

**MS-440 Main Station,
RM-440 Remote Station
and
SB-440 Main Station**

Service Manual



945 Camelia St., Berkeley, California 94710 510-527-6666

CLEAR-COM LIMITED WARRANTY

The Clear-Com warranty does not cover any defect, malfunction or failure caused beyond the control of Clear-Com, including unreasonable or negligent operation, abuse, accident, failure to follow instructions in the manual, defective or improper associated equipment, attempts at modification and repair not authorized by Clear-Com, and shipping damage. Products with their serial numbers removed or defaced are not covered by this warranty.

This warranty is the sole and exclusive express warranty given with respect to Clear-Com products. It is the responsibility of the user to determine before purchase that this product is suitable for the user's intended purpose.

Any and all implied warranties, including the implied warranty of merchantability are limited to the duration of this express limited warranty. Neither Clear-Com nor the dealer who sells Clear-Com products is liable for incidental or consequential damages of any kind.

For your own records fill in the information below:

Factory Service

* Model No. _____	* Serial No. _____
Date Purchased _____	
Purchased from (dealer) _____	
Address _____	
City _____	State _____ Zip _____

All equipment returned for repair must be accompanied by documentation stating your return address, telephone number and date of purchase, along with a description of the problem.

Note: Do not return any equipment to the factory without first obtaining a Return Authorization Number.

Send equipment to be repaired to:

Customer Service Department
Clear-Com Intercom Systems
945 Camelia Street
Berkeley, California 94710-1484
Telephone: (510) 527-6666
Telefax: (510) 527-6699

Warranty Repairs - If in warranty, no charge will be made for the repairs. Equipment being returned for warranty repair must be sent prepaid and will be returned prepaid.

Non-Warranty Repair - Equipment that is not under warranty must be sent prepaid to Clear-Com. If requested, an estimate of repair costs will be issued prior to service. Once your approval for repair, and repair of equipment is completed, the equipment will be shipped freight collect from the factory to the customer.

NOTICE ABOUT SPECIFICATIONS

Performance specifications included in this manual are design-center specifications and are included for customer guidance and to facilitate system installation. Actual operating performance may vary.

ABOUT THIS MANUAL . . .

To get the most out of the SB-440 Station, read this manual carefully. It will answer questions you might have about installation and operation. For service information you will need to order the MS/RM/SB-440 Service Manual from Clear-Com's Customer Service Department. The part number for the service manual is 810207.

P/N 810207 Rev. B
(C) 1998 Clear-Com Systems
All Rights Reserved

Clear-Com Systems
929 Camelia St.
Berkeley, Ca. 94710
U.S.A

While Clear-Com makes every attempt to maintain the accuracy of the information contained in its product manuals, that information is subject to change without notice.

ABOUT THIS MANUAL

This manual contains schematics, block diagrams, PCB assembly drawings, and bills of materials for PCBs. It will answer questions you might have about servicing the MS-440, RM-440, and SB-440 intercom stations.

This manual is divided into three sections:

- Overall Schematics and Block Diagrams of the Three Products.
- Schematics
- Bills of Materials for Individual Sections of the Units.

Overall Schematics and Block Diagrams of the Three Products.

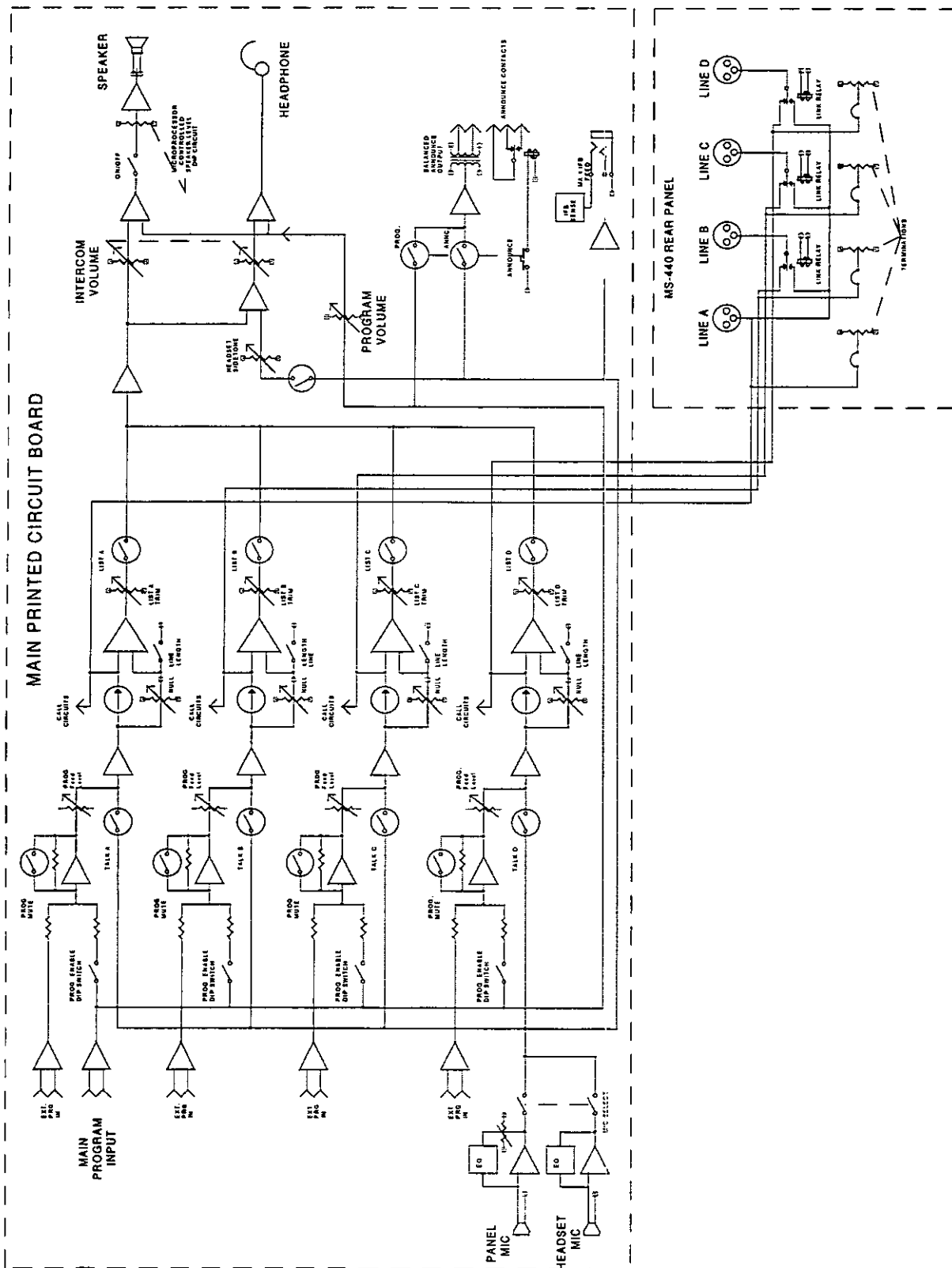
The MS-440, RM-440, and SB-440 are built from a single common design and vary in the various features available. All three intercom stations use the same Main PCB assembly. The differences in the units is the front and rear panels and whether or not a power supply is installed. The following is a brief description of the differences of the three products.

MS-440: The MS-440 is a Main Station that has a 2 amp. power supply and Linking ability between the four channels.

RM-440: The RM-440 is a Remote Station that does not provide power for a intercom system and does not have Linking ability between the four channels.

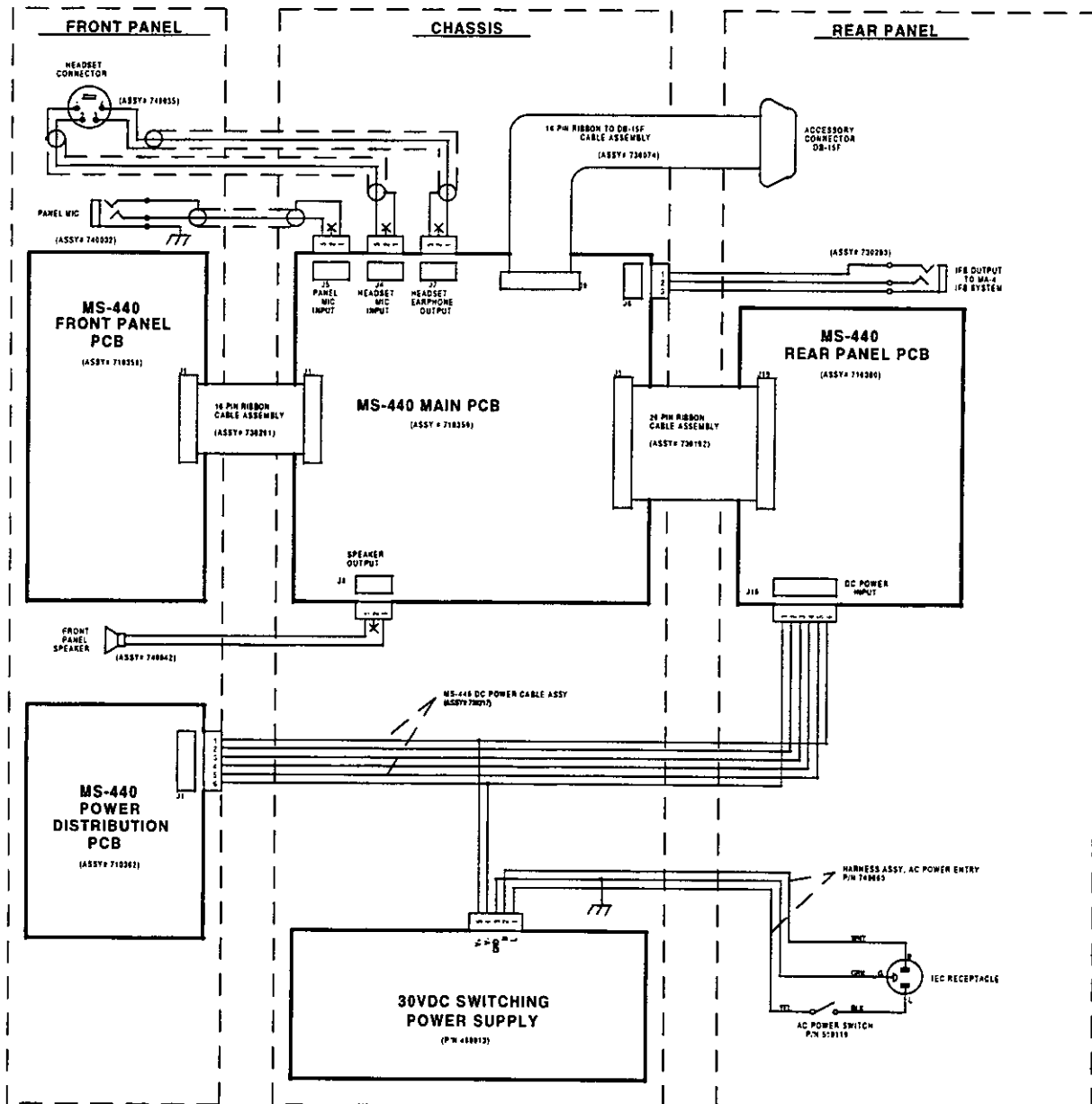
SB-440: The SB-440 is a Main Station that has a 2 amp. power supply, Linking ability between the four channels, and a ten input slide switch assignment matrix.

The following pages show an audio block diagram and an overall chassis schematic of each of the products. Use these overall schematics and block diagrams to understand the interconnection of the individual PCBs used in each product.

