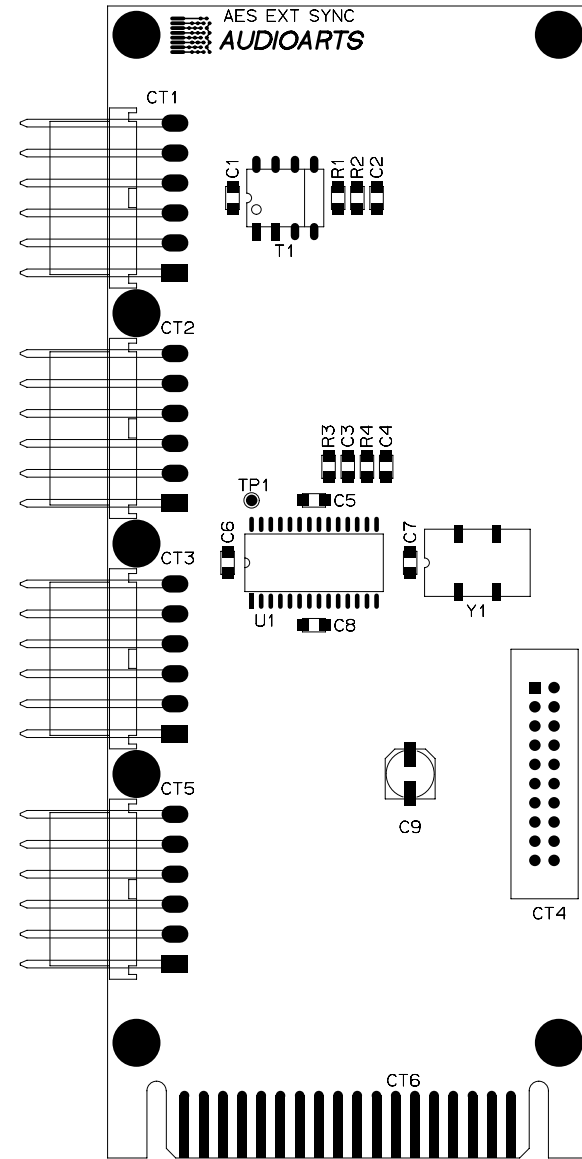
LSR-70 PCB

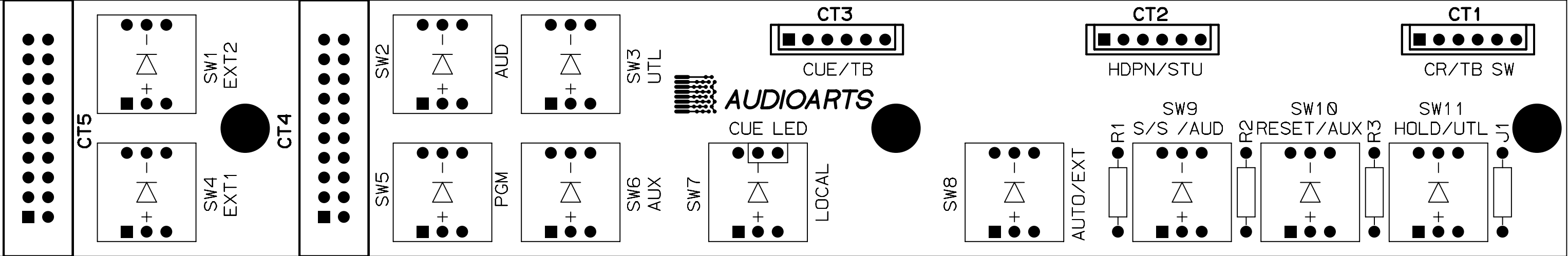
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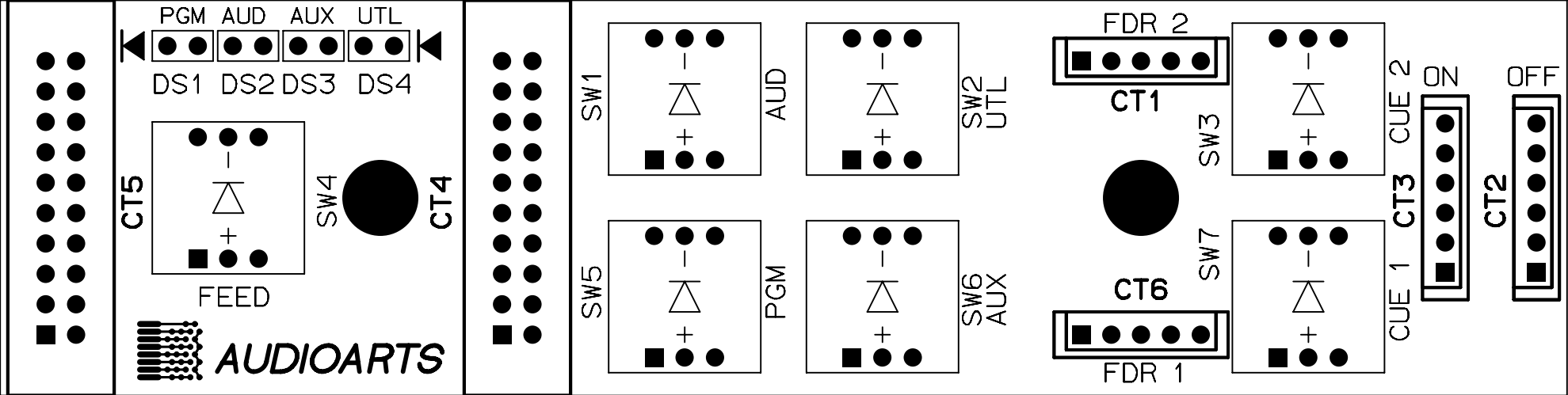
1 OF 1

