KineticSystems Company, LLC
Preston Scientific
8300 Amplifier
Operator/Maintenance Manual

BASIC SPECIFICIONS

REFERENCE:	8300AU AMPLIFIER SYSTEM data sheet and Description section of applicable User Manual for details on options.

INPUT:

IMPEDANCE:	100 megohm minimum shunted by 1500pf maximum for all gains.
CONNECTION:	3 wires; HI, LO, and GUARD
SOURCE IMPEDANCE:	1k ohm maximum to meet all specifications
SYSTEM COMMON MODE REJECTION:	130db; dc - 60Hz with up to 1k ohm unbalance
SYSTEM COMMON MODE VOLTAGE:	350 volts peak ac or dc
TRANSDUCER CMRR:	60db plus gain(db), or 108db (whichever is is greater).
TRANSDUCER CMV:	10 volts peak ac or dc including signal
BIAS CURRENT:	1 na at +25 degrees C, +/-.5na per degree C
PROTECTION:	20 volts maximum without damage.

GAIN:

STANDARD STEPS:	1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048
DECIMAL OPTION:	1, 2, 5, 10, 20, 50, 100, 200, 500, 1000
SPECIAL:	REFER TO DESCRIPTION SECTION
ACCURACY:	0.1% standard; .01% optional
LINEARITY:	0.01%
STABILITY:	0.01% for six months.
TEMPCO:	0.002% per degrees C.
TRIM:	Selected gain, front panel adjustable to .005%.

BASIC SPECIFICIONS

ZERO:

STABILITY: 5uV RTI (50uV RTI for gains less than unity)
Plus/minus 1mV RTO for 30 days

TEMPCO: 1uV RTI (10uV for gains less than unity)
plus/minus 0.1mV RTO per DEG C.

TRIM: Front panel adjust to 0.5mV RTO

OUTPUT:

CAPABILITY: 10 volts peak @ 20 mA max (output #1)
@ 50 mA max (output #2) optional
@ 20 mA max (output #3) optional*
* on 84XXXX series only

IMPEDANCE: Less than 1 Ohm

PROTECTION: Outputs are unconditionally short circuit proof.

SLEW RATE: 1.5 volts/usec

BANDWIDTH: Less than 3dB down at 100kHz (10 volts p-p)
Full power bandwidth 50kHz. (20 volts p-p)

OVERLOAD RECOVERY TIME: (WIDEBAND) 50 usec maximum to within +/-1.5mV of final value from +/-20 volt input step at Gain = 1.

NOISE: 3.25uV RTI (32.5 RTI for gain less than unity)
plus 100uV RTO (RMS) at wide band.

		RTI: uV		RTO: mV	
GAIN	BW	P-P	RMS	P-P	RMS
1	WB			.6	.1
2048	WB	19.5	3.25	.6	.1
2048	4096Hz	3.9	0.65	.6	.1
2048	256Hz	0.97	0.16	.6	.1
2048	16Hz	0.29	0.05	.6	.1
2048	1Hz	0.24	0.04	.6	.1

CONNECTION: Common 37 Pin D Connector for 16 outputs in rack.

PROGRAMMABLE VARIABLE GAIN OPTION SPECIFICATIONS

The 8300PVGAU meets all the specifications of the standard 8300AU amplifier, and is available with all of the other options, with the following changes and exceptions:

GAIN:

STEPS: 12 binary gain steps from 1 to 2048

10 decimal gain steps from 1 to 1k (optional)

VARIABLE: Programmable in 64k increments between steps. A 16 bit variable gain word has 14 bit monotonicity (16k increments) over the temperature range (15 bit and 16 bit monotonicity is available as an option). The amplifier gain can be expressed in the following formulas:

```
Ka = Ks * (1 + (1.0526 * (Kn / 65536)))
Ka = Ks * (1 + (Kn / 62261))
```

Or to solve for the value Kn:

```
Kn = 62261 * ((Ka / Ks) - 1)
```

Where:

Ka = Overall Amplifier Gain
Ks = Programmed Gain Step
Kn = Numerical value of variable gain word

For the optional decimal gain steps, the formula is:

```
Ka = Ks * (1 + (1.6667 * (Kn /65536)))
Ka = Ks * (1 + (Kn / 39321))
```

Or to solve for the value Kn:

```
Kn = 39321 * ((Ka / Ks) - 1)
```

ACCURACY: 0.1% (the 0.01% option is not available)

OTHER OPTIONAL FEATURES: REFER TO DATA SHEET and other associated documentation.

Variable Gain Option:

VARIABLE GAIN OPTION:

This option allows the amplifier gain to be adjusted to any value between programmable steps. It is included with the .01% gain accuracy option.

FIXED/VAR SWITCH:

With this switch in the "FIXED" position, the amplifier gain will be set to the programmed, gain step.

With this switch in the "VAR" position, the amplifier gain equal to the programmed FIXED gain step, increased by an amount determined by the setting of the "VARIABLE" gain potentiometer.

The range of increase is slightly over 2:1 for binary gains or 2.5:1 for decimal gains. This allows overlapping of gain ranges.

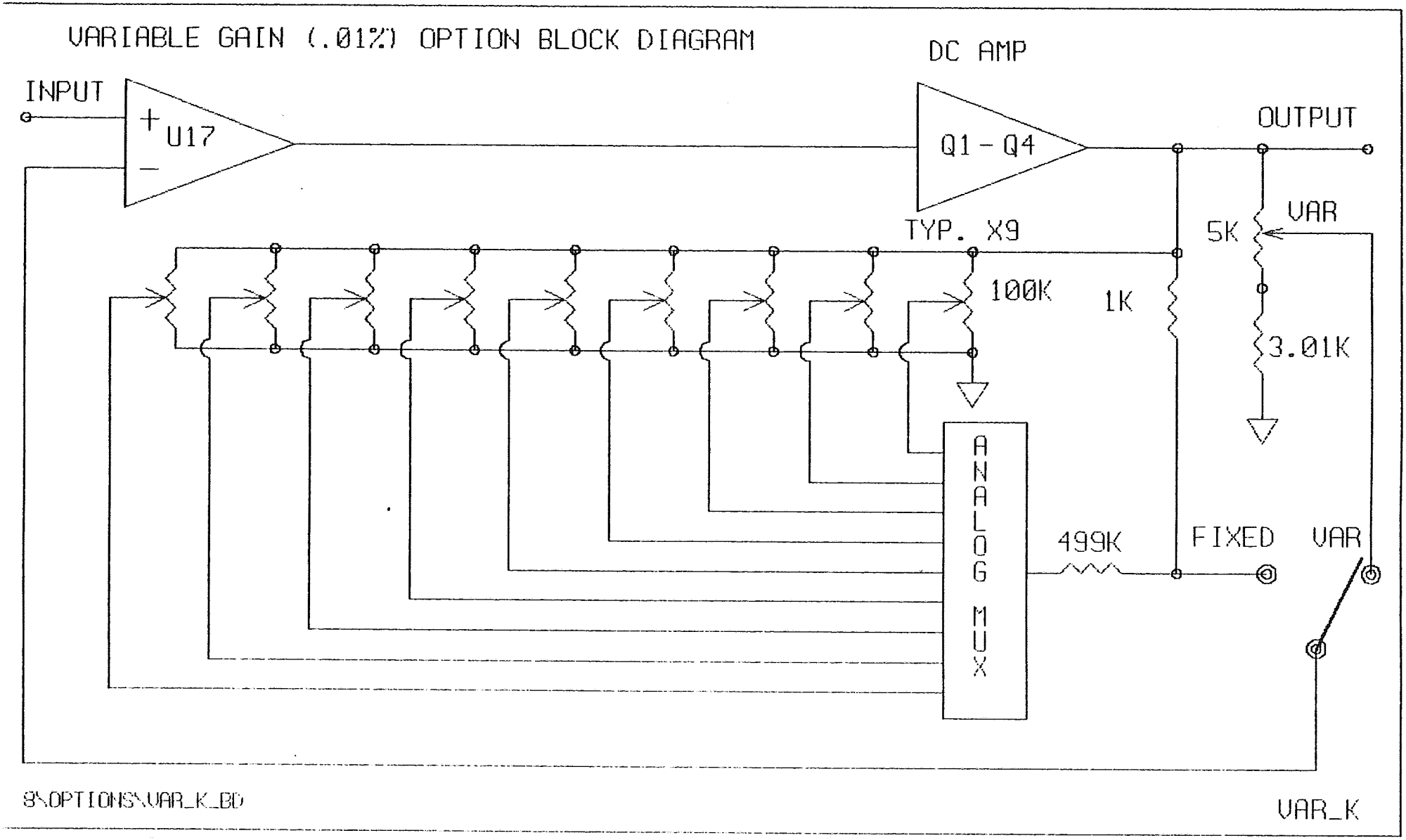
EXAMPLE:

An amplifier with binary gain steps can be set to a gain of 185, by first programming the fixed gain to 128, then adjusting the VARIABLE GAIN potentiometer on the front panel as required. Any other programmed gain step will be increased by the same ratio.

The user must monitor both amplifier input and output to set a specific gain. This gain should be recorded because the controller memory will only contain the programmed gain code. There will be no record of actual gain or that the switch was set to the "VARIABLE" position.

NOTE:

The "VARIABLE GAIN" switch and potentiometer will be inoperative on an amplifier without the "VARIABLE GAIN" option or one with the Programmable Variable Gain option.