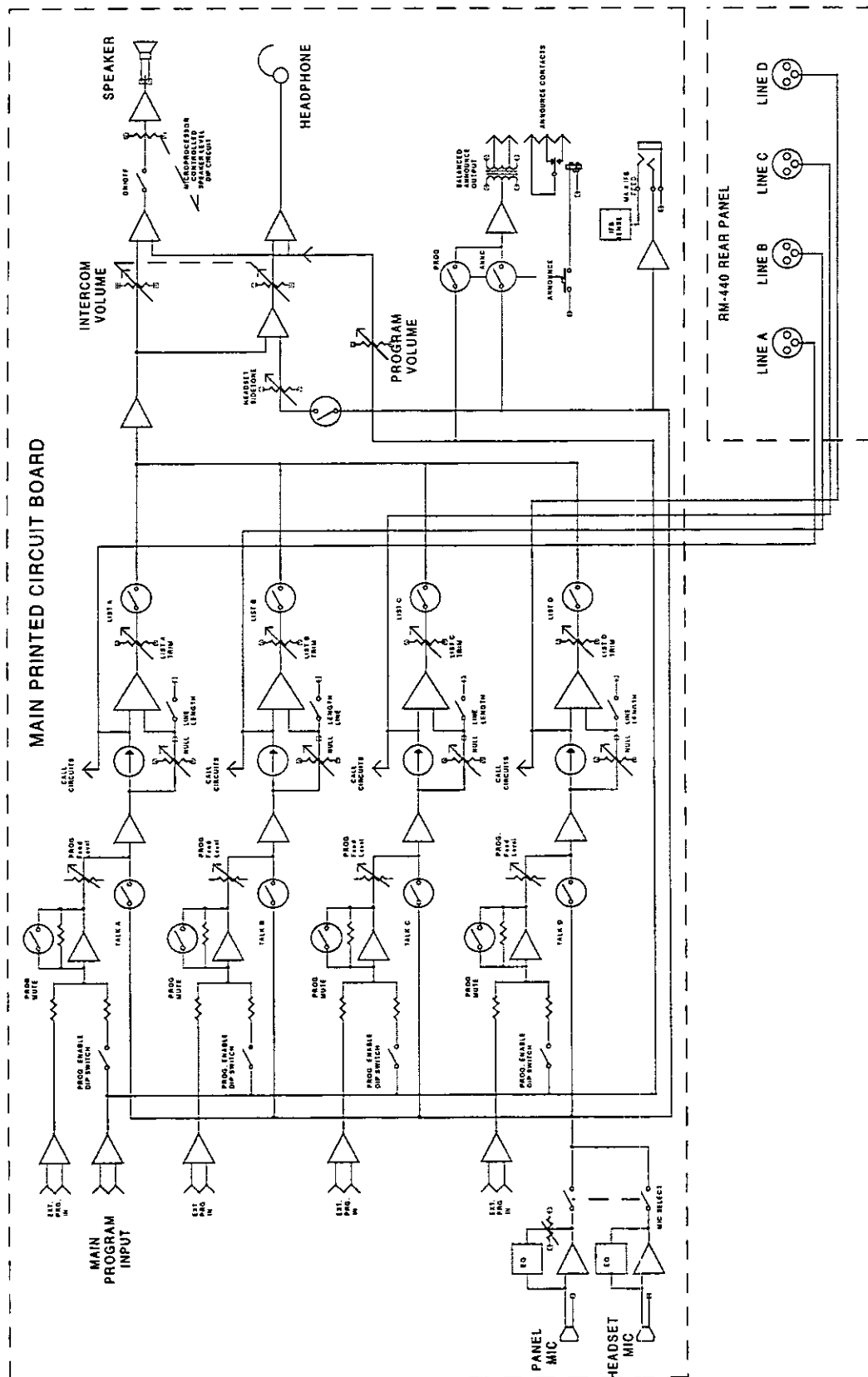


Audio Block Diagram for the MS-440

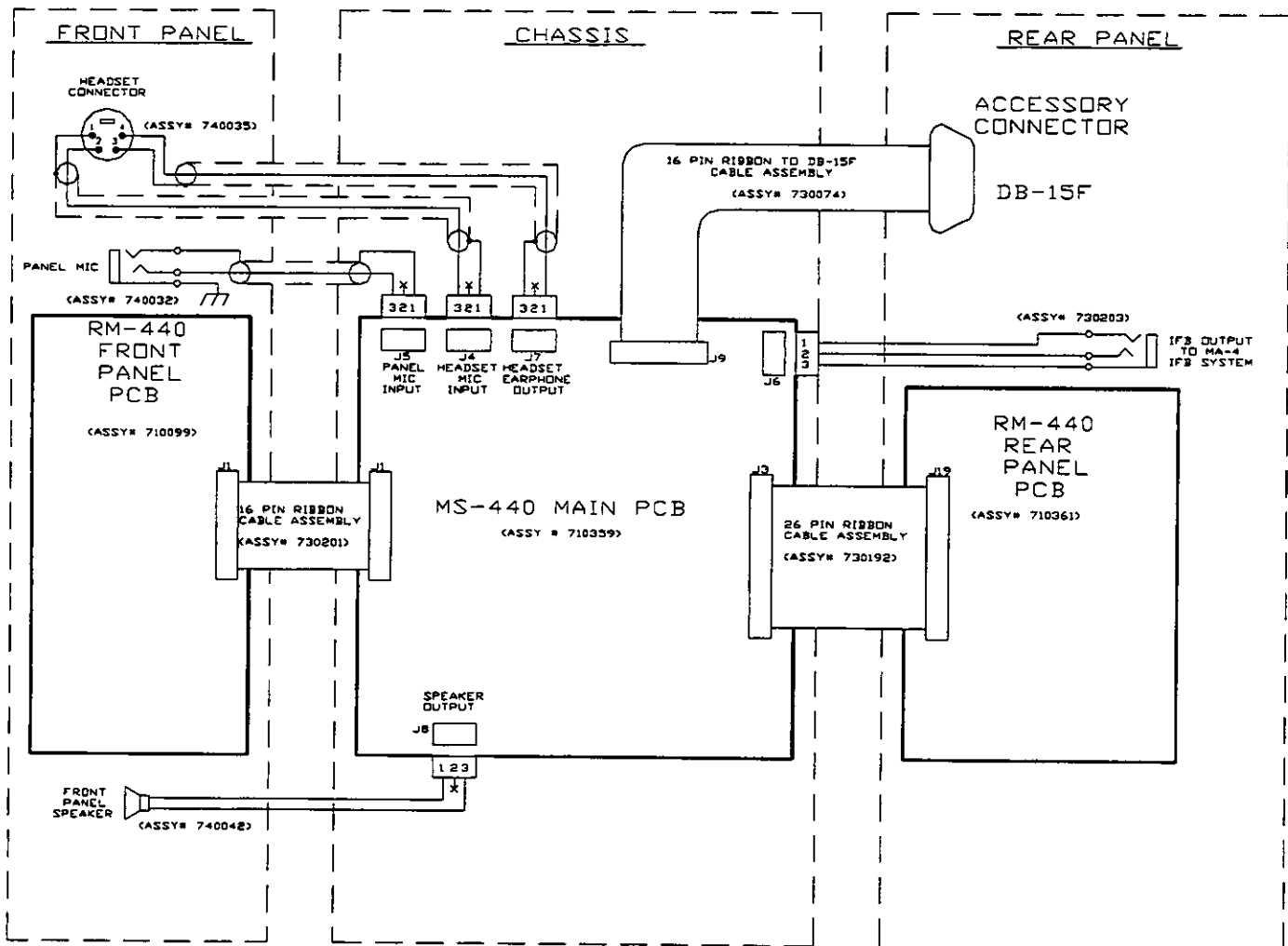
MS-440 SWR CHASSIS SCHEMATIC



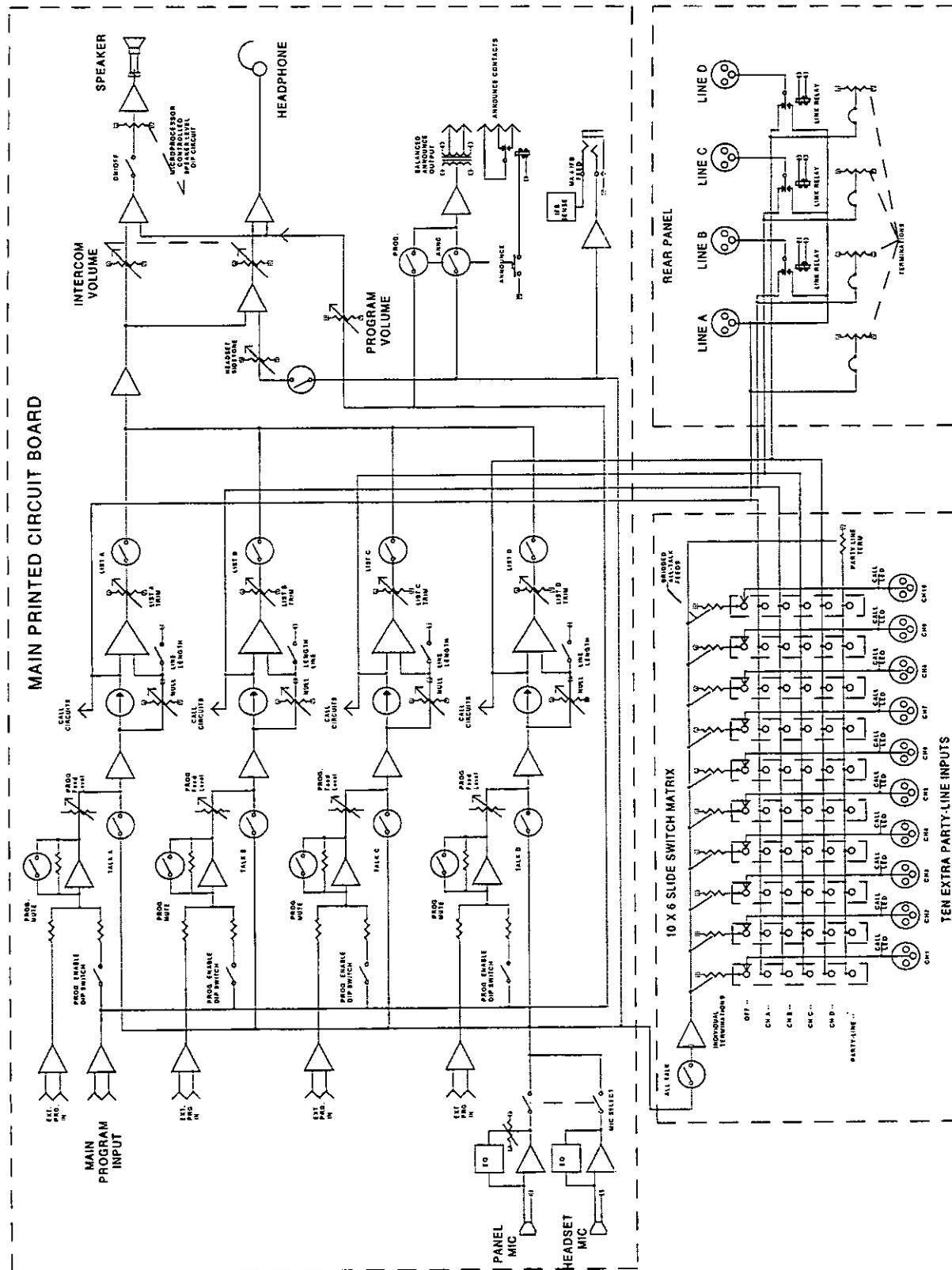
Overall Chassis Schematic of the MS-440 (760048 Rev. A)