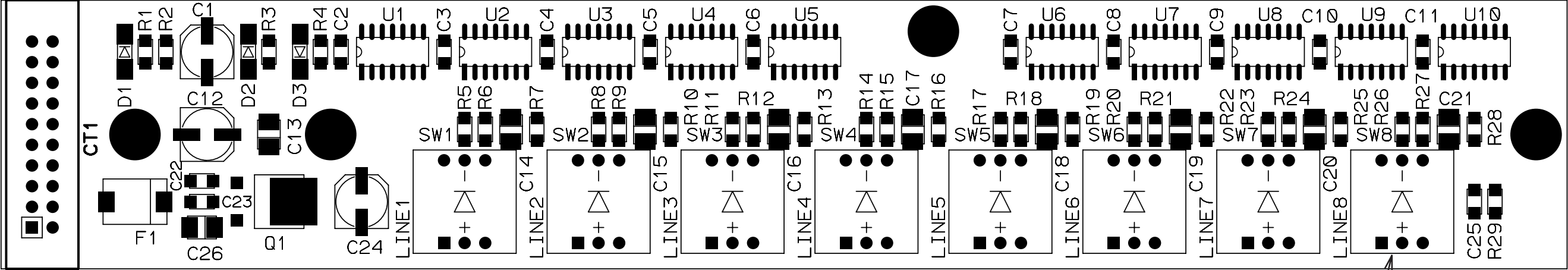
LSR-70 Line Select Relay I/O Card Schematic -Sheet 1 of 1





