



Memorandum

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From: J. Effland

Date: 18 October 1999

Subject: Costs for 3 IF Preamp Bias Boxes

This memo provides details for the relatively high cost of parts for the IF preamp bias boxes. These units provide bias voltages for the IF amplifier connected directly to the mixer, and are functionally equivalent to the existing bias boxes. Numerous improvements over the existing designs have been implemented, including correcting all PC board designs to incorporate modifications made to the original board designs and replacing much of the point-to-point wiring with mass termination connectors. Three units are required: Two for the production racks and one for amplifier development.

Parts costs for three additional preamp bias boxes total \$20,848. The most expensive items are the potentiometers with the clock-like face, at \$210 each. Because 30 of these pots are required for the three boxes the total cost, including two spares, is \$6,734.

Attached is an itemized list of the parts and their costs. Totals for each subsystem are given below each section, and the subsystem is identified in the right-most column. Following the itemized list are the system schematics.

Parts List for PreAmp Bias Chassis

Manufacturer	Part Number	Vendor P/N	Source	Description	Qty per Chassis	# of Chassis	# of Spares	Total Items	Cost	Units	Total Cost	System	Subsystem
Amphenol	31-2221	39F3130	Newark	BNC bulkhead recept. frnt. mnt.	10	3	2	32	\$2.75	Each	\$88.00	Preamp Bias	Back Panel
Amphenol	DA15P	81F5172	Newark	D-Conn. 15 pin M	1	3	2	5	\$2.65	Each	\$13.25	Preamp Bias	Back Panel
Amphenol	DB25P	81F5173	Newark	D-Conn. 25 pin M	1	3	2	5	\$2.95	Each	\$14.75	Preamp Bias	Back Panel
Amphenol	DB25S	81F5178	Newark	D-Conn. 25 pin F	2	3	2	8	\$3.20	Each	\$25.60	Preamp Bias	Back Panel
Amphenol	17HD015PAA000	84F2100	Newark	D-Conn. 15 pin High Density M	1	3	2	5	\$1.36	Each	\$6.80	Preamp Bias	Back Panel
Amphenol	126-233	87F5184	Newark	4 contact Connector F	1	3	1	4	\$7.99	Each	\$31.96	Preamp Bias	Back Panel
Amphenol	17-1724-2	89F001	Newark	D-Conn. 15 pin plastic backshell	1	3	1	4	\$3.50	Each	\$14.00	Preamp Bias	Back Panel
Amphenol	17-1726-2	89F003	Newark	D-Conn. 25 pin plastic backshell	1	3	1	4	\$4.05	Each	\$16.20	Preamp Bias	Back Panel
Corcom	6EF1F	81F4552	Newark	AC power recept./ RFI filter	1	3	1	4	\$13.16	Each	\$52.64	Preamp Bias	Back Panel
Unicorp	P-129-M04-F16-256	P-129-M04-F16-256	Unicorp	#2-56, 1/8"Dia .500 threaded standoff	4	3	-11	1	\$29.58	100	\$29.58	Preamp Bias	Back Panel
Hofman	LVHDF2216T-250A	44F162	Newark	Insulated Disconnect terminal F	3	3	-8	1	\$5.82	50	\$5.82	Preamp Bias	Back Panel
Johnson Comp.	105-0813-001	39F1572	Newark	Tip Jack Gray	1	3	1	4	\$0.78	Each	\$3.12	Preamp Bias	Back Panel
SPC	505-169-MT	50N451	Newark	Tinned Brass Soldering lugs	1	1	0	1	\$8.96	100	\$8.96	Preamp Bias	Back Panel
Thomas&Betts	A18-10	65F738	Newark	Non insulated ring terminal #10	3	3	-8	1	\$24.90	100	\$24.90	Preamp Bias	Back Panel
Waldom	02-06-2103	31F1026	Newark	Male crimp terminal	4	3	-11	1	\$12.76	100	\$12.76	Preamp Bias	Back Panel
Waldom	02-06-1103	31F1027	Newark	Female crimp terminal	4	3	-11	1	\$12.76	100	\$12.76	Preamp Bias	Back Panel
Waldom	03-06-1042	59F1781	Newark	Molex Free Hanging Receptable 4 pin	1	3	1	4	\$6.11	Each	\$24.44	Preamp Bias	Back Panel
Waldom	03-06-2042	59F1787	Newark	Molex Free Hanging Plug 4 pin	1	3	1	4	\$5.86	Each	\$23.44	Preamp Bias	Back Panel
											\$408.98		Back Panel Total
3M	3452-6000	46F8354	Newark	.100"x.100" wiremount socket, 16p	10	3	2	32	\$2.86	Each	\$91.52	Preamp Bias	Chassis
3M	3421-6000	46F8438	Newark	.100"x.100" wiremount socket, 20p	1	3	1	4	\$3.16	Each	\$12.64	Preamp Bias	Chassis
3M	3385-6000	87F3897	Newark	.100"x.100" wiremount socket, 14p	1	3	1	4	\$2.62	Each	\$10.48	Preamp Bias	Chassis
Belden	9R28020-100-0	04F4982	Newark	20 conductor ribbon cable	1	3	-2	1	\$70.38	100'	\$70.38	Preamp Bias	Chassis
Keystone	1482	89F2020	Newark	.500" round clear spacer, #8 screw	5	3	-14	1	\$27.43	100	\$27.43	Preamp Bias	Chassis
Tracewell	CH812	CH812	Tracewell	8"x12"x19" enclosure	1	3	1	4	\$225.00	Each	\$900.00	Preamp Bias	Chassis
Waldom	02-06-2103	31F1026	Newark	Male crimp terminal	3	3	-8	1	\$12.76	100	\$12.76	Preamp Bias	Chassis
Waldom	02-06-1103	31F1027	Newark	Female crimp terminal	3	3	-8	1	\$12.76	100	\$12.76	Preamp Bias	Chassis
Waldom	03-06-1032	59F1780	Newark	Molex Free Hanging Receptable 3 pin	1	3	1	4	\$4.11	Each	\$16.44	Preamp Bias	Chassis
Waldom	03-06-2032	59F1786	Newark	Molex Free Hanging Plug 3 pin	1	3	1	4	\$4.11	Each	\$16.44	Preamp Bias	Chassis
											\$1,170.85		Chassis Total
Compunetics, Inc	DABBP006			PC Board Fab	1	3	2	5	\$48.00	Each	\$240.00	Preamp Bias	CPU CONTROL PCB
Compunetics, Inc	DABBP006			PC Board Fab	1	3	1	4	\$187.50	Each	\$750.00	Preamp Bias	CPU CONTROL PCB
Analog Devices	AD741KN	05F7336	Newark	Op-Amp Semi-conductor	1	3	2	5	\$4.89	Each	\$24.45	Preamp Bias	CPU CONTROL PCB
Analog Devices	AD767	05F7509	Newark	12-bit D/A converter latching chip	2	3	2	8	\$32.57	Each	\$260.56	Preamp Bias	CPU CONTROL PCB
Augat	614-AG1	14F2935	Newark	14-pin plug adapter	1	3	2	5	\$4.31	Each	\$21.55	Preamp Bias	CPU CONTROL PCB
Augat	224-AG10DC	50F1699	Newark	24 pin chip socket, .3"	2	3	4	10	\$0.21	Each	\$2.10	Preamp Bias	CPU CONTROL PCB
Augat	208-AG19DC	65F2130	Newark	8-pin chip socket	1	3	2	5	\$0.19	Each	\$0.95	Preamp Bias	CPU CONTROL PCB
Augat	214-AG19DC	65F2131	Newark	14-pin chip socket	1	3	2	5	\$0.21	Each	\$1.05	Preamp Bias	CPU CONTROL PCB
Augat	216-AG19DC	65F2132	Newark	18-pin chip socket	1	3	2	5	\$0.24	Each	\$1.20	Preamp Bias	CPU CONTROL PCB
Augat	220-AG19DC	65F2134	Newark	20 pin chip socket, .3"	1	3	2	5	\$0.26	Each	\$1.30	Preamp Bias	CPU CONTROL PCB
Bourns	3299Z-1-103	04F6930	Newark	10K 25T side adj. pot, pc	3	3	6	15	\$2.96	Each	\$44.40	Preamp Bias	CPU CONTROL PCB
Cambion	180-7337-02-05-00	39F3642	Newark	Uninsulated soldr terminal (scope Gnd.)	1	3	2	5	\$0.33	Each	\$1.65	Preamp Bias	CPU CONTROL PCB
General Inst.	2N3904	48F4705	Newark	2N3904 NPN Transistor	5	3	10	25	\$0.16	Each	\$4.00	Preamp Bias	CPU CONTROL PCB
General Inst.	2N3906	48F4706	Newark	2N3906 PNP Transistor	1	3	2	5	\$0.16	Each	\$0.80	Preamp Bias	CPU CONTROL PCB
Kemet	C320C104K5R5CA	98F3985	Newark	0.1uf 50V ceramic capacitor	5	3	10	25	\$0.12	Each	\$3.00	Preamp Bias	CPU CONTROL PCB
Multicom	CR1/4W-5%-75R	84N2461	Newark	75ohm 1/4W 5% resistor	5	3	10	25	\$0.03	Each	\$0.75	Preamp Bias	CPU CONTROL PCB
On Semicon.	TIP31C	08F8876	Newark	Bipolar power Tranistor NPN	5	3	10	25	\$0.61	Each	\$15.25	Preamp Bias	CPU CONTROL PCB
Philips	DD200	19F305	Newark	20pf 50V ceramic capacitor	2	3	4	10	\$0.12	Each	\$1.20	Preamp Bias	CPU CONTROL PCB