Audio Block Diagram for the RM-440

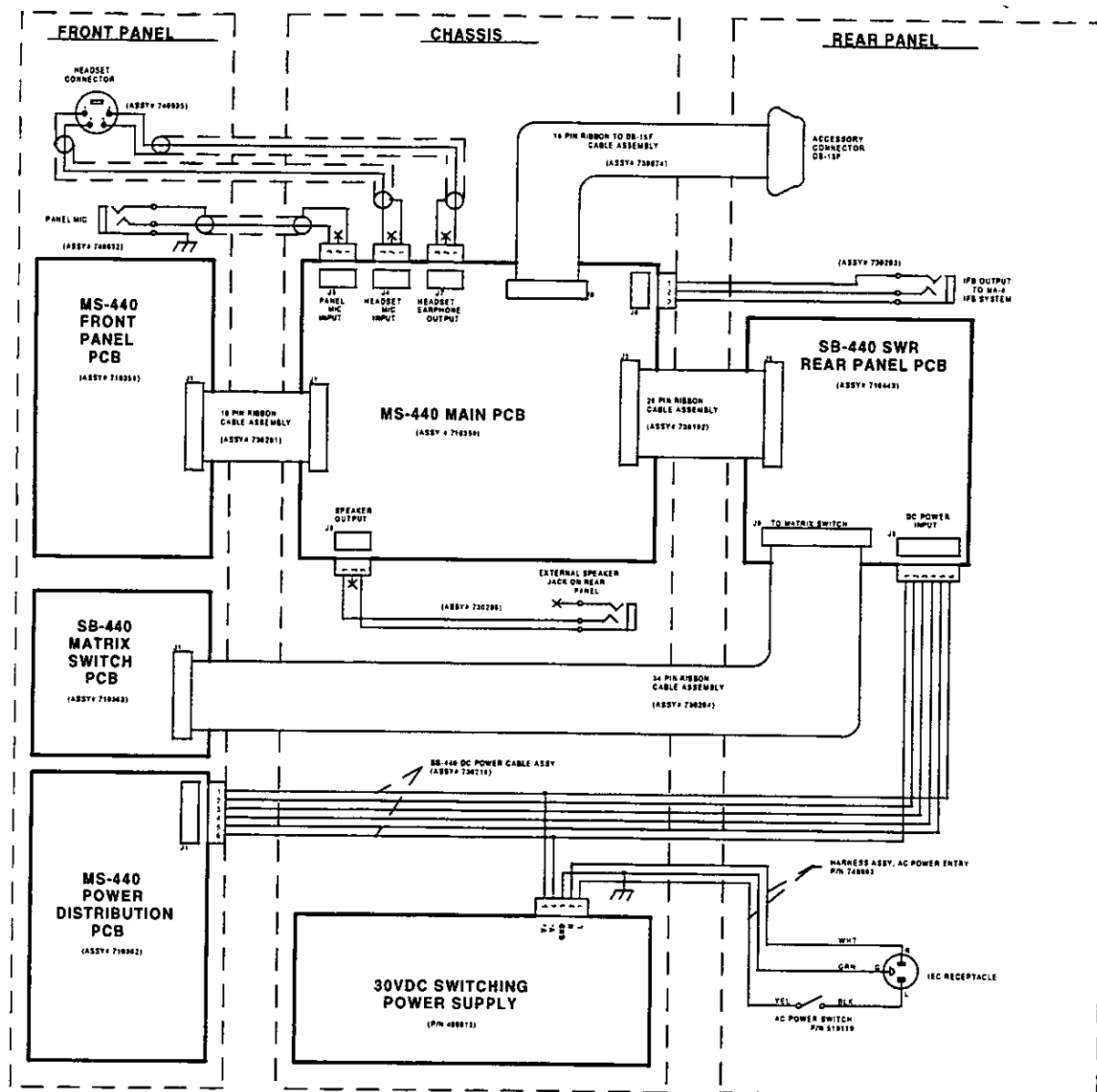


Overall Chassis Schematic of the RM-440 (760027 Rev. A)



Audio Block Diagram for the SB-440

SB-440 SWR CHASSIS SCHEMATIC



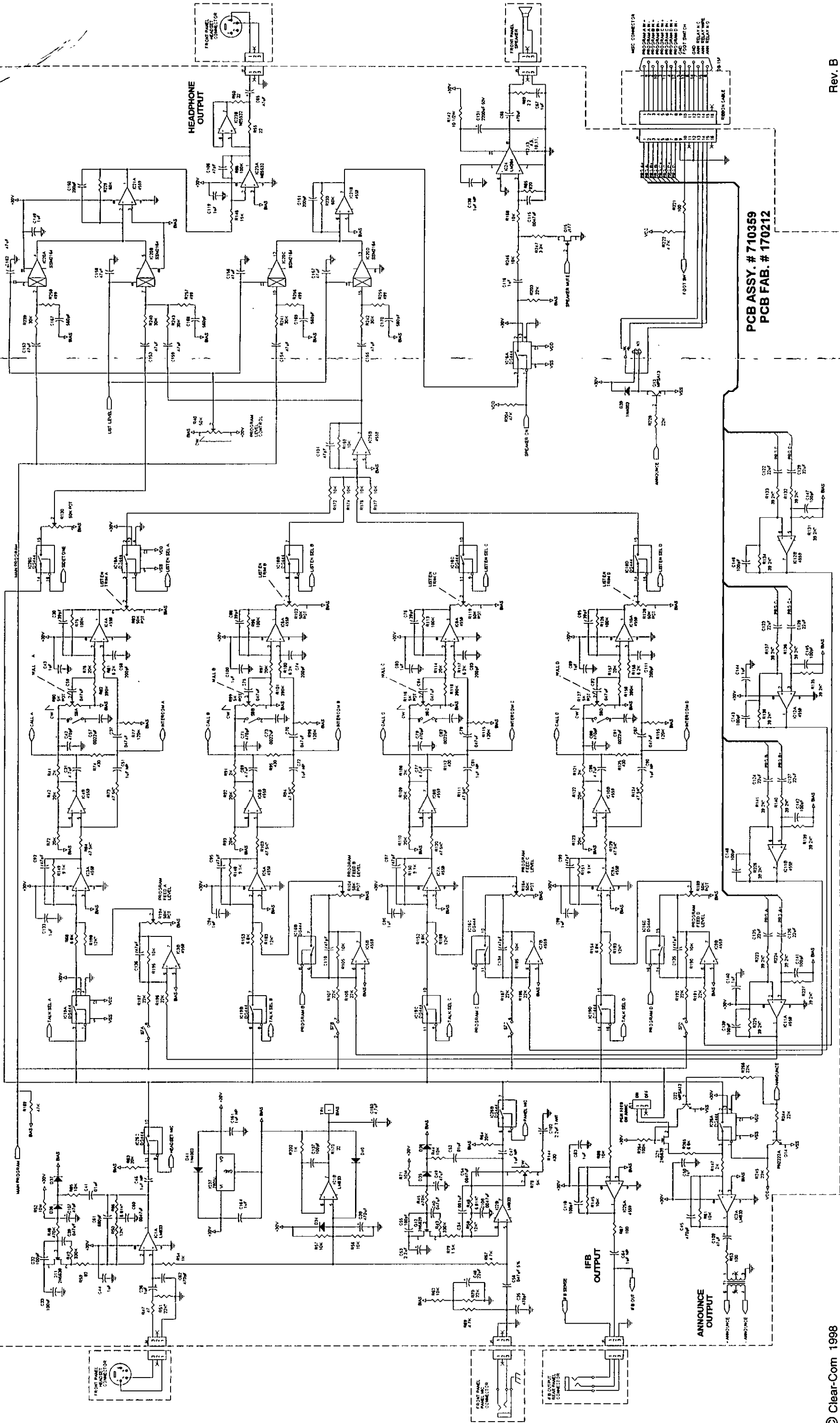
Overall Chassis Schematic of the SB-440 (760049 Rev. A)

Schematics

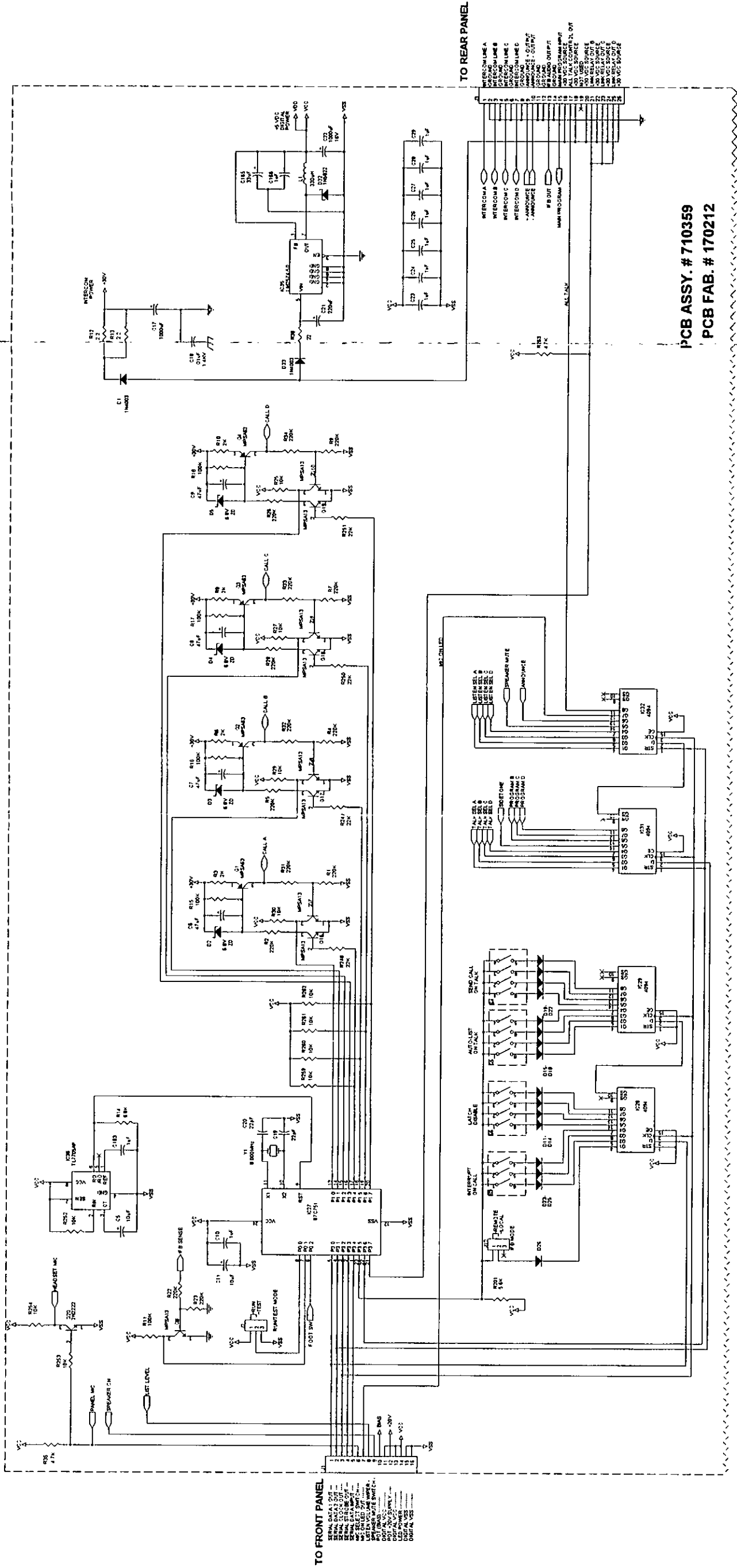
This section provides the following schematics:

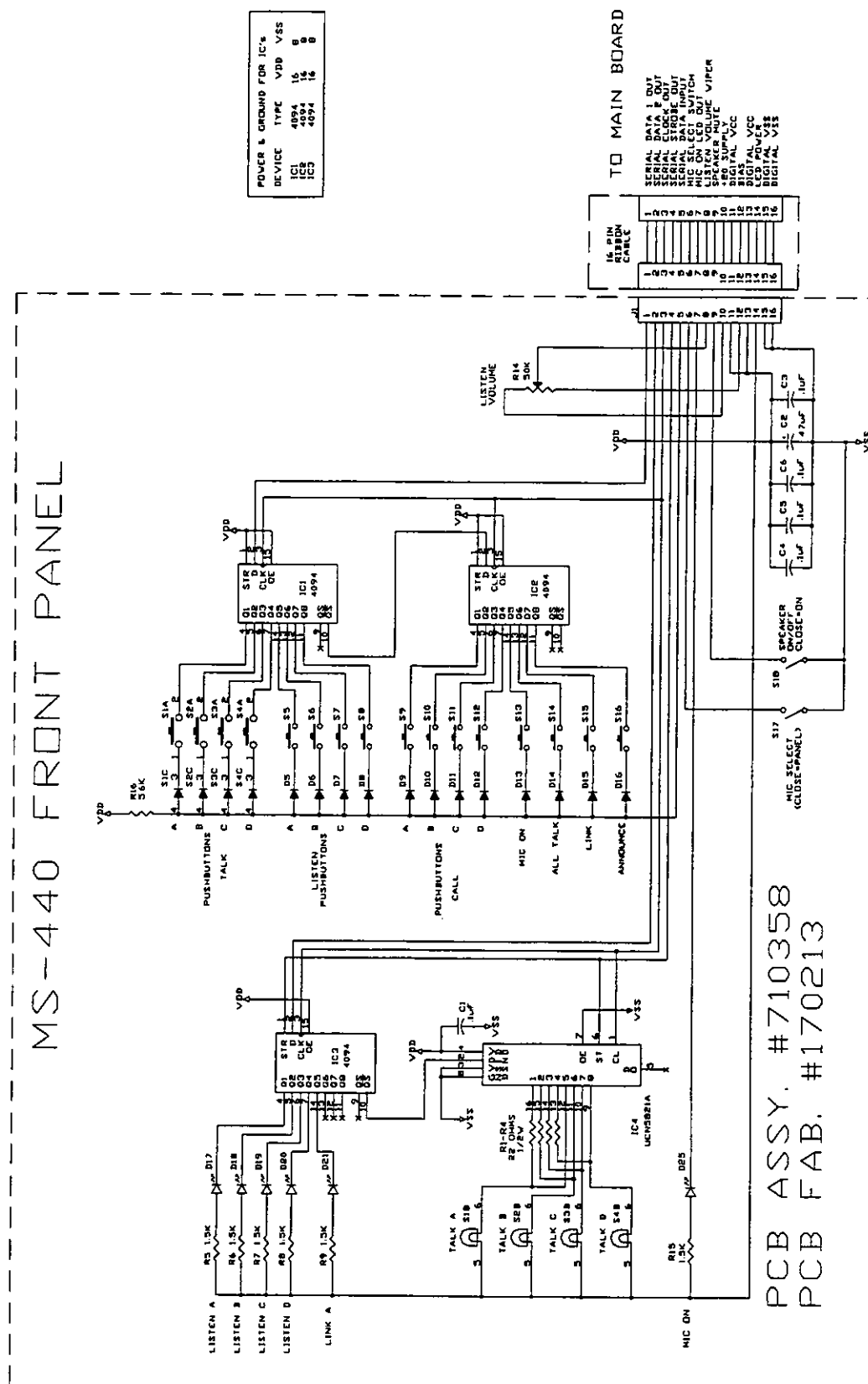
- Schematic Diagram for the Audio Portion of the Main PCB
- Schematic Diagram for the Digital Portion of the Main PCB
- MS-440/SB-440 Front Panel PCB Schematic
- RM-440 Front Panel PCB Schematic
- MS-440 Rear Panel PCB Schematic
- RM-440 Rear Panel PCB Schematic
- SB-440 Rear Panel PCB Schematic
- MS-440 Power Supply PCB Schematic
- MS-440 Power Distribution PCB Schematic
- SB-440 Assignment Switch PCB

CONTINUED ON SHEET 2

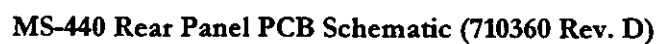


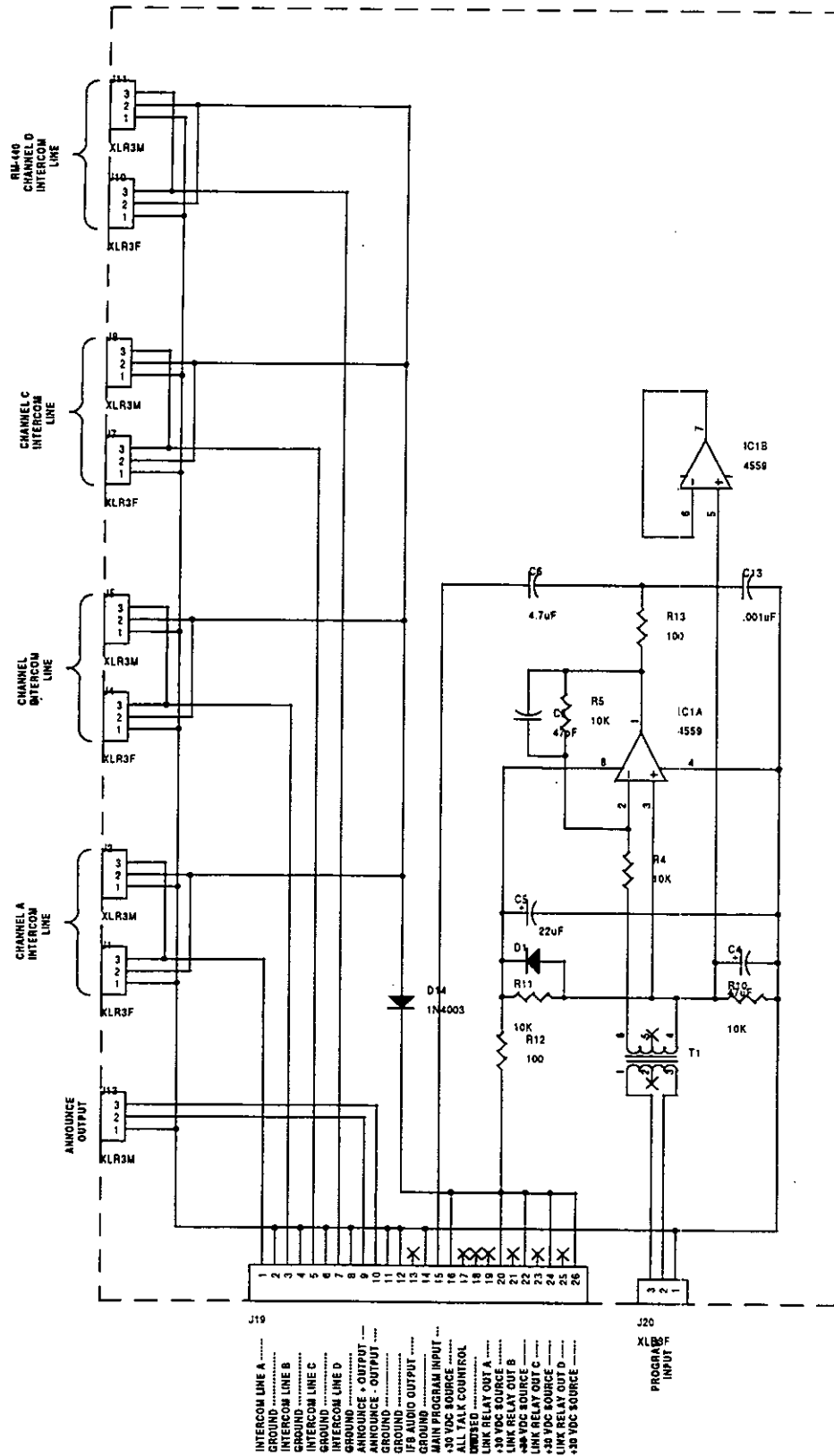
PCB ASSY. # 710359
PCB FAB. # 170212



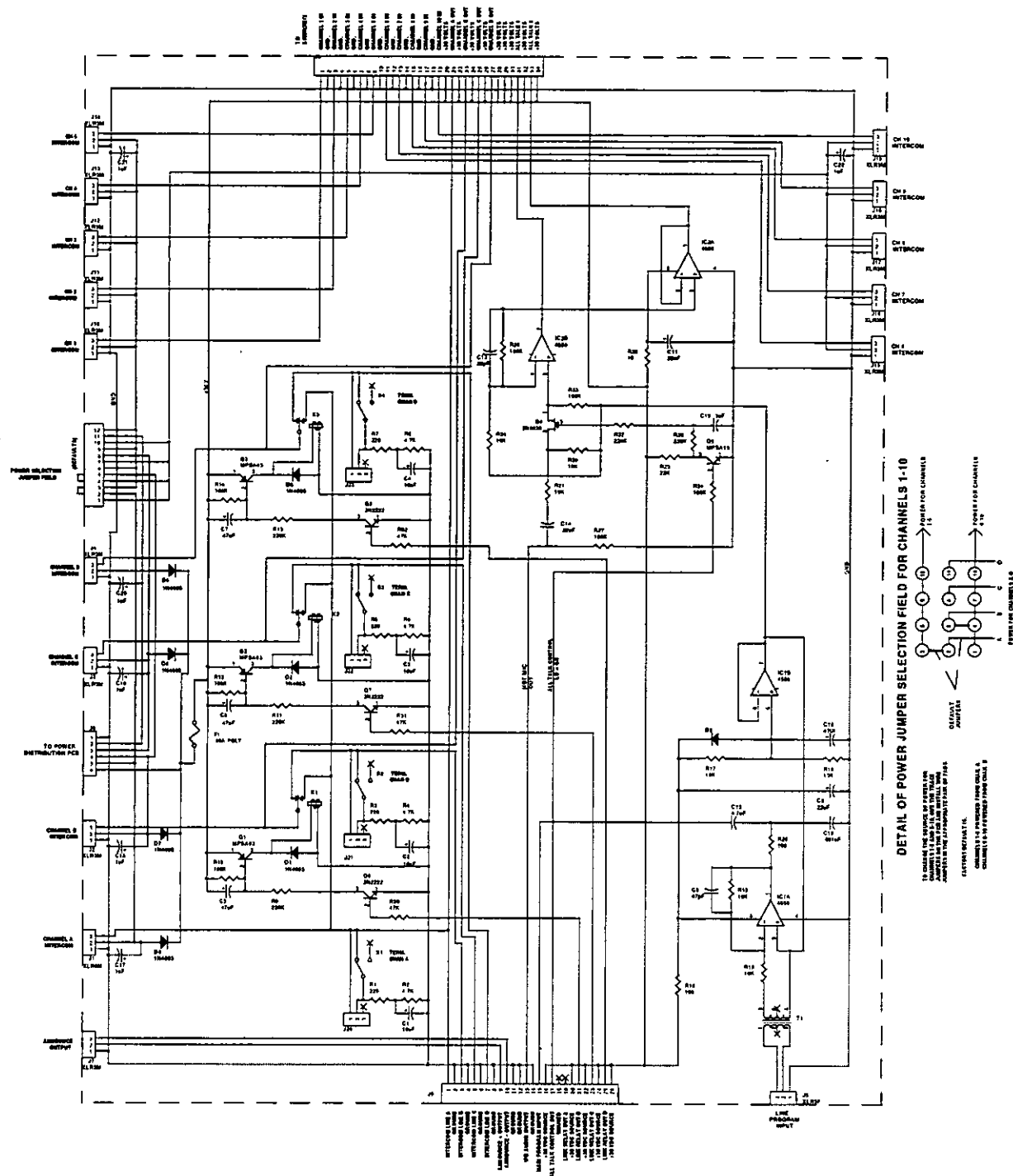


MS-440/SB-440 Front Panel PCB Schematic (710358 Rev. A)