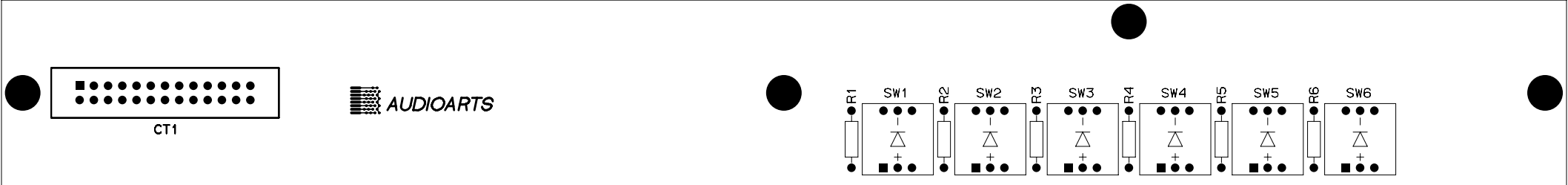


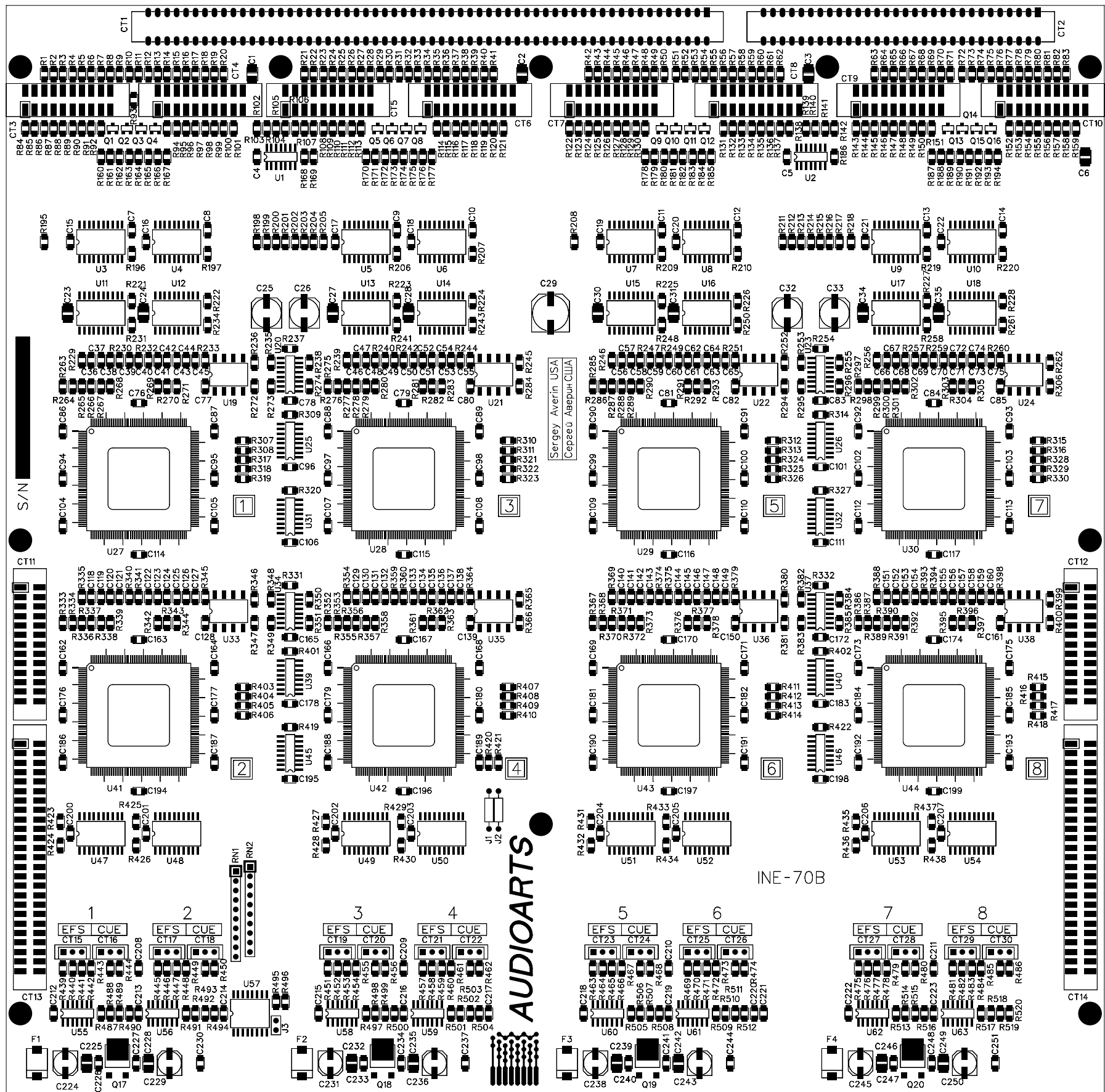


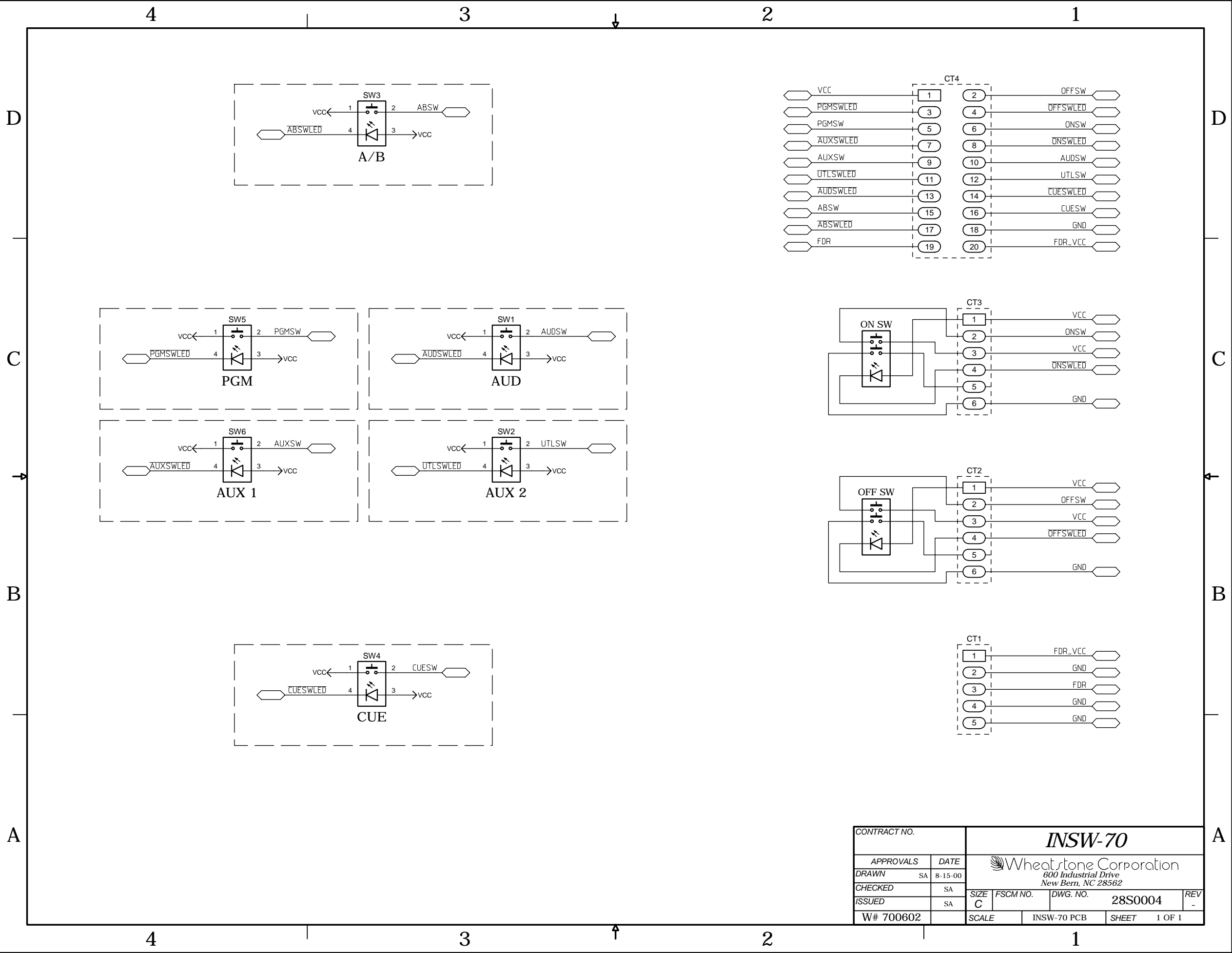


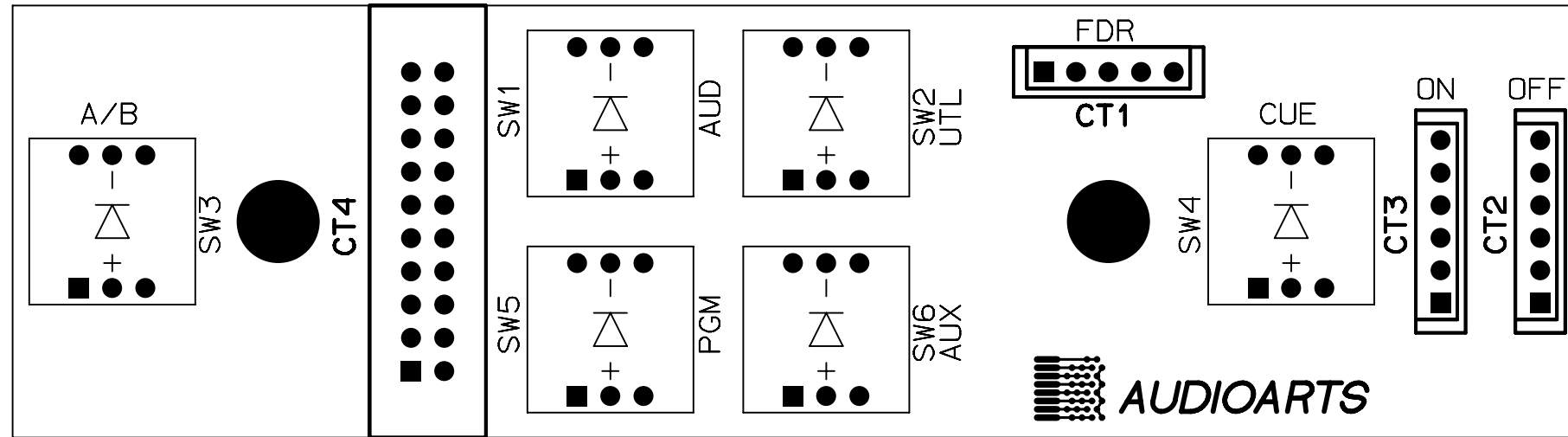