VARIABLE GAIN (.01%) OPTION BLOCK DIAGRAM
DC AMP
INPUT
+
U17
−
Q1 - Q4
OUTPUT
TYP. X9
5K
VAR
100K
1K
3.01K
ANALOG MUX
499K
FIXED
VAR
8\OPTIONS\VAR_K_BD
VAR_K

Filter Option:

The model 8300AU amplifier has four basic output filter options;

1 * Wideband only; No filter

2 * Single frequency, 4 pole, low pass filter
Cutoff frequency and type (Bessel or Butterworth) specified at time of order.

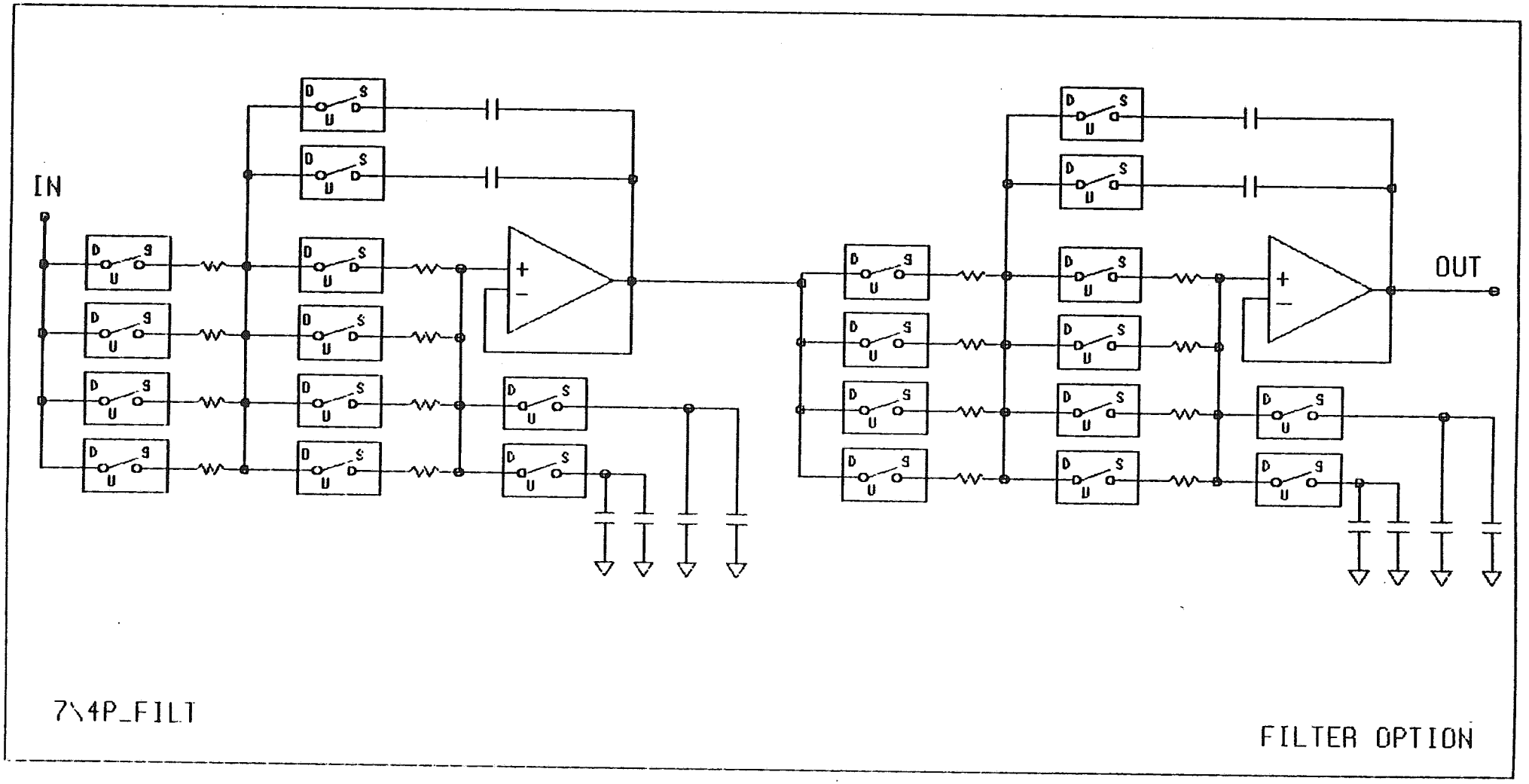
3 * Programmable frequency, 4 pole, low pass filter
Selection per table below

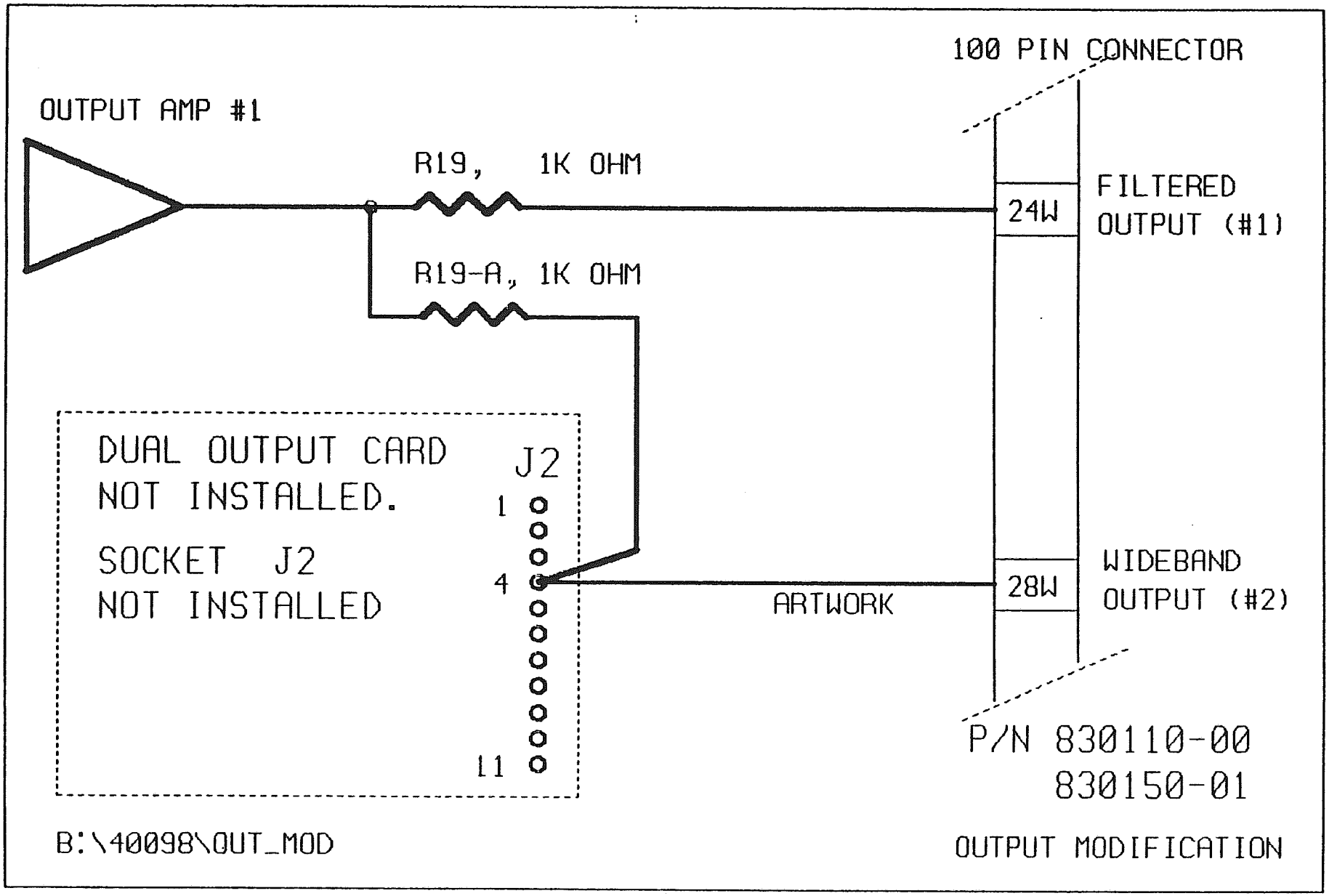
4 * Special

FILTER TYPE	BESSEL FILTER; CUTOFF FREQUENCIES							
BINARY BW	1	4	16	64	256	1024	4096	WB
DECIMAL BW1	1	3	10	30	100	300	1000	3K
DECIMAL BW2	3	10	30	100	300	1000	3000	10K
DECIMAL BW3	1K	2K	5K	5K	10K	20K	50K	WB
DECIMAL BW4	100	200	500	500	1K	2K	5K	WB
DECIMAL BW5	200	500	1K	1K	2K	5K	10K	WB
DECIMAL BW6	10	25	100	250	1K	2.5K	10K	WB
DECIMAL BW7	5	15	25	100	50	150	250	WB

FILTER TYPE	BUTTERWORTH FILTER: CUTOFF FREQUENCIES							
BINARY BW	1	4	16	64	256	1024	4096	WB
DECIMAL BW1	1	3	10	30	100	300	1000	3K
DECIMAL BW2	3	10	30	100	300	1000	3000	10K
DECIMAL BW3	1K	2K	5K	X	10K	20K	50K	WB
DECIMAL BW4	10	17.5	100	175	1K	1.75K	10K	WB
DECIMAL BW5	10	25	100	250	1K	2,5K	10K	WB
DECIMAL BW6	1	3	10	100	1K	3K	10K	WB
DECIMAL BW7	100	200	500	500	1K	2K	5K	WB

NOTE: EXCEPT FOR SPECIALS, ALL FILTER COMPONENTS ARE MOUNTED ON MAIN AMPLIFIER CIRCUIT BOARD. RESISTOR AND CAPACITOR VALUES ARE CHANGED FOR EACH CONFIGURATION. REFERENCE FILTER OPTION FIGURE.


