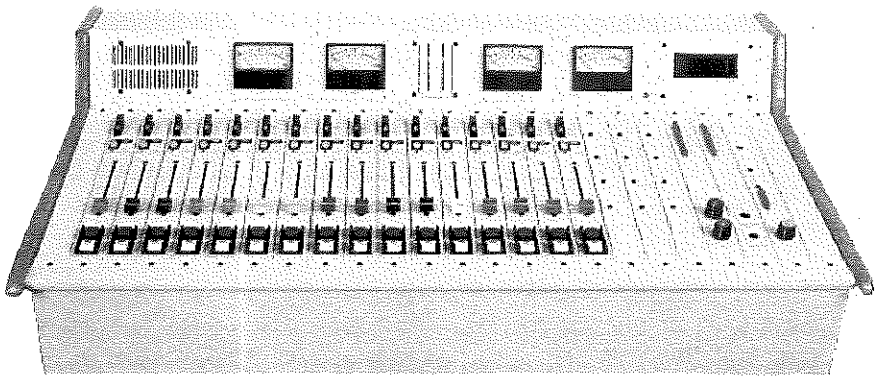
ISDN Back-Feed
"Open Collector"

Dixon Systems



Model SP-16

Broadcast Console

Owner's Manual

3545
3454

Contents:

Ubiquitous

About This Owner's Manual

This manual contains all the necessary information to install, interface, and service the **Dixon Systems** Model SP-16 Broadcast Console. It assumes the reader has a certain level of technical expertise. The experienced broadcast engineer should find it very easy to use.

This is really several manuals in one. The SP-16 is a system of modules interconnected via bus lines. Each section in this manual deals with specific module.

Every effort has been made to make this manual as easy to use as possible. You won't have to flip from an audio to logic schematic or scramble all over the book to find the information you need. Our schematic drawings are large, easy to read, and on one page.

We encourage you to read each section carefully before installing the console. Most of the modules used in the Model SP-16 offer various options and the reader should fully understand them.

Section 1:

Introduction

Introduction

Dixon System's Model SP-16 was developed to meet the demand of a reasonably priced broadcast mixing console that is easy to install, maintain, and operate while providing very high quality performance.

Designed primarily as modular on-air console, the SP-16's incredible flexibility allows it to be used for a variety of mixing needs. It is also suitable for newsrooms, production facilities, and remote broadcast locations.

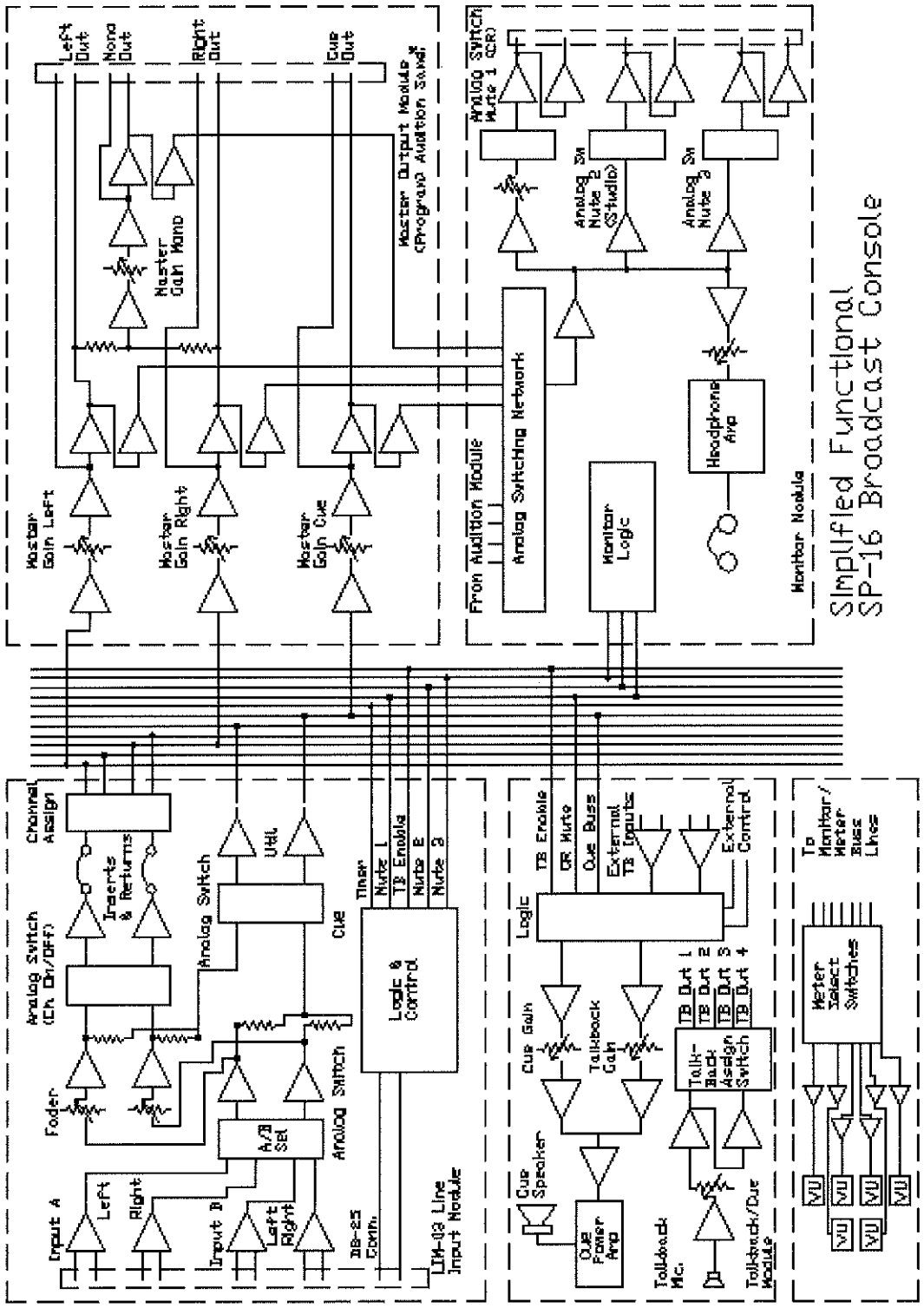
Design Approach

To achieve the best possible performance, the audio path was designed to be as direct as possible. We kept inputs away from outputs. Balanced mix buses and separate audio and logic ground systems are used. Each module is individually voltage regulated and decoupled and all are fed by a massive regulated power supply.

Almost every control room is different. At every opportunity we look for ways to make the SP-16 as versatile as possible. It has been designed to be the center of a system, capable of being interfaced with almost any equipment normally found in a control room. Phantom power for condenser microphones is standard. The console controls muting and can even control the 'On-Air' lights in three locations. It offers a third, balanced, stereo mix bus (which can be used to back-feed ISDN units), mono utility bus (for feeding a telephone hybrid) and a balanced insert and return path on each module. Several remote control and logic options are possible.

We didn't cut corners on components either. If we needed it for proper performance, we used it. For example, 1%, low noise, metal film resistors are used throughout the audio path. Full throw conductive plastic faders control levels. 'Channel-on' switching is electronic. There are no incandescent lamps to replace. It is rugged. The SP-16's frame is constructed of 16 gauge steel.

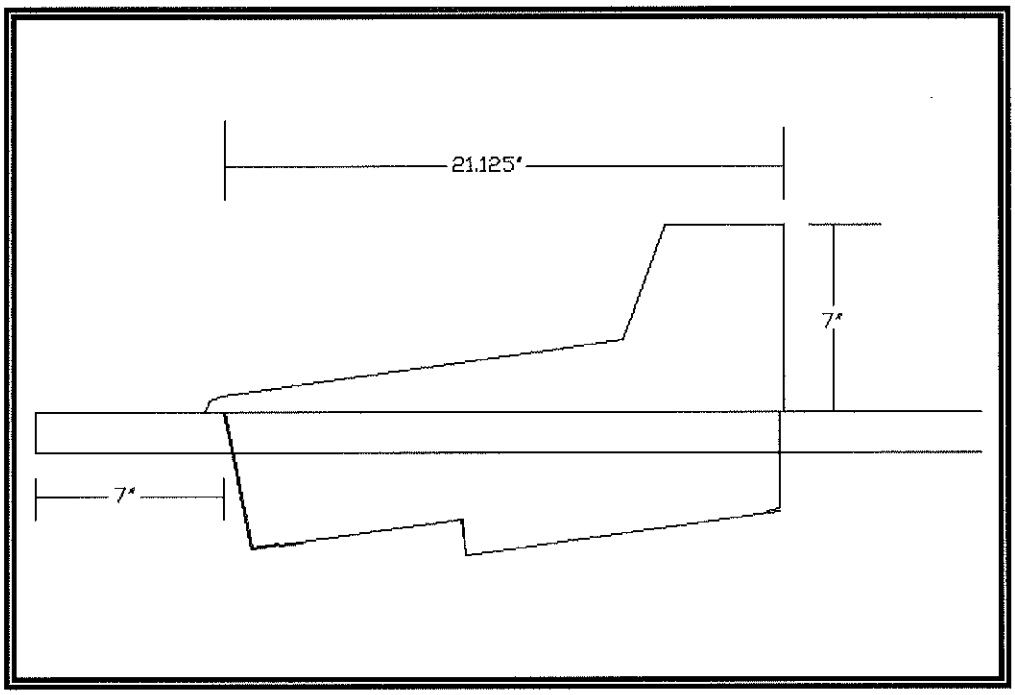
Standard components and circuits are used. There are no proprietary devices or secret black epoxy boxes to worry about. Most components can be found at any electronics parts outlet and of course, our Service Department is always ready to be of assistance.


Simplified Functional
SP-16 Broadcast Console
Left Out
Mono Out
Right Out
Cue Out
Master Output Module
(Program Audition Sum)
Master Gain Mono
Master Gain Left
Master Gain Right
Master Gain Cue
From Audition Module
Analog Switching Network
Analog Switch Mute 1 (CR)
Analog Sw Mute 2 (Studio)
Analog Sw Mute 3
Monitor Logic
Headphone Amp
Monitor Module
Channel Assign
Analog Switch (Ch On/Off)
Inserts & Returns
Fader
Analog Switch
Util
Cue
Timer
Mute 1
TB Enable
Mute 2
Mute 3
Logic & Control
A/B Sel
Analog Switch
Input A
Left
Right
Input B
Left Right
RS-422 Comm.
LIM-02 Line Input Module
Logic
TB Enable
CR Mute
Cue Buss
External TB Inputs
External Control
Cue Gain
Talkback Gain
TB Out 1
TB Out 2
TB Out 3
TB Out 4
Talk-Back Assign Switch
Cue Speaker
Cue Power Amp
Talkback Mic.
Talkback/Cue Module
To Monitor/ Meter Buss Lines
Meter Select Switches
VU

Model SP-16 Performance Specifications

Line Level Inputs:		
	Source Impedance	600 Ohms
	Input Impedance	40K Ohms Active Balanced
Line Input Level:		
		Nominal +4 dBm Maximum >+24
Microphone Input:		
	Source Impedance	150 Ohms Active Balanced Ratio > 4:1
	Input Level Range	Adjustable
Master Outputs:		
	Load Impedance	600 Ohms Minimum
	Source Impedance	60 Ohms
	Nominal Output Level	+8 dBm
	Maximum Output Level	>+24 dBm
Monitor Outputs:		
	Load Impedance	600 Ohms Minimum
	Source Impedance	60 Ohms
	Nominal Output Level	+8 dBm
	Maximum Output Level	>+8 dBm
Frequency Response:		
	Microphone Input	+/- .5 dB 20 Hz to 15 kHz
	Line Input	+/- .5 dB 20 Hz to 20 kHz
Noise:		
	Microphone Input	SNR >/= 122 dB
	Line Input	SNR >/= 90 dB (30 kHz band limited)
Distortion (T.H.D.)		
	Microphone or Line Input to Master Output	</= .01% 20 Hz to 20 kHz Typically .005%
Crosstalk:		
	Interchannel	< 65 dB 20 Hz to 20 kHz
	Program to Audition	Typically -80 dB

Installation
SP-16 Side View



The **Dixon Systems's** Model SP-16 is very easy to install. It was designed to be dropped into a 36.75 inch wide by 21.125 inch deep desk top cut-out. The table top should be no less then 1.5 inches think for best support.

The front of the console should be about 6 or 7 inches from the front of the table top for best ease of operation. A modesty panel can be installed at the back and underneath the table to conceal the various cables.

With proper preparation, the SP-16 can be installed and on the air very quickly. The DB-25 connectors, located at the front of the console, are used for all interconnections, and make moving the SP-16 console relatively simple.

Pre-assembled cables for most commonly used equipment are available, or they can be prepared in advance of installation by the station engineer. Cables are intended to enter the console at the rear, either from the bottom or from each side. They are routed to the front of the console on each side, then dressed down to the DB-25 connectors. The is most easily done with one or two modules removed from each side of the console. Individual stereo audio cable could be used for both audio and logic or in permanent installations, multi-pair cables could be used. A front panel conceals the connectors once they have been plugged in.

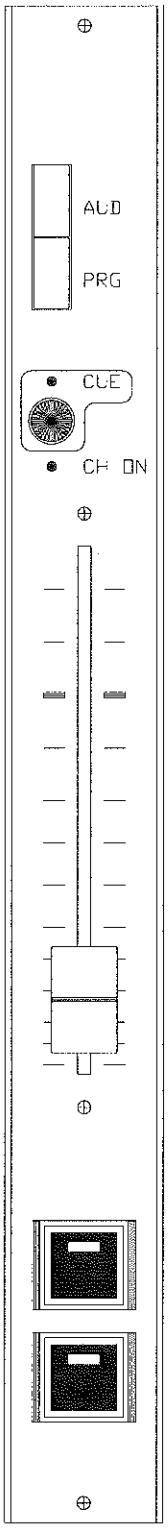
Follow the DB-25 pin-out drawings in each section carefully. The connector drawing provides the pin numbers, but look at the connector you use carefully to be sure where pin 1 is located. Each connector should be numbered to correspond to the module to which it is connected.

Section 2:

Line Input Module

(LIM-01)

SP16 Line Module Controls



Channel Assign
Selects the Program / Audition bus. Both may be assigned at the same time.

Cue LED
Lights when Cue is active.

Cue On
Toggles Cue on and off.

Channel ON LED
Indicates that assign switches and direct output are being fed.

Fader
Controls the audio level being fed to stereo and utility buses.

Start Switch
Turns ON the Channel and can control machine start.

Stop Switch
Turns the Channel OFF and can control machine stop..

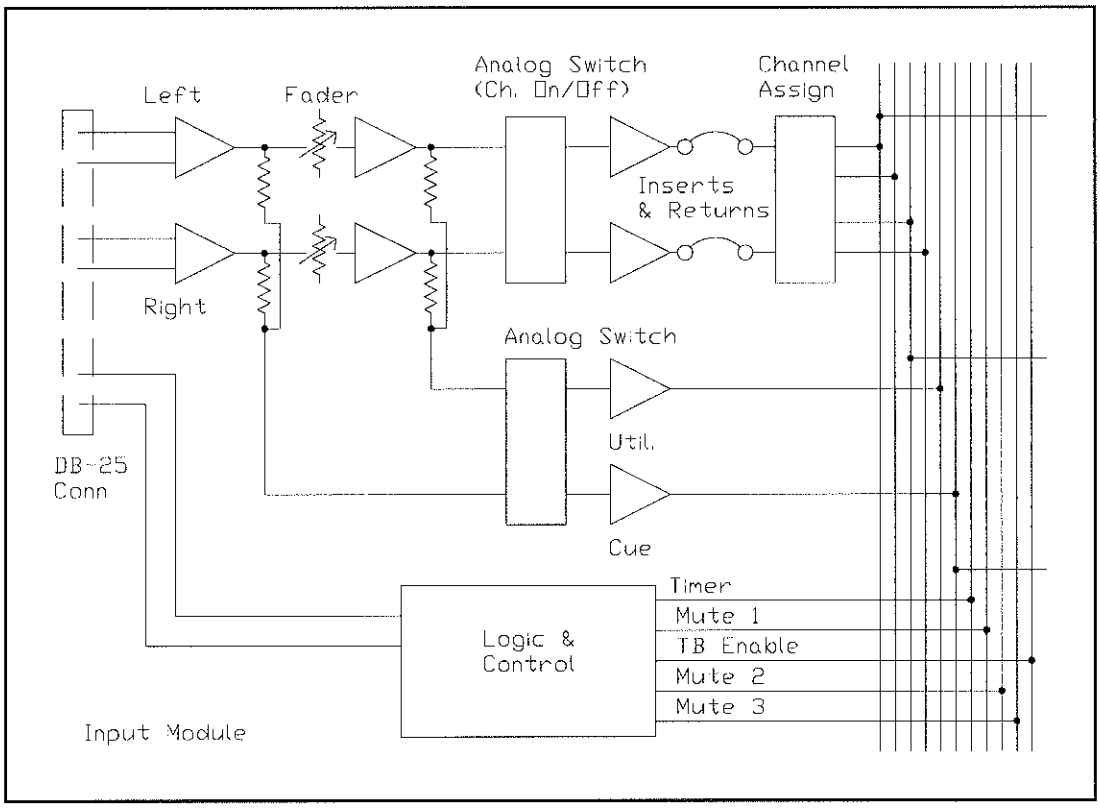
Line Input Module

Description

The line input module used in the SP16 provides both audio input to the console and full logic and remote control of the source equipment. Interconnections are made via the DB-25 connector at the front of the console.