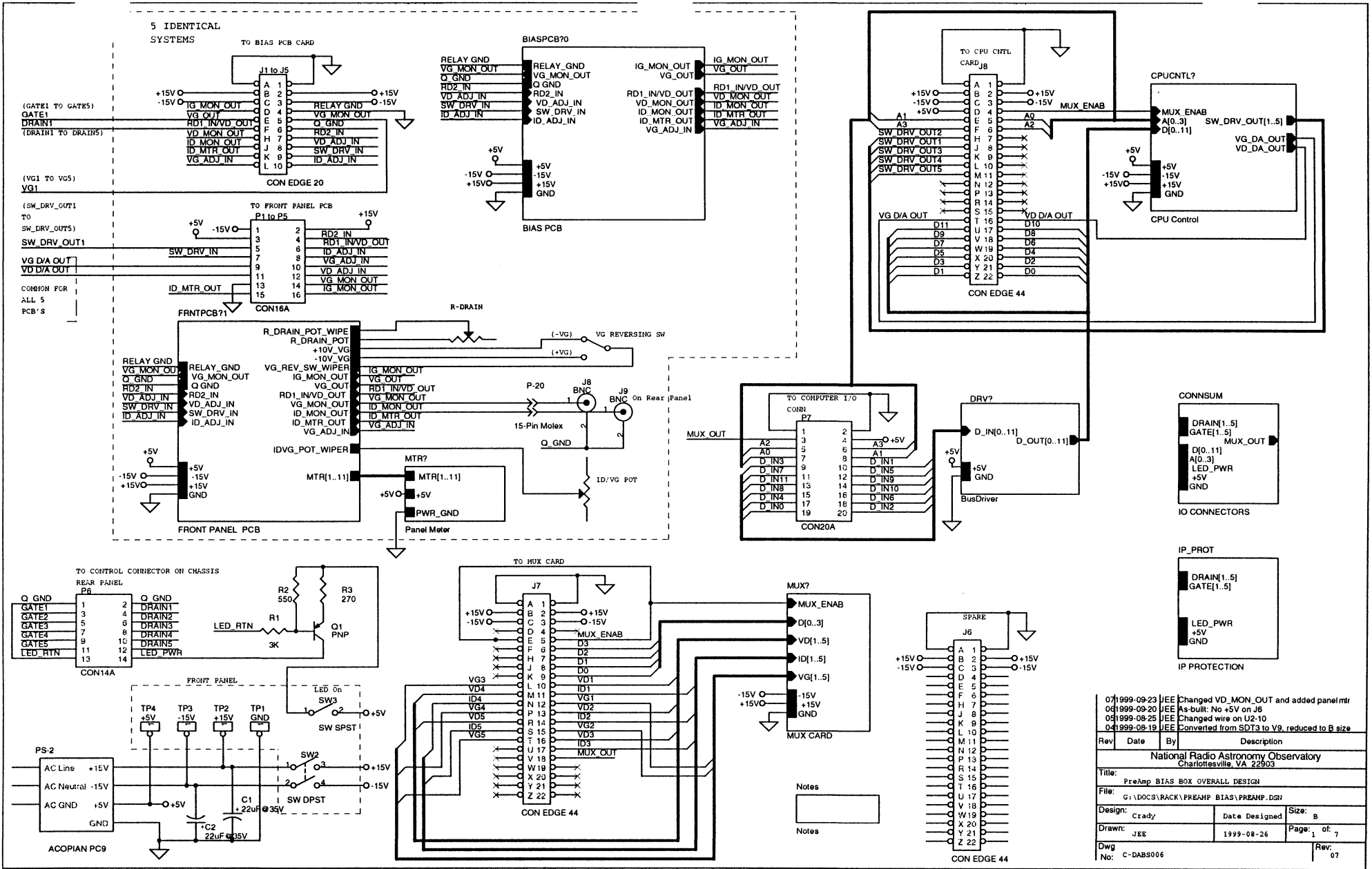
Parts List for PreAmp Bias Chassis

Manufacturer	Part Number	Vendor P/N	Source	Description	Qty per Chassis	# of Chassis	# of Spares	Total Items	Cost	Units	Total Cost	System	Subsystem
Texas Instr.	74LS04N	08F6622	Newark	74LS04N Semiconductor IC	1	3	2	5	\$0.48	Each	\$2.40	Preamp Bias	CPU CONTROL PCB
Texas Instr.	74LS138N	08F6767	Newark	74LS138N Semi-conductor IC	1	3	2	5	\$0.57	Each	\$2.85	Preamp Bias	CPU CONTROL PCB
Texas Instr.	74LS373N	08F7310	Newark	74LS373N Semi-conductor IC	1	3	2	5	\$0.76	Each	\$3.80	Preamp Bias	CPU CONTROL PCB
Vishay/Dale	RN55C1001F	01F3064	Newark	1K, 1/4W 1% resistor	9	3	18	45	\$1.02	Each	\$45.90	Preamp Bias	CPU CONTROL PCB
											\$1,429.16	CPU CONTROL PCB Total	
Bourns	3640S-1-103	01F8629	Newark	1-1/4" 10T 10K knobpot	10	3	2	32	\$210.46	Each	\$6,734.72	Preamp Bias	Front Panel
Bourns	H492-3	12F9670	Newark	counting dial w/brake	5	3	1	16	\$34.28	Each	\$548.48	Preamp Bias	Front Panel
Bourns	3500S-2-101	3500S-2-101	Brill	100 ohm 10T wirewound pot	5	3	5	20	\$41.03	Each	\$820.60	Preamp Bias	Front Panel
Dialight	515-0006	50F6025	Newark	5mm LED mount	5	3	10	25	\$0.84	Each	\$21.00	Preamp Bias	Front Panel
E.F. Johnson	105-602-001	39F879	Newark	Tip jack, red	1	3	1	4	\$1.34	Each	\$5.36	Preamp Bias	Front Panel
E.F. Johnson	105-603-001	39F880	Newark	Tip jack, black	1	3	1	4	\$1.34	Each	\$5.36	Preamp Bias	Front Panel
E.F. Johnson	105-606-001	39F882	Newark	Tip jack, orange	1	3	1	4	\$1.34	Each	\$5.36	Preamp Bias	Front Panel
E.F. Johnson	105-607-001	39F883	Newark	Tip jack, yellow	1	3	1	4	\$1.34	Each	\$5.36	Preamp Bias	Front Panel
Eaton	A123S1YZQ	65F1651	Newark	toggle sw. SPDT	6	3	1	19	\$4.59	Each	\$87.21	Preamp Bias	Front Panel
Eaton	A323S1YZQ	65F1663	Newark	toggle sw 3PDT (on-none-on)	1	3	1	4	\$13.13	Each	\$52.52	Preamp Bias	Front Panel
EDAC	307-020-500-202	95F3099	Newark	Card Edge Connector for panel meter	5	3	1	16	\$4.55	Each	\$72.80	Preamp Bias	Front Panel
EHC	72A2MA	26F345	Newark	knob, pointer, 1/8" shaft	10	3	2	32	\$8.68	Each	\$277.76	Preamp Bias	Front Panel
GrayHill	71ADF30-02-2-AJN	57F3767	Newark	4pole 6pos. rotary switch	10	3	2	32	\$26.34	Each	\$842.88	Preamp Bias	Front Panel
Microtech	EF-12S-1	EF-12S-1	Microtech	12-pin miniature conn	1	3	1	4	\$13.25	Each	\$53.00	Preamp Bias	Front Panel
Microtech	EP-7S-1	EP-7S-1	Microtech	7-pin miniature conn.	1	3	1	4	\$9.95	Each	\$39.80	Preamp Bias	Front Panel
Microtech	EF-12S-4	EF-12S-4	Microtech	12-pin miniature	1	3	1	4	\$13.25	Each	\$53.00	Preamp Bias	Front Panel
Microtech	ER-7S-4	ER-7S-4	Microtech	7-pin miniature receptacle	1	3	1	4	\$9.95	Each	\$39.80	Preamp Bias	Front Panel
Quality Tech.	MV5023A	32F1452	Newark	5mm Red LED	5	3	10	25	\$0.37	Each	\$9.25	Preamp Bias	Front Panel
TexMate	PM-45XU	PM-45XU	TexMate	200mV digital panel meter	5	3	1	16	\$110.00	Each	\$1,760.00	Preamp Bias	Front Panel
Waldom	02-06-2103	31F1026	Newark	Male crimp terminal	12	3	-35	1	\$12.76	100	\$12.76	Preamp Bias	Front Panel
Waldom	02-06-1103	31F1027	Newark	Female crimp terminal	12	3	-35	1	\$12.76	100	\$12.76	Preamp Bias	Front Panel
Waldom	03-06-1122	59F1783	Newark	Molex receptacle Free Hanging 12 pos.	2	3	1	7	\$3.63	Each	\$25.41	Preamp Bias	Front Panel
Waldom	03-06-2122	59F1791	Newark	Molex Plug Free Hanging, 12 pos.	2	3	1	7	\$3.32	Each	\$23.24	Preamp Bias	Front Panel
											\$11,508.43	Front Panel Total	
Compunetics, Inc	DABBP009			PC Board Fab	5	3	2	17	\$46.00	Each	\$782.00	Preamp Bias	Front Panel PCB
Compunetics, Inc	DABBP009			PC Board Fab	1	3	1	4	\$187.50	Each	\$750.00	Preamp Bias	Front Panel PCB
3M	3399-6000	46F8318	Newark	Socket conn. for 26 pos. right angle head	1	3	2	5	\$4.09	Each	\$20.45	Preamp Bias	Front Panel PCB
3M	30326-5002HB	30326-5002HB	Arrow	26 pos. right angle pc mount header	1	3	2	5	\$0.48	Each	\$2.40	Preamp Bias	Front Panel PCB
3M	3452-6000	46F8354	Newark	.100"x.100" 16 pin header	1	3	2	5	\$2.86	Each	\$14.30	Preamp Bias	Front Panel PCB
3M	3448-3026	46F4669	Newark	Strain Relief for 26 pos. Rt. Angle header	1	3	2	5	\$0.28	Each	\$1.40	Preamp Bias	Front Panel PCB
Analog Devices	AD581JH	05F7033	Newark	10V precision voltage reference	2	3	2	8	\$5.80	Each	\$46.40	Preamp Bias	Front Panel PCB
Augat	214-AG19DC	65F2131	Newark	14-pin chip socket	2	3	2	8	\$0.16	Each	\$1.28	Preamp Bias	Front Panel PCB
Cambion	180-7337-02-05-00	39F3642	Newark	Uninsulated soldr terminal (scope Gnd.)	5	3	10	25	\$0.33	Each	\$8.25	Preamp Bias	Front Panel PCB
Kemet	C320C104K5R5CA	98F3985	Newark	0.1uf 50V ceramic capacitor	2	3	4	10	\$0.12	Each	\$1.20	Preamp Bias	Front Panel PCB
Magnecraft	W172DIP-21	23F5557	Newark	SPDT relay	2	3	4	10	\$39.49	Each	\$394.90	Preamp Bias	Front Panel PCB
Multicomp	MFR1/4W-1%-1K	84N1712	Newark	1K 1/4W 5%	1	3	2	5	\$0.03	Each	\$0.15	Preamp Bias	Front Panel PCB
Multicomp	MFR1/4W-1%-1M	84N1719	Newark	1M 1/4W 5%	5	3	10	25	\$0.03	Each	\$0.75	Preamp Bias	Front Panel PCB