IN
OUT
7\4P_FILT
FILTER OPTION


100 PIN CONNECTOR
OUTPUT AMP #1
R19, 1K OHM
R19-A, 1K OHM
24W
FILTERED
OUTPUT (#1)
DUAL OUTPUT CARD
NOT INSTALLED.
SOCKET J2
NOT INSTALLED
J2
1
4
11
ARTWORK
28W
WIDEBAND
OUTPUT (#2)
P/N 830110-00
830150-01
B:\40098\OUT_MOD
OUTPUT MODIFICATION

V-CAL OPTION

GENERAL:

This option allows the amplifier input to be switched between the normal signal and either an external precision dc voltage source, or the optional Signal Conditioner power supply, if installed in the amplifier. Reference FIGURE V-CAL_BD.

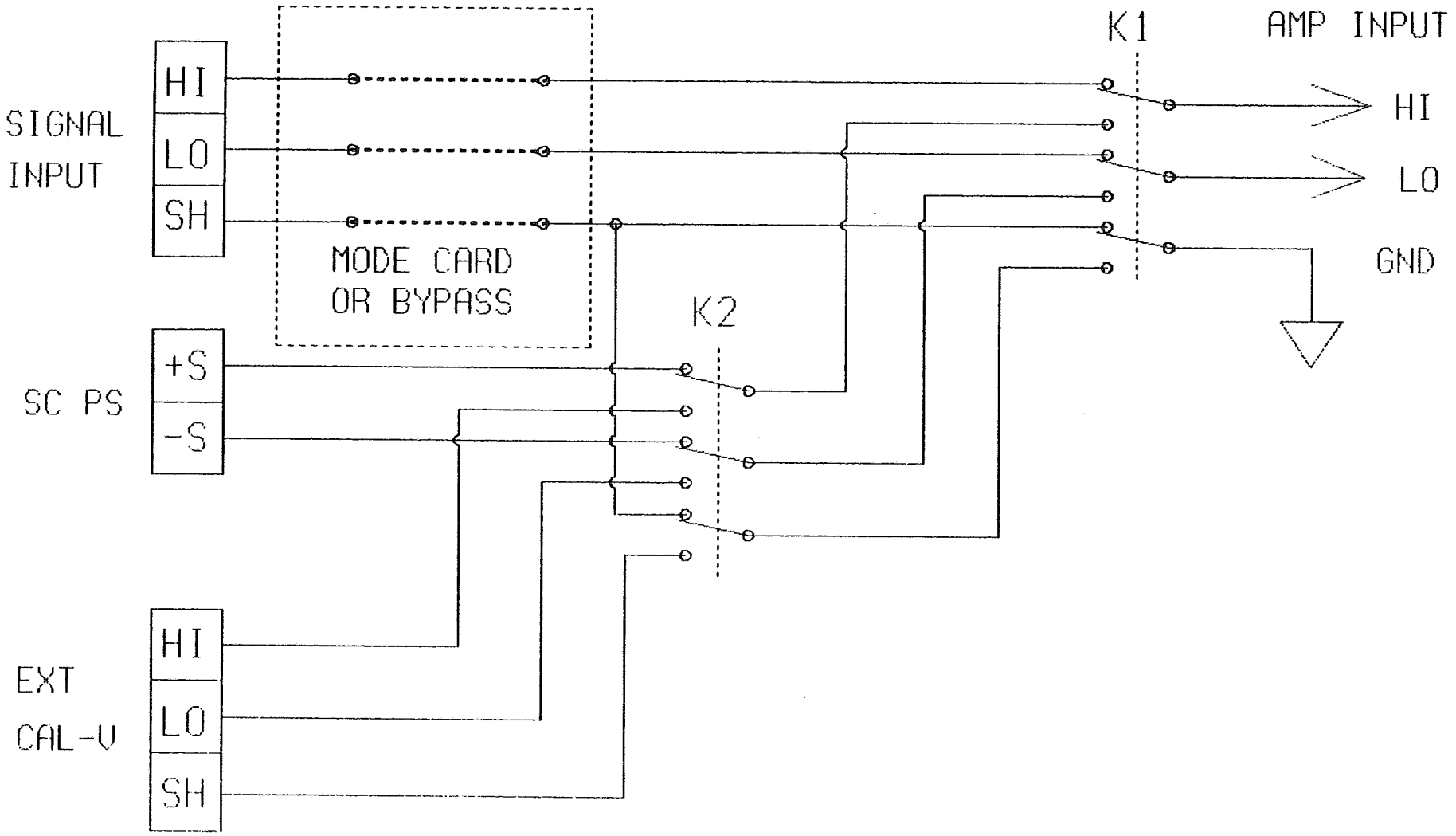
ADDED HARDWARE:

Two relays, are installed on the main amplifier pc board. If this option is not included, jumper wires are installed across K1 contacts to connect the amplifier to the normal signal. If the V-CAL option is added in the field, these jumpers must be removed before the relays can be installed. The basic amplifier includes all other necessary components for controlling the relays.

CALIBRATION BUS:

The calibration inputs to all amplifiers in a rack are connected to a common bus wired to J16, on the back of the rack. All amplifiers switched to the EXT CAL mode, should be programmed to the same gain. If not, some may have inputs driven into overload. This, in turn, may overload the calibration source. Optimal calibration will result when only one amplifier is set to the EXT CAL mode at a given time.

V-CAL OPTION BLOCK DIAGRAM



* K1 SELECTS BETWEEN: SIGNAL INPUT AND CALIBRATION INPUT.
  SHOWN IN SIGNAL INPUT POSITION.
* K2 SELECTS BETWEEN: EXTERNAL CAL INPUT AND SC POWER SUPPLY.
  SHOWN IN SC POWER SUPPLY POSITION.

8\FIG\V-CAL_BD

V-CAL_BD

MASTER SIGNAL JUMPER CARD

1.0 GENERAL:

The Master Signal Jumper card, P/N 72035 must be installed on all model 8300AU amplifiers which do not include mode cards. This connects the signal inputs to amplifier when no mode card is installed.

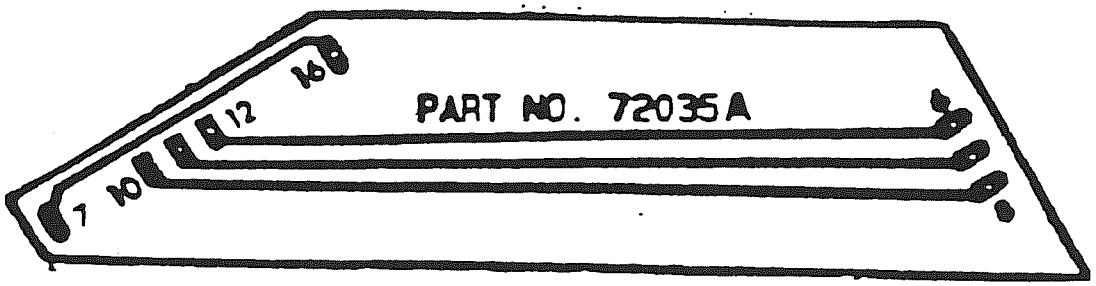
1.1 DESCRIPTION OF OPERATION

This card is installed on 8300AU assembly across J2A and J2B. The diagonal shape and pin designations screened on the main circuit card indicate the proper orientation. It cannot be installed incorrectly.

Artwork included on assembly 72035 makes the following connections:

J2A-10	-------	J2B-8	INPUT HIGH
J2A-11	-------	J2B-7	INPUT LOW
J2A-12	-------	J2B-6	GUARD
J2A-16	-------	J2A-7	+15V from P/S to CAL relay coils (derived from +18v)

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	E.O. 7049	4-1-87	ST/ML



	BY	DATE
DWN	ML	6-2-86
CHK	DG	6-2-86
ENG	MB	6-2-86
APP		

NEXT ASSY

TITLE: PRINTED CIRCUIT MASTER SIGNAL JUMPER

MAT'L: ———

FINISH: ———

A
SIZE

PRESTON
PRESTON SCIENTIFIC
805 East Cerritos Ave., Anaheim, Calif. 92805
Tel. (714) 776-6400

72035

SCALE 1:1

SH 1 OF 2

SECTION 2

1.0 MOUNTING:

The model 8300AU amplifier is a remotely controlled instrument with all input/output connections made by artwork fingers on the rear of the main circuit board. It is designed to be plugged into a backplane connector on a Preston 8300AU mounting rack assembly.

The backplane in the rack, provides all necessary connections for ac input voltage, control signals, analog inputs and outputs for 16 amplifiers.

The rack is either attached to a Master or Slave controller. This combined assembly, is designed to mount in a standard 19 inch RETMA equipment rack. Each model 8300AU system must contain 1 MASTER controller with a computer interface. It may also contain 1 to 31 SLAVE controllers.

NOTE:

Each controller / rack assembly includes an isolation transformer which is strapped for 117 vrms output with input voltages of 117 or 223 vrms, as specified on the sales order. The 8300AU amplifiers are always powered by 117vrms, regardless of the controller input voltage.

WARNING:

To avoid possible damage, turn "OFF" rack power before installing, or removing amplifiers.

1.1 WIRING CONNECTORS:

Mating connectors are supplied with the controller assembly. Refer to figures referenced in paragraphs 1.2, 1.3, and 1.4 for pin assignment information.