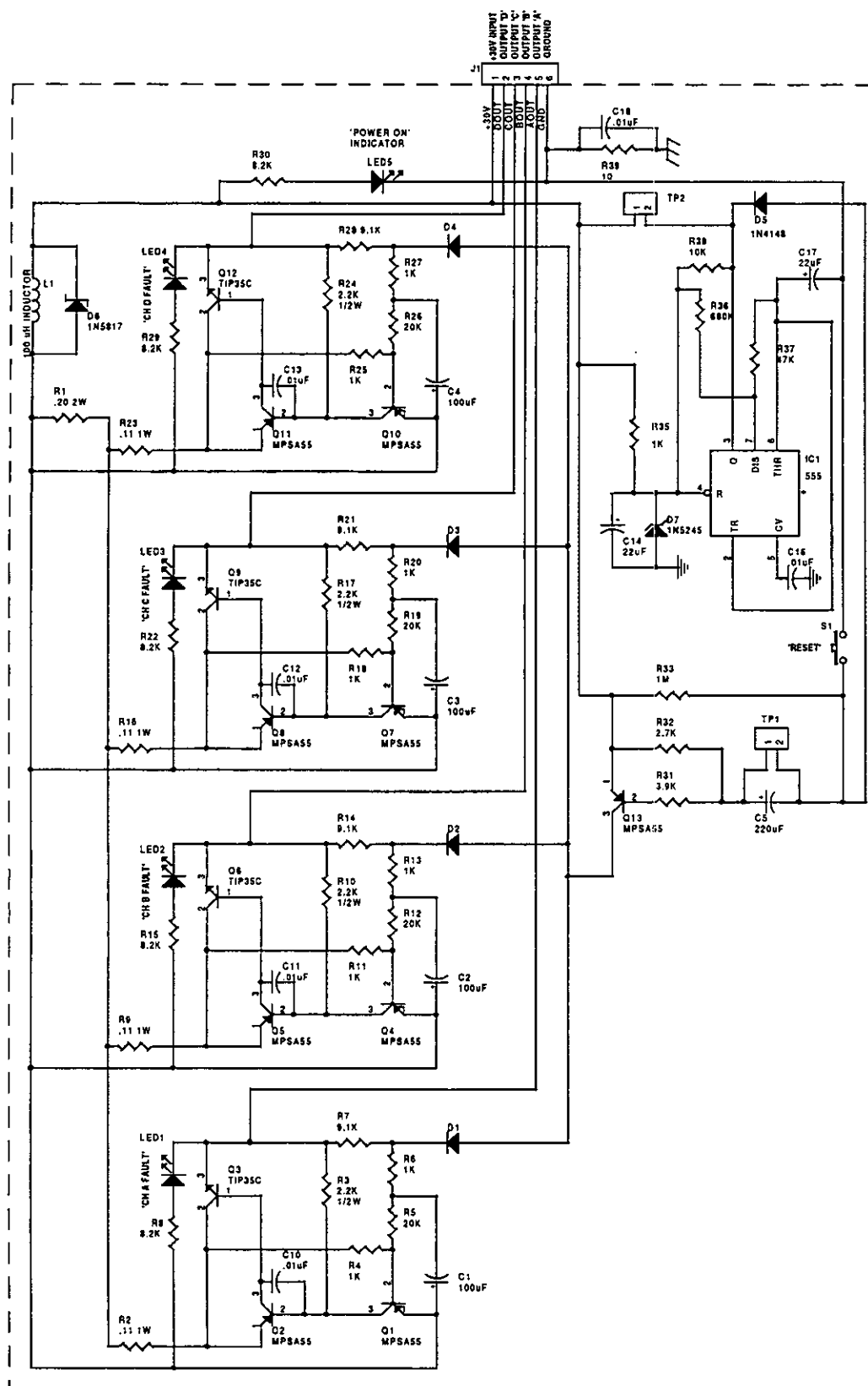




RM-440 Rear Panel PCB Schematic (710361 Rev. C)

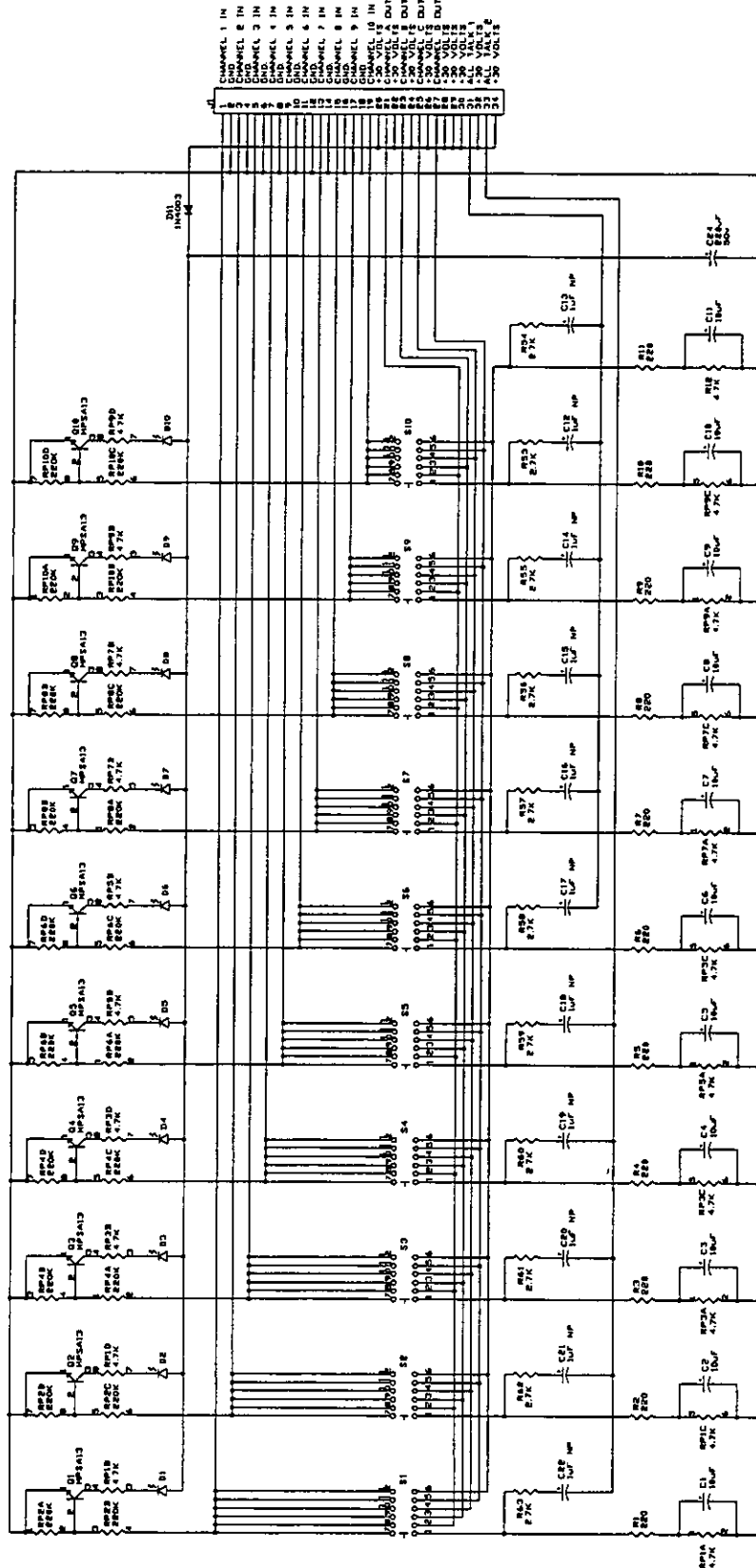


SB-440 Rear Panel PCB Schematic (710443 Rev. A)



NOTE: * IC1 (74VHC01) is connected to pin 4 (RESET)
 Pin 1 is connected to ground
 Pin 8 has a .1uF bypass cap (C15) to ground

MS-440 Power Distribution PCB Schematic (710362 Rev. E)



SB-440 Selector Switch PCB Schematic (710363 Rev. A)

intentionally left blank

Bills of Materials for Individual Sections of the Units

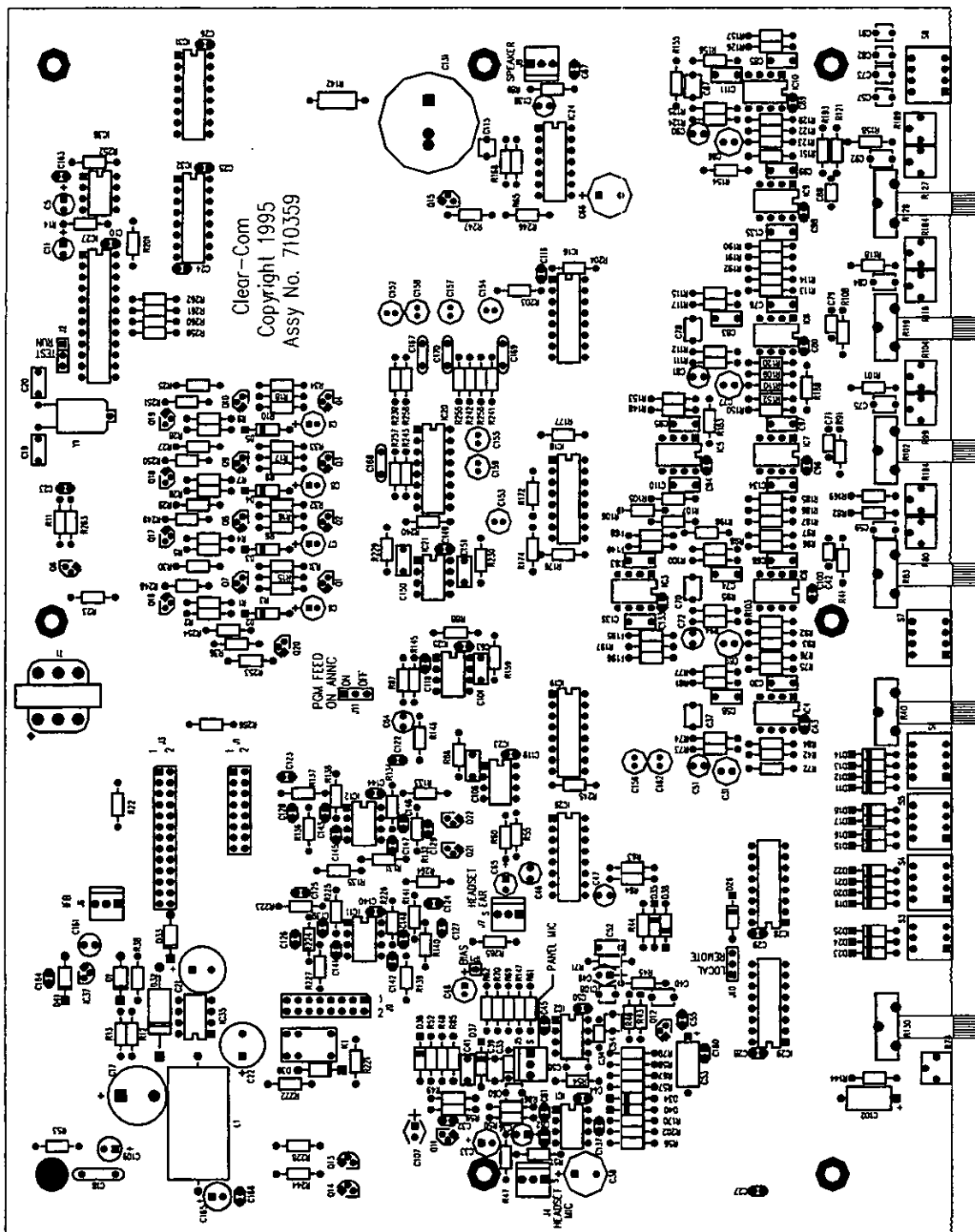
This section provides assembly drawings of printed circuit boards and bills of materials for those assemblies.