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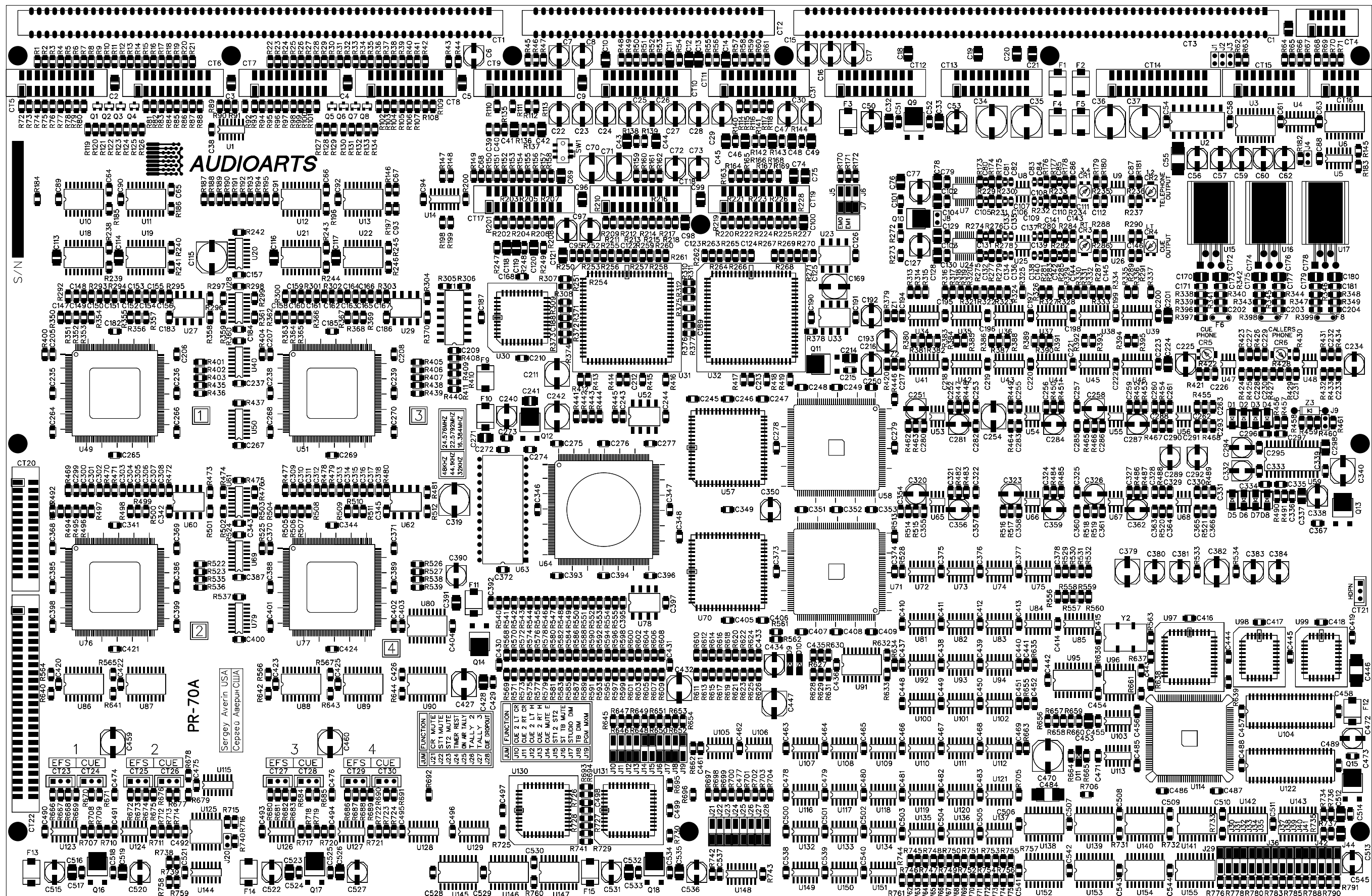
Line Select Module Switch Card Load Sheet (LSW-70)