1.2 SIGNAL INPUTS:

9 pin connectors, J00 through J15 are used for signal inputs, and to supply excitation voltage and sense lines to an external strain gage bridge if the applicable signal conditioning option is included. Reference Figure J00_16 for pin assignments.

Each connector includes three signal input lines; HI, LO, and GUARD. Since the input is differential, the voltage between HI and LO will be amplified. Refer to Figure AU_INPUT for recommended user connections.

1.3 CALIBRATION BUS:

The "EXTCAL" pins on all amplifiers in the rack are connected to a common bus which is connected to J16. Reference FIGURE J00_16 for pin assignments. Amplifiers with the V-CAL input option may have inputs switched from the normal signals to this calibration bus.

> **NOTE:**
>
> All amplifiers with inputs connected to this bus should have gains programmed to the same value, to avoid overloading inputs.

1.4.A 83XXXXX SERIES AMPLIFIER OUTPUTS:

The 83XXXXX series amplifiers plug into a 72070-00 rack assembly. All standard outputs (#1) are brought out on J18, a 37 pin D type connector. A mating connector is included in the shipping kit.

The optional dual outputs (#2), if included, are brought out on individual pins on the 100 pin connectors for each amplifier. Refer to below figures for detailed input / output connections. Sixteen each, 5 pin mating connectors are included in the shipping kit.

FIGURE	DESCRIPTION
91031	CONNECTOR LOCATIONS AND DESIGNATIONS ON REAR OF RACK
91036-B	PIN ASSIGNMENTS FOR AMPLIFIER MATING CONNECTORS
J18-AU	AMPLIFIER OUTPUTS

1.4.B 84XXXXX SERIES AMPLIFIER OUTPUTS:

The 84XXXXX series amplifiers plug into 72070-01 rack assemblies. These amplifiers include triple output and signal conditioner output options. Each amplifier output is routed to connectors designated as "OUTPUT" and "OUTPUT MONITOR". Refer to the following figures for detailed input / output connection information.

FIGURE	DESCRIPTION
91031-3	CONNECTOR LOCATIONS AND DESIGNATIONS ON REAR OF RACK
91036-A	PIN ASSIGNMENTS FOR AMPLIFIER MATING CONNECTORS
JOUT_37D	PIN ASSIGNMENTS FOR 37 PIN CONNECTORS
TRI_OUT	BLOCK DIAGRAM OF AMPLIFIER OUTPUTS
J18_SC	PIN ASSIGNMENTS FOR SIGNAL CONDITIONER POWER SUPPLY OR CALIBRATION OUTPUT VOLTAGE MONITORS.

OUTPUTS	NUMBER / CONNECTORS:	
OUTPUT #1 (20ma)	X16	J20
OUTPUT #1 MONITOR	X16	J21
OUTPUT #2 (50ma)	X16	BACKPLANE PINS **
OUTPUT #2 MONITOR	X16	J19
OUTPUT #3 (20ma)	X16	BAKCPLANE PINS **
OUTPUT #3 MONITOR	X16	J22
SIGNAL CONDITIONER MONITOR	X16	J18

** Connections made to individual amplifiers.

1.5 PRIMARY POWER:

A fused, multi-voltage connector on the rear of the control drawer assembly allows the user to select ac input voltages of 100, 120, 220, or 240 volts RMS, 50 to 60 Hz. The jumpers in the connector assembly set the output of the isolation transformer to the 117 volt RMS value required by the 8300AU amplifier and cooling fans.

> **NOTE:**
> The AC power cord is polarized. Verify that ac voltage is compatible before applying power. Reference Figure AC_INPUT.

1.6 PRIMARY POWER VOLTAGE SELECTION:

The following procedure is used to change the ac input voltage to the controller, which is shipped from Preston to operate with the ac input voltage set as ordered.

VOLTAGE SELECTION PROCEDURE

1. Unplug ac power cord from rear of the control drawer assembly.
2. Slide the voltage selector cover door to the left.
3. Remove the selector card, and align it to the desired voltage. See the Voltage Selection Table below for the voltage settings. Replace the selector card, pushing it firmly into the card slot.
4. Close the voltage selector cover door. Replace power cord.
5. The desired voltage rating should appear on the top side of the card, in the voltage window, as shown in the "Selector Card" column of the Voltage Selection Table on the following page.

SECTION 2

VOLTAGE SELECTION TABLE

SELECTOR CARD	INPUT VOLTAGE RANGE	NOMINAL INPUT VOLTAGE
100	95 to 118	107
120	105 to 130	118
220	198 to 246	223
240	210 to 260	236

1.7 COOLING:

The air surrounding the amplifier should be kept between 0 and +50 degrees C for proper operation. Fans in the bottom of the rack force cooling air across the amplifiers. For optimum performance, this should be kept at a constant temperature.

Figure RACK_MT shows the recommended rack / controller installation for proper airflow. It is important to maintain spacing between units and provide airflow within the cabinet.

The storage temperature range is from -20 and +85 degrees C.

1.8 CONTROL SIGNALS:

The model 8300AU amplifier may be programmed by front panel switches on the controller, or remotely from a computer interface connected to the Master Controller. The interface may be either IEEE-488 or RS232. One of these must be specified at time of order. Refer to SECTION 7 for programming details.

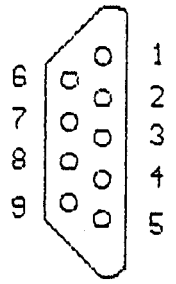
CONTROL LINE TERMINATION:

Digital output control line are connected, in parallel, to J1-A and J1-B on the rear of the controller. In systems having more than one controller, J1- B of the first controller (Master) is connected to J1-A of the next controller. This pattern is repeated until all controllers are connected. Reference Figure 91032-A in Section 8.

Terminator plug, P/N 72170-22 must be connected to J1-B of the last controller. If a system has only one controller (Master), the terminator plug may be connected to either J1-A or J1-B.

CONNECTOR PIN ASSIGNMENTS

8300AU RACK, BACKPLANE
INPUT CONNECTIONS
9 PIN "D" CONNECTOR **
TYPICAL FOR J00 - J16



(REAR VIEW)

** MATING SUPPLIED IN
SHIPPING KIT

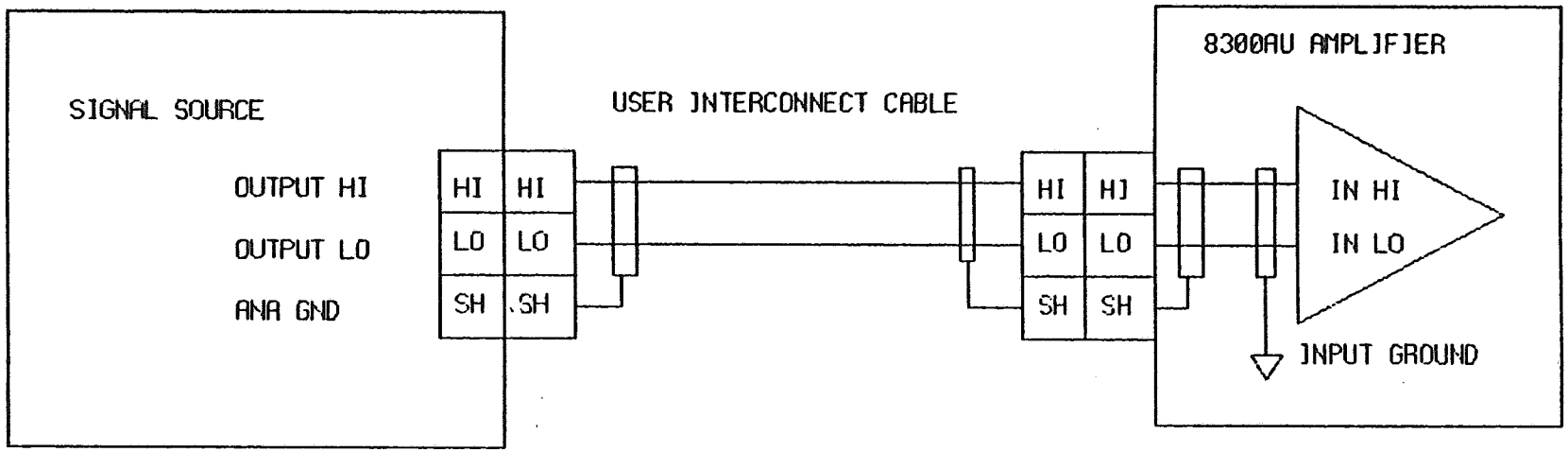
J00 - J15

PIN	SIGNAL
1	ANALOG INPUT SIGNAL HI
2	ANALOG INPUT SIGNAL LO
3	SHUNTCAL + (SHUNT CAL RESISTOR)
4	SHUNTCAL - (SHUNT CAL RESISTOR)
5	INPUT GUARD
6	SIGNAL CONDITIONER POWER SUPPLY OUTPUT + SENSE
7	SIGNAL CONDITIONER POWER SUPPLY OUTPUT - SENSE
8	SIGNAL CONDITIONER POWER SUPPLY OUTPUT +
9	SIGNAL CONDITIONER POWER SUPPLY OUTPUT -