Audio inputs are stereo, active balanced and bridging with an input impedance of about 40K ohms. Modules are normally supplied set for an input level of +4 dBm but can be field modified for a wide range of input levels. Outputs from the module are fed to the program and audition busses, (stereo and balanced) and to the cue and utility busses (mono and unbalanced). Provision has been made for a third stereo mix buss. This bus is also balanced and is intended for such things as ISDN back-feeds.

Each module can be turned on and off remotely and can control (start/stop) source equipment. In addition, the module can be programmed to enable any of the three mute buses and to reset the console's timer.



Audio Interface

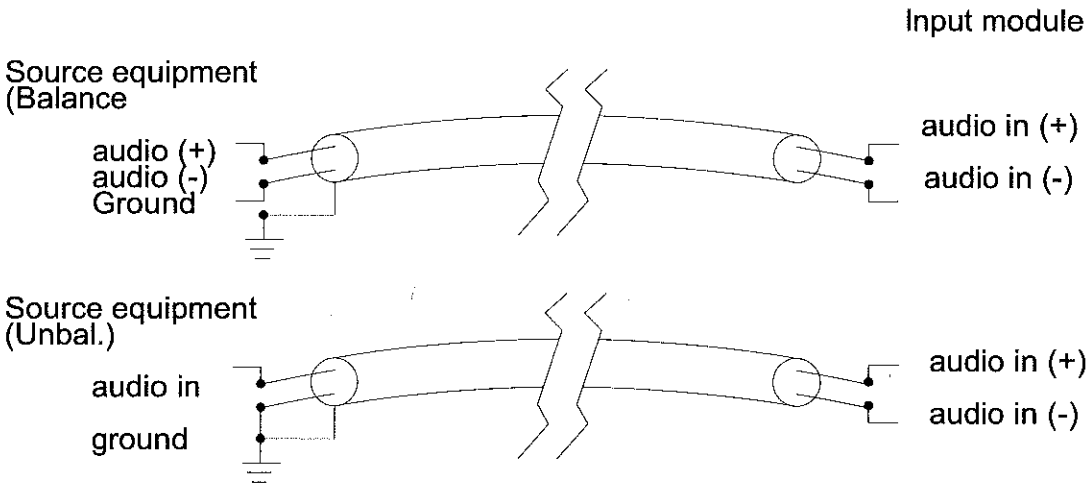
Proper performance of the console depends to a great extent on good grounding practices. A great deal has been written on this subject and we ill not attempt to repeat it here. We do however offer the following suggestions:

1) When using balanced lines, ground at one end only. (Source end recommended)

2) Be consistent throughout the installation.

3) Do not mix logic and audio grounds.

4) Avoid low level unbalanced sources.



NB: The *unbalanced* output level of most equipment is -10 dB.

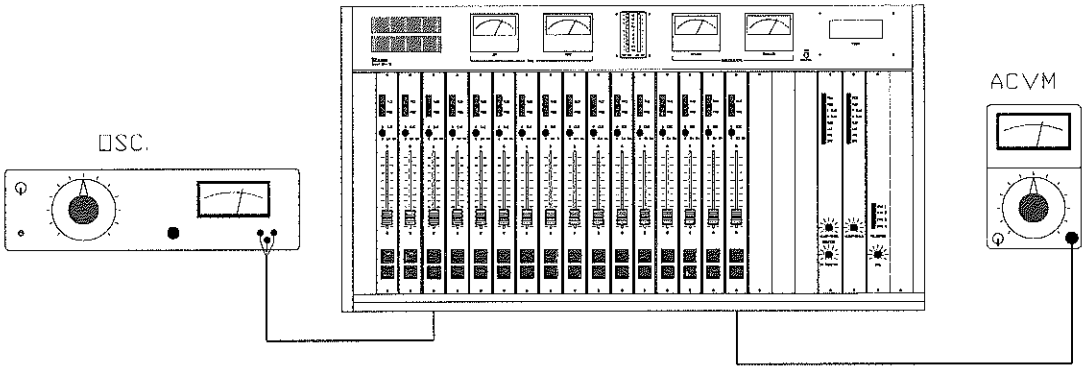
Audio is fed to the console via the DB-25 connector at the front of the board. Normally, only pins 3,4,6,and 7 would be used but provision has been made for a second audio source to be connected to pins 16,17,18, and 19. This was included so that two sources, IE: two cart decks might share one fader. (In this case, the 'stop' switch on the input module would be configured as the second cart machine's 'start' button. There would be no stop.) Space for a resistive combining network is provided on the board and is designated as R1 through R 12. (Six of these positions would normally have jumpers.) This space can also be used for an attenuator pad should a source have an unusually high level.

Audio Path

Audio is fed from the DB-25 connector to U1, and active balanced input stage, with gain established by resistors R14, 17, 20, and 24. There are no gain trim-pots. Over time, gain trim-pots tend to get "tweaked" resulting in a console that can take a considerable amount of time to re-align. It was decided early in the design stage that the SP16 console would not be a resistor decade box. Proper levels, set at the source equipment, will provide the best overall noise and phase performance.

If field modification to gain is made, resistors should be 1% low noise metal film type. Re-adjustment of VR1 and VR2, the common mode adjust trim-pots should then be made. To do this, connect an audio generator (with high and low audio tied together and referenced to ground) to each input (left and right) and adjust VR1 and VR2 for minimum output as seen on the AC voltmeter. (An oscilloscope is even better.)

The output of U1 is fed to a conductive plastic fader and to resistors R27 and R28. These resistors sum the left and right signals from U1 and are fed to U6 which controls audio sent to the cue bus. Accuracy of the fader is better than +/- 1 dB at



normal settings.

The fader controls the amount of signal fed to U2, a non-inverting gain stage. The voltage gain of this stage is approximately 3. The output of U2 is fed to analog switch U3 which determines if the channel is on or off. At the same time, resistors R35 and R36 sum the left and right audio (post fader) and feed this signal to U6 which controls audio sent to the utility bus. U4 and U5 form balanced drivers for the program and audition buses. U7 is used as two current to voltage converters which drive the cue and utility buses.

Insert Points

An insert point is available on the edge connector of each input module but the SP16's frame is not normally supplied pre-wired to connectors. Positions requiring an insert and return path for outboard equipment should be identified prior to ordering the SP16.

However, if needs change, or only one or two modules require an insert point, the field engineer can easily install them. The outputs of U4 and U5 are fed, via jumpers marked "Nor" to the program and audition assign switches. At the same time, a direct output is always available on pins of the board's edge connector. If an insert and return is required for a module, the "Nor." jumpers are removed and then re-installed in the module to the positions marked "Ret." or return. A send and return path is then available on the main connector pins and can be brought to the back of the console via small size shielded cable. There is ample space at the back of the console for a variety of connector options.

It should be noted the direct output is coupled through 47 uF capacitors and so should only be fed to high impedance bridging inputs, typical of most current equipment.

Observe the same grounding practices as all other inputs and outputs of the console.

A Third Stereo Bus

MIX-MINUS PHONE CALLS! Main Mic should be 3rd bus

The SP16 is equipped to accommodate a third stereo, balanced mixing bus. The outputs of the program assign switch go the program buss summing resistors and to positions on the board for resistors R59,62,65, and 68.

When summing resistors are installed in these positions, the third bus is fed and controlled by the program assign switch. Audition is unaffected. This third bus is ideal fro grouping of several sources or for use as a stereo mix-minus bus for back feeding ISDN units.

Utility Bus

The mono utility bus is intended primarily for feeding the telephone system. As indicated earlier, left and right audio is summed and fed to analog switch U6. A jumper located near this switch determines if audio is controlled by the channel on/off logic (position 1) or is locked "on" (position 2) In either case, audio level is controlled by the fader.

If an ~~input~~ module is used to bring a telephone system back into the console, resistor R56 should be removed from the board to prevent audio from reaching the utility bus ~~and~~ causing feedback.

Phone Input Utility Bus "Mono"

Logic and Control

The SP16 is easy to interface with equipment normally found in control rooms, such as CD players, cart machines, turntables, and more recently, hard disc systems. Logic and control connections are made via the DB-25 connectors as well. If cables are pre-wired, installation can be very fast.

The channel Start switch and Stop switch can be sued to remotely control machine start and stop functions. A simple contact closure appears on the DB-25 connector from each of these switches. The are isolated from both audio and logic ground systems in the console and are often all that is required for remote control. At the same time, the collectors of Q3 and Q4 are available on the connector and can be configured as either open collectors or as logic pull down points. Jumpers located near Q3 and Q4 determine either 12 or 24 volt operation of the pull downs. As well, a return to logic ground from pins 12 and 24 of the DB-25 will remotely turn the channel on and off.

The channel start and stop switches control nand gates U11a and U11b which form a latch. The ground starts on pins 12 and 24 also operate this latch. The outputs on pins 3 and 4 then control Q1, Q2, Q3, Q4, Q5, U3 and U11d. If mute diodes are installed, any of three mute buses can be enabled.

U11c and U11d are configured as a one-shot for the timer reset bus. The timer diode must be installed to enable the timer reset function.

The other one-shot, U12a and U12b is used to clock half of U13, a dual D flip-flop. It's output goes to the cue control gate of U6. Pressing the Cue button once turns cue on, pressing it again turns cue off.

Note

Analog switch U3 determines if the module is on or off. Note that when control logic from pin 4 of U11b is high and the analog switch is on, audio is off. Analog switch U6 controls audio fed to the Utility and Cue buses. Again, when the control gate is high, audio is off.

Mute Buses

The mute buses control the Monitor Module and are brought back to the power supply to facilitate inter-connection with "On-Air" lights and other equipment such as 'skimmers.' Mute 1 is the Main Control mute. When high, this bus mutes the control room monitor output and the cue speaker.

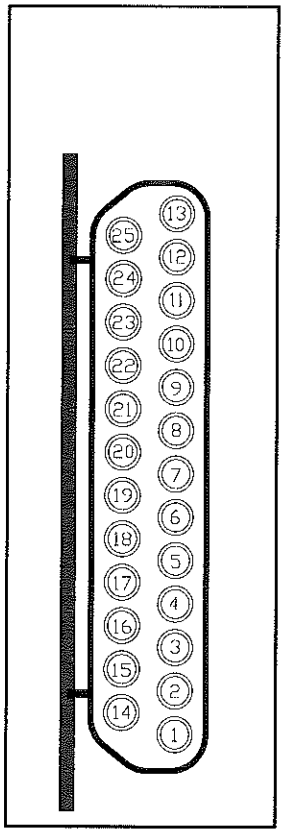
Two other fixed level outputs from the monitor module are controlled by mutes 23 and 3. There is space in the SP16 for two monitor modules.

Timer Bus

Each time a channel "On" button in a line or microphone input module is pressed, a pulse is generated by U11. If a timer diode is installed in the module, this pulse is fed to the timer bus and the timer resets to 0.

Line Input Connector Pinout

Viewed from front of SP16



1 +24V logic
2 Open Collector "off"
3 Audio in (low) left
4 Audio in (high) left
5 Audio ground
6 Audio in (high) right
7 Audio in (low) right
8 Open Collector "on"
9 +12V logic
10 Switch contact "on"
11 Switch contact "on"
12 Remote Channel on
13 Logic ground
14 Logic ground
15 Audio ground
16 Audio in (low) left *
17 Audio in (high) left *
18 Audio in (high) right *
19 Audio in (low) right *
20 Audio ground
21 Logic ground
22 Switch contact "off"
23 Switch contact "off"
24 Remote channel off
25 Logic ground

Line Input Board Parts List

Des.	Item	Value	Rated	Tol.	Mfr.	Part No.
R1	Resistor MF	US	.25w	1%	Phl	MR25F
R2	Resistor MF	US	.25w	1%	Phl	MR25F
R3	Resistor MF	US	.25w	1%	Phl	MR25F
R4	Resistor MF	US	.25w	1%	Phl	MR25F
R5	Resistor MF	US	.25w	1%	Phl	MR25F
R6	Resistor MF	US	.25w	1%	Phl	MR25F
R7	Resistor MF	US	.25w	1%	Phl	MR25F
R8	Resistor MF	US	.25w	1%	Phl	MR25F
R9	Resistor MF	US	.25w	1%	Phl	MR25F
R10	Resistor MF	US	.25w	1%	Phl	MR25F
R11	Resistor MF	US	.25w	1%	Phl	MR25F
R12	Resistor MF	US	.25w	1%	Phl	MR25F
R13	Resistor MF	100K	.25w	1%	Brn	MR25F100K
R14	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R15	Resistor MF	20K	.25w	1%	Phl	MR25F20K
R16	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R17	Resistor MF	9K35	.25w	1%	Phl	MR25F9K35
R18	Resistor MF	24K7	.25w	1%	Phl	MR25F27K4
R19	Resistor MF	100K	.25w	1%	Phl	MR25F100K
R20	Resistor MF	10K	.25w	1%	Phl	MR25F10K
R21	Resistor MF	20K	.25w	1%	Phl	MR25F20K
R22	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R23	Resistor MF	27K4	.25w	1%	Phl	MR25F27K4
R24	Resistor MF	9K35	.25w	1%	Phl	MR25F9K53
R25	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R26	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R27	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R28	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R29	Resistor MF	3K01	.25w	1%	Phl	MR25F3K01
R30	Resistor MF	200R	.25w	1%	Phl	MR25F200R
R31	Resistor MF	3K01	.25w	1%	Phl	MR25F3K01
R32	Resistor MF	200R	.25w	1%	Phl	MR25F200R
R33	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R34	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R35	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R36	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R37	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R38	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R39	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R40	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R41	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R42	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R43	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R44	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R45	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R46	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R47	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R48	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R49	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R50	Resistor MF	30R	.25w	1%	Phl	MR25F30R1

Line Input Board Parts List (Cont.)

Des.	Item	Value	Rated	Tol.	Mfr.	Part No.
R51	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R52	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R53	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R54	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R55	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R56	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R57	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R58	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R59	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R60	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R61	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R62	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R63	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R64	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R65	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R66	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R67	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R68	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R69	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R70	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R71	Resistor MF	56K	.25w	1%	Phl	CR2556k
R72	Resistor C	1 M	.25w	5%	Phl	CR251M
R73	Resistor MF	56K	.25w	1%	Phl	MR25F56K
R74	Resistor C	1 M	.25w	5%	Phl	CR251M
R75	Resistor MF	56K	.25w	1%	Phl	MR25F56K
R76	Resistor C	2K	.25w	5%	Phl	CR25F2K
R77	Resistor C	2K	.25w	5%	Phl	CR25F2K
R78	Resistor C	1K	.25w	5%	Phl	CR25F1K0
R79	Resistor C	1K	.25w	5%	Phl	CR251K
R80	Resistor C	1K	.25w	5%	Phl	CR251K
R81	Resistor C	1K	.25w	5%	Phl	CR251K
R82	Resistor C	1 M	.25w	5%	Phl	CR251M
R83	Resistor MF	56K	.25w	1%	Phl	MRF2556K
R84	Resistor C	2K	.25w	5%	Phl	CR252K
R85	Resistor C	1K	.25w	5%	Phl	CR251K
R86	Resistor MF	56K	.25w	1%	Phl	MRF2556K
R87	Resistor C	2K	.25w	5%	Phl	CR25F2K
R88	Resistor C	1K	.25w	5%	Phl	CR25F1K
C1	Capacitor	22ufd	35v	2%	Phl	681-70181
C2	Capacitor	22ufd	35v	2%	Phl	681-70181
C3	Capacitor	22ufd	35v		Phl	681-70181
C4	Capacitor	22ufd	35v		Phl	681-70181
C5	Capacitor	100pfd	100v	2%	Phl	681-10101
C6	Capacitor	47ufd	35v	2%	Phl	037-56479
C7	Capacitor	100pfd	100v	2%	Phl	681-10101
C8	Capacitor	100pfd	100v	2%	Phl	681-10101
C9	Capacitor	47ufd	35v		Phl	037-56479
C10	Capacitor	100pfd	100v		Phl	681-10101
C11	Capacitor	56pfd	100v	2%	Phl	681-10569
C12	Capacitor	47ufd	35v	2%	Phl	037-10569
C13	Capacitor	56pfd	100v	2%	Phl	681-10569
C14	Capacitor	56pfd	100v	2%	Phl	681-10569
C15	Capacitor	47ufd	35v		Phl	037-56479
C16	Capacitor	56pfd	100v		Phl	681-10569
C17	Capacitor	82pfd	100v	2%	Phl	681-10829
C18	Capacitor	47ufd	35v		Phl	037-56479
C19	Capacitor	82pfd	100v	2%	Phl	681-10829
C20	Capacitor	47ufd	35v		Phl	037-56479

Line Input Board Parts List (Cont.)