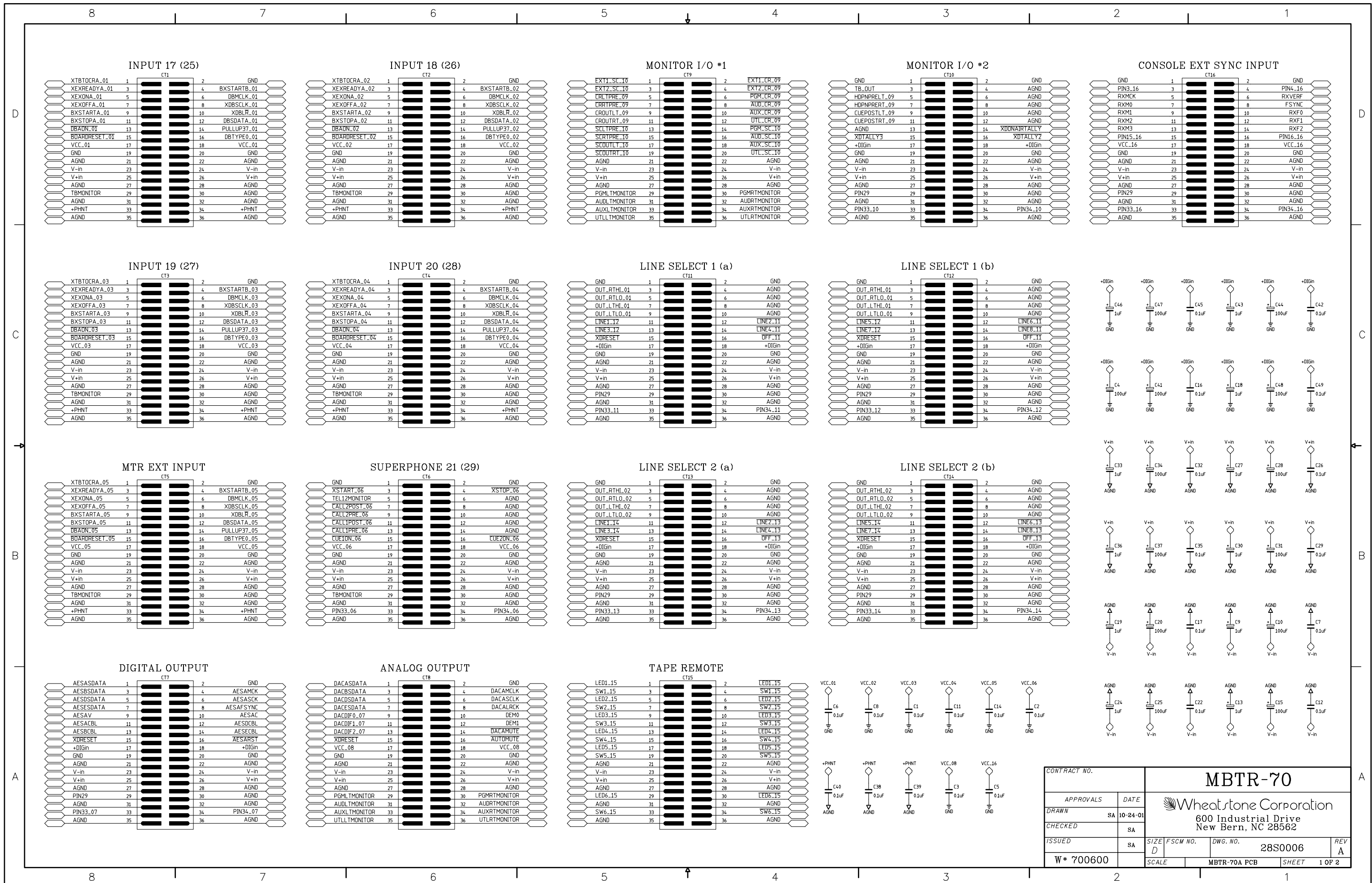




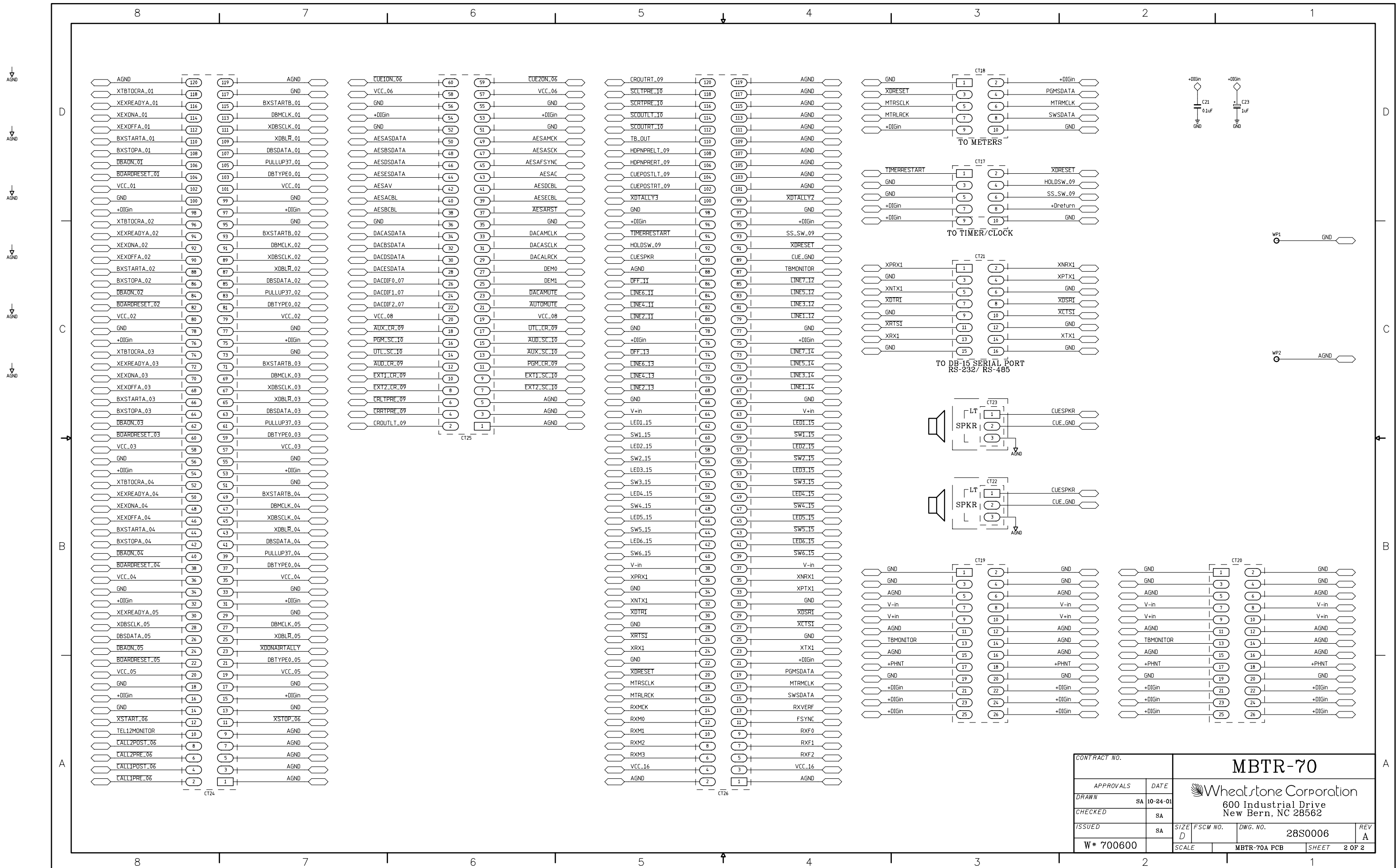


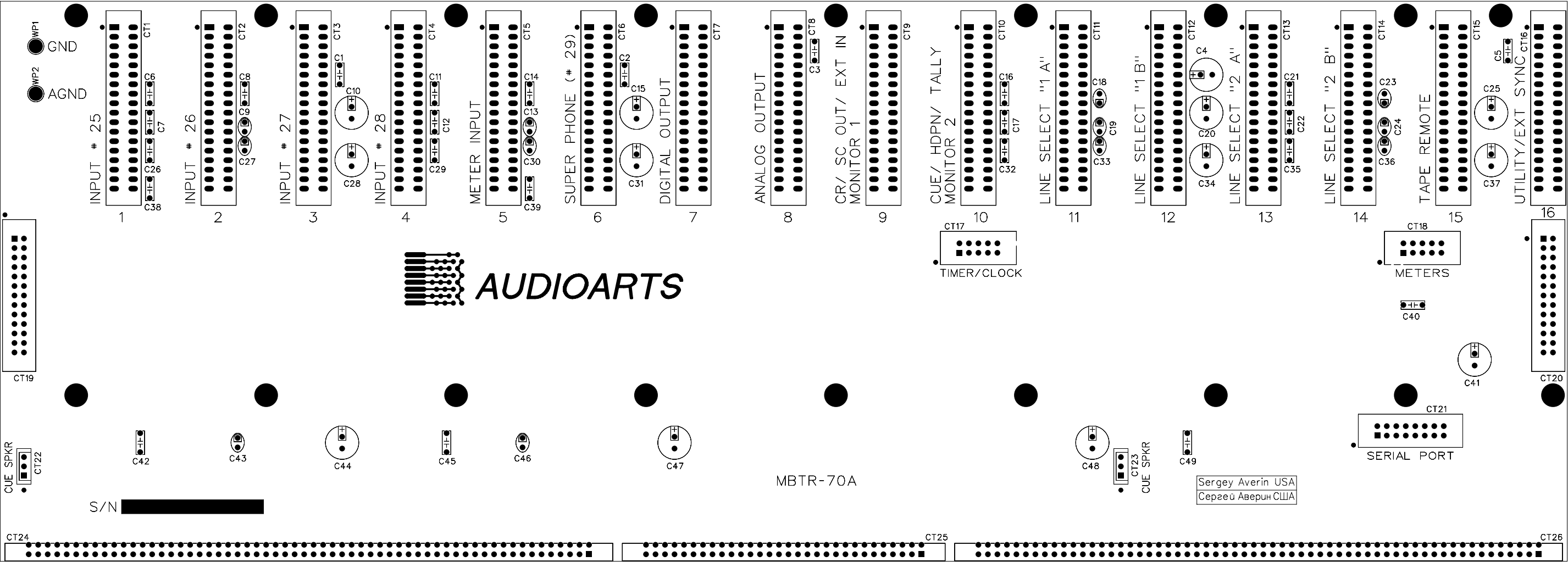


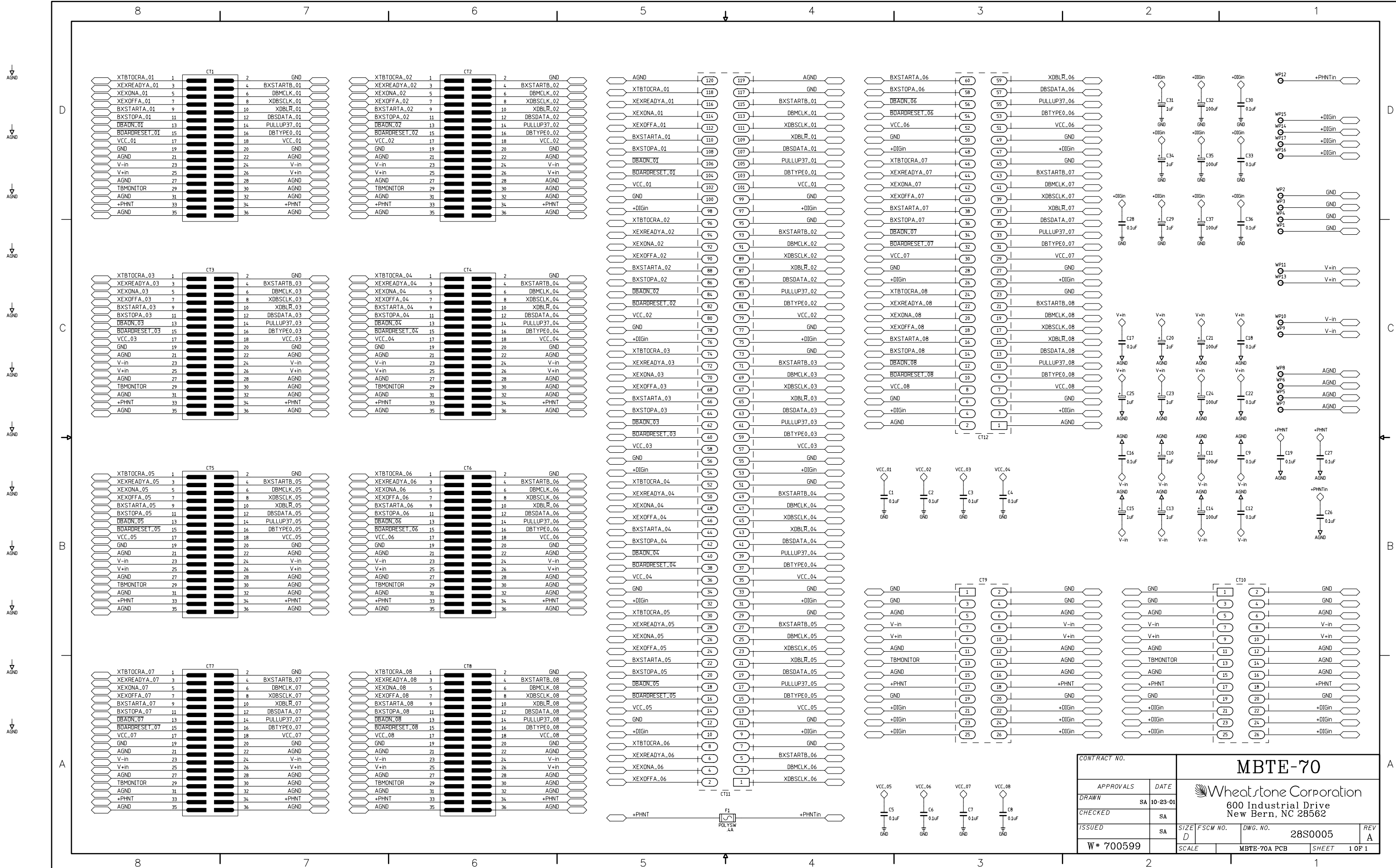


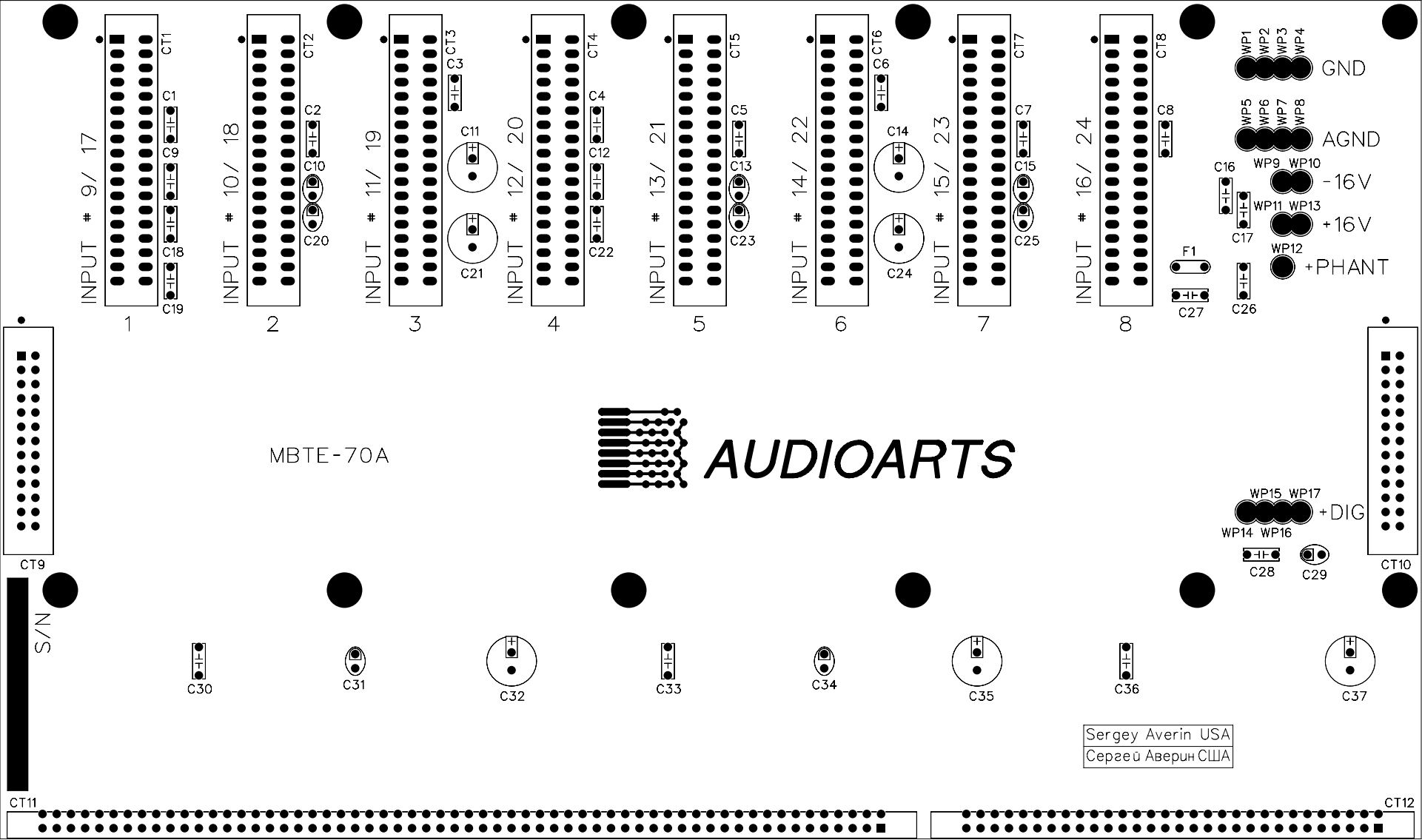


Mother Board Right Transition Card Schematic - Sheet 1 of 2









Appendix

Contents

Replacement Parts List	A-2
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For the most part there are no user-replaceable parts in the D-70 console. Exceptions are those controls and components that in the course of normal use may need maintenance (i.e., faders, pots, ON/OFF switches, indicator lamps, etc.). A complete list of available components is shown on the next page. Contact Wheatstone technical support for further information.

Wheatstone Corporation (600 Industrial Drive, New Bern, North Carolina, USA 28562) may be reached by phone at 252-638-7000, fax 252-637-1285, electronic mail "email@wheatstone.com".