J16

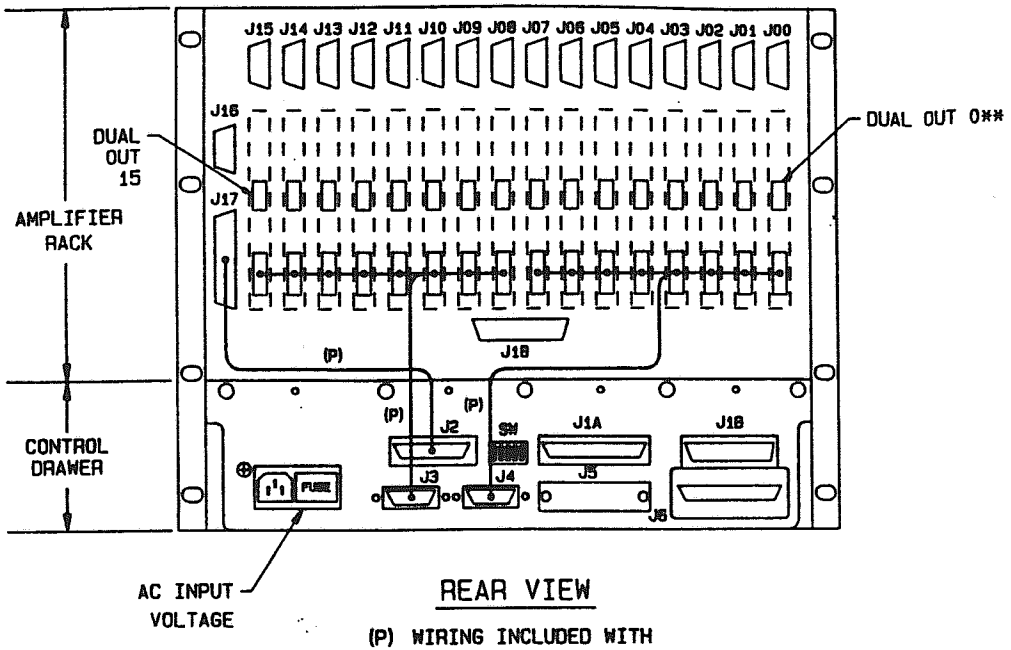
PIN	SIGNAL
1	CALIBRATE INPUT SIGNAL SHIELD
2	CALIBRATE INPUT SIGNAL HI
3	CALIBRATE INPUT SIGNAL LO
4	CALIBRATE INPUT SIGNAL SHIELD
5	N/C
6	N/C
7	N/C
8	N/C
9	N/C

J00_16



SHIELD SHOULD BE CONNECTED TO SIGNAL OUTPUT LO OR ANA GND AT SOURCE END.

THE SIGNAL BETWEEN INPUT HI AND INPUT LO WILL BE AMPLIFIED, BUT A GROUND REFERENCE IS REQUIRED.



REAR VIEW

(P) WIRING INCLUDED WITH RACK/CONTROL DRAWER ASSY

ANALOG INPUT CONNECTOR PIN ASSIGNMENTS: TYP. J00-J15 (9 PIN D)

JXX-01	INPUT HI	(ANALOG INPUT SIGNAL HI)
JXX-02	INPUT LO	(ANALOG INPUT SIGNAL LO)
JXX-03	SHUNTCAL +	(SHUNT CALIBRATE RESISTOR +)
JXX-04	SHUNTCAL -	(SHUNT CALIBRATE RESISTOR -)
JXX-05	GUARD	(GUARD SHIELD)
JXX-06	SCPWR SEN +	(TRANSDUCER POWER SENSE +)
JXX-07	SCPWR SEN -	(TRANSDUCER POWER SENSE -)
JXX-08	SCPWR OUT +	(TRANSDUCER POWER +)
JXX-09	SCPWR OUT -	(TRANSDUCER POWER -)

J16 (9 PIN D) CALIBRATE VOLTAGE INPUTS TO AMPLIFIER RACK

CAL SHIELD	J16	01
CAL IN HI	J16	02
CAL IN LO	J16	03
CAL SHIELD	J16	04

8300AU RACK/CONTROLLER CONNECTOR IDENTIFICATION:

* AMPLIFIER RACK

J00	AMPLIFIER # 1 SIGNAL INPUT
J01	AMPLIFIER # 2 SIGNAL INPUT
J02	AMPLIFIER # 3 SIGNAL INPUT
J03	AMPLIFIER # 4 SIGNAL INPUT
J04	AMPLIFIER # 5 SIGNAL INPUT
J05	AMPLIFIER # 6 SIGNAL INPUT
J06	AMPLIFIER # 7 SIGNAL INPUT
J07	AMPLIFIER # 8 SIGNAL INPUT
J08	AMPLIFIER # 9 SIGNAL INPUT
J09	AMPLIFIER #10 SIGNAL INPUT
J10	AMPLIFIER #11 SIGNAL INPUT
J11	AMPLIFIER #12 SIGNAL INPUT
J12	AMPLIFIER #13 SIGNAL INPUT
J13	AMPLIFIER #14 SIGNAL INPUT
J14	AMPLIFIER #15 SIGNAL INPUT
J15	AMPLIFIER #16 SIGNAL INPUT
J16	CALIBRATION INPUT VOLTAGE FOR ALL 16 AMPLIFIERS
J17	PROGRAMMING SIGNALS FROM CONTROLLER
J18	ANALOG OUTPUTS FROM 16 AMPLIFIERS (FILTERED)
**	DUAL OUTPUTS (UN-FILTERED) AND OVERLOAD INDICATOR CONNECTED TO REAR PANEL INTERCONNECT BOARD PINS BENEATH CORRESPONDING INPUT CONNECTORS AS FOLLOWS

PIN 28-W	OUTPUT #2 HI
PIN 28-C	OUTPUT #2 LO (GRDF2)
PIN 27-C	OUTPUT #2 LO (GRDF2)
PIN 27-W	OUTPUT #2 LO (GRDF2)
PIN 29-C	OUTPUT #2 LO (GRDF2)
PIN 29-W	OUTPUT #2 LO (GRDF2)
PIN 39-C	OVERSCALE INDICATOR
PIN 39-W	OVERSCALE GRD

* CONTROL DRAWER ASSEMBLY

J1A	DIGITAL CONTROLS TO SLAVE CONTROLLER ***
J1B	DIGITAL CONTROLS TO SLAVE CONTROLLER ***
J2	OUTPUT CONTROL TO ATTACHED AMP RACK
J3	117 VRMS AC OUTPUT VOLTAGE TO AMPLIFIERS 8 - 15
J4	117 VRMS AC OUTPUT VOLTAGE TO AMPLIFIERS 0 - 7
J5	NO CONNECTION / FOR FUTURE USE
J6	TO COMPUTER INTERFACE; EITHER RS232 OR IEEE-488
***	J1A AND J1B WIRED IN PARALLEL

8300AU AMPLIFIER RACK/CONTR
CONNECTOR INDENTIFICATI(
FIGURE 91031-A

8300AU AMPLIFIER INPUT/OUTPUT CONNECTIONS (JI)
FOR BACKPLANE 72088-00

	1C ¦ 1W	
	2C ¦ 2W	
GUARD	3C ¦ 3W	GUARD
-VI	4C ¦ 4W	+VI
-SENSE	5C ¦ 5W	SENSE
RCAL LO	6C ¦ 6W	RCAL HI
INPUT LO	7C ¦ 7W	INPUT HI
GUARD	8C ¦ 8W	GUARD
	9C ¦ 9W	
	10C ¦ 10W	
	11C ¦ 11W	
	12C ¦ 12W	
	13C ¦ 13W	
CAL GUARD	14C ¦ 14W	CAL GUARD
CAL INPUT HI	15C ¦ 15W	CAL INPUT HI
CAL INPUT LO	16C ¦ 16W	CAL INPT LO
CAL GUARD	17C ¦ 17W	CAL GUARD
	18C ¦ 18W	
	19C ¦ 19W	
	20C ¦ 20W	
	21C ¦ 21W	
	22C ¦ 22W	
SHIELD	23C ¦ 23W	SHIELD
OUT#1 LO	24C ¦ 24W	OUT#1 HI
SHIELD	25C ¦ 25W	SHIELD
	26C ¦ 26W	
	27C ¦ 27W	OUT#2 LO
	28C ¦ 28W	OUT#2 HI
	29C ¦ 29W	OUT#2 SHIELD
	30C ¦ 30W	
DATA1*	31C ¦ 31W	DATA0*
DATA3*	32C ¦ 32W	DATA2*
DFNT0*	33C ¦ 33W	DFNT1*
DSTB*	34C ¦ 34W	DENABLE
ADDRESS 0	35C ¦ 35W	ADDRESS 0
ADDRESS 1	36C ¦ 36W	ADDRESS 1
ADDRESS 2	37C ¦ 37W	ADDRESS 2
ADDRESS 3	38C ¦ 38W	ADDRESS 3
	39C ¦ 39W	DIGGRD
	40C ¦ 40W	
E GRD	41C ¦ 41W	E GRD
E GRD	42C ¦ 42W	E GRD
	43C ¦ 43W	
AC INPUT HI	44C ¦ 44W	AC INPUT HI
AC INPUT HI	45C ¦ 45W	AC INPUT HI
	46C ¦ 46W	
AC INPUT LO	47C ¦ 47W	AC INPUT LO
AC INPUT LO	48C ¦ 48W	AC INPUT LO
	49C ¦ 49W	
E GRD	50C ¦ 50W	E GRD