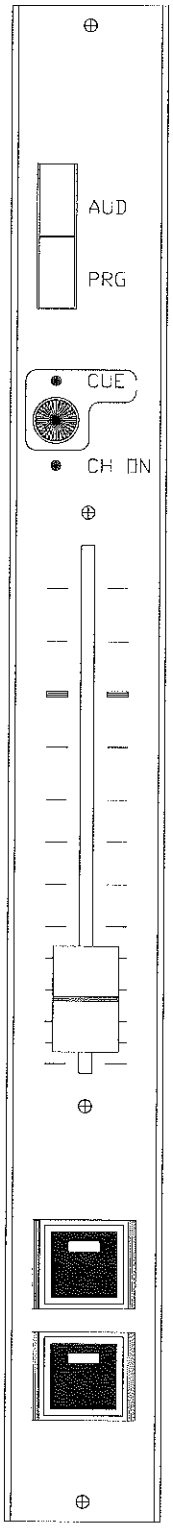
Des.	Item	Value	Rated	Tol.	Mfr.	Part No.
C21	Capacitor	82pfd	100v	2%	Phl	681-10829
C22	Capacitor	47ufd	35v		Phl	037-56479
C23	Capacitor	82pfd	100v	2%	Phl	681-10829
C24	Capacitor	47ufd	35v		Phl	037-56479
C25	Capacitor	82pfd	100v	2%	Phl	681-10829
C26	Capacitor	82pfd	100v	2%	Phl	681-10829
C27	Capacitor	6.8ufd	35v		Mat	
C28	Capacitor	.01ufd	100v		Mat	
C29	Capacitor	.01ufd	100v		Var	
C30	Capacitor	.01ufd	100v		Var	
C31	Capacitor	.01ufd	100v		Var	
C32	Capacitor	6.8ufd	35v		Var	
C33	Capacitor	.01ufd	100v		Phl	
C34	Capacitor	100ufd	35v		Var	
C35	Capacitor	.01ufd	100v		Phl	
C36	Capacitor	.01ufd	100v		Var	
C37	Capacitor	100ufd	35v		Var	
C38	Capacitor	.01ufd	100v		Phl	
C39	Capacitor	100ufd	35v		Var	
C40	Capacitor	.01ufd	100v		Phl	
C41	Capacitor	.01ufd	100v		Phl	
C42	Capacitor	.01ufd	100v		Phl	
Q1	Transistor	NPN			Var	2N3904
Q2	Transistor	NPN			Var	2N3904
Q3	Transistor	NPN			Var	2N3904
Q4	Transistor	NPN			Var	2N3904
Q5	Transistor	NPN			Var	2N3904
Q6	Transistor	NPN			Var	2N3904
U1	Dual Opamp				TI	TL072
U2	Opamp				SI	NE5534
U3	Analog Switch				Var	CD4053
U4	Dual Opamp				TI	TL072
U5	Dual Opamp				TI	TL072
U6	Analog Switch				Var	CD4053
U7	Dual Opamp				TI	TL072
U8	Voltage Regulator		+12v		Var	7912
U9	Voltage Regulator		+15v		Var	7815
U10	Voltage Regulator		-15v		Var	7915
U11	Cmos Logic				Var	4011
U12	Cmos Logic				Var	4011
U13	Cmos Logic				Var	4013
D1	Diode (Small Sig.)				Var	1N914
D2	Diode (Small Sig.)				Var	1N914
D3	Diode (Small Sig.)				Var	1N914
D4	Diode (Small Sig.)				Var	1N914

Section 3:

Microphone Input Module

(MIM-01)

SP-16 Microphone Input Module Controls



Channel Assign
Selects the Program / Audition bus. Both may be assigned at the same time.

Cue/Talkback LED
Lights when Cue or talkback is active.

Cue On
Toggles Cue on and off.

Channel ON LED
Indicates that assign switches and direct output are being fed.

Fader
Controls the audio level being fed to stereo and utility buses.

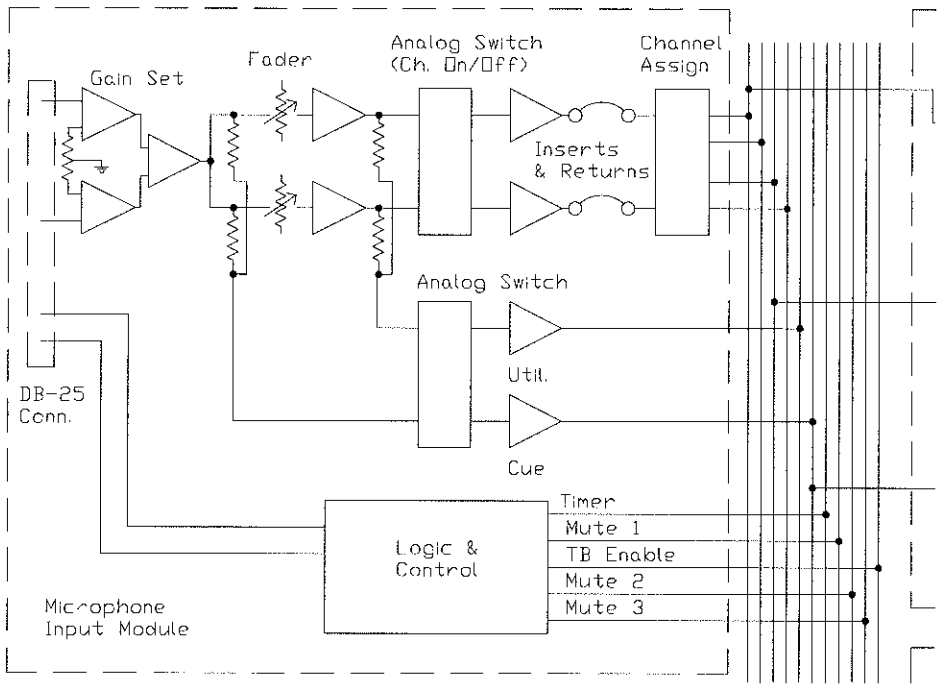
Start Switch
Turns ON the Channel and can control any of 3 mute lines.

Stop Switch
Turns the Channel OFF.

Microphone Input Module

The microphone input module used in the SP-16 has circiutry which provides for audio input to the console, phantom power for condenser microphones, and full logic and talkback capability. All interconnections are made via the DB-25 connector at the front of the console. The module is intended for use with professional low impedance microphones. The module employs a transformerless differential input pre-amplifier. Avoiding transformers has several advantages, including lower cost, smaller physical size, and reduced distortion. The equivalent input noise is about 760 nV over a 20 Hz to 20 kHz frequency band or about -122 dB referred to 1V, which is over 26 dB lower than a typical microphone's output from the 30 dB SPL ambient noise level in a quiet room. THD at maximum gain is under .01% and less than .005% at minimum gain. Potentiometer R7 is used to adjust the circuit gain from about 4 to 270 which permits the use of a wide variety of microphones. To further enhance circuit performance, potentiometer R13 is used to trim common mode rejection.

Each microphone module can be turned on and off remotely and can be programmed to enable any of the three mute buses and to reset the console's timer.



Audio Path

Audio is fed from the DB-25 connector to U1 and U2 which form the differential microphone preamplifier. From this point on, the audio path is identical to that of the line input module. Note that a stereo fader is used. While this is not necessary, it simplifies the number of spare parts you may wish to keep on hand. At the same time, it permits the installation of a stereo 'pan pot' which may be desirable in some situations.

Common mode rejection is set at the factory and should not need further adjustment unless components are changed. The adjustment procedure is the same as outlined in the line input module section of this manual and will not be repeated here.

The microphone preamplifier's gain is "roughed in" at the factory. You may wish to adjust this for the specific microphone used with each module. It should be adjusted so that the loudest voice will not cause clipping. This should be done during or prior to the installation of the SP-16.

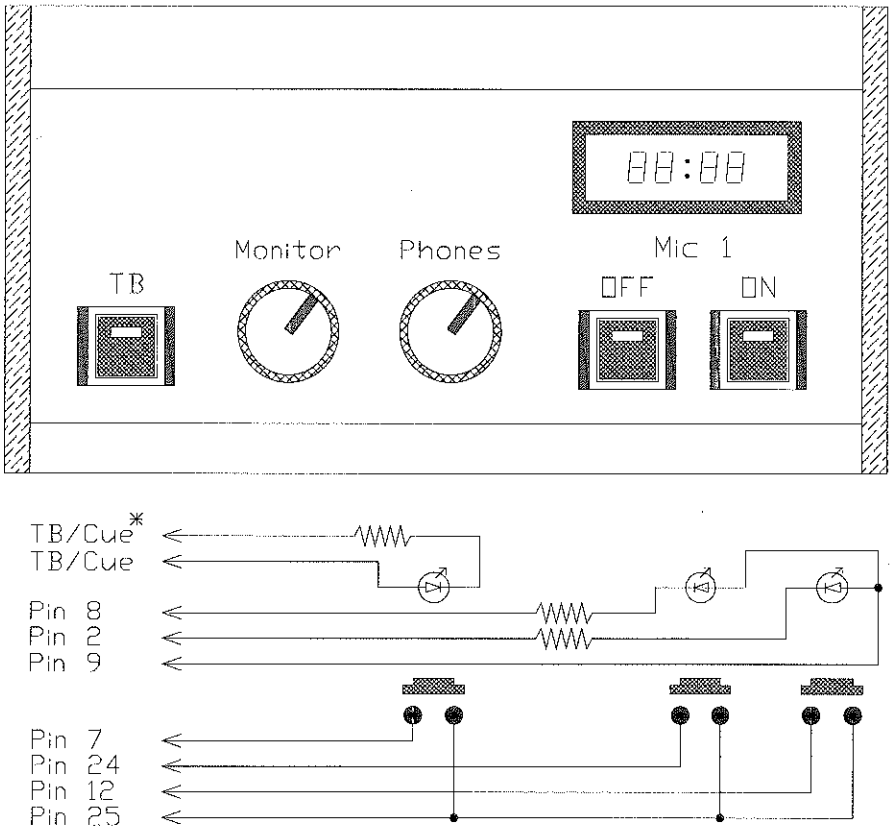
Logic and Control

Again, all the features of the line input module such as remote start and stop, isolated switch contacts, and open collectors or pull down logic points are available on the DB-25 connector of the microphone module. Pin 7 on this connector is the Talkback Enable pin. When returned to logic ground, this pin activates the control gate of U7, turns on the cue send in the module and activates the talkback LED located beside the cue LED. If Cue is turned on, the talkback LED will turn off and the cue LED will come on. At the same time, the enable line signals the talkback/cue module to bypass the cue volume control permitting talkback to be heard even if the cue volume is turned all the way down.

Turrets

The SP-16 microphone input module has provision for remote channel "On/Off" control and tally. The illustration below is typical of a single microphone turret with microphone "On/Off" and talkback buttons. The pin numbers are those for the microphone module's input connector. The channel "On" and "Off" LEDs are driven by the open collector outputs of the module. Note that the channel "On" LED is actually driven by the channel "off" transistor and vise versa. The talkback LED would be controlled by the talkback/cue module and would be connected to one of the four stations.

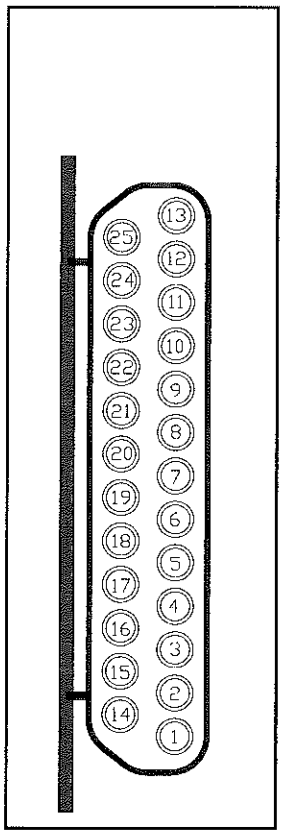
The gain controls shown in the illustration would typically control a studio power amplifier and studio headphone amplifier.



Dixon Systems offers the CT-22 turret which controls two microphones.

Microphone Module Connector Pinout

Viewed from front of SP-16



1 +24V logic
2 Open Collector "off"
3 NC
4 Microphone audio in
5 Audio ground
6 Microphone audio in
7 Talkback Enable
8 Open Collector "on"
9 +12V logic
10 Switch contact "on"
11 Switch contact "on"
12 Remote Channel on
13 Logic ground
14 Logic ground
15 Audio ground
16 NC
17 Audio ground
18 Audio ground
19 +48V Phantom Power
20 NC
21 Logic ground
22 Switch contact "off"
23 Switch contact "off"
24 Remote channel off
25 Logic ground

Microphone Input Board Parts List

Des.	Item	Value	Rated	Tol.	Mfr.	Part No.
R1	Resistor MF	6K8	.25w	1%	Phl	MR25F6K81
R2	Resistor MF	6K8	.25w	1%	Phl	MR25F6K81
R3	Resistor MF	1K	.25w	1%	Phl	MR25F1K0
R4	Resistor MF	1K	.25w	1%	Phl	MR25F1K0
R5	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R6	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R7	Resistor VAR	20K	.25w	1%	Phl	MR25F20K0
R8	Resistor MF	200R	.25w	1%	Phl	MR25F200R
R9	Resistor MF	3K01	.25w	1%	Phl	MR25F3K01
R10	Resistor MF	3K01	.25w	1%	Phl	MR25F3K01
R11	Resistor MF	100K	.25w	1%	Phl	MR25F100K0
R12	Resistor MF	95K3	.25w	1%	Phl	MR25F95K3
R13	Resistor VAR	5K	.25w	1%	Brn	
R14	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R15	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R16	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R17	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R18	Resistor MF	3K01	.25w	1%	Phl	MR25F3K01
R19	Resistor MF	3K01	.25w	1%	Phl	MR25F3K01
R20	Resistor MF	200R	.25w	1%	Phl	MR25F200R
R21	Resistor MF	200R	.25w	1%	Phl	MR25F200R
R22	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R23	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R24	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R25	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R26	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R27	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R28	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R29	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R30	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R31	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R32	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R33	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R34	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R35	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R36	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R37	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R38	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R39	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R40	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R41	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R42	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R43	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R44	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R45	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R46	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R47	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R48	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R49	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R50	Resistor MF	20K	.25w	1%	Phl	MR25F20K0

Microphone Input Board Parts List (Cont.)

Des.	Item	Value	Rated	Tol.	Mfr.	Part No.
R51	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R52	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R53	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R54	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R55	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R56	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R57	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R58	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R59	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R60	Resistor C	56K	.25w	5%	Phl	CR2556K
R61	Resistor C	1K	.25w	5%	Phl	CR251K
R62	Resistor C	56K	.25w	5%	Phl	CR2556K
R63	Resistor C	1M	.25w	5%	Phl	CR251M
R64	Resistor C	1K	.25w	5%	Phl	CR251K
R65	Resistor C	1K	.25w	5%	Phl	CR251K
R66	Resistor C	56K	.25w	5%	Phl	CR2556K
R67	Resistor C	2K	.25w	5%	Phl	CR252K
R68	Resistor C	2K	.25w	5%	Phl	CR252K
R69	Resistor C	1K	.25w	5%	Phl	CR251K
R70	Resistor C	1K	.25w	5%	Phl	CR251K
R71	Resistor C	1M	.25w	5%	Phl	CR251M
R72	Resistor C	56K	.25w	5%	Phl	CR2556K
R73	Resistor C	1M	.25w	5%	Phl	CR251M
R74	Resistor C	56K	.25w	5%	Phl	CR2556K
R75	Resistor C	2K	.25w	5%	Phl	CR252K
R76	Resistor C	2K	.25w	5%	Phl	CR25F2K
R77	Resistor C	1K	.25w	5%	Phl	CR25F1K
R78	Resistor C	1K	.25w	5%	Phl	CR25F1K0
C1	Capacitor	180pfd	100v	2%	Phl	681-70181
C2	Capacitor	180pfd	100v	2%	Phl	681-70181
C3	Capacitor	47ufd	35v		Phl	037-56479
C4	Capacitor	47ufd	35v		Phl	037-56479
C5	Capacitor	100pfd	100v	2%	Phl	681-10101
C6	Capacitor	100pfd	100v	2%	Phl	681-10101
C7	Capacitor	56pfd	100v	2%	Phl	681-10569
C8	Capacitor	56pfd	100v	2%	Phl	681-10569
C9	Capacitor	47ufd	35v		Phl	037-56479
C10	Capacitor	47ufd	35v		Phl	037-56479
C11	Capacitor	56pfd	100v	2%	Phl	681-10569
C12	Capacitor	56pfd	100v	2%	Phl	037-10569
C13	Capacitor	56pfd	100v	2%	Phl	681-10569
C14	Capacitor	56pfd	100v	2%	Phl	681-10569
C15	Capacitor	47ufd	35v		Phl	037-56479
C16	Capacitor	47ufd	35v		Phl	037-56479
C17	Capacitor	82pfd	100v	2%	Phl	681-10829
C18	Capacitor	47ufd	35v		Phl	037-56479
C19	Capacitor	82pfd	100v	2%	Phl	681-10829
C20	Capacitor	47ufd	35v		Phl	037-56479
C21	Capacitor	82pfd	100v	2%	Phl	681-10829
C22	Capacitor	47ufd	35v		Phl	037-56479

Microphone Input Board Parts List (Cont.)