This section is divided into the following sections:

- Miscellaneous Chassis Parts for the MS-440/RM-440/SB-440
- Assembly Drawing and Bill of Materials for the Main PCB
- Assembly Drawing and Bill of Materials for the MS-440/RM-440/SB-440 Front Panel PCB
- Assembly Drawing and Bill of Materials for the MS-440 Rear Panel PCB
- Assembly Drawing and Bill of Materials for the RM-440 Rear Panel PCB
- Assembly Drawing and Bill of Materials for the SB-440 Rear Panel PCB
- Assembly Drawing and Bill of Materials for the Power Supply PCB
- Assembly Drawing and Bill of Materials for the Power Distribution PCB
- Assembly Drawing and Bill of Materials for the SB-440 Assignment Switch PCB

Miscellaneous Chassis Parts for the MS-440/RM-440/SB-440

Device	Description	Part #	Designator
	Choke, Filter 15MH	180000	
	Power Entry Module	210313	
	Foot, Rubber .50 Inch Sq.	240010	
	Speaker, 3 Inch Round	500089	
	Power Transformer	560011	
	Cord, Power	610022	



MS-440/RM-440/SB-440 Main PCB Assembly Drawing

Bill of Materials for the MS-440/RM-440/SB-440 Main PCB**Capacitors**

Value		Type	Volts	Tol.	Part #	Designator
22	pF	Ceramic Disc	50V	10%	150098	C19,C20
39	pF	Ceramic Disc	50V	5%	150026	C30,C68,C76,C85
47	pF	Ceramic Disc	50V	10%	150041	C93,C95,C97,C99,C101, C106,C110,C134,C135, C136
100	pF	Ceramic Disc	50V	10%	150006	C32,C55,C118,C137,C139, C141,C142,C143,C145, C146, C147,C148
200	pF	Ceramic Disc	50V	10%	150007	C150,C151
200	pF	Ceramic Disc	100V	5%	150063	C58,C74,C83,C111
470	pF	Ceramic Disc	50V	10%	150014	C35,C42,C71,C79,C88
470	pF	Monolithic	50V	20%	150102	C45,C62
680	pF	Ceramic Disc	50V	5%	150061	C61
.0047	uF	Mylar	50V	5%	150114	C54,C60,C108,C115
.0022	uF	Mylar	100V	5%	150045	C57,C73,C82,C91
.047	uF	Mylar	100V	5%	150131	C37,C39,C40,C56,C59, C70,C75,C78,C84,C87,C92
.001	uF	Ceramic Disc	30V	20%	150052	C34
.47	uF	Tant.	35V	10%	150110	C49,C107
.47	uF	Aluminum NP	50V		150151	C6,C7,C8,C9,C152, C153, C154,C155,C156, C157, C158, C159,C162
.22	uF	Mylar	100V	20%	150003	C122,C123,C124,C125, C126, C127,C128,C129
.01	uF	Ceramic Disc	30V	20%	150012	C41,C52
.01	uF	Ceramic Disc	1.4KV	20%	150029	C18
.1	uF	Monolithic	50V	10%	150035	C10,C23,C24,C25,C26, C27,C28,C29,C43,C44, C50,C63,C67,C80,C89, C94,C96,C98,C100,C116, C119,C133,C140, C144, C149,C160,C163
1	uF	Tant.	35V	20%	150116	C36
1	uF	Aluminum NP	50V	10%	150002	C46,C47,C51,C64,C72, C81,C90,C138,C161
2.2	uF	Tant.	35V	10%	150019	C53,C102

Capacitors ... continued

Value		Type	Volts	Tol.	Part #	Designator
4.7	uF	Aluminum NP	50V		150087	C31,C69,C77,C86
10	uF	Aluminum NP	35V	10%	150072	C5,C11
22	uF	Aluminum	35V	20%	150152	C48
47	uF	Aluminum	35V		150081	C65,C109
100	uF	Aluminum	25V	20%	150099	C33
220	uF	Aluminum	50V		150037	C21
470	uF	Aluminum	35V		150156	C38,C66
1000	uF	Aluminum	16V		150145	C22
1000	uF	Aluminum	35V		150092	C17
2200	uF	Aluminum	50V		150135	C131

Resistors & Resistor Packs

Value		Power	Type	Tol.	Part #	Designator
2.2	OHMS	1/4W	Carbon Film	5%	410113	R12,R13,R89
10	OHMS	1/2W	Carbon Film	5%	410066	R142
22	OHMS	1/4W	Carbon Film	5%	410004	R38,R55,R60,R170
47	OHMS	1/4W	Carbon Film	5%	410039	R47
82	OHMS	1/4W	Carbon Film	5%	410038	R59
100	OHMS	1/4W	Carbon Film	5%	410071	R53,R87,R221
200	OHMS	1/4W	Carbon Film	5%	410072	R255,R256,R257,R258
430	OHMS	1/4W	Carbon Film	5%	410106	R74,R95,R112,R125,R144
820	OHMS	1/4W	Carbon Film	5%	410096	R65
1K	OHMS	1/4W	Carbon Film	5%	410010	R54,R202
1.5K	OHMS	1/4W	Carbon Film	5%	410055	R79
2K	OHMS	1/4W	Carbon Film	5%	410014	R3,R6,R8,R10,R41,R91, R108,R121,R147
3.3K	OHMS	1/4W	Carbon Film	5%	410015	R247
3.6K	OHMS	1/4W	Carbon Film	5%	410170	R231,R232,R233,R234, R235,R236,R237,R238
4.7K	OHMS	1/4W	Carbon Film	5%	410013	R36,R67,R69,R222,R263
5.6K	OHMS	1/4W	Carbon Film	5%	410056	R201
6.2K	OHMS	1/4W	Carbon Film	5%	410137	R81,R100,R117,R156
6.8K	OHMS	1/4W	Carbon Film	5%	410036	R14,R68,R152,R153,R154, R265
6.81K	OHMS	1/8W	Metal Film	1%	410063	R46,R86
9.1K	OHMS	1/4W	Carbon Film	5%	410100	R148,R149,R150,R151

Resistors & Resistor Packs ... continued

Value	Power	Type	Tol.	Part #	Designator
10K OHMS	1/4W	Carbon Film	5%	410016	R25,R27,R29,R30,R44,R56, R57,R61,R62,R85,R88, R105,R145,R159,R168, R172,R174,R176,R177, R185,R190,R195,R239, R240,R241,R242,R243, R246,R252,R254,R259, R260,R261,R262
12K OHMS	1/4W	Metal Film	1%	410140	R50,R58,R183,R188,R193, R198
20K OHM	1/4W	Carbon Film	5%	410151	R42,R63,R64,R72,R76,R92, R93,R97,R109,R110,R114, R122,R123,R146,R157, R229, R230
22K OHMS	1/4W	Carbon Film	5%	410018	R70,R106,R107,R186,R187, R191,R192,R196,R197, R203,R228,R244,R245, R248,R249,R250,R251, R266
22K OHMS	1/8W	Metal Film	1%	410157	R51
39.2K OHMS	1/8W	Metal Film	1%	410111	R131,R132,R133,R134, R135,R136,R137,R138, R139,R140,R141,R223, R224,R225,R226,R227
47K OHMS	1/4W	Carbon Film	5%	410021	R169,R204,R253
47.5K OHMS	1/8W	Metal Film	1%	410105	R73,R84,R94,R103,R111, R120,R124,R129
100K OHMS	1/4W	Carbon Film	5%	410024	R11,R15,R16,R17,R18,R66 R75,R96,R113,R126,R264
120K OHMS	1/4W	Carbon Film	5%	410079	R77,R98,R115,R155
220K OHMS	1/4W	Carbon Film	5%	410028	R1,R2,R4,R5,R7,R9, R22,R23,R26,R28, R31,R32,R33,R34
330K OHMS	1/4W	Carbon Film	5%	410033	R43,R49
390K OHMS	1/4W	Carbon Film	5%	410029	R82,R101,R118,R158
470K OHMS	1/4W	Carbon Film	5%	410030	R45,R48
10M OHMS	1/4W	Carbon Film	5%	410059	R52,R71

Diodes, Transistors, and Integrated Circuits

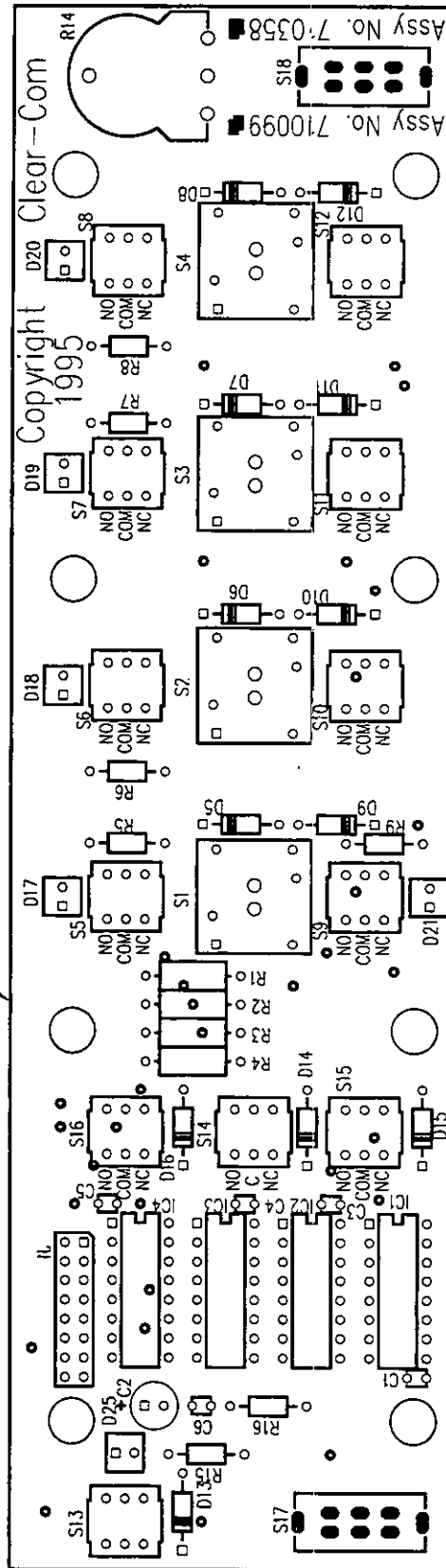
Device	Description	Part #	Designator
1N957B	Zener 6.8V .4W 5%	480026	D2,D3,D4,D5
1N4003	Rectifier, 1A 200PIV	480058	D1,D33,D39,D41
1N4148	Diode, Signal 10MA 75PIV	480000	D11,D12,D13,D14,D15, D16,D17,D18,D19,D20, D21,D22,D23,D24,D25, D26,D34,D35,D36,D37, D38,D40
1N5822	Diode, Shtky 3A 40PIV	480100	D32
2N5639	Transistor, JFET N-Chan	480069	Q11,Q12,Q21
JI77	Transistor, JFET P-Chan	480044	Q15
MPS-A13	Transistor, NPN 30V Darl	480004	Q6,Q7,Q8,Q9,Q10,Q13, Q14,Q16,Q17,Q18,Q19, Q20,Q22
MPS-A63	Transistor, PNP 30V Darl	480008	Q1,Q2,Q3,Q4
4094B	IC, CMOS Shift Register	480107	IC28,IC29,IC31,IC32
4559NB	OP AMP, Dual	480056	IC3,IC4,IC5,IC6,IC7,IC8, IC9,IC10,IC11,IC12,IC21, IC25
7805L	Regulator, POS 5V TO-92	480088	IC37
DG444	IC, Quad Analog Switch	480212	IC16,IC18,IC19,IC26
LM2574	Regulator, SW 5V .5A	480216	IC35
LM384	OP AMP, Power 4W	480012	IC24
LM833N	OP AMP, Dual Low Noise	480175	IC1,IC2,IC23
SSM-2024P	VCA, Quad	480168	IC20
TL7705AP	IC, Reset Supervisor	480134	IC36

Miscellaneous

Device	Description	Part #	Designator
Crystal	8.000MHz Parallel	230003	Y1
Inductor	1000uH 280MA	180006	L1,L2
Microproc.	MS-440 Eprom Assy	710357	IC27
Pot	Trim 50K	470035	R40,R83,R102,R119, R128,R130
Pot	Trim 50K Lin Side	470064	R104,R184,R189,R194
Pot	Trim 5K Lin Side	470065	R78,R80,R99,R116,R127
Relay	SPDT 24V PC Relay ITT#SZ24	450004	K1
Switch	Piano Dip 4 Pos	510039	S4,S5,S6,S7,S8
Switch	Piano Dip 3 Pos	510114	S1,S3
Transformer	600CT/600CT	560018	T1

intentionally left blank

170213 PC FAB



MS-440/RM-440/SB-440 Front Panel PCB Assembly Drawing

Bill of Materials for the MS-440/RM-440/SB-440 Front Panel PCB

The Front Panel for the RM-440 is identical to the MS-440 except the following parts are omitted: S9 and D21.