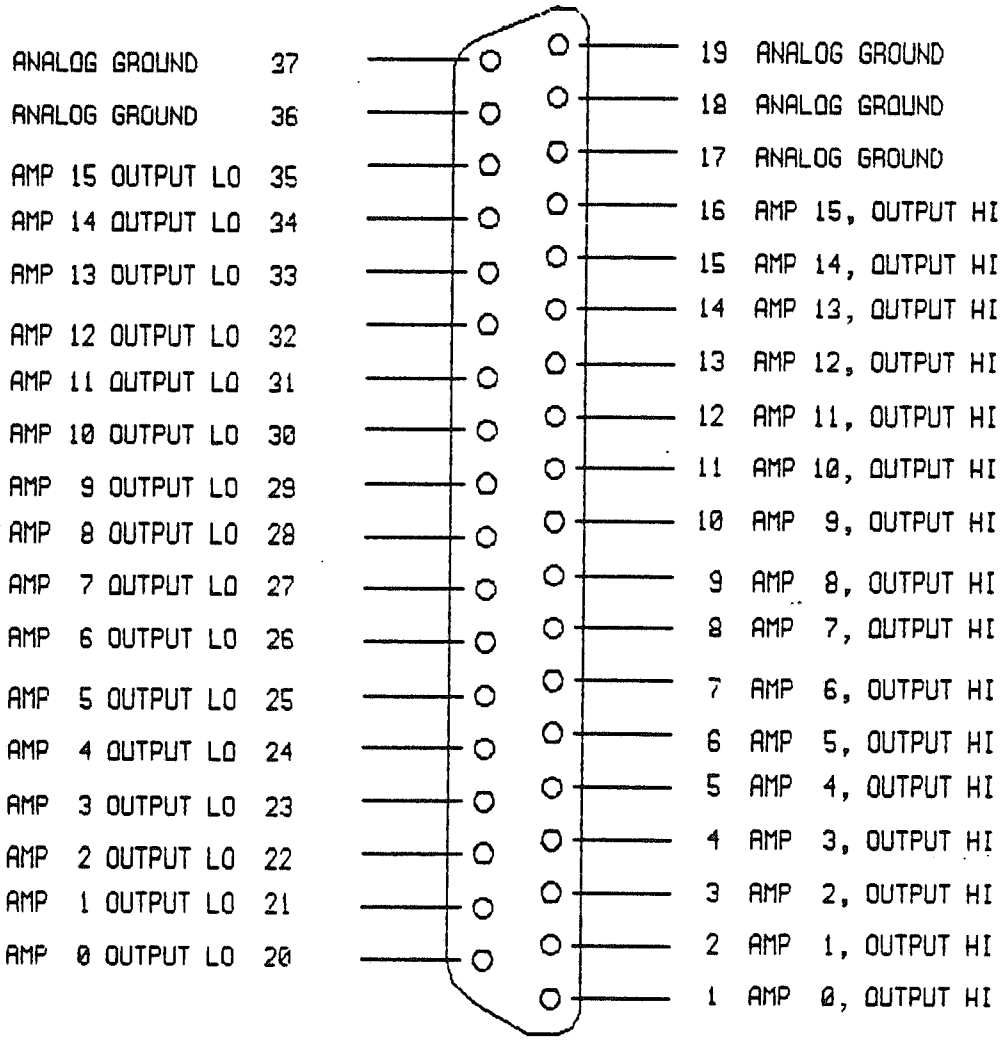
NOTE: W = WIRING SIDE
C = COMPONENT SIDE

FIGURE 91036-B

8300AU AMPLIFIER RACK, OUTPUT CONNECTIONS

37 PIN "D" TYPE CONNECTOR **

(J18, REAR VIEW)