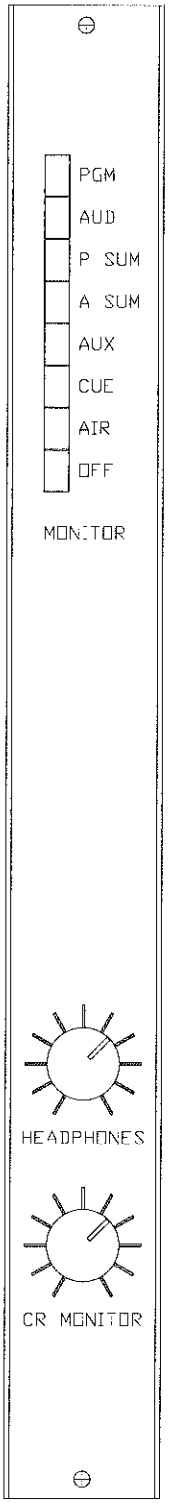
Des.	Item	Value	Rated	Tol.	Mfr.	Part No.
C23	Capacitor	82pfd	100v	2%	Phl	681-10829
C24	Capacitor	47ufd	35v		Phl	037-56479
C25	Capacitor	82pfd	100v	2%	Phl	681-10829
C26	Capacitor	82pfd	100v	2%	Phl	681-10829
C27	Capacitor	6.8ufd	20v		Mat	6.8K20
C28	Capacitor	6.8ufd	20v		Mat	6.8K20
C29	Capacitor	.01ufd	100v		Var	
C30	Capacitor	.01ufd	100v		Var	
C31	Capacitor	.01ufd	100v		Var	
C32	Capacitor	.01ufd	100v		Var	
C33	Capacitor	470ufd	35v		Phl	037-50471
C34	Capacitor	.01ufd	100v		Var	
C35	Capacitor	470ufd	35v		Phl	037-50471
C36	Capacitor	.01ufd	100v		Var	CFR15/250A
C37	Capacitor	.01ufd	100v		Var	CFR15/250A
C38	Capacitor	470ufd	35v		Phl	037-50471
C39	Capacitor	.01ufd	100v		Var	CFR15/250A
C40	Capacitor	.01ufd	100v		Phl	CFR15/250A
C41	Capacitor	470ufd	35v		Phl	037-50471
C42	Capacitor	.01ufd	100v		Phl	CFR15/250A
C43	Capacitor	22pfd	100v	2%	Phl	681-10829
C44	Capacitor	.01ufd	100v		Var	CFR15/250A
C45	Capacitor	.01ufd	100v		Phl	CFR15/250A
Q1	Transistor	NPN			Var	2N3904
Q2	Transistor	NPN			Var	2N3904
Q3	Transistor	NPN			Var	2N3904
Q4	Transistor	NPN			Var	2N3904
Q5	Transistor	NPN			Var	2N3904
Q6	Transistor	NPN			Var	2N3904
U1	Dual Opamp				AD	SSM2932
U2	Opamp				SI	NE5534
U3	Dual Opamp				Var	5532
U4	Analog Switch				Var	CD4053
U5	Dual Opamp				TI	TL072
U6	Dual Opamp				TI	TL072
U7	Analog Switch				Var	CD4053
U8	Dual Opamp				TI	TL072
U9	Voltage Regulator		-15v		Var	7915
U10	Voltage Regulator		+15v		Var	7815
U11	Voltage Regulator		+12v		Var	7915
U12	Cmos Logic				Var	4011
U13	Cmos Logic				Var	4011
U14	Cmos Logic				Var	4013
D1	Diode (Small Sig.)				Var	1N914
D2	Diode (Small Sig.)				Var	1N914
D3	Diode (Small Sig.)				Var	1N914
D4	Diode (Small Sig.)				Var	1N914
D5	Diode (Small Sig.)				Var	1N914
D6	Diode (Small Sig.)				Var	1N914
D7	Diode (Small Sig.)				Var	1N914

Section 4:

Monitor Module

(MON-01)

SP-16 Monitor Controls



Monitor Select Switches
Selects the source to be monitored.
All outputs from the module follow these switches.

Headphone Volume
Adjusts the level at the Headphone jack.

Control Room Monitor
Adjusts the signal level fed to the control room's monitor power amplifier.

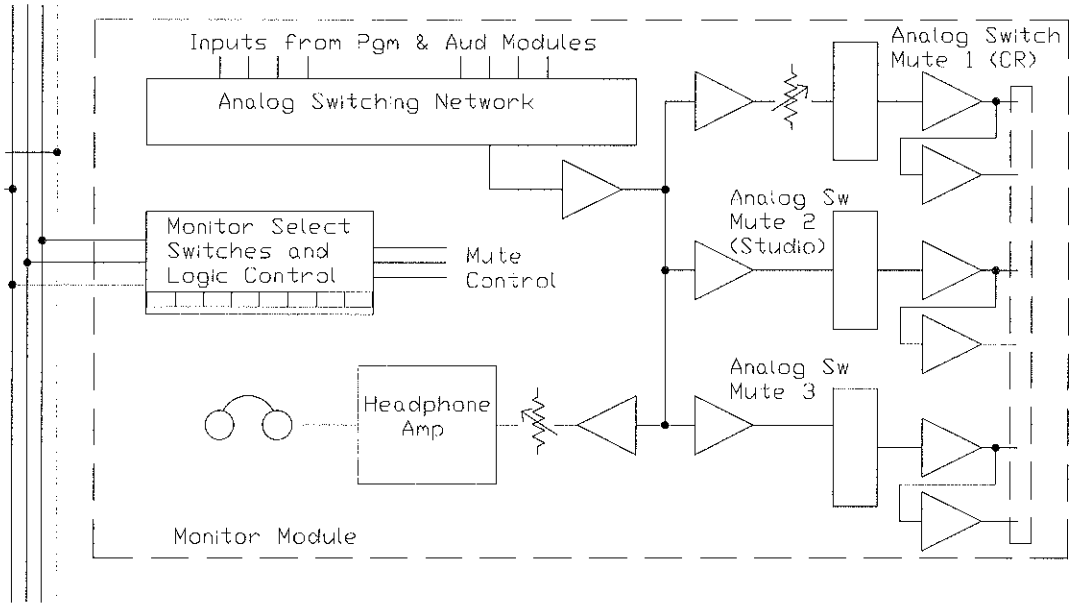
Monitor Module

Description

The monitor module in the SP-16 allows monitoring of all buses in the console. There are four stereo outputs and an external balanced stereo input. Normally, one module is used for the control room, a second one is used to feed studios. Connections are made via the DB-25 connector at the front of the console.

The module allows monitoring of Program stereo, Audition stereo, Program sum (mono), Audition sum (mono), Cue and Utility master output amplifiers, or an external, active-balanced input. This input is most often used for off-air monitoring. A preselector (such as **Dixon System's** AS110B Remote Switcher) ahead of this input could be used to expand monitoring capability considerably.

The module is normally supplied with a switch bank of eight interlocking switches but the unique (and simple) switching arrangement makes it possible, on special order, to monitor more than one source at a time. Note that only a DC voltage is present on these switches.



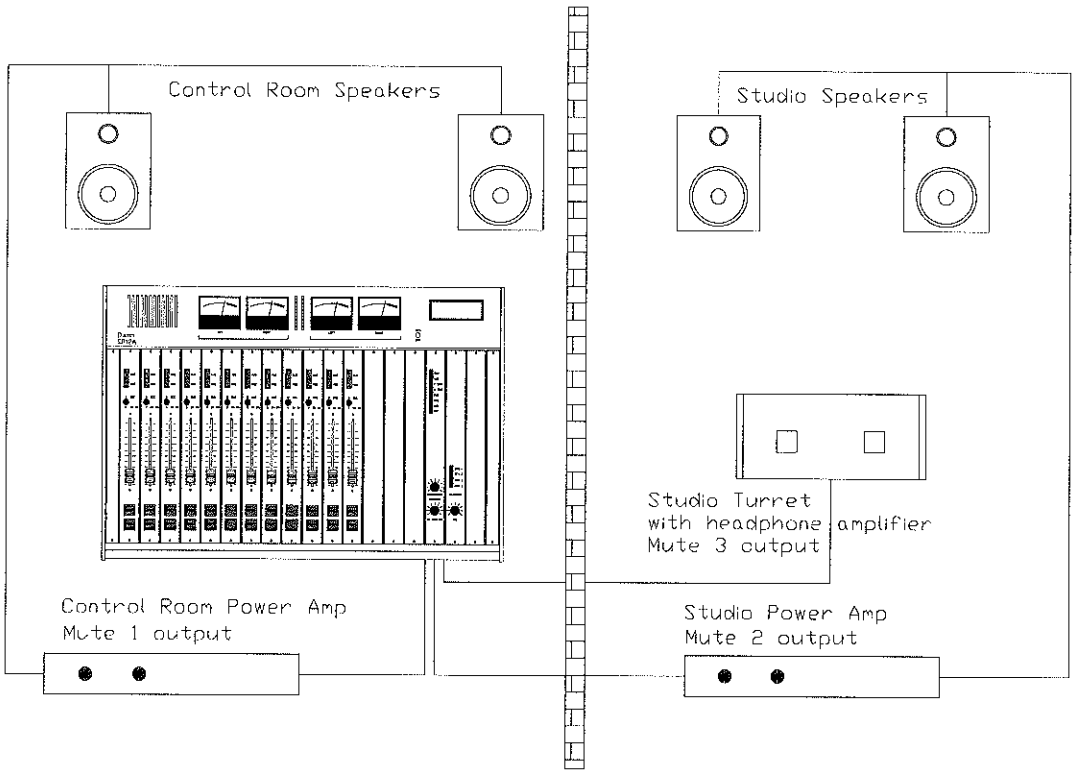
MON-01 Simplified Block Diagram

Typical Monitor Setup

The illustration below is typical of many installations. As shown, the first output of the monitor module should feed the control room's power amplifier. The output is low impedance, balanced and its level is controlled by the CR MONITOR volume control. When Mute 1 is activated, there is no audio at this output.

Two fixed level outputs are also provided and are controlled by Mutes 2 and 3. They are also low impedance and active-balanced. Usually, the output controlled by Mute 2 is used to feed studio power amplifiers and Mute 3 is used to drive all studio headphone amplifiers. Since the source impedance is low, more than one high impedance bridging amplifier can be used. Gains are usually controlled in the studios at turrets which may also have microphone on/off controls, talkback etc. built in.

The fourth output (not shown) is intended for headphones and is brought out to a frame-mounted headphone jack. Its output level is determined by the setting of the HEADPHONES volume control located directly above the CR MONITOR control.



CAUTION:

The headphone amplifier in the SP-16 is capable of driving most headphones to a VERY LOUD level. Avoid periods of loud monitoring and preserve your hearing!

The headphone amplifiers in the SP-16 can withstand considerable abuse. Note that a 91 Ohm build-out resistor is used to feed the headphones. Nominal 8 Ohm headphones present a total load of about 100 Ohms. Even if the headphones short out, the amplifiers are quite safe and won't suffer any damage.

Input Switching

The monitor module is connected via the circuit board's edge connector to all monitor/meter buses and to the external input via the DB-25 connector. A bank of analog switches, U1 through U7, have their gates controlled by the mechanical switches. This makes a number of switching options possible and determines which buses are fed to voltage followers U8a and U8b. Note that when a gate is "high", audio is routed through the analog switch to audio ground and no audio reaches U8. When a gate goes "low", the analog switch feeds the signal to the inverting or virtual ground input of U8. If more than one gate is "low", U8 acts as a current summing amplifier.

Audio and Logic

Left and right audio from U8a and U8b is fed to the control room gain control, R26 and R27, the headphone gain control, R105 and R106 and to analog switches U9 and U12. These switches are controlled by Q1 (Mute 3) and Q2 (Mute 2) respectively.

Audio from the control room gain control is fed to U18a and U18b and then to analog switch U15 which provides a mute for this output. U15 is controlled by Q3 which monitors the Mute 1 bus. Operational amplifiers U16 and U17 are arranged as active balanced line drivers as are U10 & U11 (Mute 3) and U13 & U14 (Mute 2).

Audio from the headphone gain control is fed to U19a and U19b which drive the Class AB stereo headphone amplifiers Q4, Q5, Q6, and Q7.

U20a and U20b form an active-balanced, bridging external stereo input to the module. This is normally used for the off-air feed to the console. Nominal input level is +4 dBm but, since signal processing varies so greatly from station to station, we SOUNDsuggest the level fed to this input should be adjusted at the source to sound as loud as the other sources.

CAUTION:

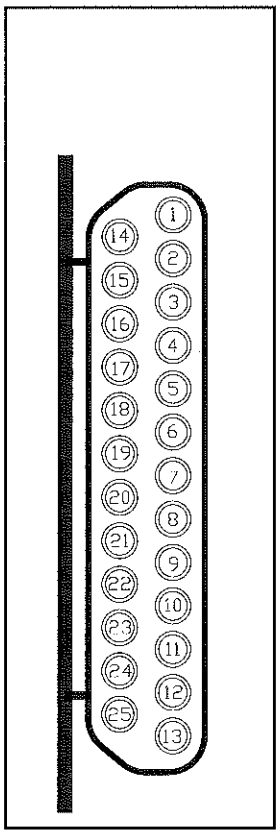
When removing the monitor module from the console, remember to

disconnect the headphone connector cable, located at the front of the

circuit board, before attempting to fully extract the module.

Monitor Module Connector Pinout

Viewed from front of SP-16



1 Audio ground
2 CR Mon out (R)+
3 CR Mon out (L) +
4 Studio 1 out (R) -
5 Studio 1 out (L) -
6 Audio ground
7 Studio 2 out (L) +
8 Studio 2 out (R) +
9 Ext. input (L) +
10 Audio ground
11 Ext. input (R) +
12 Mute line #2
13 Audio ground
14 CR Mon out (R) -
15 CR Mon out (L) -
16 Audio ground
17 Studio 1 out (R) +
18 Studio 1 out (L) +
19 Studio 2 out (L) -
20 Studio 2 out (R) -
21 Audio ground
22 Ext input (L) -
23 Ext input (R) -
24 Mute line #1
25 Mute line #3

Monitor Board Parts List

Des.	Item	Value	Rated	Tol.	Mfr.	Part No.
R1	Resistor MF	100K	.25w	1%	Phl	MR25F100K0
R2	Resistor MF	100K	.25w	1%	Phl	MR25F100K0
R3	Resistor MF	100K	.25w	1%	Phl	MR25F100K0
R4	Resistor MF	100K	.25w	1%	Phl	MR25F100K0
R5	Resistor MF	100K	.25w	1%	Phl	MR25F100K0
R6	Resistor MF	100K	.25w	1%	Phl	MR25F100K0
R7	Resistor MF	100K	.25w	1%	Phl	MR25F100K0
R8	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R9	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R10	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R11	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R12	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R13	Resistor MF	20K	.25w	1%	Brn	MR25F20K0
R14	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R15	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R16	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R17	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R18	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R19	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R20	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R21	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R22	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R23	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R24	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R25	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R26	Var Pot	5K	.5w		Brn	95A2DC24
R27	Var Pot	5K	.5w		Brn	95A2DC24
R28	Resistor MF	2K	.25w	1%	Phl	MR25F2K0
R29	Resistor MF	200R	.25w	1%	Phl	MR25F200R0
R30	Resistor MF	200R	.25w	1%	Phl	MR25F200R0
R31	Resistor MF	2K	.25w	1%	Phl	MR25F2K0
R32	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R33	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R34	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R35	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R36	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R37	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R38	Resistor MF	100K	.25w	1%	Phl	MR25F100K0
R39	Resistor MF	1K	.25w	1%	Phl	MR25F1K0
R40	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R41	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R42	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R43	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R44	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R45	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R46	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R47	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R48	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R49	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R50	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R51	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R52	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R53	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R54	Resistor MF	20K	.25w	1%	Phl	MR25F20K0

Monitor Board Parts List (Cont.)