REPLACEMENT PARTS — D-70 AUDIO CONSOLE

COMPONENT	DESCRIPTION	WS P/N
IND-70 MODULE	COMPLETE INPUT MODULE	"002700"
CRD-70 MODULE	COMPLETE CONTROL ROOM MONITOR MODULE	"002702"
SCD-70 MODULE	COMPLETE STUDIO MONITOR MODULE	"002703"
SPD-70 MODULE	COMPLETE PHONE MODULE	"002704"
LS-70 MODULE	COMPLETE LINE SELECT MODULE	"002701"
TR-70/FF MODULE	COMPLETE FULL-FUNCTION TAPE REMOTE CONTROL MODULE	"002705"
SLADC-70 CARD	A-TO-D CONVERTER DAUGHTER BOARD FOR ANALOG STEREO LINE INPUTS	"002742"
SRC-74 CARD	SAMPLE RATE CONVERTER CARD FOR DIGITAL INPUTS	"002753"
MMADC-70 CARD	A-TO-D CONVERTER DAUGHTER BOARD FOR ANALOG MIC INPUTS	"002744"
LSR-70/1 CARD	LINE SELECTOR RELAY CARD, INPUTS 1-4	"002745"
LSR-70/2 CARD	LINE SELECTOR RELAY CARD, INPUTS 5-7, OUTPUTS	"002747"