											\$2,023.48	Front Panel PCB Total	
American Power	1N914B	09F4830	Newark	1N914B Signal Diode	30	3	60	150	\$0.10	Each	\$15.00	Preamp Bias	Hemt Protection Board
											\$15.00	Hemt Protection Board Total	

Parts List for PreAmp Bias Chassis

Manufacturer	Part Number	Vendor P/N	Source	Description	Qty per Chassis	# of Chassis	# of Spares	Total Items	Cost	Units	Total Cost	System	Subsystem
Compunetics, Inc	DABBP010			PC Board Fab	1	3	1	4	\$187.50	Each	\$750.00	Preamp Bias	Motherboard
Compunetics, Inc	DABBP010			PC Board Setup Charge	1	1	0	1	\$250.00	Each	\$250.00	Preamp Bias	Motherboard
3M	2514-6002UB	46F4726	Newark	.100"x.100" 14 pin header	1	3	2	5	\$1.53	Each	\$7.65	Preamp Bias	Motherboard
3M	2520-6002UB	98F5933	Newark	.100"x.100" 20 pin header	1	3	2	5	\$1.78	Each	\$8.90	Preamp Bias	Motherboard
Augat	216-AG19DC	65F2132	Newark	16-pin chip socket	2	3	4	10	\$0.18	Each	\$1.80	Preamp Bias	Motherboard
Cambion	180-7337-02-05-00	39F3642	Newark	Uninsulated soldr terminal (scope Gnd.)	13	3	26	65	\$0.33	Each	\$21.45	Preamp Bias	Motherboard
EBY	CL-10-OAA-83	CL-10-OAA-83	EBY	10/20 .156" edge card connector	5	3	10	25	\$3.52	Each	\$88.00	Preamp Bias	Motherboard
EBY	CL-22-OAA-83	CL-22-OAA-83	EBY	22/44 .156" edge card connector	3	3	6	15	\$3.98	Each	\$59.70	Preamp Bias	Motherboard
General Inst.	2N3906	48F4706	Newark	2N3906 PNP Transistor	1	3	2	5	\$0.16	Each	\$0.80	Preamp Bias	Motherboard
Kemet	C320C104K5R5CA	98F3985	Newark	0.1uf 50V ceramic capacitor	1	3	2	5	\$0.12	Each	\$0.60	Preamp Bias	Motherboard
Multicomp	CR1/4W-5%-270R	84N2381	Newark	270 ohm 1/4W 5% Resistor	1	3	2	5	\$0.03	Each	\$0.15	Preamp Bias	Motherboard
Multicomp	CR1/4W-5%-3K	84N2408	Newark	3K, 1/4W 5% Resistor	1	3	2	5	\$0.03	Each	\$0.15	Preamp Bias	Motherboard
Multicomp	CR1/4W-5%-680R	84N2449	Newark	680 ohm 1/4W 5% Resistor	1	3	2	5	\$0.03	Each	\$0.15	Preamp Bias	Motherboard
Sprague	150D156X9020B2	65F2345	Newark	15uf 20V electrolytic capacitor	2	3	4	10	\$1.14	Each	\$11.40	Preamp Bias	Motherboard
Texas Instr.	74LS367AN	08F7284	Newark	74LS366 hex bus driver	2	3	4	10	\$0.69	Each	\$6.90	Preamp Bias	Motherboard
											\$1,207.65	Motherboard Total	
Compunetics, Inc	DABBP005			PC Board Fab	1	3	1	4	\$50.00	Each	\$200.00	Preamp Bias	MULTIPLEXER
Compunetics, Inc	DABBP005			PC Board Setup Charge	1	1	0	1	\$250.00	Each	\$250.00	Preamp Bias	MULTIPLEXER
Analog-Devices	AD7506KN	05F7362	Newark	16 in, 1 out mux	1	3	2	5	\$32.20	Each	\$161.00	Preamp Bias	MULTIPLEXER
Augat	228-AG19DC	65F2137	Newark	28 pin, .6" chip socket	1	3	2	5	\$0.25	Each	\$1.25	Preamp Bias	MULTIPLEXER
Kemet	C320C104K5RCA	98F3985	Newark	0.1uf 50V ceramic capacitor	2	3	4	10	\$0.12	Each	\$1.20	Preamp Bias	MULTIPLEXER
Multicomp	CR1/8W-5%-10K	84N2479	Newark	10K, 1/8W 5% resistor	1	3	2	5	\$0.03	Each	\$0.15	Preamp Bias	MULTIPLEXER
											\$613.60	MULTIPLEXER Total	
Acopian	51515T9A	51515T9A	Acopian	+/-15, +5V supply	1	3	0	3	\$295.00	Each	\$885.00	Preamp Bias	Power Supply
Belden	17251B1	01F8318	Newark	AC power cord, 8'	1	3	0	3	\$3.78	Each	\$11.34	Preamp Bias	Power Supply
Belden	20AWG stranded, insul	A/R				3		0		Each	\$0.00	Preamp Bias	Power Supply
Hoffman	FVL2216-S3AR2	84F261	Newark	#6 spade lugs	12	3	-35	1	\$5.45	100	\$5.45	Preamp Bias	Power Supply
											\$901.79	Power Supply Total	
Compunetics, Inc	DABBP006			PC Board Fab	5	3	2	17	\$48.00	Each	\$816.00	Preamp Bias	SINGLE STAGE PCB
Compunetics, Inc	DABBP006			PC Board Setup Charge	1	1	0	1	\$250.00	Each	\$250.00	Preamp Bias	SINGLE STAGE PCB
AMP	2-640357-1	44F7963	Newark	14 pin chip socket	4	3	8	20	\$0.28	Each	\$5.60	Preamp Bias	SINGLE STAGE PCB
Bourns	3299P-1-202	01F8318	Newark	2K multi-turn pot	2	3	4	10	\$2.96	Each	\$29.60	Preamp Bias	SINGLE STAGE PCB
Cambion	180-7337-02-05-00	39F3642	Newark	Uninsulated soldr terminal (scope Gnd.)	1	3	2	5	\$0.33	Each	\$1.65	Preamp Bias	SINGLE STAGE PCB
Dial-Light	521-9186	25F867	Newark	521 SERIES 2mm LED	4	3	8	20	\$0.51	Each	\$10.20	Preamp Bias	SINGLE STAGE PCB
Kemet	C330C105K5R5CA	87F4752	Newark	1.0uf 50V ceramic capacitor	4	3	8	20	\$0.76	Each	\$15.20	Preamp Bias	SINGLE STAGE PCB
Kemet	C315C103K5R5CA	87F6001	Newark	0.01uf 50V ceramic capacitor	2	3	4	10	\$0.10	Each	\$1.00	Preamp Bias	SINGLE STAGE PCB
Kemet	C320C104K5R5CA	98F3985	Newark	0.1uf 50V ceramic capacitor	3	3	6	15	\$0.12	Each	\$1.80	Preamp Bias	SINGLE STAGE PCB
Magnecraft	W172DIP-21	23F5557	Newark	DIP dry reed DPDT relay	2	3	4	10	\$39.49	Each	\$394.90	Preamp Bias	SINGLE STAGE PCB
On Semicon.	TIP31C	08F8876	Newark	Bipolar power Tranistor NPN	1	3	2	5	\$0.61	Each	\$3.05	Preamp Bias	SINGLE STAGE PCB
Multicomp	MFR1/4W-1%-100K	84N1685	Newark	100K 1/4W 1%	9	3	18	45	\$0.03	Each	\$1.35	Preamp Bias	SINGLE STAGE PCB
Multicomp	MFR1/4W-1%-10K	84N1687	Newark	10K 1/4W 1%	6	3	12	30	\$0.03	Each	\$0.90	Preamp Bias	SINGLE STAGE PCB