Des.	Item	Value	Rated	Tol.	Mfr.	Part No.
R55	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R56	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R57	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R58	Resistor MF	100K	.25w	1%	Phl	MR25F100K0
R59	Resistor MF	1K	.25w	1%	Phl	MR25F1K0
R60	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R61	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R62	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R63	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R64	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R65	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R66	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R67	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R68	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R69	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R70	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R71	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R72	Resistor MF	100K	.25w	1%	Phl	MR25F100K0
R73	Resistor MF	1K	.25w	1%	Phl	MR25F1K0
R74	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R75	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R76	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R77	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R78	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R79	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R80	Resistor MF	27K	.25w	1%	Phl	MR25F27K4
R81	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R82	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R83	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R84	Resistor MF	100K	.25w	1%	Phl	MR25F100K0
R85	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R86	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R87	Resistor MF	27K	.25w	1%	Phl	MR25F27K4
R88	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R89	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R90	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R91	Resistor MF	100K	.25w	1%	Phl	MR25F100K0
R92	Resistor MF	1K	.25w	1%	Phl	MR25F1K0
R93	Resistor MF	6K8	.25w	1%	Phl	MR25F6K81
R94	Resistor C	22R	.25w	5%	Phl	CR2522R
R95	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R96	Resistor MF	680R	.25w	1%	Phl	MR25F680R
R97	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R98	Resistor MF	200R	.25w	1%	Phl	MR25F200R
R99	Resistor MF	680R	.25w	1%	Phl	MR25F680R
R100	Resistor C	10R	.25w	5%	Phl	CR2510R
R101	Resistor C	10R	.25w	5%	Phl	CR2510R
R102	Resistor MF	91R	.25w	1%	Phl	MR25R91R
R103	Resistor MF	6K8	.25w	1%	Phl	MR25F6K81
R104	Resistor C	22R	.25w	5%	Phl	CR2522R
R105	Var Pot	5K	.5w		Brn	
R106	Var Pot	5K	.5w		Brn	
R107	Resistor MF	1K	.25w	1%	Phl	MR25F1K0
R108	Resistor MF	6K8	.25w	1%	Phl	MR25R6K81

Monitor Board Parts List (Cont.)

Des.	Item	Value	Rated	Tol.	Mfr.	Part No.
R109	Resistor C	22R	.25w	5%	Phl	CR2522R
R110	Resistor C	10R	.25w	5%	Phl	CR2510R
R111	Resistor MF	680R	.25w	1%	Phl	MR25F680R
R112	Resistor MF	91R	.25w	1%	Phl	MR25F91R
R113	Resistor C	10R	.25w	5%	Phl	CR2510R
R114	Resistor C	10R	.25w	5%	Phl	CR2510R
R115	Resistor MF	200R	.25w	1%	Phl	MR25F200R
R116	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R117	Resistor MF	680R	.25w	1%	Phl	MR25F680R
R118	Resistor MF	6K8	.25w	1%	Phl	MR25F6K81
R119	Resistor C	22R	.25w	5%	Phl	CR2522R
C1	Capacitor	100pfd	100v	2%	Phl	681-10101
C2	Capacitor	47ufd	35v		Ucc	037-56479
C3	Capacitor	47ufd	35v		Ucc	037-56479
C4	Capacitor	100pfd	100v	2%	Phl	681-10101
C5	Capacitor	100pfd	100v	2%	Phl	681-10101
C6	Capacitor	22ufd	35v		Phl	037-50229
C7	Capacitor	22ufd	35v		Phl	037-50229
C8	Capacitor	100pfd	100v	2%	Phl	681-10101
C9	Capacitor	56pfd	100v	2%	Phl	681-10569
C10	Capacitor	56pfd	100v	2%	Phl	681-10569
C11	Capacitor	470ufd	35v		Ucc	SME35VB471
C12	Capacitor	470ufd	35v		Ucc	SME35VB471
C13	Capacitor	56pfd	100v	2%	Phl	681-10569
C14	Capacitor	56pfd	100v	2%	Phl	681-10569
C15	Capacitor	470ufd	35v		Ucc	SME35VB471
C16	Capacitor	470ufd	35v		Ucc	SME35VB471
C17	Capacitor	56pfd	100v	2%	Phl	681-10569
C18	Capacitor	56pfd	100v	2%	Phl	681-10569
C19	Capacitor	470ufd	35v		Ucc	SME35VB471
C20	Capacitor	470ufd	35v		Ucc	SME35VB471
C21	Capacitor	56pfd	100v	2%	Phl	681-10569
C22	Capacitor	56pfd	100v	2%	Phl	681-10569
C23	Capacitor	470ufd	35v		Ucc	SME35VB471
C24	Capacitor	470ufd	35v		Ucc	SME35VB471
C25	Capacitor	56pfd	100v	2%	Phl	681-10569
C26	Capacitor	56pfd	100v	2%	Phl	681-10569
C27	Capacitor	470ufd	35v		Ucc	SME35VB471
C28	Capacitor	470ufd	35v		Ucc	SME35VB471
C29	Capacitor	56pfd	100v	2%	Phl	681-10569
C30	Capacitor	56pfd	100v	2%	Phl	681-10569
C31	Capacitor	470ufd	35v		Ucc	SME35VB471
C32	Capacitor	470ufd	35v		Ucc	SME35VB471
C33	Capacitor	100pfd	100v	2%	Phl	681-10101
C34	Capacitor	22ufd	35v		Phl	037-50229
C35	Capacitor	22ufd	35v		Phl	037-50229
C36	Capacitor	100pfd	100v	2%	Phl	681-10101
C37	Capacitor	22ufd	35v		Phl	037-50229
C38	Capacitor	22ufd	35v		Phl	037-50229
C39	Capacitor	100pfd	100v	2%	Phl	681-10101
C40	Capacitor	100pfd	100v	2%	Phl	681-10101
C41	Capacitor	22ufd	35v		Phl	037-50229
C42	Capacitor	22ufd	35v		Phl	037-50229
C43	Capacitor	470ufd	35v		Ucc	SME35VB471

Monitor Board Parts List (Cont.)

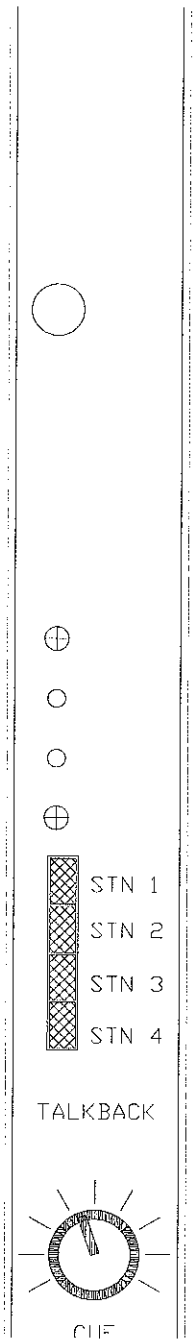
Des.	Item	Value	Rated	Tol.	Mfr.	Part No.
C44	Capacitor	6.8ufd	25v		Var	
C45	Capacitor	100pfd	100v	2%	Phl	681-10101
C46	Capacitor	1000ufd	35v		Var	
C47	Capacitor	470ufd	35v		Ucc	SME35VB471
C48	Capacitor	100pfd	100v	2%	Phl	681-10101
C49	Capacitor	1000ufd	35v		Var	
C50	Capacitor	6.8ufd	25v		Var	
C51	Capacitor	470ufd	35v		Ucc	SME35VB471
C52	Capacitor	.01ufd	100v		Phl	CFR15/250A
C53	Capacitor	.01ufd	100v		Phl	CFR15/250A
C54	Capacitor	470ufd	35v		Ucc	SME35VB471
C55	Capacitor	470ufd	35v		Ucc	SME35VB471
C56	Capacitor	.01ufd	100v		Phl	CFR15/250A
C57	Capacitor	.01ufd	100v		Phl	CFR15/250A
C58	Capacitor	.01ufd	100v		Phl	CFR15/150A
C59	Capacitor	.01ufd	100v		Phl	CFR15/250A
C60	Capacitor	470ufd	35v		Ucc	SME35VB471
C61	Capacitor	470ufd	35v		Ucc	SME35VB471
C62	Capacitor	.01ufd	100v		Phl	CFR15/250A
C63	Capacitor	.01ufd	100v		Phl	CFR15/250A
C64	Capacitor	.01ufd	100v		Phl	CFR15/250A
Q1	Transistor	NPN			Var	2N3904
Q2	Transistor	NPN			Var	2N3904
Q3	Transistor	NPN			Var	2N3904
Q4	Transistor	NPN			Var	MPSU06
Q5	Transistor	PNP			Var	MPSU56
Q6	Transistor	NPN			Var	MPSU06
Q7	Transistor	PNP			Var	MPSU56
U1	Analog Switch				Var	CD4053
U2	Analog Switch				Var	CD4053
U3	Analog Switch				Var	CD4053
U4	Analog Switch				Var	CD4053
U5	Analog Switch				Var	CD4053
U6	Analog Switch				Var	CD4053
U7	Analog Switch				Var	CD4053
U8	Dual Opamp				Si	NE5532
U9	Analog Switch				Var	CD4053
U10	Dual Opamp				Si	NE5532
U11	Dual Opamp				Sl	NE5532
U12	Analog Switch				Var	CD4053
U13	Dual Opamp				Si	NE5532
U14	Dual Opamp				Si	
U15	Analog Switch				Var	CD4053
U16	Dual Opamp				Var	NE5532
U17	Dual Opamp				Var	NE5532
U18	Dual Opamp				Var	NE5532
U19	Dual Opamp				Var	NE5532
U20	Dual Opamp				Var	NE5532
U21	Voltage Regulator		+12v		Var	7812
U22	Voltage Regulator		+15v		Var	7815
U23	Voltage Regulator		-15v		Var	7915
D1	Diode (Led)				Mot	MLED71
D2	Diode (Led)				Mot	MELD71

Section 5:

Talkback/Cue Module

(TBC-01)

SP-16 Talkback/Cue Module Controls



Talkback Microphone
Used to feed talkback amplifier.

TB send Gain Control
Access to the trim-pot used to adjust TB send level.

Ext 1 LED indicates Ext 1 is calling

Ext 2 LED indicates Ext 2 is calling

TB Receive Level Set
Access to the trim-pot used to adjust the talkback level fed to the cue speaker.

Talkback Assign Switches
Momentary push-buttons used to direct talkback to any of four locations.

Cue Gain
Used to adjust the volume of the cue speaker.

Talkback/Cue Module

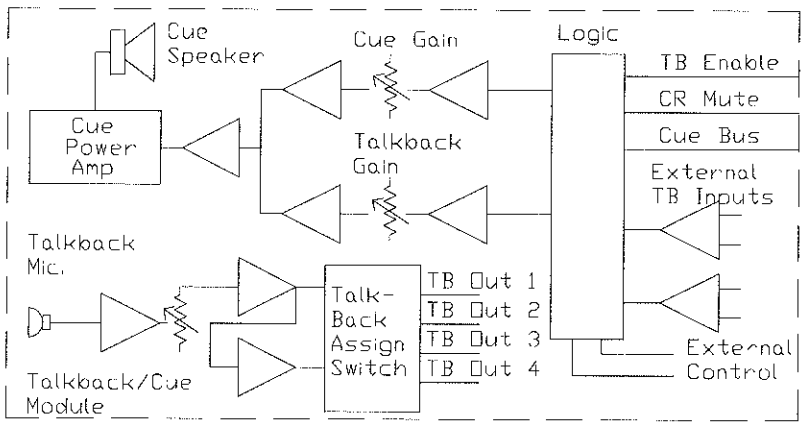
Description

The talkback/cue module used in the Model SP-16 contains a cue gain control stage and power amplifier, a talkback send amplifier, a talkback receive gain control stage, and external talkback input amplifiers. As well, the module contains logic for external control and muting.

The cue system works in the conventional manner. When the cue switch is activated on an input module, its audio is fed to the cue system's volume control, to the power amplifier and to the cue speaker. If Mute 1 is active there will be no output from the speaker.

The power amplifier used to drive the cue speaker employs a class AB output stage which greatly enhances its output capability while maintaining the linear operation of the driver op-amp.

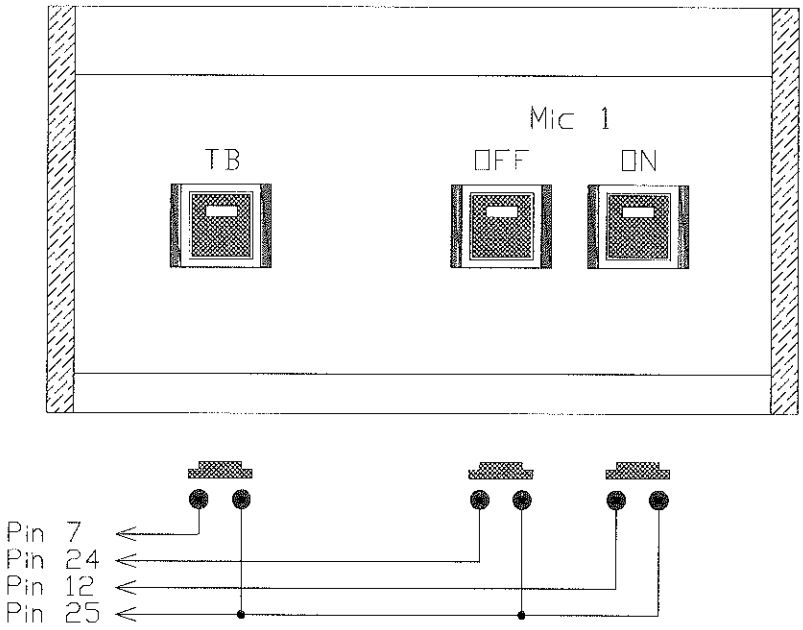
The talkback send amplifier, with four station capability, provides balanced audio at +4dBm and a ground start to each location. The talkback module uses an independent microphone to aid talent in distinguishing between live announcer and talkback.



Any SP-16 microphone input module can be used to send audio to the talkback system. A logic ground to the talkback enable pin of the microphone module's DB-25 connector switches on the module's cue amplifier and an LED for talkback indication. At the same time, the input module signals the talkback/cue module to go into the talkback mode. When in this mode, the cue volume control is disabled and gain is determined by the talkback trim-pot. This ensures that talkback will be heard even if the cue volume is turned off.

As well, there are two external talkback inputs which can be brought into the console via the DB-25 connector on the talkback/cue module. They are balanced, +4dBm level inputs and are engaged by a simple logic ground start, also on the DB-25. Unless ground-started, these inputs are muted. These have been provided for such things as inputs from larger intercoms, other studios, even STLs and two-way radios or 'the back door'.

It should be noted that unless the cue volume control and the talkback trim-pot are set to exactly the same level, a change in level of the cue speaker will occur whenever talkback is engaged. This arrangement helps to alert the operator that talkback is in use. We suggest setting talkback gain to a level slightly higher than the normal cue volume.



The illustration above shows basic DC control for a remote microphone such as in a news booth. The pin numbers are those on the microphone input module's DB-25 connector. Note that talkback functions even if the microphone is 'on-air'. This can be useful for signaling an operator. Dixon Systems offers the CT-22 turret which controls two microphones and has two headphone amplifiers with talkback.

Audio and Logic

The first section of analog switch U2 acts as the control gate between the cue and talkback gain stages of the module. Audio from the cue monitor/meter bus is fed to pin 15 of U2. It is then fed to U3b, a voltage follower, through the cue volume control and to analog switch U5 which provides muting. If not muted, audio then goes to summing amplifier U6b and on to the power amplifier consisting of U6a and Q2 and Q3.

Should the talkback enable line go low, U2 routes the audio to U3a, another voltage follower, through the talkback gain control, to U5 and, if not muted, to summing amplifier U6b.

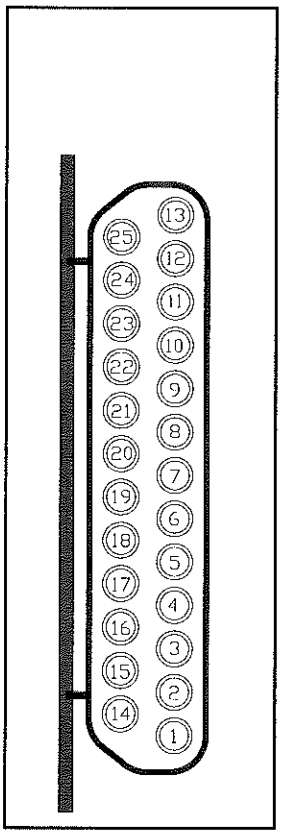
Op-amps U1a and U1b provide active balanced inputs for the two external talkback inputs. These stages are similar in design to the inputs used in the SP-16's line input module. This external audio goes to the other two sections of U2 and is normally muted unless ground started. LEDs D3 and D4 provide an indication when these inputs are active. When activated, audio goes through U2 and to the talkback gain stage.