TR-70 CARD	TAPE REMOTE CARD	"002746"
MON1-70 CARD	MONITOR 1 CARD	"002741"
MON2-70 CARD	MONITOR 2 CARD	"002748"
OMA-70 CARD	OUTPUT CARD FOR ANALOG OUTPUTS	"002757"
OMD-70 CARD	OUTPUT CARD FOR DIGITAL OUTPUTS	"002758"
SPD-70 CARD	TELEPHONE CARD	"002772"
ESYN-70 CARD	EXTERNAL SYNC INPUT CARD	"002770"
VUD-220 CARD	METERBRIDGE LED VU CARD	"026045A"
CLK/TMR-70 CARD	CLOCK AND EVENT TIMER CARD	"002749"
PR-70 CARD	MAIN PROCESSOR CARD	"002775"
INE-70 CARD	EXPANSION PROCESSOR CARD	002750"
MBTR-70 CARD	MAIN INTERFACE MOTHERBOARD	"002771"
MBTE-70 CARD	EXPANSION INTERFACE MOTHERBOARD	"002751"
CRYSTAL FOR 32 KHZ CONSOLE SAMPLE RATE	16.384 MHZ CRYSTAL	"370010"
CRYSTAL FOR 44.1 KHZ CONSOLE SAMPLE RATE	22.579 MHZ CRYSTAL	"370011"
CRYSTAL FOR 48 KHZ CONSOLE SAMPLE RATE	24.576 MHZ CRYSTAL	"370012"

REPLACEMENT PARTS — D-70 AUDIO CONSOLE

COMPONENT	DESCRIPTION	WS P/N