Parts List for PreAmp Bias Chassis													
Manufacturer	Part Number	Vendor P/N	Source	Description	Qty per Chassis	# of Chassis	# of Spares	Total Items	Cost	Units	Total Cost	System	Subsystem
Multicomp	MFR1/4W-1%-1K	84N1712	Newark	1K 1/4W 1%	3	3	6	15	\$0.03	Each	\$0.45	Preamp Bias	SINGLE STAGE PCB
Multicomp	MFR1/4W-1%-1M	84N1719	Newark	1M 1/4W 1%	4	3	8	20	\$0.03	Each	\$0.60	Preamp Bias	SINGLE STAGE PCB
Multicomp	MFR1/4W-1%-2K	84N1736	Newark	2K 1/4W 1%	1	3	2	5	\$0.03	Each	\$0.15	Preamp Bias	SINGLE STAGE PCB
Vishay/Dale	CMF60T1-5M-1	CMF60T1-5M-1	Pioneer	5M 1/4W 1%	1	3	2	5	\$0.75	Each	\$3.75	Preamp Bias	SINGLE STAGE PCB
American Power	1N914B	09F4830	Newark	diode 1N914	7	3	14	35	\$0.10	Each	\$3.50	Preamp Bias	SINGLE STAGE PCB
Texas Instr.	TL084BCN	08F9367	Newark	TL084BCN quad op-amp	2	3	4	10	\$2.18	Each	\$21.80	Preamp Bias	SINGLE STAGE PCB
Vishay/Dale	RN60D 499<1%	83F1703	Newark	499 1/4W 1%	1	3	2	5	\$0.20	Each	\$1.00	Preamp Bias	SINGLE STAGE PCB
Vishay/Dale	RN60D 49.9K 1%	83F1705	Newark	49.9K 1/4W 1%	2	3	4	10	\$0.20	Each	\$2.00	Preamp Bias	SINGLE STAGE PCB
Vishay/Dale	RN65D 249<1%	83F1783	Newark	249K 1/4W 1%	2	3	4	10	\$0.48	Each	\$4.80	Preamp Bias	SINGLE STAGE PCB
Vishay/Dale	RN60D 97.6K 1%	03F8682	Newark	97.6K 1/4W 1%	2	3	4	10	\$0.03	Each	\$0.30	Preamp Bias	SINGLE STAGE PCB
											\$1,569.60		SINGLE STAGE PCB Total
											\$20,848.54		Grand Total

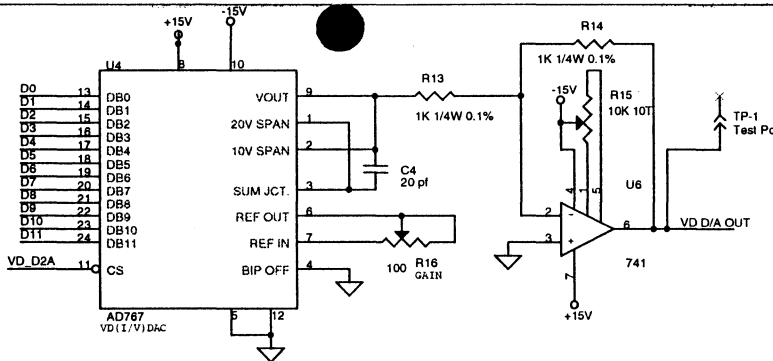
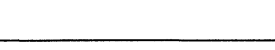
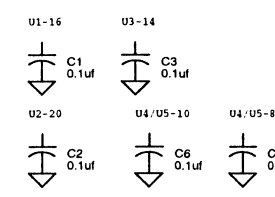
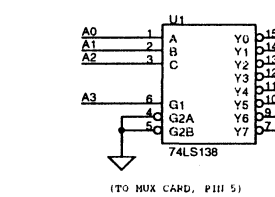
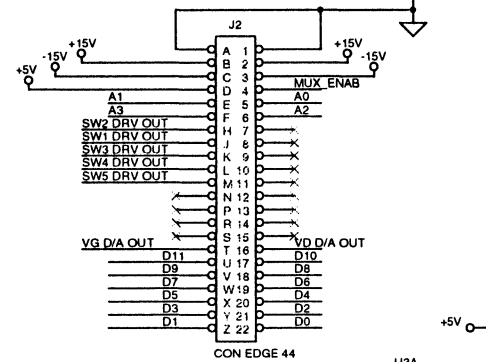


07/1999-09-23	JEE	Changed VD_MON_OUT and added panel mtr	
06/1999-09-20	JEE	As-built: No +5V on J6	
05/1999-08-25	JEE	Changed wire on U2-10	
04/1999-08-19	JEE	Converted from SDT3 to V9, reduced to B size	
Rev	Date	By	Description
National Radio Astronomy Observatory Charlottesville, VA 22903			
Title: Preamp BIAS BOX OVERALL DESIGN			
File: G:\DOCS\RACK\PREAMP BIAS\PREAMP.DGN			
Design:	Crady	Date Designed:	Size: B
Drawn:	JEE	1999-08-26	Page: 1 of 7
Dwg No: C-DABS006			Rev: 07