Capacitors

Value	Type	Volts	Tol.	Part #	Designator
.1 uF	Monolithic	50V	10%	150035	C1,C3,C4,C5,C6
47 uF	Aluminum	35V		150081	C2

Resistors & Resistor Packs

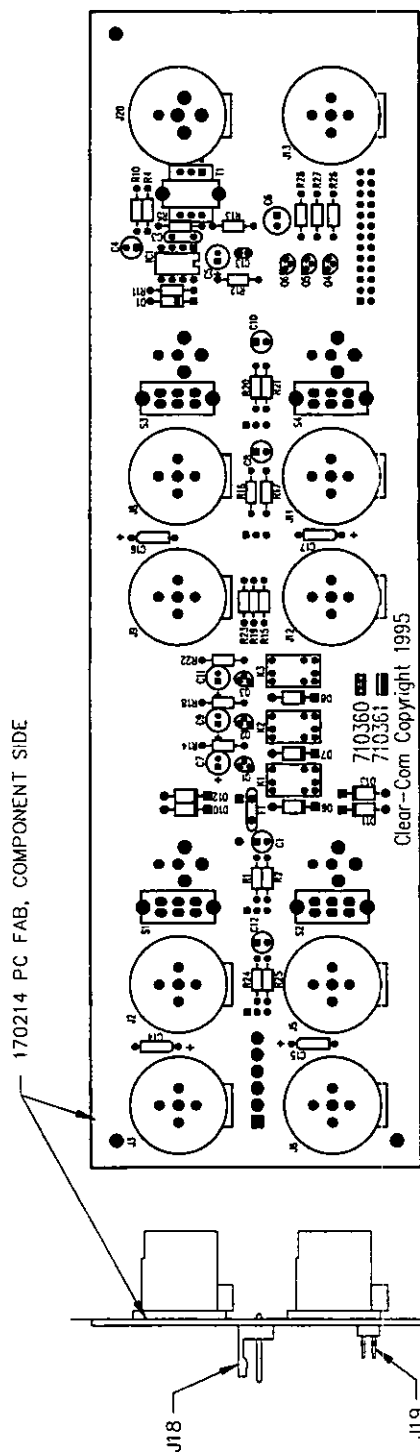
Value	Power	Type	Tol.	Part #	Designator
22 OHMS	1/2W	Carbon Film	5%	410065	R1,R2,R3,R4
1.5K OHMS	1/4W	Carbon Film	5%	410055	R5,R6,R7,R8,R9,R10,R11, R12,R15
5.6K OHMS	1/4W	Carbon Film	5%	410056	R16

Diodes, Transistors, and Integrated Circuits

Device	Description	Part #	Designator
1N4148	Diode, Signal 10MA 75PIV	480000	D5,D6,D7,D8,D9, D12,D13,D14,D15,D16
4094B	CMOS Shift Register	480107	IC1,IC2,IC3
UCN5821A	Shift Reg/Latch/Drivers	480164	IC4

Miscellaneous

Device	Description	Part #	Designator
Keycap	.600in Flat Top	240064	S1,S2,S3,S4
Led	Red, Round, Flat Top	390044	D21
Led	Green, Round, Flat Top	390045	D17,D18,D19,D20,D25
Lamp	Incand. 5V 75MA Bi-Pin	390054	S1,S2,S3,S4
Pot	5K PC Mount	470072	R14
Switch	Slide, DPDT	510090	S17,S18
Switch	Push. DPDT Short Plunger	510106	S5,S6,S7,S8,S9,S10,S11,S12
Switch	Push. DPDT Long Plunger	510107	S13,S14,S15,S16
Switch	Push. Illuminated	510116	S1,S2,S3,S4



MS-440 Rear Panel PCB Assembly Drawing

Bill of Materials for the MS-440 Rear Panel PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
1 uF	Tantalum	35V	10%	150009	C14,C15,C16,C17
47 pF	Ceramic Disc	50V	10%	150041	C3
.001 uF	Monolithic	50V	20%	150113	C13
.47 uF	Aluminum	50V		150024	C7,C9,C11
4.7 uF	Aluminum NP	50V		150087	C6
10 uF	Aluminum	50V		150064	C1,C8,C10,C12
22 uF	Aluminum	35V	20%	150152	C5
47 uF	Aluminum	35V		150081	C4

Resistors & Resistor Packs

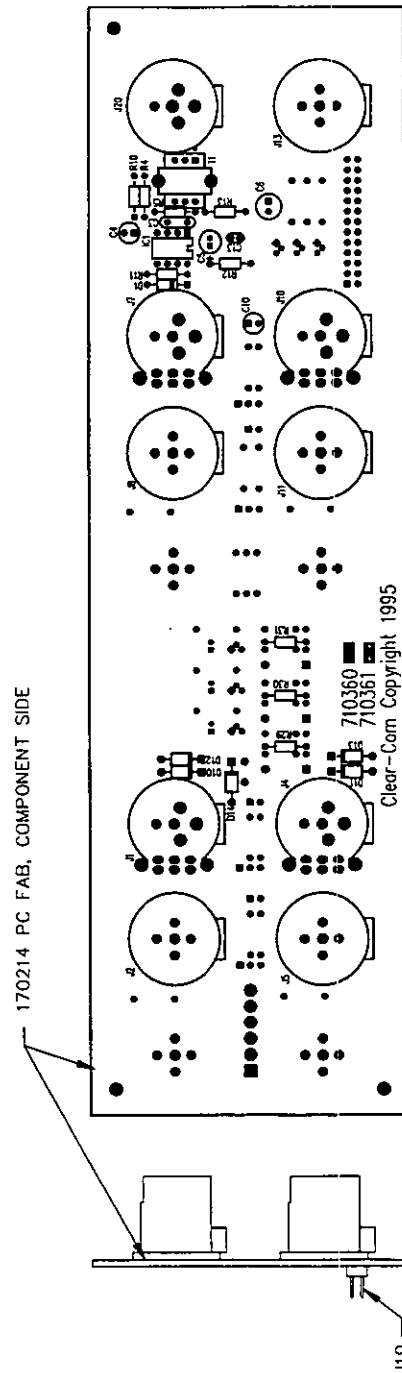
Value	Power	Type	Tol.	Part #	Designator
100 OHMS	1/4W	Carbon Film	5%	410071	R12, R13
220 OHMS	1/4W	Carbon Film	5%	410007	R1,R16,R20,R24
4.7K OHMS	1/4W	Carbon Film	5%	410013	R2,R17,R21,R25
10K OHMS	1/4W	Carbon Film	5%	410016	R4,R5,R10,R11
47K OHMS	1/4W	Carbon Film	5%	410021	R26,R27,R28
100K OHMS	1/4W	Carbon Film	5%	410024	R14,R18,R22
220K OHMS	1/4W	Carbon Film	5%	410028	R15,R19,R23

Diodes, Transistors, and Integrated Circuits

Device	Description	Part #	Designator
1N4003	Rectifier 1A 200PIV	480058	D6,D7,D8,D10,D11, D12,D13
1N4148	Diode, Signal 10MA 75PIV	480000	D1
2N2222	Transistor, NPN 30V	480006	Q4,Q5,Q6
MPS-A63	Transistor, PNP 30V DARL	480008	Q1,Q2,Q3
4559NB	OP AMP, Dual	480056	IC1

Miscellaneous

Device	Description	Part #	Designator
Connector	XLR 3 Pin Male Neutrik	210239	J2,J3,J5,J6,J8,J9,J11,J12,J13
Connector	XLR 3 Pin Female Neutrik	210240	J20
Fuse	Poly 0.90A Raychem#RXE 090	520036	F1
Relay	SPDT 24V Mini PC ITT#SZ24	450004	K1,K2,K3
Transformer	7K:10K TL018	560009	T1



RM-440 Rear Panel PCB Assembly Drawing

Bill of Materials for the RM-440 Rear Panel PCB**Capacitors**

Value		Type	Volts	Tol.	Part #	Designator
47	pF	Ceramic Disc	50V	10%	150041	C3
.001	uF	Monolithic	50V	20%	150113	C13
4.7	uF	Aluminum NP	50V		150087	C6
22	uF	Aluminum	35V	20%	150152	C5

Resistors & Resistor Packs

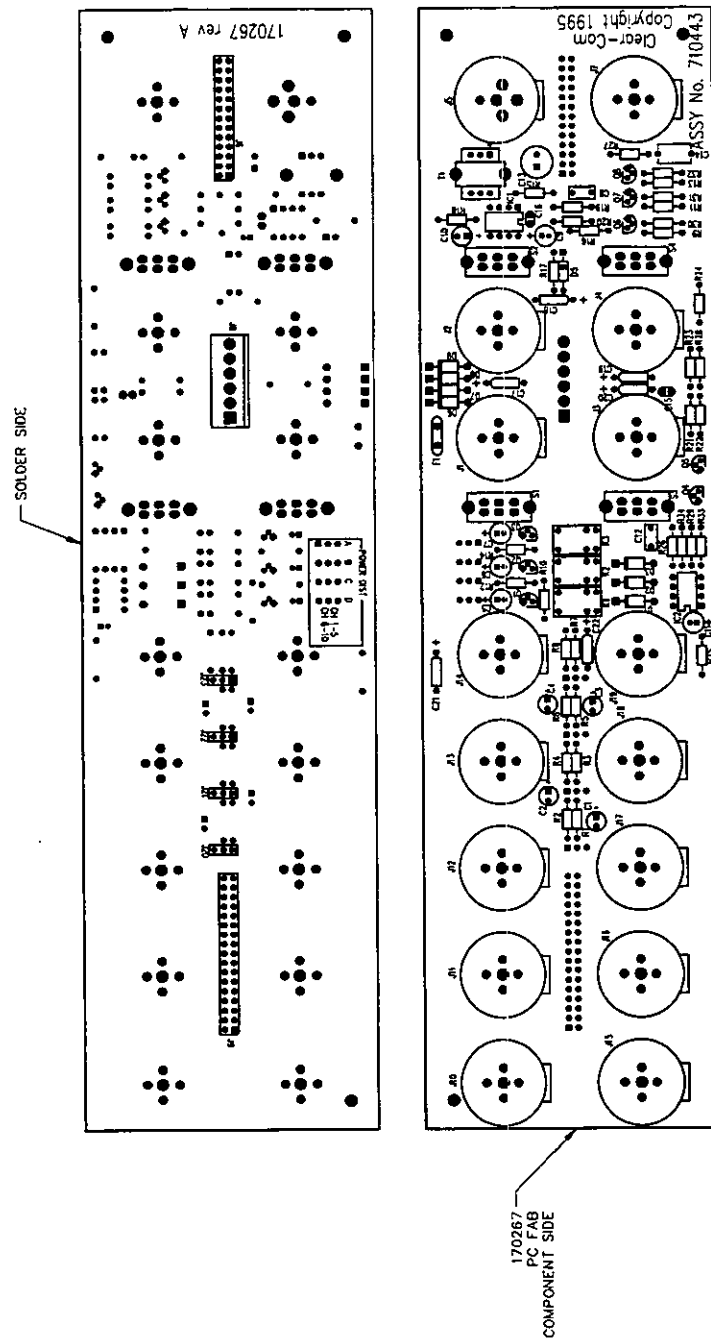
Value		Power	Type	Tol.	Part #	Designator
100	OHMS	1/4W	Carbon Film	5%	410071	R12, R13
10K	OHMS	1/4W	Carbon Film	5%	410016	R4,R5,R10,R11

Diodes, Transistors, and Integrated Circuits

Device	Description	Part #	Designator
1N4003	Rectifier 1A 200PIV	480058	D10,D11,D12,D13,D14
1N4148	Diode, Signal 10MA 75PIV	480000	D1
4559NB	OP AMP, Dual	480056	IC1

Miscellaneous

Device	Description	Part #	Designator
Connector	XLR 3 Pin Male Neutrik	210239	J2,J5,J8,J11,J13
Connector	XLR 3 Pin Female Neutrik	210240	J1,J4,J7,J10,J20
Transformer	7K:10K TL018	560009	T1



SB-440 Rear Panel PCB Assembly Drawing

Bill of Materials for the SB-440 Rear Panel PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
1 uF	Tantalum	35V	10%	150009	C17,C18,C19,C20,C21,C22
47 pF	Ceramic Disc	50V	10%	150041	C8
.001 uF	Monolithic .1LS	50V	20%	150113	C16
.47 uF	Electrolytic	50V	20%	150024	C5,C6,C7
.22 uF	Mylar	100V	20%	150003	C14
.1 uF	Monolithic	50V	10%	150035	C15
4.7 uF	Electrolytic NP	50V	10%	150087	C13
10 uF	Electrolytic NP	50V	20%	150064	C1,C2,C3,C4
22 pF	Ceramic Disc	50V	10%	150098	C12
22 uF	Electrolytic	35V	20%	150152	C9,C11
47 uF	Electrolytic Small	35V	20%	150081	C10