An electret condenser microphone drives U7b, a microphone pre-amp. Level set for talkback send is established by R52 and additional gain is provided by U7a. U8a and U8b form an active balanced line driver which feeds the four station push-button assembly. When a talkback button on the module is pressed, audio is routed through the switch to the module's DB-25 connector. A logic ground start from each switch is also provided at the connector. When these buttons are not pressed, the audio send lines are shorted at the switch to ensure quiet operation.

Analog switch U5 is controlled by Q1 which is connected to the console's Mute 1 or control room line. Any time this line goes high, the cue speaker is muted. The talkback send push-buttons are also arranged to activate Q1. This was done so that no feedback would occur through the cue speaker should both the control room operator and remote talent press their talkback buttons at the same time. Replacing diode D5 with a wire jumper will also mute the control room monitor output whenever a talkback send button on the module is pressed.

Talkback/Cue Module Connector Pinout

Viewed from front of SP-16



1 Audio ground
2 Logic ground
3 Ground start #3
4 TB audio out #3
5 TB audio out #3
6 Logic ground
7 Ground start #4
8 TB audio out #4
9 TB audio out #4
10 Remote TB 'B' signal
11 Audio in Remote B A
12 Audio ground
13 Audio in Remote TB B
14 TB audio out #2
15 TB audio out #2
16 Ground start #2
17 Logic ground
18 Audio ground
19 TB audio out #1
20 TB audio out #1
21 Ground start #1
22 Logic ground
23 Remote TB A signal
24 Audio in Remote TB A
25 Audio in Remote TB B

Talkback/Cue Board Parts List

Des.	Item	Value	Rated	Tol.	Mfr.	Part No.
R1	Resistor MF	20K	.25w	1%	Phl	MR25F
R2	Resistor MF	20K	.25w	1%	Phl	MR25F
R3	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R4	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R5	Resistor MF	121K	.25w	1%	Phl	MR25F121K0
R6	Resistor MF	27K	.25w	1%	Phl	MR25F27K0
R7	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R8	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R9	Resistor MF	10K	.25w	1%	Phl	MR25F20K0
R10	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R11	Resistor MF	121K	.25w	1%	Phl	MR25F121K0
R12	Resistor MF	27K	.25w	1%	Phl	MR25F27K4
R13	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R14	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R15	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R16	Resistor MF	27K	.25w	1%	Phl	MR25F27K4
R17	Resistor MF	27K	.25w	1%	Phl	MR25F27K4
R18	Resistor MF	27K	.25w	1%	Phl	MR25F27K4
R19	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R20	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R21	Var Pot.	10K			Brn	
R22	Resistor MF	3K	.25w	1%	Phl	MR25F3K01
R23	Resistor MF	200R	.25w	1%	Phl	MR25F200R
R24	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R25	Var Pot.	10K			Brn	
R26	Resistor MF	3K	.25w	1%	Phl	MR25F3K01
R27	Resistor MF	200R	.25w	1%	Phl	MR25F200R
R28	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R29	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R30	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R31	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R32	Resistor MF	27K	.25w	1%	Phl	MR25F27K4
R33	Resistor C	2K	.25w	5%	Phl	CR252K0
R34	Resistor C	2K	.25w	5%	Phl	CR252K0
R35	Resistor MF	3K	.25w	1%	Phl	MR25F3K0
R36	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R37	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R38	Resistor MF	680R	.25w	1%	Phl	MR25F680R
R39	Resistor MF	680R	.25w	1%	Phl	MR25F680R
R40	Resistor MF	6K8	.25w	1%	Phl	MR25F6K81
R41	Resistor MF	6K8	.25w	1%	Phl	MR25F6K81
R42	Resistor C	22R	1w	5%	Phl	MR25F22R
R43	Resistor C	22R	1w	5%	Phl	MR25F22R
R44	Resistor C	10R	1w	5%	Phl	MR25F10R
R45	Resistor C	10R	1w	5%	Phl	MR25F10R
R46	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R47	Resistor C	SOT	1w	5%	Phl	
R48	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R49	Resistor MF	100K	.25w	1%	Phl	MR25F100K0
R50	Resistor MF	200R	.25w	1%	Phl	MR25F200R

Talkback/Cue Board Parts List (Cont.)

Des.	Item	Value	Rated	Tol.	Mfr.	Part No.
R51	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R52	Var Pot.	10K			Brn	MR25F10K0
R53	Resistor MF	1K	.25w	1%	Phl	MR25F1K0
R54	Resistor MF	200R	.25w	1%	Phl	MR25F200R
R55	Resistor MF	20K	.25w	1%	Phl	MR25F20K0
R56	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R57	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R58	Resistor MF	30R	.25w	1%	Phl	MR25F30R
R59	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R60	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R61	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R62	Resistor MF	30R	.25w	1%	Phl	MR25F30R
R63	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R64	Resistor C	1Meg	.25w	5%	Phl	CR251M
R65	Resistor MF	30R	.25w	1%	Phl	MR25F30R
C1	Capacitor	22ufd	35v		Phl	037-50229
C2	Capacitor	22ufd	35v		Phl	037-50229
C3	Capacitor	100pfd	100v	2%	Phl	681-10101
C4	Capacitor	100pfd	100v	2%	Phl	681-10101
C5	Capacitor	22ufd	35v		Phl	037-50229
C6	Capacitor	22ufd	35v		Phl	037-50229
C7	Capacitor	100pfd	100v	2%	Phl	681-10101
C8	Capacitor	100pfd	100v	2%	Phl	681-10101
C9	Capacitor	47ufd	35v		Phl	037-56479
C10	Capacitor	47ufd	35v		Phl	037-56479
C11	Capacitor	100pfd	100v	2%	Phl	681-10101
C12	Capacitor	100pfd	100v	2%	Phl	681-10101
C13	Capacitor	47ufd	35v		Phl	037-56479
C14	Capacitor	47ufd	35v		Phl	037-56479
C15	Capacitor	100pfd	100v	2%	Phl	681-10101
C16	Capacitor	100pfd	100v	2%	Phl	681-10101
C17	Capacitor	100pfd	100v	2%	Phl	681-10101
C18	Capacitor	100pfd	100v	2%	Phl	681-10101
C19	Capacitor	47ufd	35v		Phl	037-56479
C20	Capacitor	47ufd	35v		Phl	037-56479
C21	Capacitor	56pfd	100v	2%	Phl	681-10569
C22	Capacitor	47ufd	35v		Phl	037-56479
C23	Capacitor	470ufd	35v		Ucc	SME35VB471
C24	Capacitor	.01ufd	100v		Var	
C25	Capacitor	470ufd	35v		Ucc	SME35VB471
C26	Capacitor	.01ufd	100v		Var	
C27	Capacitor	470ufd	35v		Ucc	SME35VB471
C28	Capacitor	100pfd	100v	2%	Phl	681-10101
C29	Capacitor	1000ufd	35v		Var	
C30	Capacitor	470ufd	35v		Ucc	SME35VB471
C31	Capacitor	22ufd	35v		Phl	037-50229
C32	Capacitor	56pfd	100v	2%	Phl	681-10569
C33	Capacitor	47ufd	35v		Phl	037-56479
C34	Capacitor	100pfd	100v	2%	Phl	681-10101
C35	Capacitor	100pfd	100v	2%	Phl	681-10101

Talkback/Cue Board Parts List (Cont.)

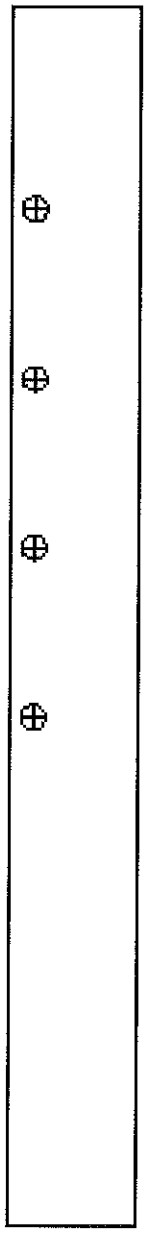
Des.	Item	Value	Rated	Tol.	Mfr.	Part No.
C36	Capacitor	47ufd	35v		Phl	037-56479
C37	Capacitor	56pfd	100v	2%	Phl	681-10569
C38	Capacitor	470ufd	35v		Ucc	SME35VB471
C39	Capacitor	56pfd	100v	2%	Phl	681-10569
C40	Capacitor	470ufd	35v		Ucc	SME35VB471
C41	Capacitor	.01ufd	100v		Phl	CFR15/250A
C42	Capacitor	470ufd	35v		Ucc	SME35VB471
C43	Capacitor	470ufd	35v		Ucc	SME35VB471
C44	Capacitor	.01ufd	100v		Var	CFR15/250A
C45	Capacitor	470ufd	35v		Ucc	SME35VB471
C46	Capacitor	470ufd	35v		Ucc	SME35VB471
C47	Capacitor	.01ufd	100v		Var	CFR15/250A
C48	Capacitor	.01ufd	100v		Var	CFR15/250A
C49	Capacitor	470ufd	35v		Ucc	SME35VB471
C50	Capacitor	470ufd	35v		Ucc	SME35VB471
C51	Capacitor	.01ufd	100v		Var	CFR15/250A
C52	Capacitor	.01ufd	100v		Var	CFR15/250A
C53	Capacitor	.01ufd	100v		Var	CFR15/250A
Q1	Transistor	NPN			Var	2N3904
Q2	Transistor	NPN			Mot	MPSU06
Q3	Transistor	PNP			Mot	MPSU56
U1	Dual Opamp				TI	TL072
U2	Analog Switch				Var	CD4053
U3	Dual Opamp				Var	5532
U4	Dual Opamp				Var	5532
U5	Analog Switch				Var	CD4053
U6	Dual Opamp				Var	5532
U7	Dual Opamp				Var	5532
U8	Dual Opamp				Var	5532
U9	Voltage Regulator		+12v		Var	7812
U10	Voltage Regulator		+15v		Var	7815
U11	Voltage Regulator		-15v		Var	7915
D1	Diode (Small Sig.)				Var	1N914
D2	Diode (Small Sig.)				Var	1N914
D3	Diode (LED)				Var	
D4	Diode (LED)				Var	
D5	Diode (Optional)				Var	1N914
D6	Diode (IR)				Mot	MLED71
D7	Diode				Var	1N914

Section 6:

Master Output Module

(MAS-01)

Master Output Module Controls



Master Gain Right

Master Gain Left

Master Gain
Mono Sum

Master Gain
Cue or Utility

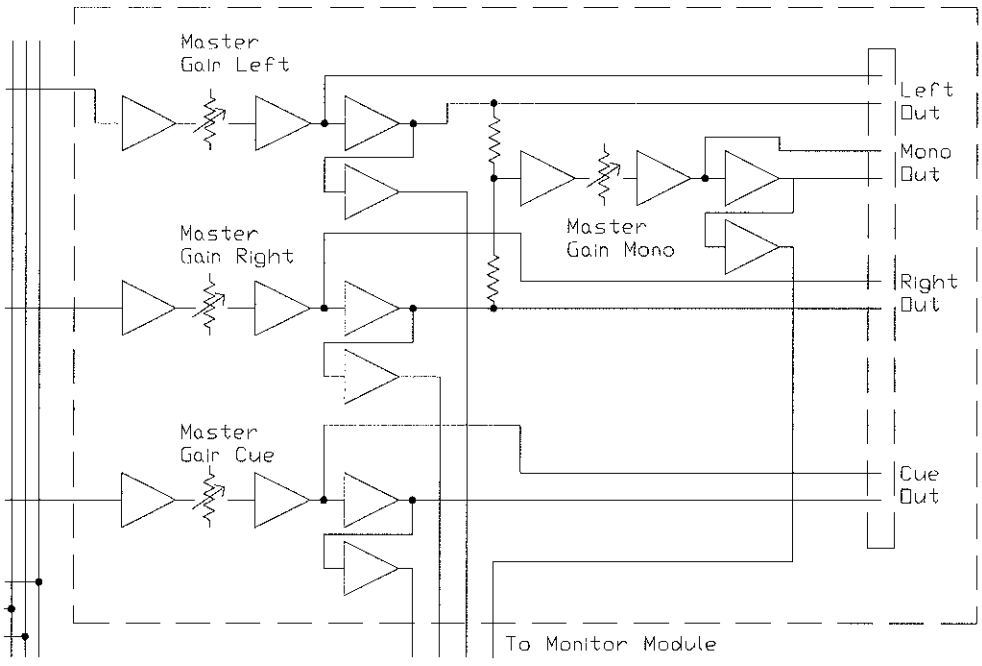
Master Output Module

Description

At least two master modules are required for normal operation of the SP16. If the third stereo summing bus is to be used, a third master is required. Each master module is programmed by jumper wires for use as the program, audition, or auxiliary summing amplifier.

Audio from a balanced stereo bus is current summed, fed to the master left and right gain controls and then to active balanced line drivers (left and right out). At the same time, audio from the inverted side of these line output amplifiers is fed to a buffer amplifier which drives the monitor/meter bus. As well, audio from the left and right are summed, fed to the master mono gain control and then to another active balanced output amplifier (mono out). The unbalanced summing amplifier on the module is used for cue or utility. This stage also drives a monitor/meter bus and an active balanced output amplifier.

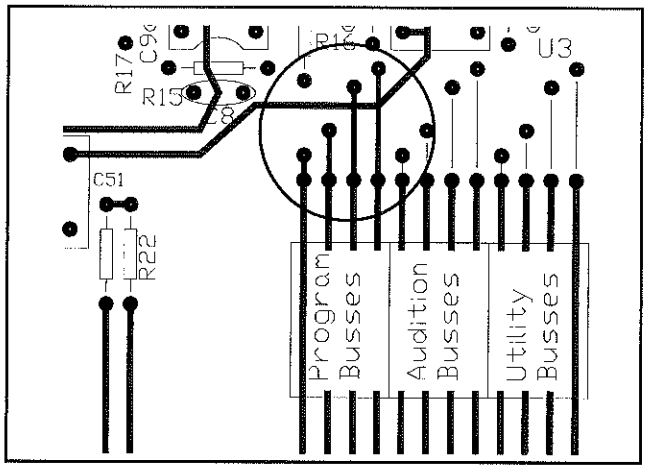
This arrangement greatly simplifies set-up of the console. Once the master output levels are properly set and the VU meters are adjusted, all other levels in the console will be properly set.



Simplified Block Diagram MAS-01

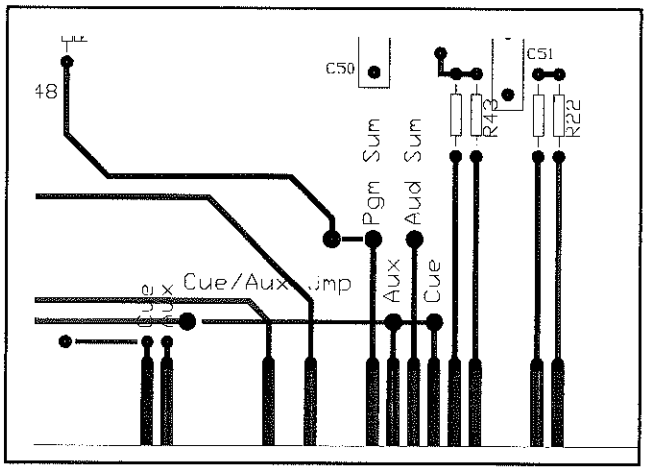
Programming Jumpers

Each master module is programmed by jumper wires at the factory for use as the program, audition or third stereo master output amplifier.



Located at the back of the master module printed circuit board are the jumper positions for the stereo buses. Only one set of jumpers may be installed in any one module. The illustration to the left shows jumpers installed for use as the program amplifier (circled). Note that the other positions have no jumpers.

Normally, the program amplifier has jumpers installed for cue functions and the audition amplifier is jumpered for the utility bus. Resistors R22 and R43 are installed in the appropriate spots for cue or utility.



NOTE: If a master module is used for the third stereo bus, cue and utility are not used and the feed to the mono monitor/meter output is disabled by removing the output jumper.

Audio Path

Audio from the right summing bus is fed to U3a and U3b which form a balanced current summing amplifier. Op-amp U4a converts this audio to single ended form and feeds the audio to the master gain control R9. Note that the gain can never be completely shut off as a result of resistor R8. U5 and U6 form an active balanced line driver and provide the main right output to the DB-25 connector. Audio from the left summing bus is treated in an identical manner using U7, U8, U9 and U10.

Audio for the main mono output is taken from the inverted or second half of the left and right line drivers. This was done so that a failure in either side of the line driver would be apparent in the mono output. Resistors R44 and R45 feed the left and right audio to current summing amplifier U11a, to the master mono gain control and to balanced line driver U12 and U13. The mono output is then fed to the DB-25 connector.