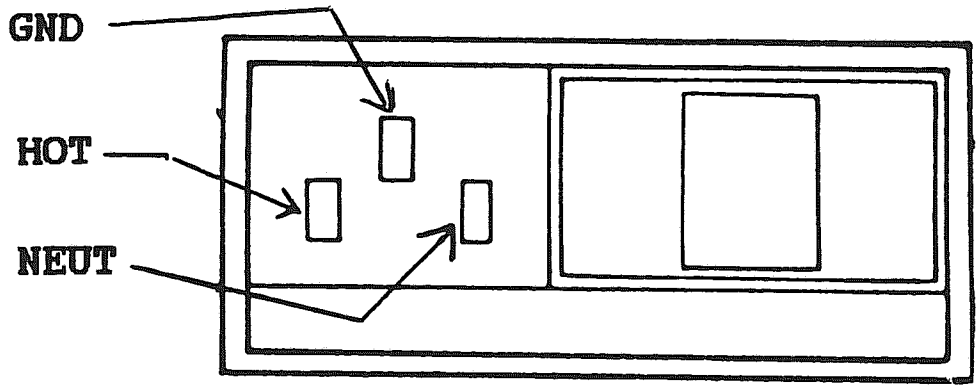


** (MATING CONNECTOR SUPPLIED IN SHIPPING KIT)

6\FIG\J18_AU.SCH

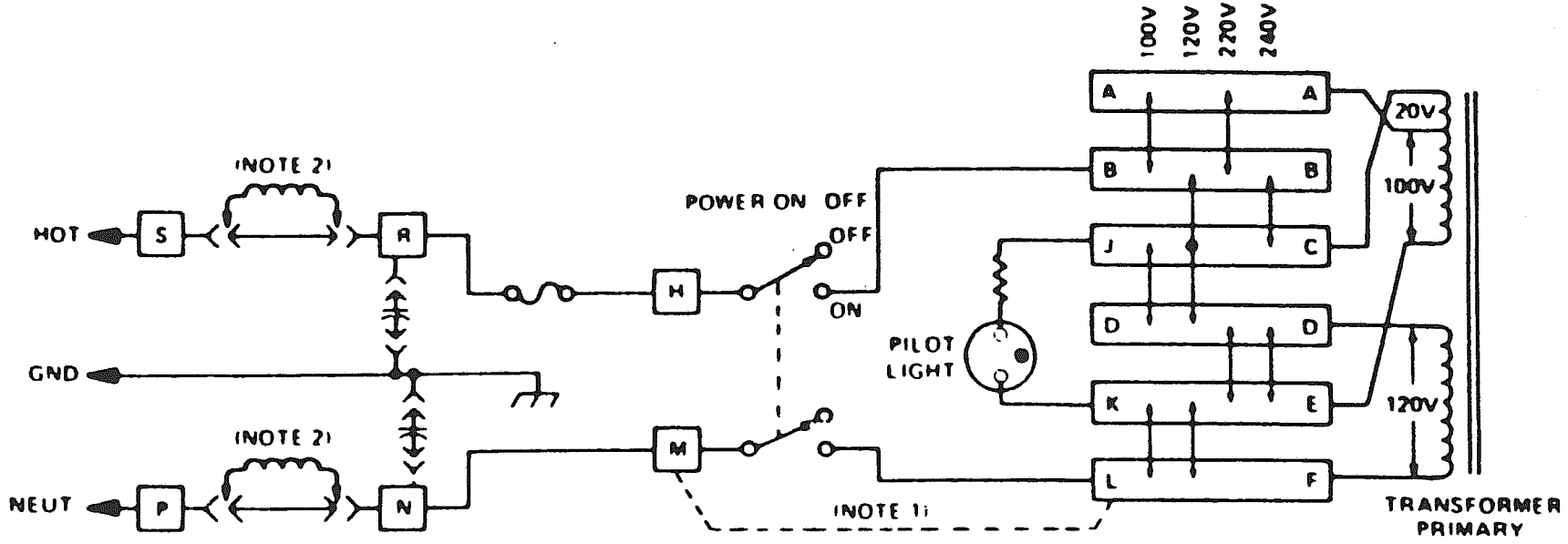
J18_AU

VS & F CONNECTOR / MODEL 6VJ1



REAR VIEW

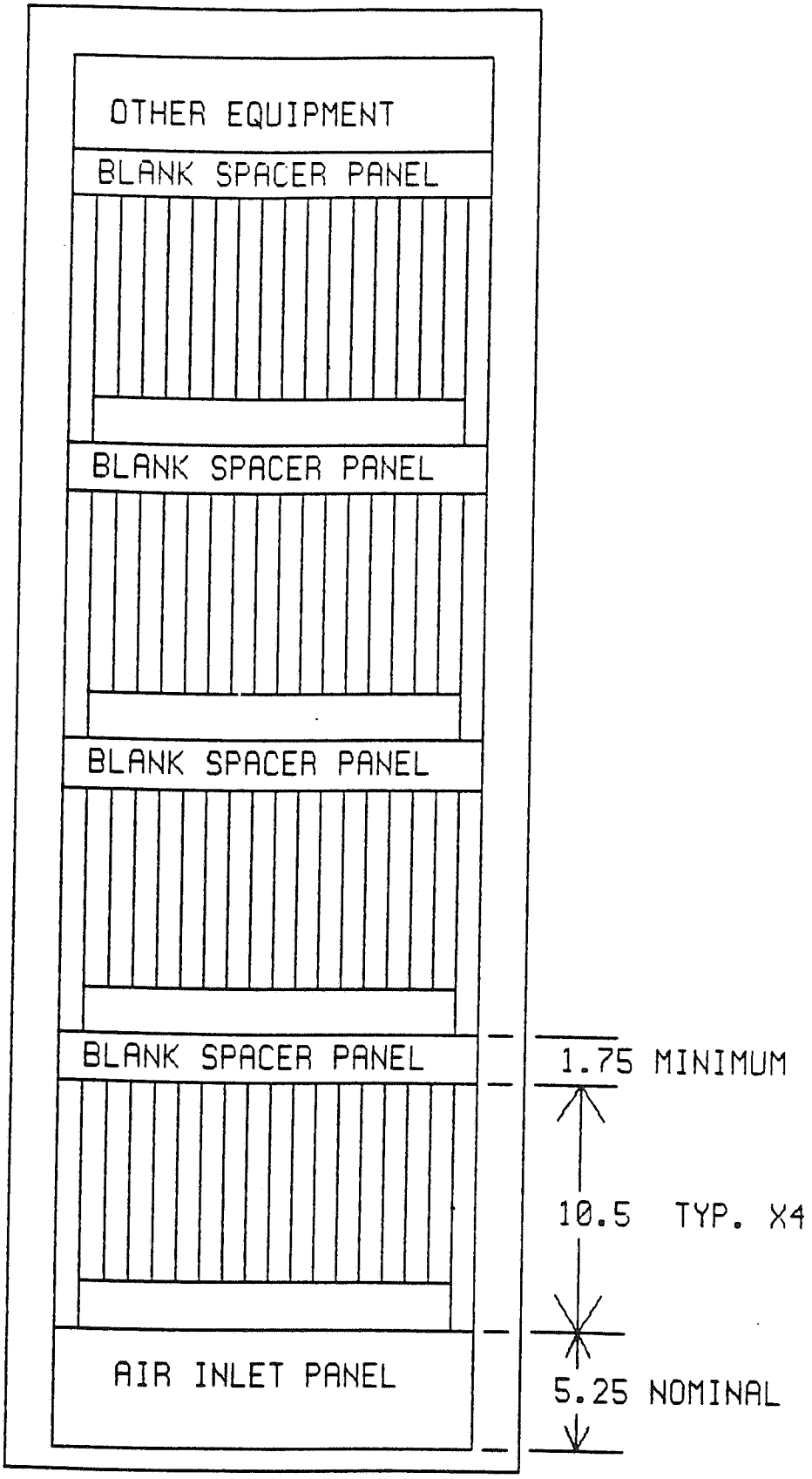
ELECTRICAL SCHEMATIC



Note 1: Jumper required if only SPST Power Switch is used.
Note 2: Jumpers required if no input filtering is used.

FIGURE AC_INPUT

EXHAUST FAN PANEL ON TOP OF RACK

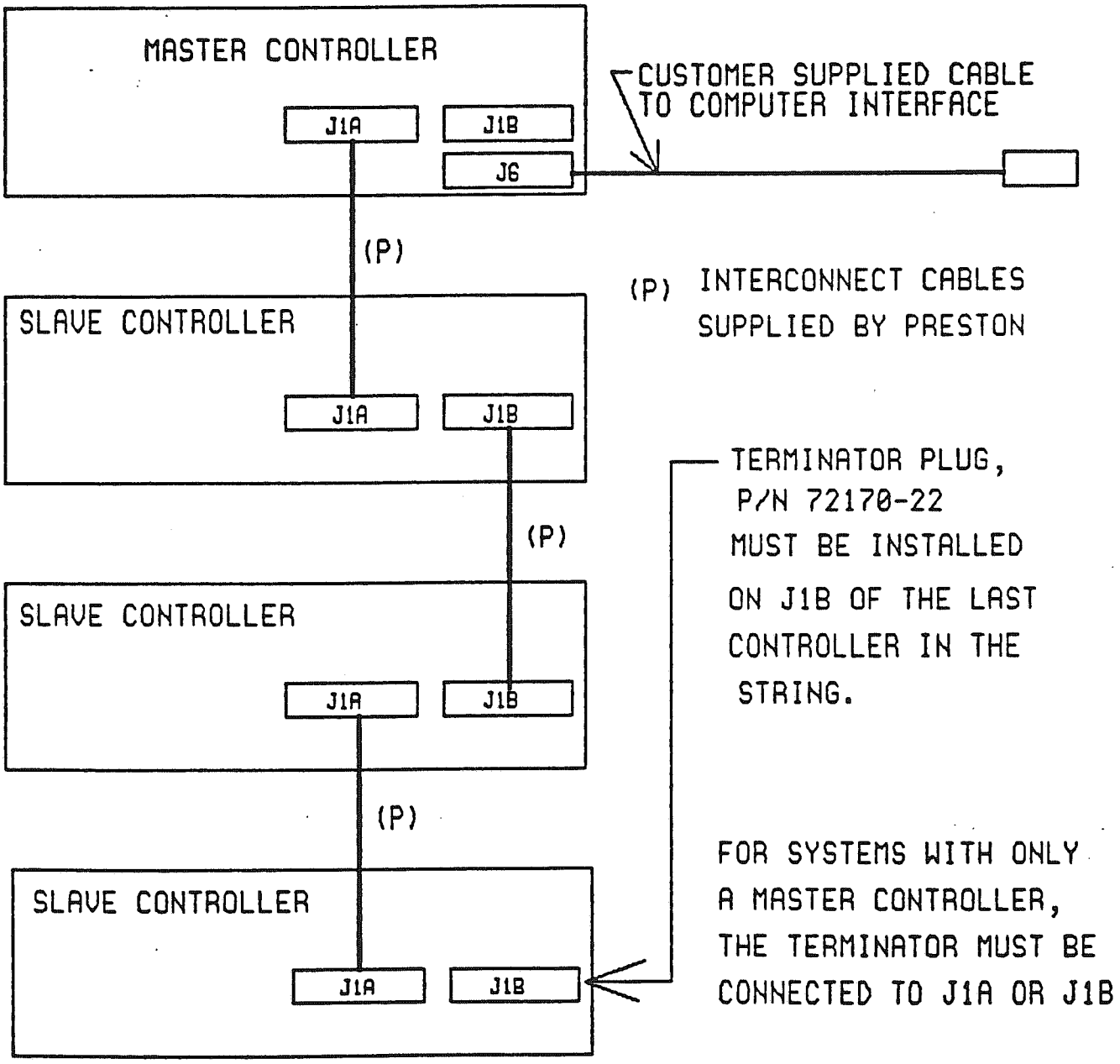


64 CHANNELS 8300AU AMPLIFIER SYSTEM

RECOMMENDED MOUNTING FOR PROPER AIRFLOW

FIGURE RACK_MT

8300AU MASTER/SLAVE INTERCONNECT BLOCK DIAGRAM



NOTE: J1A AND J1B ARE WIRED IN PARALLEL. EITHER MAY BE USED.

FIGURE 91032-A

FRONT PANEL OPERATION

MODEL 8300AU
AMPLIFIER SYSTEM

PROGRAMMABLE OPTIONS:

* DECIMAL GAIN STEPS:

GAIN CODE	FIXED GAIN STEP
0	1
1	2
2	5
3 (NOT RECOMMENDED)	10
4	10
5	20
6	50
7 (NOT RECOMMENDED)	100
8	100
9	200
10	500
11	1000

* PROGRAMMABLE FILTER:

FILTER CODE	CUTOFF FREQUENCY
0	1 Hz
1	4 Hz
2	16 Hz
3	64 Hz
4	256 Hz
5	1024 Hz
6	4096 Hz
7	WB (UNFILTERED)

* V-CAL: Reference SUB CAL on FIGURE 91040.WP.

FRONT PANEL OPERATION

GENERAL:

The Master Controller/Rack holds up to 16 amplifiers. Slave Controller/Rack(s) with up to 16 amplifiers each, may be added to configure systems with up to 512 amplifiers. One Master Controller per system is required. For the remainder of this document, the term Controller shall refer to the combination of the Controller and Rack.

FRONT PANEL CONTROLS:

The 8300AU Master Controller has front panel switches for manual programming of most amplifier functions. Reference FIGURE 8.

Before attempting use to front panel controls, the operator must know the options installed in the amplifiers as well as the number and channel addresses of all amplifiers in the system. The GAIN, BANDWIDTH, and other functions are programmed by entering the appropriate codes. The applicable codes and information on other options installed must be known before the amplifier can be properly programmed.

Refer to the Description section of the Operation manual for amplifier options and addendum of this document for additional information.

PROGRAMMING SEQUENCE:

Since the Master Controller can address any or all amplifiers in the system, the amplifier channel number must be included with the function to be programmed.

NOTE: Addresses and other codes are in "DECIMAL" format.

(1) Depress ("0") switch as many times as required to blank the front panel display (4 times maximum). This step provides a known starting point.

(2) Press three digit CODE for the desired channel address. Use leading zeros.

Example: (Enter 0 0 3 for channel 3).
Display will indicate 0 0 3.
OR
Press ("9") to enter same data into all amplifiers.
Display will indicate "LLL".

(3) Press a single digit CODE ("0" through "8") to select the desired function. Reference FIGURE 91040.WP.

If CODE is ("0"), ("2"), ("4"), ("5"), ("6"), ("7"), or ("8") press "ENTER" switch.

If CODE is ("7") AUTOBAL, but the OPTION BYTE function is desired, enter 3 digit number and press "ENTER".

A. If a MODE has been selected, it will be loaded into memory of the selected amplifier(s).

B: If READOUT GAIN ("0") or READOUT BANDWIDTH ("2") was selected, the gain or bandwidth code of the selected channel, or ALL channels will be displayed.

If CODE is ("0") and jumper W8 is removed to enable the PROGRAMMABLE VARIABLE GAIN the gain code will be displayed for approximately 3 seconds. The display will then switch the VARIABLE GAIN code.