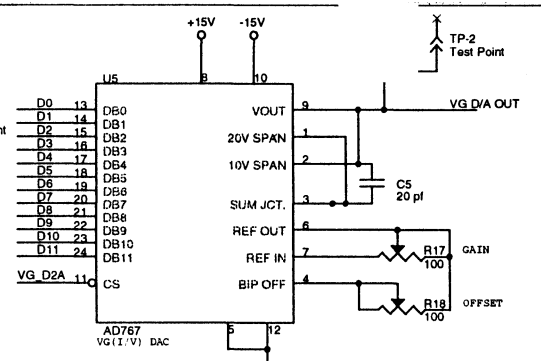
74LS1 TABLE

A3	A2	A1	A0	STATE
1	0	0	0	NO SEL.
1	0	0	1	VD D/A
1	0	1	0	VG D/A
1	0	1	1	RELAYS
1	1	0	0	MUX

RELAY CONTROL	TRUTH TABLE	STAGE			
D4	D3	D2	D1	D0	1
0	0	0	0	0	2
0	0	0	1	0	3
0	1	0	0	0	4
1	0	0	0	0	5

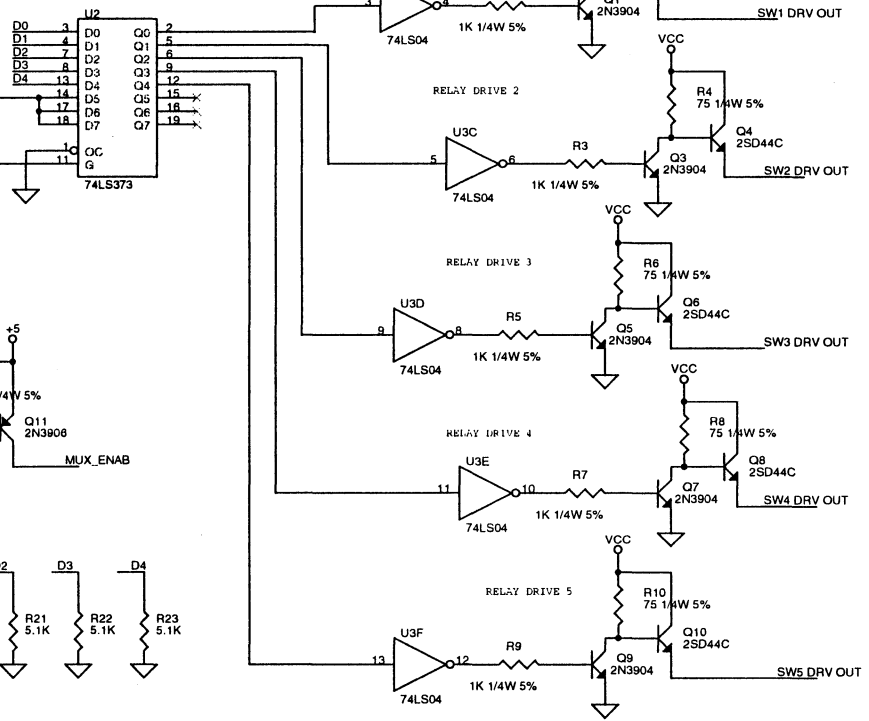


12 BIT WORD = INT[(VD / .001221)
 0 TO +5V STRAIGHT BINARY
 (0 TO -5V AFTER INVERTER)
 ALL 0s = 0V
 ALL 1s = -5V



12 BIT WORD = INT[(-VG + 2.5) * 819.2]
 +/- 2.5V OFFSET BINARY
 ALL 0s = -2.5V
 MSB ON ONLY = 0V
 ALL 1s = +2.5V

RELAY SW. CNTL.



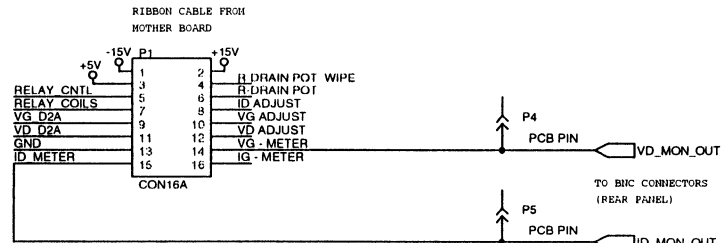
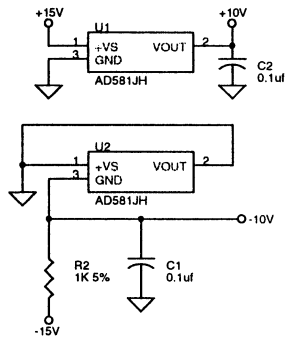
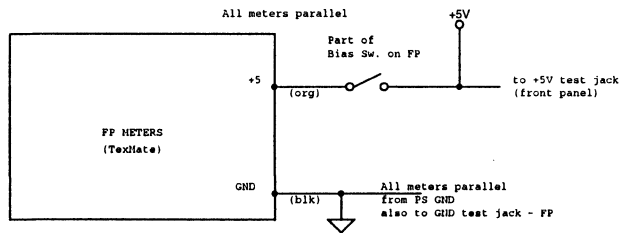
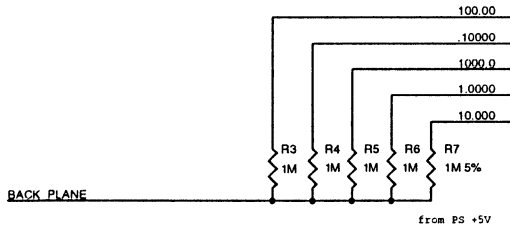
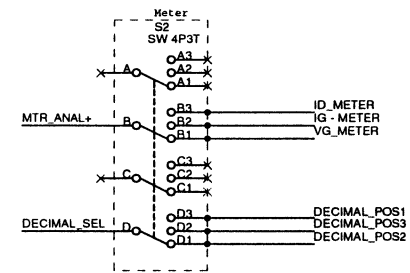
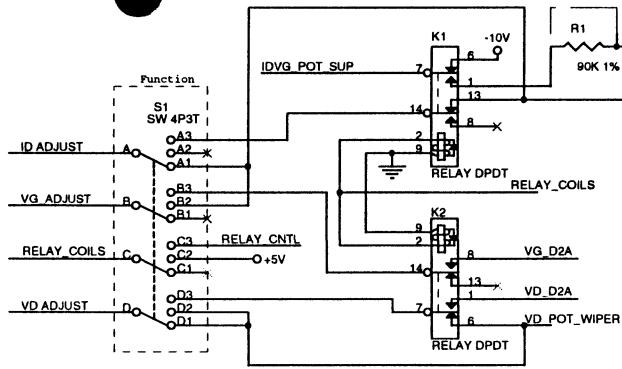
TYPICAL PROGRAMMING SEQUENCE

- 1) SET VG DATA LINES (D0-D11) (01011)
- 2) ADDRESS VG DAC (01011)
- 3) RESET ADDRESS (0000)
- 4) SET VD DATA LINES (D0-D11) (1001)
- 5) ADDRESS VD DAC (0000)
- 6) RESET ADDRESS (0000)
- 7) SET STAGE DESIRED (D0-D4) (1101)
- 8) ADDRESS RELAY LATCH (1101)
- 9) RESET ADDRESS (0000)

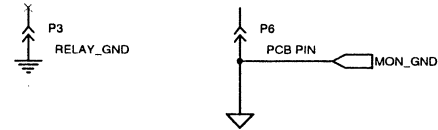
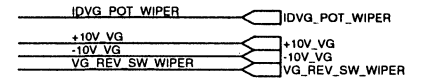
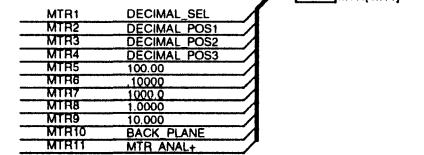
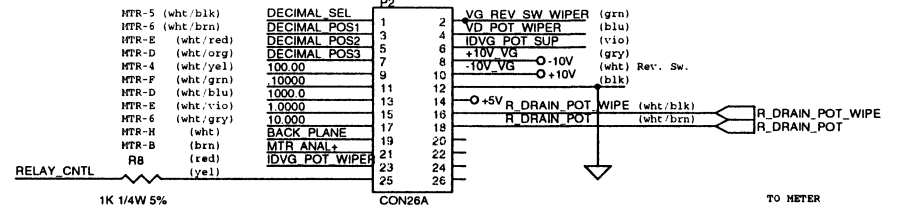
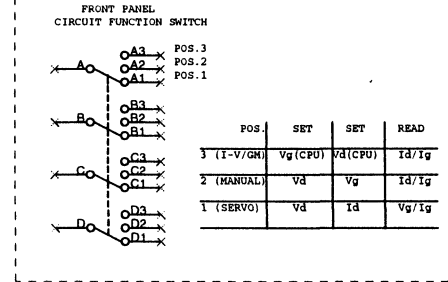
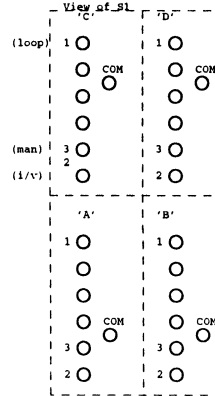
Rev	Date	By	Description
03	1999-09-17	JEE	Modified based on as-built board
02	1999-08-25	JEE	Converted from C to B size
01	1998-08-19	JEE	Converted from SDT to V9