An unbalanced summing amplifier, U14a, is programmed by jumper wires for either the cue or utility summing bus. U15 and U16 provide a balanced output on the DB-25 connector. The operation of this section is identical to the others. If a master module is being used for the third stereo bus, this section must be disabled (no input jumper is used).

Op-amps U4b, U8b, U11b and U14b are unity gain buffer amplifiers used to drive the monitor/meter buses. This eliminates the bridging error and distortion caused by the meter impedance in shunt with a signal line. Again, the inputs to these buffers are taken from the inverted side of each output line driver. Should a failure ever occur in either side of an output stage, it will be apparent on the VU meters and in the monitor outputs.

Set-Up

Set-up of the master module is extremely simple. Using an oscillator, feed a +4dBm 1 kHz signal into a line input (both left and right). Assign the module to either program or audition, depending on which master module is being adjusted. Be sure to use a channel where the utility bus has been made active. Position the fader to the normal "12dB in hand" marking and turn the channel on. Using an accurate AC voltmeter, set the left and right gain controls of the master module for the desired output level **measured at the DB-25 connector.** Once this has been done, the mono master gain control should be adjusted for the **same** output level. Turn on cue for the channel being fed and adjust the cue and utility gain controls for the same output level. The SP16 is normally set at the factory for +4 dBm operation.

Master Gain Controls

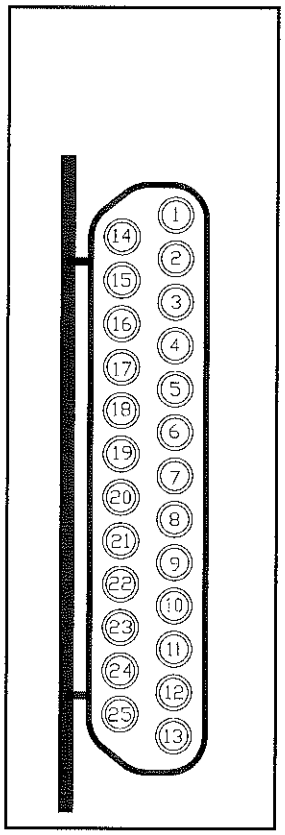
You will notice that the trim-pots used to set the master gains are not mounted at the very top of the circuit board. They are mounted about 3/4 of an inch below the top panel. This is intentional. While it may be a bit tricky, at first, to locate these controls, you won't have to worry about announcers and operators who may take the screws out of the panel to stick pens tops into these holes.

Once all master gain controls have been properly set, it is unlikely that they will need any further adjustment. All that remains to be done is the calibration of the VU meters.

(See Section on Meter Board)

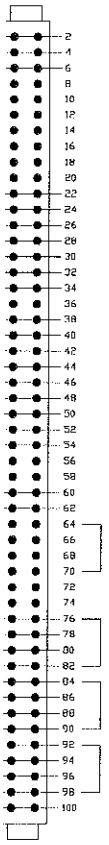
Master Module Connector Pinout

Viewed from front of SP16



1 Audio ground
2 Output #1 (+) Right
3 Output #1 (-) Right
4 Audio ground
5 Output #2 (+) Left
6 Output #2 (-) Left
7 Audio ground
8 Mono Sum output (+)
9 Mono Sum output (-)
10 Audio ground
11 Cue/Util output (+)
12 Cue/Util output (-)
13 NC
14 NC
15 NC
16 NC
17 NC
18 NC
19 NC
20 NC
21 NC
22 NC
23 NC
24 NC
25 NC

Main Buss Connector



1/2	Audio ground
3/4	Audio ground
5/6	Talkback enable line
7/8	NC
9/10	NC
11/12	NC
13/14	NC
15/16	NC
17/18	NC
19/20	NC
21/22	Cue monitor/meter buss
23/24	Util monitor/meter buss
25/26	Mute 3
27/28	Mute 2
29/30	Mute 1
31/32	Timer reset buss
33/34	-24v DC (Audio)
35/36	NC
37/38	+24vDC (Audio)
39/40	+24vDC (Logic)
41/42	Logic ground
43/44	Program Sum monitor/meter buss
45/46	Util summing buss
47/48	Audition Sum monitor/meter buss
49/50	Cue summing buss
51/52	Program left monitor/meter buss
53/54	Audition left monitor/meter buss
55/56	Direct out *
57/58	Direct out *
59/60	Program right monitor/meter buss
61/62	Audition right monitor/meter buss
63/64	
65/66	Insert returns (64 through 70)
67/68	
69/70	
71/72	NC
73/74	NC
75/76	
77/78	Program summing busses
79/80	(75 through 82)
81/82	
83/84	
85/86	Audition summing busses
87/88	(83 through 90)
89/90	
91/92	
93/94	Third summing busses
95/96	(91 through 98
97/98	
99/100	+48vDC Phantom power

Master Output Board Parts List

Des.	Item	Value	Rated	Tol.	Mfr.	Part No.
R1	Resistor MF	6K8	.25w	1%	Phl	MR25F6K81
R2	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R3	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R4	Resistor MF	6K8	.25w	1%	Phl	MR25F6K81
R5	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R6	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R7	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R8	Resistor MF	200R	.25w	1%	Phl	MR25F200R
R9	Var Pot	5K			Brn	3006-1-502
R10	Resistor MF	1K	.25w	1%	Phl	MR25F1K02
R11	Resistor MF	200R	.25w	1%	Phl	MR25F200R
R12	Resistor MF	3K01	.25w	1%	Phl	MR25F3K01
R13	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R14	Resistor MF	3K	.25w	1%	Phl	MR25F3K01
R15	Resistor MF	3K	.25w	1%	Phl	MR25F3K01
R16	Resistor MF	1K5	.25w	1%	Phl	MR25F1K5
R17	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R18	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R19	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R20	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R21	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R22	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R23	Resistor MF	6K8	.25w	1%	Phl	MR25F6K81
R24	Resistor MF	6K8	.25w	1%	Phl	MR25F6K81
R25	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R26	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R27	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R28	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R29	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R30	Var Pot	5K			Brn	3006-1-502
R31	Resistor MF	200R	.25w	1%	Phl	MR25F200R
R32	Resistor MF	200R	.25w	1%	Phl	MR25F200R
R33	Resistor MF	1K	.25w	1%	Phl	MR25F1K02
R34	Resistor MF	3K	.25w	1%	Phl	MR25F3K01
R35	Resistor MF	3K	.25w	1%	Phl	MR25F3K01
R36	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R37	Resistor MF	3K	.25w	1%	Phl	MR25F3K01
R38	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R39	Resistor MF	1K5	.25w	1%	Phl	MR25F1K5
R40	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R41	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R42	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R43	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R44	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R45	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R46	Resistor MF	6K8	.25w	1%	Phl	MR25F6K81
R47	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R48	Var Pot	5K			Brn	3006-1-502
R49	Resistor MF	200R	.25w	1%	Phl	MR25F200R
R50	Resistor MF	1K	.25w	1%	Phl	MR25F1K02

Master Output Board Parts List (Cont.)

Des.	Item	Value	Rated	Tol.	Mfr.	Part No.
R51	Resistor MF	3K	.25w	1%	Phl	MR25F3K01
R52	Resistor MF	200R	.25w	1%	Phl	MR25F200R
R53	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R54	Resistor MF	3K	.25w	1%	Phl	MR25F3K01
R55	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R56	Resistor MF	3K	.25w	1%	Phl	MR25F3K01
R57	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R58	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R59	Resistor MF	1K5	.25w	1%	Phl	MR25F1K5
R60	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R61	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R62	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R63	Resistor MF	1K	.25w	1%	Phl	MR25F1K02
R64	Resistor MF	3K	.25w	1%	Phl	MR25F3K01
R65	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R66	Resistor MF	3K	.25w	1%	Phl	MR25F3K01
R67	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R68	Var Pot	5K			Brn	3006P-1-502
R69	Resistor MF	200R	.25w	1%	Phl	MR25F200R
R70	Resistor MF	200R	.25w	1%	Phl	MR25F200R
R71	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R72	Resistor MF	3K	.25w	1%	Phl	MR25F3K01
R73	Resistor MF	1K5	.25w	1%	Phl	MR25F1K5
R74	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R75	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R76	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R77	Resistor MF	10K	.25w	1%	Phl	MR25F10K0
R78	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
R79	Resistor MF	6K8	.25w	1%	Phl	MR25F6K81
R80	Resistor MF	30R	.25w	1%	Phl	MR25F30R1
C1	Capacitor	180pfd	100v	2%	Phl	681-70181
C2	Capacitor	180pfd	100v	2%	Phl	681-70181
C3	Capacitor	56pfd	100v	2%	Phl	681-10569
C4	Capacitor	56pfd	100v	2%	Phl	681-10569
C5	Capacitor	100pfd	100v	2%	Phl	681-10101
C6	Capacitor	22pfd	100v	2%	Phl	681-58229
C7	Capacitor	100pfd	100v	2%	Phl	681-10101
C8	Capacitor	22pfd	100v	2%	Phl	681-58229
C9	Capacitor	22pfd	100v	2%	Phl	681-58229
C10	Capacitor	470ufd	35v		Ucc	SME35VB471
C11	Capacitor	470ufd	35v		Ucc	SME35VB471
C12	Capacitor	56pfd	100v	2%	Phl	681-10569
C13	Capacitor	180pfd	100v	2%	Phl	681-70181
C14	Capacitor	180pfd	100v	2%	Phl	681-70181
C15	Capacitor	56pfd	100v	2%	Phl	681-10569
C16	Capacitor	56pfd	100v	2%	Phl	681-10569
C17	Capacitor	100pfd	100v	2%	Phl	681-10101
C18	Capacitor	22pfd	100v	2%	Phl	681-58229
C19	Capacitor	100pfd	100v	2%	Phl	681-10101
C20	Capacitor	22pfd	100v	2%	Phl	681-58229

Master Output Board Parts List (Cont.)

Des.	Item	Value	Rated	Tol.	Mfr.	Part No.
C21	Capacitor	22pfd	100v	2%	Phl	681-58229
C22	Capacitor	470ufd	35v		Ucc	SME35VB471
C23	Capacitor	470ufd	35v		Ucc	SME35VB471
C24	Capacitor	56pfd	100v	2%	Phl	681-10569
C25	Capacitor	180pfd	100v	2%	Phl	681-70181
C26	Capacitor	100pfd	100v	2%	Phl	681-10101
C27	Capacitor	22pfd	100v	2%	Phl	681-58229
C28	Capacitor	100pfd	100v	2%	Phl	681-10101
C29	Capacitor	22pfd	100v	2%	Phl	681-58229
C30	Capacitor	22pfd	100v	2%	Phl	681-58229
C31	Capacitor	56pfd	100v	2%	Phl	681-10569
C32	Capacitor	470ufd	35v		Ucc	SME35VB471
C33	Capacitor	470ufd	35v		Ucc	SME35VB471
C34	Capacitor	100pfd	100v	2%	Phl	681-10101
C35	Capacitor	22pfd	100v	2%	Phl	681-58229
C36	Capacitor	100pfd	100v	2%	Phl	681-10101
C37	Capacitor	22pfd	100v	2%	Phl	681-58229
C38	Capacitor	22pfd	100v	2%	Phl	681-58229
C39	Capacitor	470ufd	35v		Ucc	SME35VB471
C40	Capacitor	470ufd	35v		Ucc	SME35VB471
C41	Capacitor	56pfd	100v	2%	Phl	037-50229
C42	Capacitor	180pfd	100v	2%	Phl	681-70181
C43	Capacitor	470ufd	35v		Ucc	SME35VB471
C44	Capacitor	470ufd	35v		Ucc	SME35VB471
C45	Capacitor	470ufd	35v		Ucc	SME35VB471
C46	Capacitor	470ufd	35v		Ucc	SME35VB471
C47	Capacitor	.01ufd	100v		Var	
C48	Capacitor	.01ufd	100v		Var	
C49	Capacitor	.01ufd	100v		Var	
C50	Capacitor	.01ufd	100v		Var	
C51	Capacitor	.01ufd	100v		Var	
C52	Capacitor	.01ufd	100v		Var	
U1	Voltage Regulator		+18v		Var	7818
U2	Voltage Regulator		-18v		Var	7918
U3	Dual Opamp				Si	NE5532N
U4	Dual Opamp				Si	NE5532N
U5	Opamp				Si	NE5534N
U6	Opamp				Si	NE5534N
U7	Dual Opamp				Si	NE5532N
U8	Dual Opamp				Si	NE5532N
U9	Opamp				Si	NE5534N
U10	Opamp				Si	NE5534N
U11	Dual Opamp				Si	NE5532N
U12	Opamp				Si	NE5534N
U13	Opamp				Si	NE5534N
U14	Dual Opamp				Si	NE5532N
U15	Opamp				Si	NE5534N
U16	Opamp				Si	NE5534N

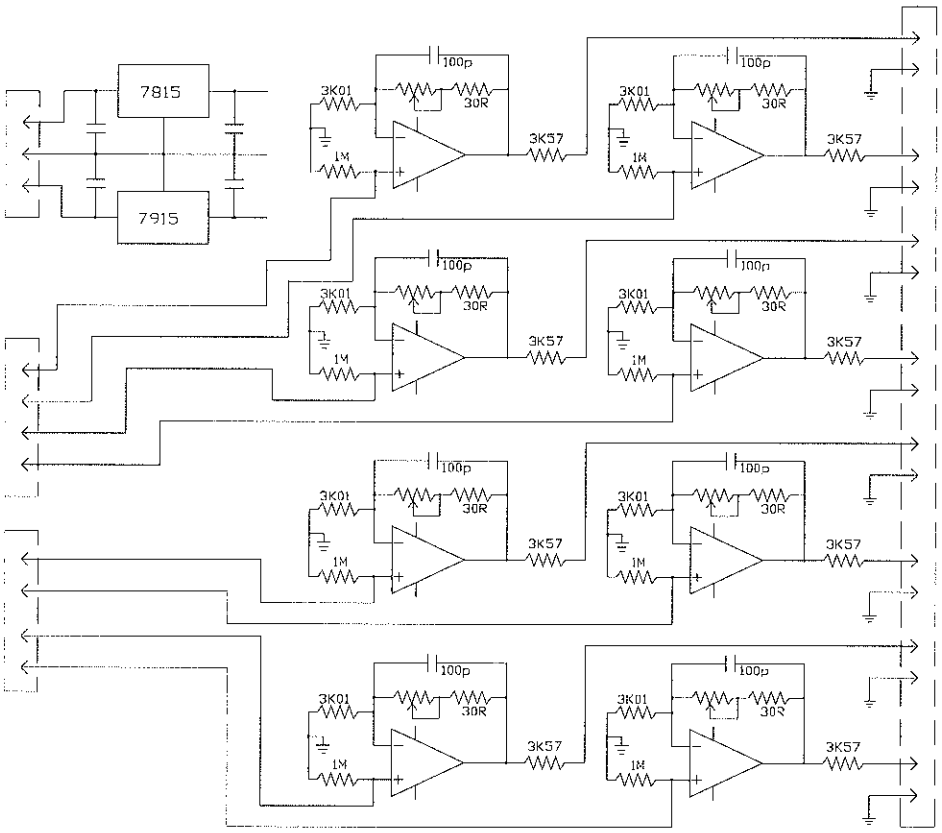
Section 7:

Meter and Timer Boards

VU Meters

Dixon Systems' Model SP16 uses four analog and two LED VU meters to monitor output levels. Two analog meters monitor program left and right. Another two meters monitor audition left and right. The audition left and right meters can also be switched to monitor the levels of the cue and utility outputs. Two LED VU meters monitor program and audition sum.

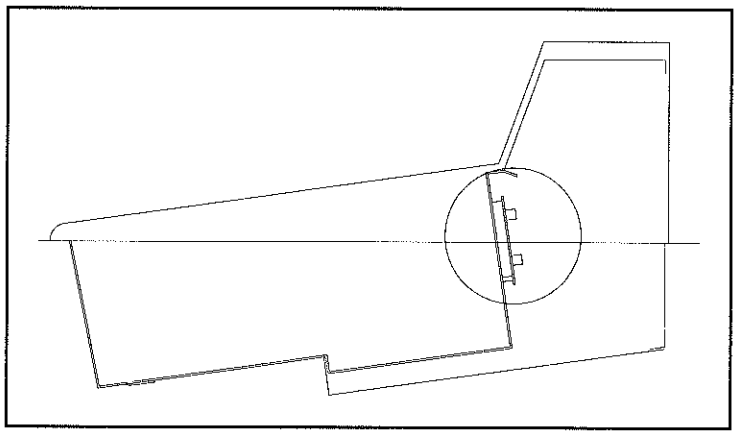
The meter amplifiers are high impedance voltage followers which isolate the meters from the monitor/meter bus. This eliminates any distortion of the signal due to a meter in shunt with the signal line.