Resistors & Resistor Packs

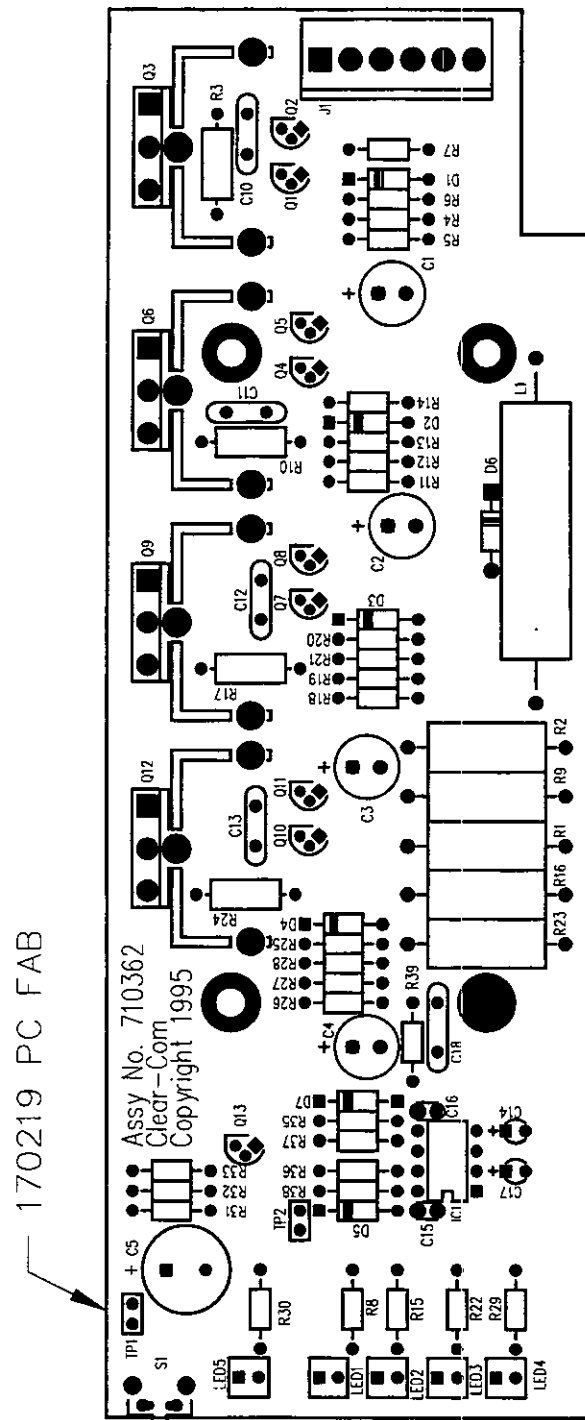
Value	Power	Type	Tol.	Part #	Designator
10 OHMS	1/4W	Carbon Film	5%	410002	R25
220 OHMS	1/4W	Carbon Film	5%	410007	R1,R3,R5,R7
4.7K OHMS	1/4W	Carbon Film	5%	410013	R2,R4,R6,R8
10K OHMS	1/4W	Carbon Film	5%	410016	R15,R17,R18,R19, R21,R26,R29
22K OHMS	1/4W	Carbon Film	5%	410018	R23
47K OHMS	1/4W	Carbon Film	5%	410021	R30,R31,R32
100K OHMS	1/4W	Carbon Film	5%	410024	R10,R12,R14,R24
220K OHMS	1/4W	Carbon Film	5%	410028	R9,R11,R13,R22,R28
100 OHMS	1/4W	Carbon Film	5%	410071	R16,R20

Diodes, Transistors, and Integrated Circuits

Device	Description	Part #	Designator
1N4003	Rectifier 1A 200PIV	480058	D1,D2,D3,D6,D7,D8,D9
1N4148	Diode, Signal	480000	D5
2N2222	Transistor, NPN 30V	480006	Q6,Q7,Q8
2N5639	Transistor, JFET N-Chan	480069	Q4
MPS-A13	Transistor, NPN 30V DARL	480004	Q5
MPS-A63	Transistor, PNP 30V DARL	480008	Q1,Q2,Q3
RC4559NB	OP AMP, Dual	480056	IC1,IC2

Miscellaneous

Device	Description	Part #	Designator
Connector	3 Pin Male Neutrik	210239	J1,J2,J3,J4,J7,J10,J11,J12 J13,J14,J15,J16,J17,J18,J19
Connector	3 Pin Female Neutrik	210240	J5
Fuse	0.90A Poly Switch	520036	F1
Relay	SPDT 24V Mini PC Relay	450004	K1,K2,K3
Switch	DPDT Slide	510090	S1,S2,S3,S4
Transformer	7K:10K Mini Transformer	560009	T1



MS-440 Power Distribution PCB Assembly Drawing

Bill of Materials for the MS-440 Power Distribution PCB**Capacitors**

Value	Type	Volts	Tol.	Part #	Designator
.01 uF	Ceramic Disc	30V	20%	150012	C10,C11,C12,C13
220 uF	Aluminum	35V		150021	C5
.01 uF	Ceramic Disc	1.4KV	20%	150029	C18
22 uF	Tantalum	16V		150032	C14,C17
.1 uF	Monolithic	50V	10%	150035	C15
.01 uF	Monolithic	50V	20%	150109	C16
100 uF	Aluminum	35V		150136	C1,C2,C3,C4

Resistors & Resistor Packs

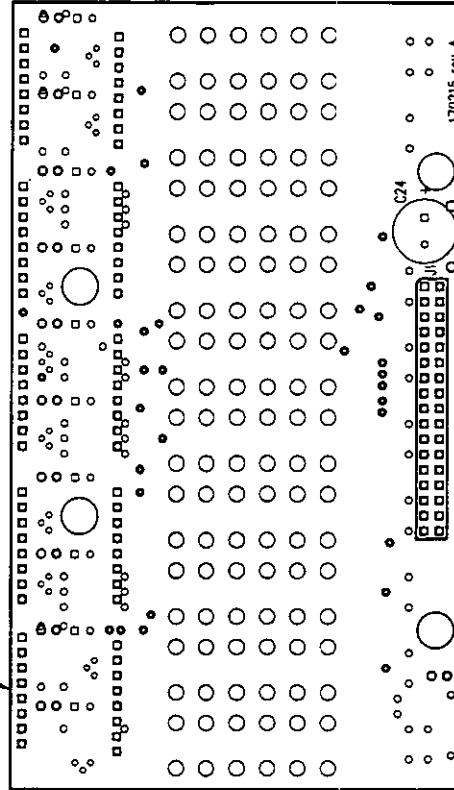
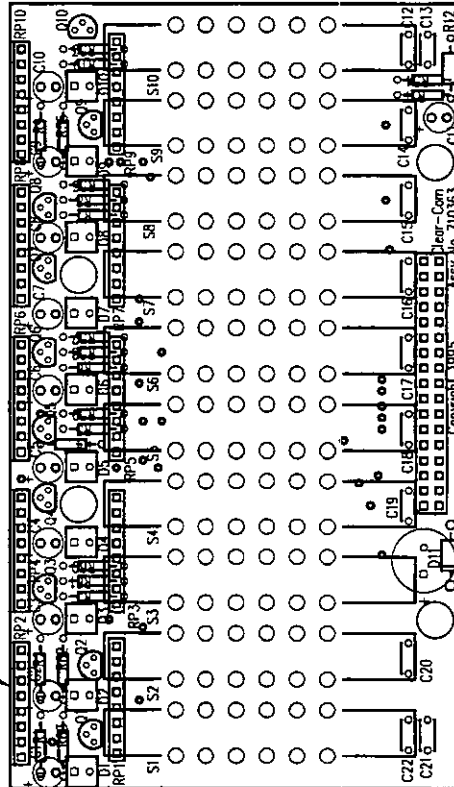
Value	Power	Type	Tol.	Part #	Designator
10 OHM	1/4	Carbon Film	5%	410002	R39
1K OHM	1/4	Carbon Film	5%	410010	R4,R6,R11,R13,R18,R20, R25,R27,R35
3.9K OHM	1/4	Carbon Film	5%	410012	R31
10K OHM	1/4	Carbon Film	5%	410016	R38
47K OHM	1/4	Carbon Film	5%	410021	R37
8.2K OHM	1/4	Carbon Film	5%	410037	R8,R15,R22,R29,R30
2.7K OHM	1/4	Carbon Film	5%	410040	R32
680K OHM	1/4	Carbon Film	5%	410045	R36
1M OHM	1/4	Carbon Film	5%	410058	R33
2.2K OHM	1/2	Carbon Film	5%	410068	R3,R10,R17,R24
9.1K OHM	1/4	Carbon Film	5%	410100	R7,R14,R21,R28
20K OHM	1/4	Carbon Film	5%	410151	R5,R12,R19,R26
.11 OHM	1	Carbon Comp	5%	410201	R2,R9,R16,R23
.20 OHM	2	Metal Film	5%	410215	R1

Diodes, Transistors, and Integrated Circuits

Device	Description	Part #	Designator
Diode	1N4148 SIGNAL 10MA 75PIV	480000	D1,D2,D3,D4,D5
IC	555 TIMER 8-PIN DIP	480017	IC1
Transistor	MPS-A55 PNP 60V	480050	Q1,Q2,Q4,Q5,Q7,Q8, Q10, Q11,Q13
Diode	1N5245B ZENER 15V 1/2W 5%	480053	D7
Diode	1N5817 SHTKY 1A 20V	480147	D6
Transistor	TIP35C NPN 100V 25A TO-218	480228	Q3,Q6,Q9,Q12

Miscellaneous

Device	Description	Part #	Designator
LED	RED, FLAT TOP LED	390044	LED1,LED2,LED3, LED4
LED	GREEN, FLAT TOP LED	390045	LED5
Inductor	100UH 2A	180010	L1
Switch	SPST RT ANGLE PC MOUNT	510099	S1

170215 PC FAB, SOLDER SIDE170215 PC FAB, COMPONENT SIDE

SB-440 Selector Switch PCB Assembly Drawing

Bill of Materials for the SB-440 Selector Switch PCB**Capacitors**

Value		Type	Volts	Tol.	Part #	Designator
1	uF	Ceramic	50V	10%	150073	C12,C13,C14,C15,C16, C17,C18,C19,C20,C21,C22
10	uF	Aluminum NP	35V	10%	150072	C1,C2,C3,C4,C5, C6,C7,C8,C9,C10,C11
220	uF	Aluminum	50V		150037	C24

Resistors & Resistor Packs

Value		Power	Type	Tol.	Part #	Designator
220	OHM	1/8W	Carbon Film	5%	410193	R1,R2,R3,R4,R5,R6, R7,R8,R9,R10,R11
2.7K	OHM	1/8W	Carbon Film	5%	410194	R53,R54,R55,R56,R57,R58, R59,R60,R61,R62,R63
4.7K	OHM	1/4W	Carbon Film	5%	410013	R12
4.7K	OHM		X 4 SIP Isolated		415008	RP1,RP3,RP5,RP7,RP9
220K	OHM		X 4 SIP Isolated		415007	RP2,RP4,RP6,RP8,RP10

Diodes, Transistors, and Integrated Circuits

Device	Description	Part #	Designator
1N4003	Rect 1A 200PIV	480058	D11
MPS-A13	Transistor NPN 30V Darl	480004	Q1,Q2,Q3,Q4,Q5, Q6,Q7,Q8,Q9,Q10

Miscellaneous

Device	Description	Part #	Designator
Led	Yellow, Round, Flat Top	390053	D1,D2,D3,D4,D5,D6, D7,D8,D9,D10
Switch	6 Position Slide	510030	S1,S2,S3,S4,S5,S6, S7,S8,S9,S10