National Radio Astronomy Observatory
 Charlottesville, VA 22903

Title:	BIAS BOX CPU CONTROL INTERFACE	
File:	G:\DOCS\RACK\FREAMP\BIAS\FREAMP.DSN	
Design:	Crady	Date Designed: Size: B
Drawn:	Crady	Date Drawn: Page: 2 of 7
Dwg No:	C-DABBS007	Rev: 03



Bottom (solder side)

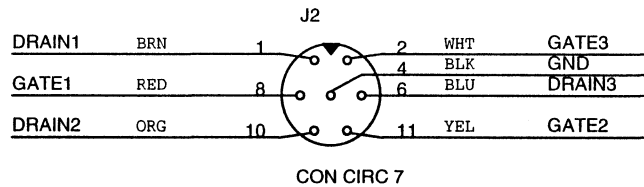
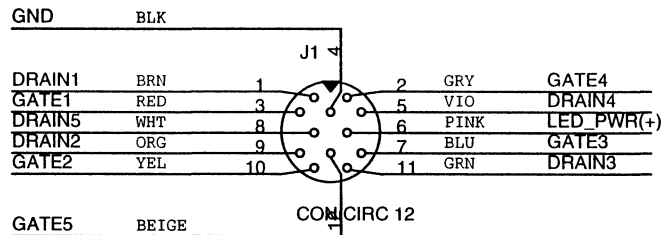


05/1999-09-21	JEE	Updated after design check	
04/1999-08-30	JEE	Added U1 and U2 to V regs.	
03/1999-08-27	JEE	Changed J1 to ribbon cable conn.	
02/1999-08-26	JEE	Converted from C to B size	
01/1999-08-19	JEE	Converted from SOT to V9	
Rev	Date	By	Description
National Radio Astronomy Observatory Charlottesville, VA 22903			
Title: BIAS BOX FRONT PANEL PCB			
File: G:\DOCS\RACK\PREAMP\BIAS\PREAMP.DSN			
Design:	Crady	Date Designed:	Size: 8
Drawn:	Crady	Date Drawn:	Page: 1 of 10
Dwg No:	C-DAB8009		Rev: 05

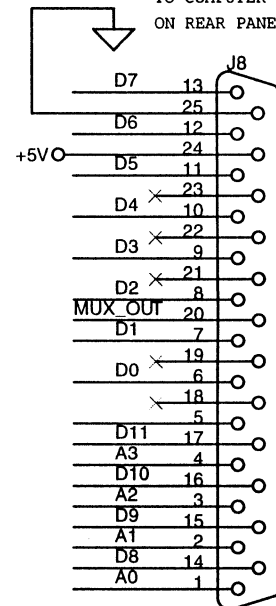
PROT_DRAIN5
 PROT_GATE1[1..5]
 DRAIN[1..5]
 GATE[1..5]
 D[0..11]
 A[0..3]
 LED_PWR(+)
 LED_PWR(-)
 +5V
 GND

MUX_OUT

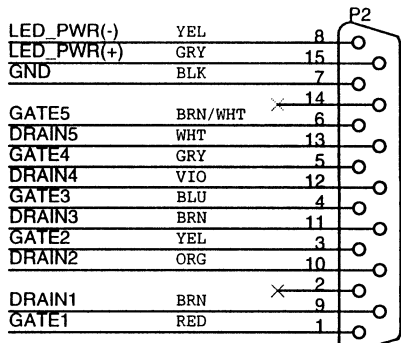
CONNECTORS TO POWER FETS LOCATED ON FRONT PANEL



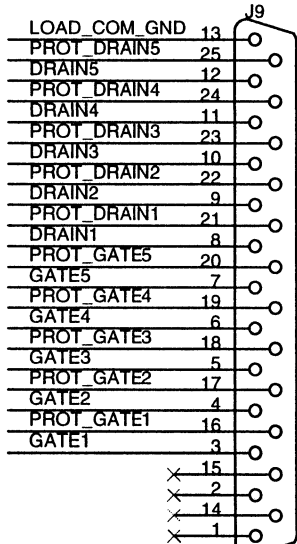
TO COMPUTER INTERFACE ON REAR PANEL



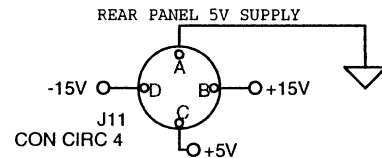
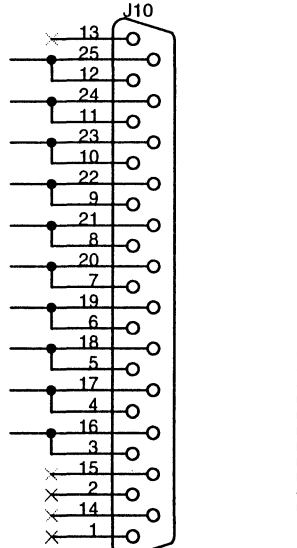
BIAS OUTPUT ON REAR PANEL