MANUAL	OWNER'S MANUAL	"002799"
SPS-16 POWER SUPPLY	CONSOLE POWER SUPPLY	"007277"
SPS POWER SUPPLY CABLE	CONSOLE POWER SUPPLY CABLE	"007289"
WIRED REPLACEMENT FADER	WIRED FADER FOR IND-70 MODULES	"052710"
WIRED REPLACEMENT FADER	WIRED FADER FOR SPD-70 MODULES	"052711"
WIRED REPLACEMENT SWITCH	WIRED "ON/OFF" SWITCH	"052701"
WIRED REPLACEMENT POT	WIRED POT FOR CONTROL ROOM AND HEADPHONE MONITOR	"052702"
I/O CONNECTOR	6 PIN PLUG FOR MODULE I/O CONNECTIONS	"250114"
I/O CONNECTOR	12 PIN PLUG FOR MODULE I/O CONNECTIONS	"250115"
REPLACEMENT SWITCH	"ON/OFF" SWITCH	"510080"
REPLACEMENT RED BUTTON	MODULE "ON" BUTTON	"530049"
REPLACEMENT AMBER BUTTON	MODULE "OFF" BUTTON	"530048"
RED LED LAMP REPLACEMENT	MODULE "ON" LED LAMP	"600025"
YELLOW LED LAMP REPLACEMENT	MODULE "OFF" LED LAMP	"600029"
REPLACEMENT CUE SPEAKER	REPLACEMENT CUE SPEAKER	"960000"