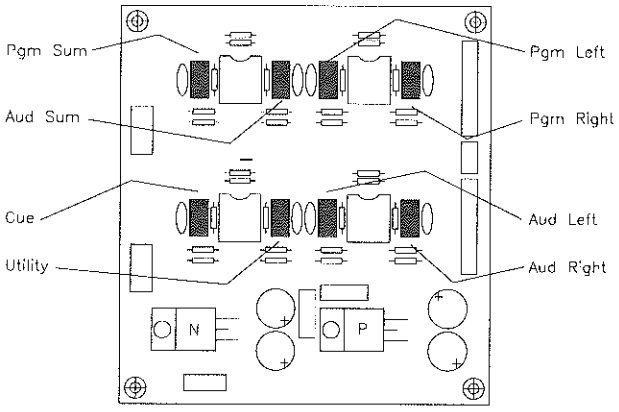


Simplified Meter Driver Board Schematic Diagram.

Driver Board Location

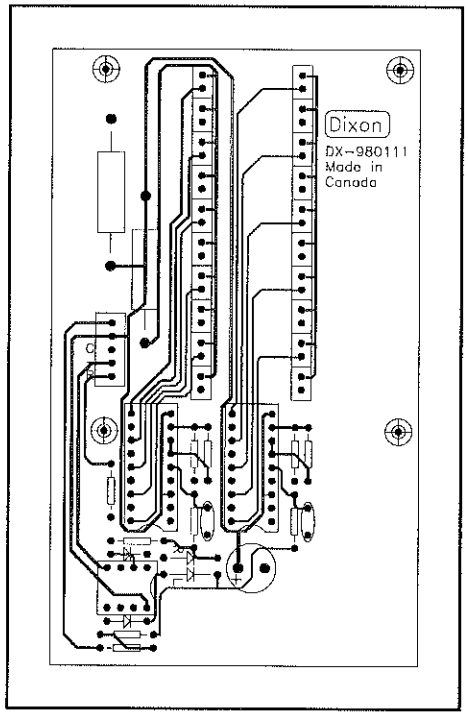
The meter driver board (DX-693-MT2) is mounted at the back of the console tub. Remove the rear cover panel of the SP16 to gain access to the level set trim-pots. NOTE: It will not likely be necessary to adjust these amplifiers unless a meter is replaced. Always set the level of the master output module, then adjust the meter driver amplifiers.





The illustration shows the location of the various meter level adjust trim-pots. The trim-pots are multi-turn to make adjustment as easy as possible.

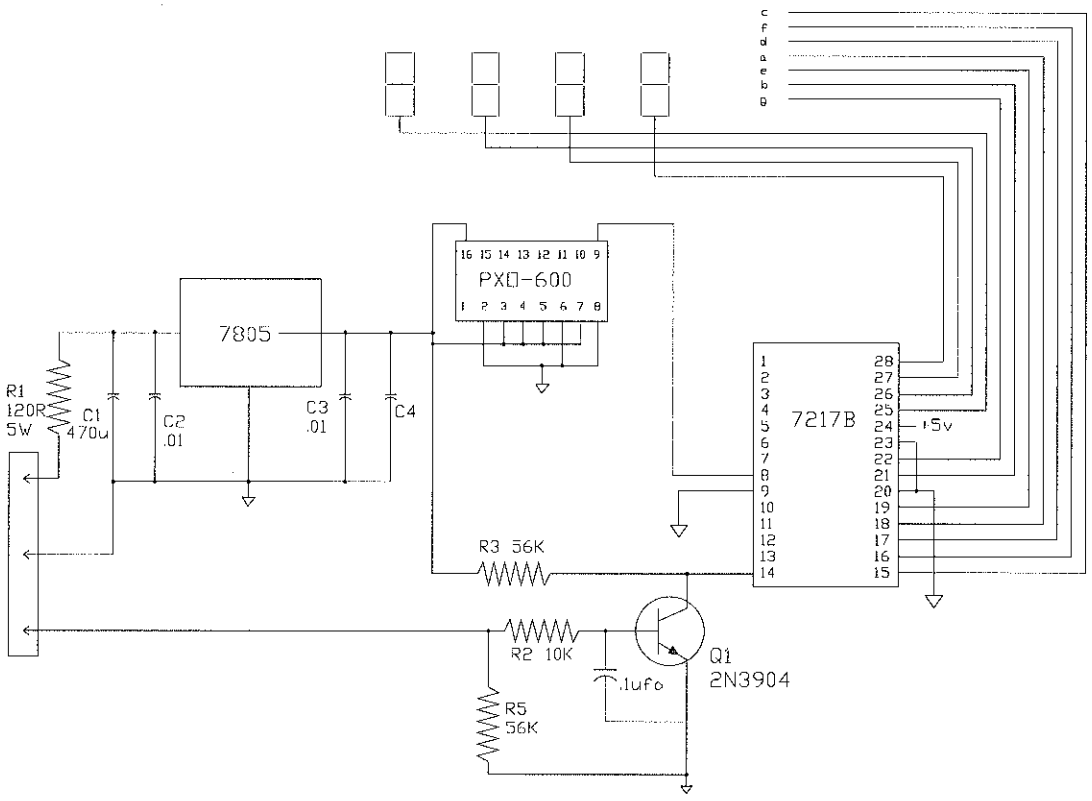
The LED Vus monitor program and audition sum. Each consists of a single driver chip and a ten diode display. The main purpose of these meters is to monitor for phase problems. If there are proper levels on both left and right meters but in indication on the sum meter, then a source or line is probably 180 degrees out of phase.



Timer Board

Description

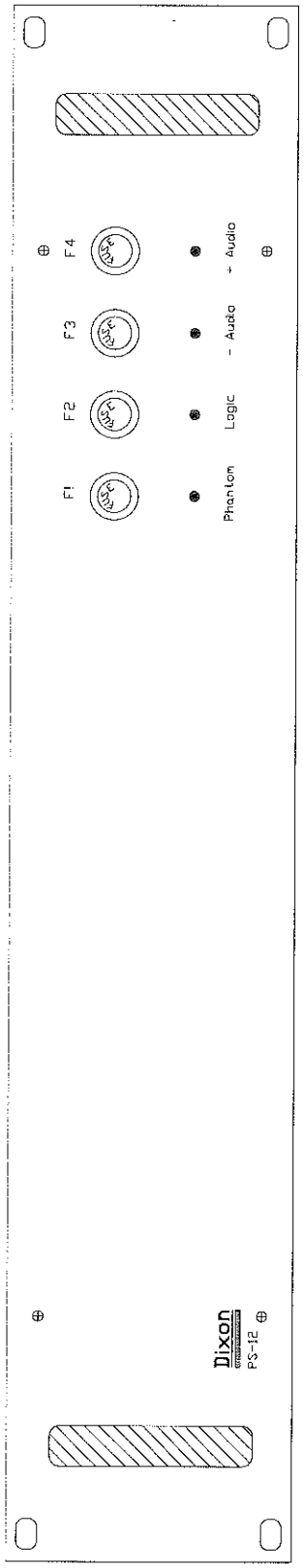
The timer in the SP16 employs a crystal controlled clock chip driving an LSI timer/display driver chip. No AC is required for the time base. The display uses standard seven segment LED read-outs. It is a simple up-counter with resets controlled by the input modules. Maximum count is 59 minutes, 59 seconds. The timer board is mounted behind the meter panel and can easily be removed should service ever be required.



Simplified Timer Board Schematic.

Section 8:

PS16 Power Supply


F4
F3
F2
F1
+ Audio
- Audio
Logic
Phantom
Dixon
PS-12

Model PS16 Power Supply

Description

The Model PS16 is used to supply all the necessary voltages to run the Model SP16 console including phantom power for microphones. It's total output capability is nearly 200 Watts. As well, all three mute logic lines are brought back to the power supply from the console to allow the user to interface 'on-air' lights and 'skimmers'. An open relay contact is available at the DB-9 connector at the rear of the PS16 for each mute line. There is also +24VDC and logic ground available on the DB9. **Do not attempt to switch 110VAC with the internal relays in the PS 16.** We recommend the use of "zero-cross" solid state relays for switching AC power to lights. They are available in several current handling packages and can be supplied by **Dixon Systems** as an option at nominal cost.

The power supply is packaged in a steel 19" rack mount unit that occupies 3.5 inches of space (two rack spaces). A minimum of 15 inches in depth should be available behind the front panel to allow for the line cord and power cable. Remember to leave room for air flow.

When we designed the SP16 console we kept reminding ourselves of the basics of good design. The simple truth is:

The performance of any piece of audio equipment depends to a great degree on its power supply.

The full potential of the components used, such as op-amps, can only be realized if the supply voltages have ample current and are clean and stable. A power supply must be rugged, use conservatively rated components and generate little heat. Separate ground systems for audio and logic should be used and all grounding should be "common point." The Model PS16 is such a supply.

The toroidal power transformer is custom manufactured for **Dixon Systems** and meets or exceeds UL and CSA standards. Toroidal transformers offer a number of advantages that are now well known. The self shielding characteristic of toroidal transformers makes it possible to mount the supply in locations that would not be possible with conventional transformers.

Components in the PS16 are conservatively rated. Full-wave bridge rectifiers are used. The main audio adjustable voltage regulators are rated at 5 amperes which allows them to run very cool. (The adjustable regulators are factory set for +/- 22 volt operation but may be changed in cases where line voltage may be low.) Each output voltage rail is individually fused on the front panel and has an LED after the fuse to indicate if voltage present.

Toroidal Transformer

Our PS-16 toroid is custom manufactured for Dixon Systems and is CSA and UL approved as a component.

North American Version

Dixon Systems Part No.: FPT-282

PRIMARIES

Frequency 60.00 Hertz

PRIMARY

ITEM	VAC	COLOR
Winding	120	Black/White

SECONDARIES

ITEM	VAC	IAC	COLORS.
Winding	21.0	3 A	Blue/Grey
Winding	21.0	4.5	Red/Yellow
Winding	21.0	1.8	Brown/Orange
Winding	36.2	.36	Green/Violet

Safety

The Model PS16 power supply chassis is grounded or "earthed" through the grounding pin of the power line entry module and line cord. Use only the proper line cord. A ground line from the SP16 console frame is also connected to this pin, through the power supply cable, for operator safety.

There are two binding posts on the rear of the power supply unit. The green colored post is connected to this chassis (hydro) ground. The other post, colored black, is the common point ground for all audio and logic grounds in the SP16 console. This allows the audio and logic system commons to be isolated from the AC ground. If this is done, the black binding post must be connected to the user's technical ground system in any permanent installation. Ensure the safety of this ground system.

NOTE:

The PS16 is normally supplied with the green and black binding posts jumpered together.

RECOMMENDED FUSING

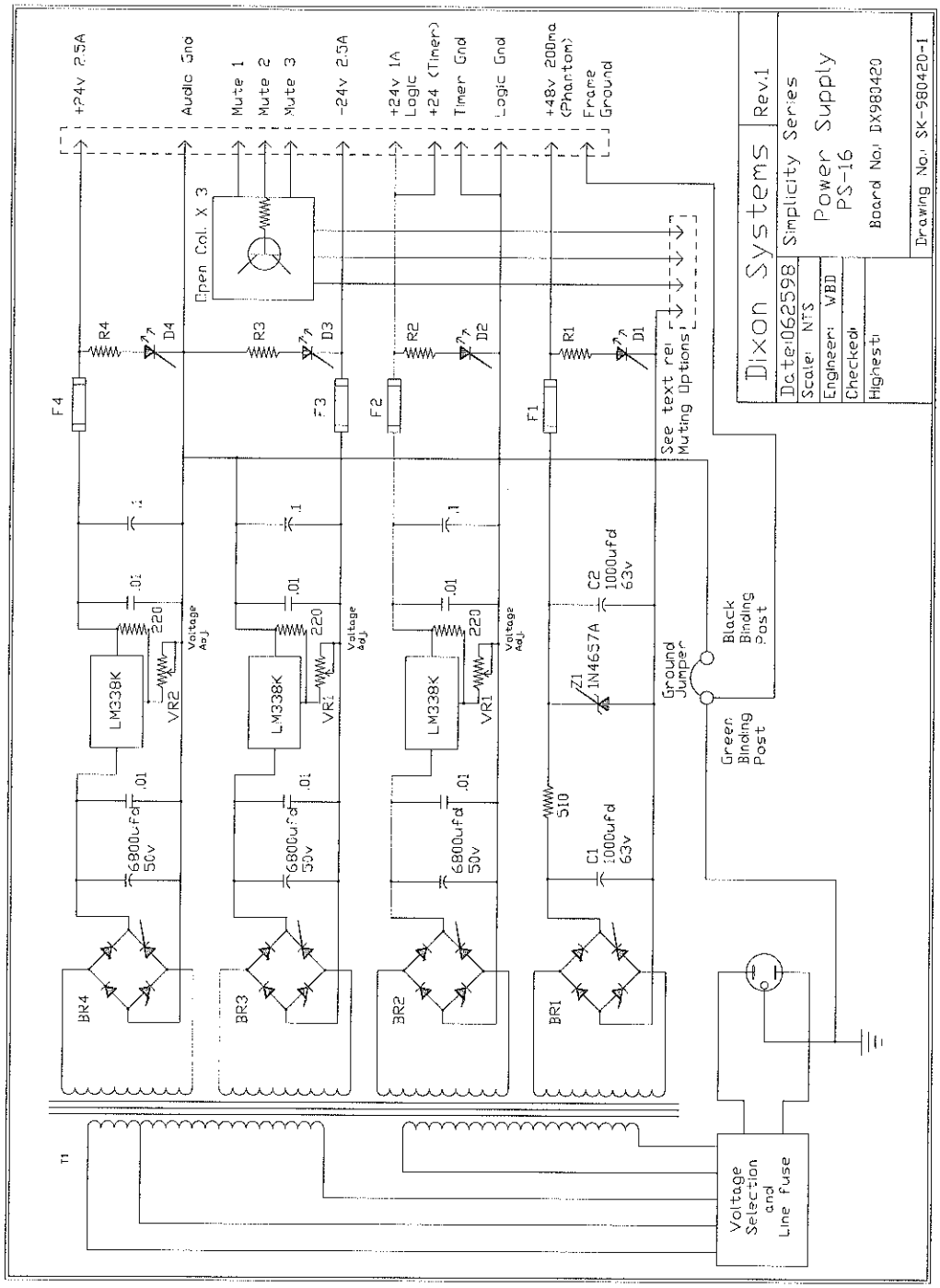
Power Line: 2.0A Slo-Blow

F1 Phantom: .25A

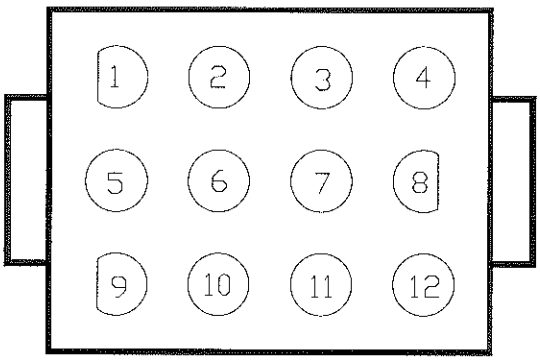
F2 Logic: 1A

F3 - Audio: 2.5A Slo-Blow

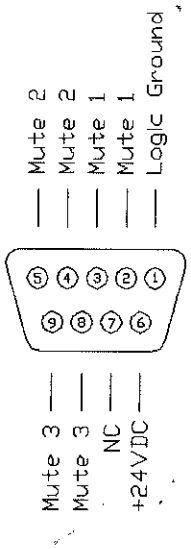
F4 + Audio: 2.5A Slo-Blow


+24v 2.5A
Audio Gnd
Mute 1
Mute 2
Mute 3
-24v 2.5A
+24v 1A Logic
+24 (Timer)
Timer Gnd
Logic Gnd
+48v 200ma (Phantom)
Frame Ground
Open Col. X 3
R4
R3
R2
R1
D4
D3
D2
D1
F4
F3
F2
F1
See text re Muting Options
LM338K
VR2
VR1
Voltage Adj
220
510
6800ufd 50v
C1 1000ufd 63v
C2 1000ufd 63v
Z1 1N4657A
Ground Jumper
Black Binding Post
Green Binding Post
BR4
BR3
BR2
BR1
T1
Voltage Selection and Line Fuse
Dixon Systems
Rev.1
Date:062598
Scale: NTS
Engineer: WBD
Checked:
Highest:
Simplicity Series
Power Supply
PS-16
Board No: DX980420
Drawing No: SK-980420-1

Power Supply Connector - Viewed from Console end



1) Audio ground
2) -22V audio (adjustable)
3) +24V audio (adjustable) +22V (Manual Typo)
4) Logic ground
5) +24V Logic
6) +24V Timer
7) Timer ground
8) +48v Phantom power
9) Mute 1
10) Mute 2
11) Mute 3
12) Frame ground



Remote Connector (DB-9) for 'On-Air' lights/skimmers