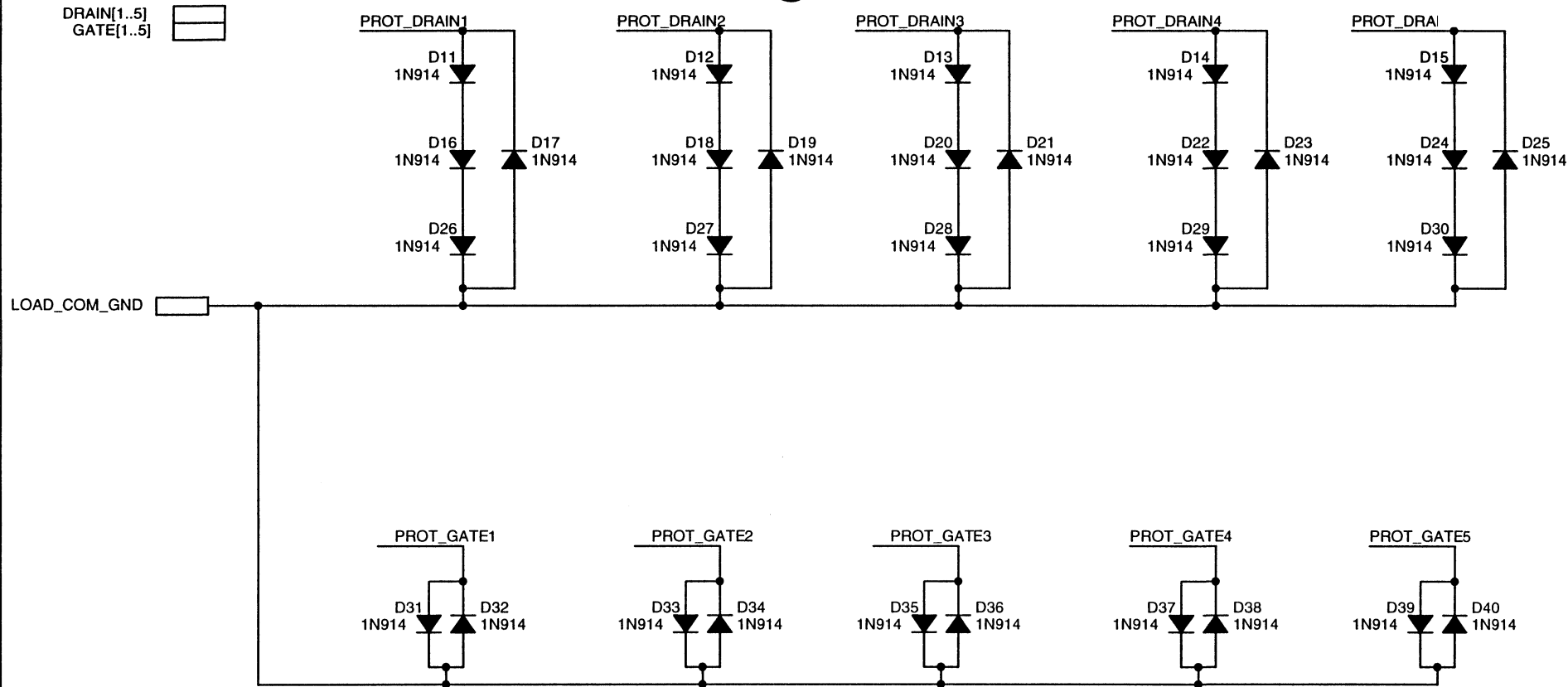
PROTECTION PLUG ON REAR PANEL



JUMPER PLUG LOOSELY CONNECTED TO REAR PANEL

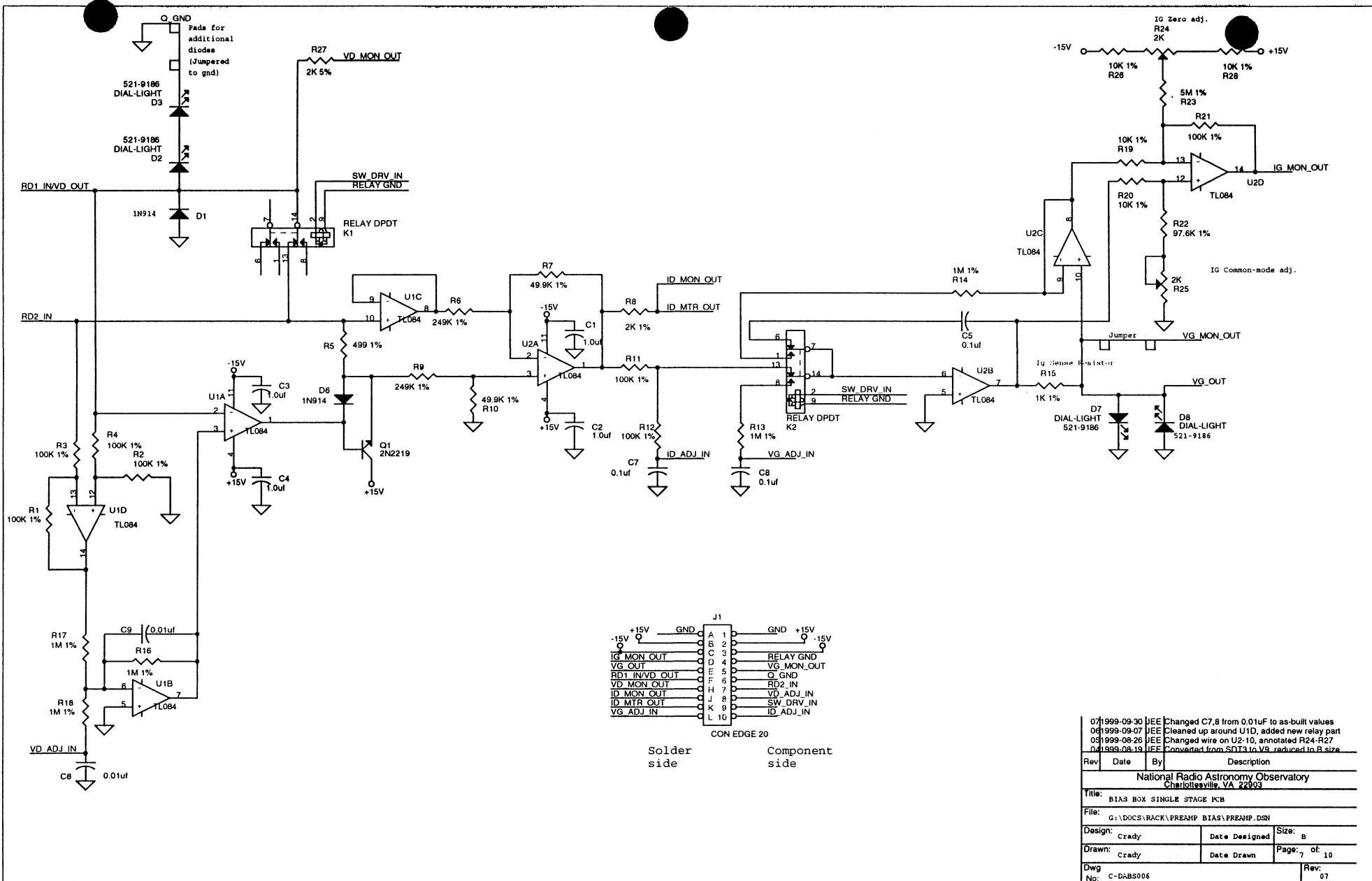


Rev	Date	By	Description
National Radio Astronomy Observatory Charlottesville, VA 22903			
Title: IO CONNECTORS			
File: G:\DOCS\RACK\PREAMP\BIAS\PREAMP.DSN			
Design:	Designed by	Date Designed	Size: A
Drawn:	JEE	1999-09-08	Page: 3 of 7
Dwg No:	<Doc>		Rev: 00

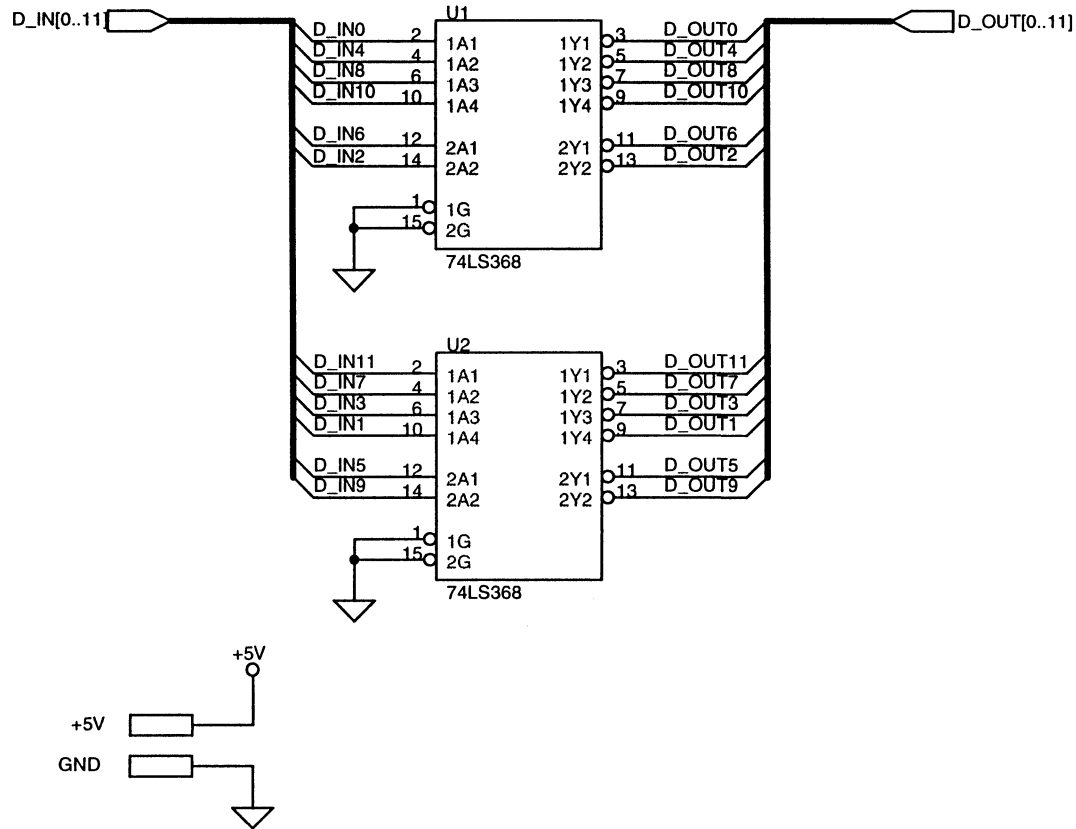


WHEN SHORTING PLUG IS CONNECTED TO REAR OF CHASSIS ON CONNECTOR ??, THESE DIODES ARE PLACED IN SERIES WITH THE GATE AND DRAIN LINES

Rev	Date	By	Description
National Radio Astronomy Observatory Charlottesville, VA 22903			
Title: IP Protection Board			
File: G:\DOCS\RACK\PREAMP BIAS\PREAMP.DSN			
Design:	Designed by	Date Designed	Size: A
Drawn:	JEE	1999-09-08	Page: 5 of 10
Dwg No:	<Doc>		Rev: '00



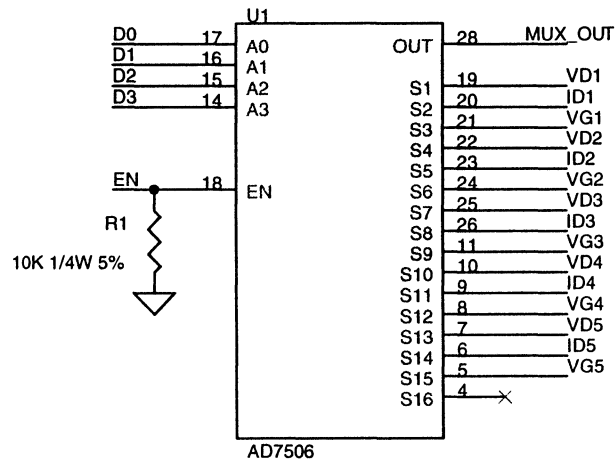
07/1999-09-30	JEE	Changed C7,8 from 0.01uF to as-built values	
08/1999-09-07	JEE	Cleaned up around U1D, added new relay part	
05/1999-08-26	JEE	Changed wire on U2-10, annotated R24-R27	
04/1999-08-19	JEE	Converted from SOT3 to V9, reduced to R size	
Rev	Date	By	Description
National Radio Astronomy Observatory Charlottesville, VA 22903			
Title: BIAS BOX SINGLE STAGE PCB			
File: G:\DOCS\RACK\FREHNP\BIAS\FREHNP.DSN			
Design:	Crady	Date Designed	Size: B
Drawn:	Crady	Date Drawn	Page: 7 of 10
Dwg No:	C-DAS006		Rev: 07



Rev	Date	By	Description
National Radio Astronomy Observatory Charlottesville, VA 22903			
Title: MOTHERBOARD BUX DRIVER			
File: G:\DOCS\RACK\PREAMP BIAS\PREAMP.DSN			
Design:	Crady	Date Designed	Size: A
Drawn:	JEE	1999-08-26	Page: 7 of 7
Dwg No:	<Doc>	Rev: 01	

Notes:

Rev	Date	By	Description
National Radio Astronomy Observatory Charlottesville, VA 22903			
Title: NOTES			
File: G:\DOCS\RACK\PREAMP BIAS\PREAMP.DSN			
Design: Designed by		Date Designed	Size: A
Drawn: JEE		1999-09-08	Page: 8 of: 10
Dwg No: <Doc>			Rev: 00

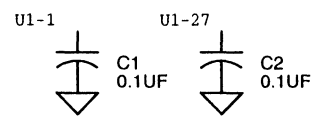
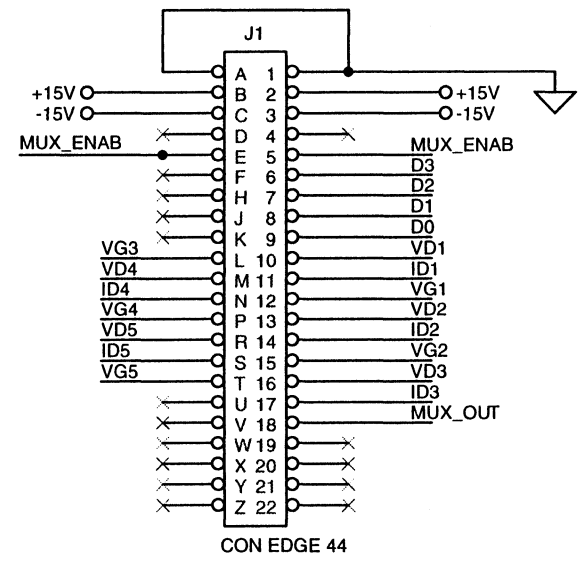


MUX ENABLE
(ADDRESS BUS)

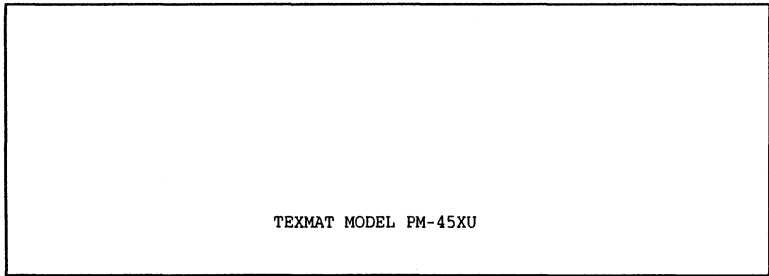
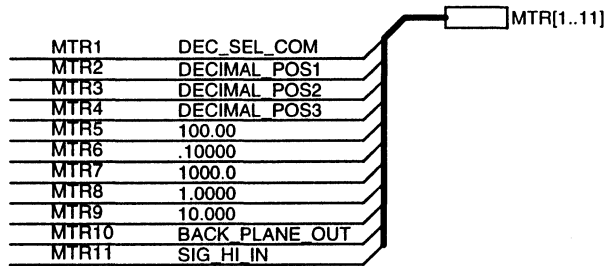
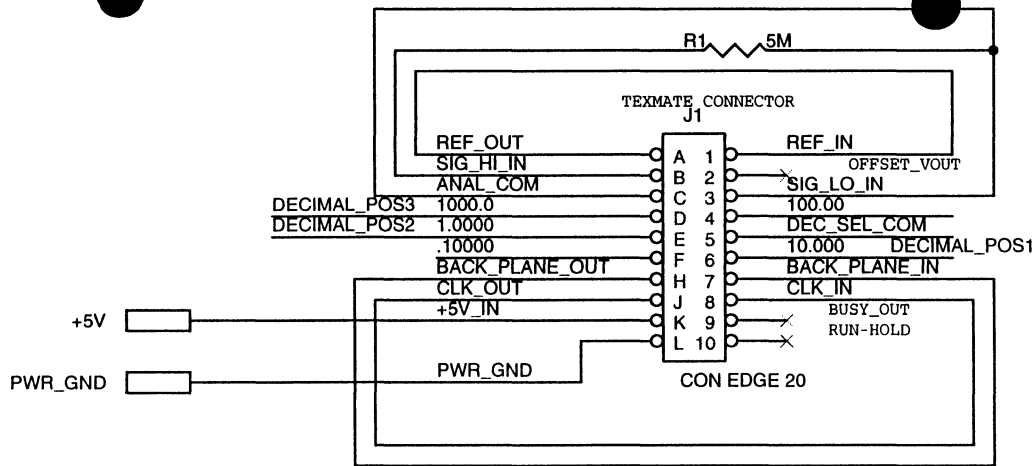
A0	A1	A2	A3
0	0	1	1

MUX SWITCHING
(DATA BUS)

Function	SW	D0	D1	D2	D3	EN
VD1	1	0	0	0	0	1
ID1	2	1	0	0	0	1
VG2	3	0	1	0	0	1
VD2	4	1	1	0	0	1
ID2	5	0	0	1	0	1
VG2	6	1	0	1	0	1
VD3	7	0	1	1	0	1
ID3	8	1	1	1	0	1
VG3	9	0	0	0	1	1
VD4	10	1	0	0	1	1
ID4	11	0	1	0	1	1
VG4	12	1	1	0	1	1
VD5	13	0	0	1	1	1
ID5	14	1	0	1	1	1
VG5	15	0	1	1	1	1
N/C	16	1	1	1	1	1



02	1999-08-26	JEE	Converted from B to A size
01	1999-08-19	JEE	Converted from SDT to V9
Rev	Date	By	Description
National Radio Astronomy Observatory Charlottesville, VA 22903			
Title: BIAS BOX MULTIPLEXER CARD			
File: G:\DOCS\RACK\PREAMP BIAS\PREAMP.DSN			
Design:	Crady	Date Designed	Size: A
Drawn:	Crady	Date Drawn	Page: 9 of: 10
Dwg No:	C-DABBS008		Rev: 02



TEXMAT MODEL PM-45XU

Rev	Date	By	Description
National Radio Astronomy Observatory Charlottesville, VA 22903			
Title: PANEL METER, BIAS BOX			
File: G:\DOCS\RACK\PREAMP BIAS\PREAMP.DSN			
Design:	Date Designed	Size: A	
Drawn: JEE	1999-09-23	Page: 10 of 10	
Dwg No:			Rev: 00