N O T E :

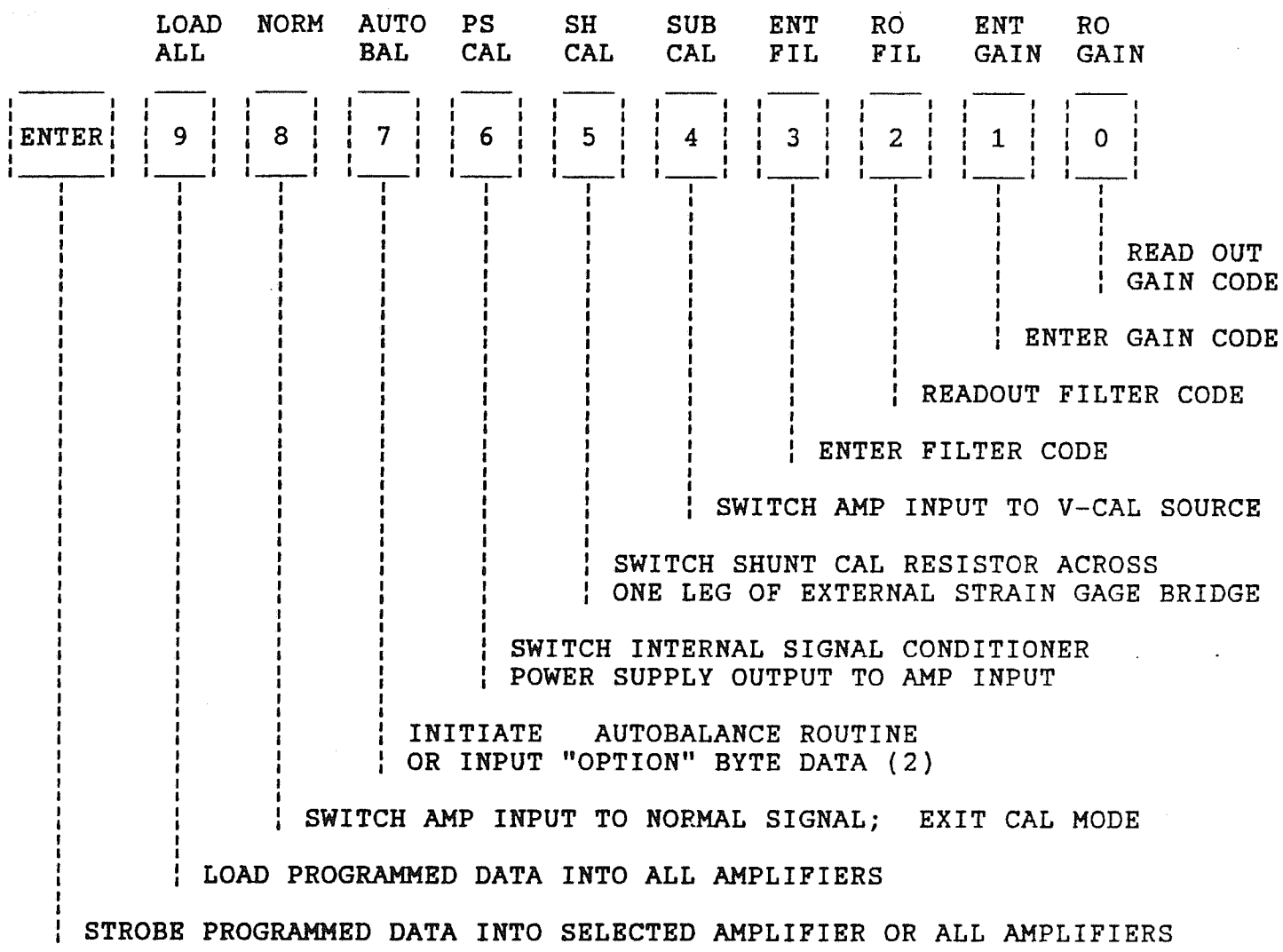
The front panel READOUT displays the data stored in the controller memory which has been loaded into the amplifier storage registers. Barring a malfunction, the amplifier storage registers will contain identical data.

C: If ENTER GAIN ("1") or ENTER BANDWIDTH ("3") was selected, enter the desired GAIN or BANDWIDTH code, and press "ENTER".

If CODE is ("1") and jumper W8 is removed to enable the PROGRAMMABLE VARIABLE GAIN function, the display will switch to the VARIABLE GAIN CODE when "ENTER" is pressed. A new VARIABLE GAIN CODE may then be entered. It will be loaded into controller and amplifier registers by pressing "ENTER" a second time.

Pressing "ENTER" will load the code into memories in both the controller and amplifier channel(s) displayed.

FRONT PANEL OPERATION



(1) USABLE FUNCTIONS DEPEND UPON OPTIONS INSTALLED IN AMPLIFIERS.

(2) "OPTION BYTE" ONLY APPLICABLE TO COMPATIBLE MODE CARDS.

(3) REFER TO SECTION 6 FOR OPTION BYTE PROGRAMMING DATA. THE MODE CARDS DETERMINES THE FUNCTION OF THE DATA.

(4) FOR SPECIAL MODE CARDS OR AMPLIFIERS SOME OF THE STANDARD FUNCTIONS LISTED ABOVE MAY BE USED FOR OTHER PURPOSES. THE OPTIONS SECTION WILL INCLUDE THIS INFORMATION, IF APPLICABLE.

FIGURE 91040.WP

N O T E :

Each time "ENTER" is pressed, the channel address will increment by one and the operation will repeat. If the operation reaches the last channel in the system (as set on the "SLAVES" switch on the microprocessor), the next operation will occur on channel zero.

If "ENTER" is held down for approximately 1/2 second, data entry will occur for each channel, starting with the selected channel, at a rate of about 5 per second, until "ENTER" is released. When the last channel is reached, the next channel will be channel zero.

If an error, such as too many digits or out of range entries(**), is detected in data entry, the field or fields of the display will blank, and correct data may be re-entered.

CAUTION:

To avoid possible damage, power to the rack should be turned off before removing or installing an amplifier.

GAIN CODES:

(**) Refer to amplifier options section for legal gain codes. These are limited to 0 - 11, but for some special amplifiers all of these may not be included. The controller will accept codes of 0 - 15 without generating an error indication. If a code of 12 - 15 is entered it will be stored in the controller memory and acknowledged on the display but the "actual" GAIN CODE in the amplifier memory will remain unchanged.

BANDWIDTH CODES:

Legal bandwidth codes are 0 - 7, but do not apply to all amplifiers. If codes of 8 - 15 are entered they will be stored in the controller memory and acknowledged on the display but the "actual" BANDWIDTH CODE in the amplifier memory will remain unchanged.

CODE STORAGE:

The standard memory in the Master Controller is volatile. When power is first applied to a Master Controller, the amplifiers will typically come up in states with GAIN CODE = 0, BANDWIDTH CODE = 7, and MODE = NORM, the as shipped, factory settings. This is not, however, guaranteed so they should be programmed to desired states via front panel controls or remotely, each time power is applied.

If a SLAVE CONTROLLER rack is powered "down" normally only the amplifiers in that rack need to be re-programmed, however re-programming all amplifiers in the system is good practice.

NON-VOLATILE MEMORY OPTION:

As an option, the Master Controller may be ordered with non-volatile memory. The amplifiers will then be set to the previously programmed states, whenever power is applied.

ERROR CODES:

If an error occurs upon pressing "ENTER", while attempting to enter a GAIN or BANDWIDTH or setting a calibration mode while "Local lockout" is in effect, the display will show an "--E--".

FRONT PANEL ERROR CODES:

DISPLAY	ERROR CONDITION
E- 1	I/O board not identified.
E- 2	IEEE-488 error.
E- 3	I/O parity error.
E- 4	RS-232 overrun error.
E- 5	RS-232 frame error.
--E--	A front panel entry has been attempted while in the local lockout mode.

TEST MODE (FRONT PANEL)

A. ENTER TEST MODE

To enter the test mode, depress any button 0 though 7 while turning on power to the controller. When the display shows "PPPPPPPP", release the depressed button and select the desired test by pressing the button associated with that test.

To exit the test mode, turn off the power to the control module for 5 seconds and then turn power on again. The display will show "HHHHHHHH" while the amplifiers are loaded with the current memory contents. When the display then blanks, the system is ready for operation.

	BUTTON	TEST FUNCTION
A	0	All digit positions of front panel readout display a repetitive pattern.
	1	Data input from the controlling device is displayed in octal format on the front panel. Each input byte is displayed for approximately two seconds.
	2	If the binary mode is selected, the interface outputs to the controlling device a sequential byte pattern 00H to FFH. If the ASCII mode is selected, the output will be the byte pattern 20H to 7FH, transmitted in blocks of 23 characters followed by the byte 10H (line feed). When using the IEEE-488 Interface, an RSV will be sent at the beginning of each line.
	3	Data output on the data lines to the amplifiers in box zero is a repeating pattern of 00H to 0FH.
	4	Data output on the address lines to the amplifiers in box zero is a repeating pattern of 00H to 0FH.
	5	Data output on the function lines to the amplifiers in box zero is a repeating pattern of 00H to 03H (complemented).
	6	The enable line to the amplifier will have a 10 millisecond pulse occurring every 320 milliseconds. The strobe signal will be a 6 millisecond pulse occurring 10 microseconds after the leading edge of the enable signal. A sequential pattern of 00H to 1FH will appear on the rack address lines.
	7	The readout displays the bit pattern of I/O dip switch number 1 of the IEEE I/O board, and of the first five bits of I/O dip switch number 1 of the RS232 I\O board.
	8	The readout displays the bit pattern of I/O dip switch #2 of the IEEE I/O board, and the bit pattern of the second five bits of I/O dip switch #1 of the RS232 I/O board.
	9	The readout displays the bit pattern of the SLAVES dip switch on the microprocessor board.
	ENTER	The readout displays "ttrrmmyy". Where: tt = Prom part number 9981 rr = Revision number. mm = Month of manufacture. YY = Year of manufacture.

Addendum

SYSTEM CONFIGURATION:

Before attempting to program the system it is necessary to determine the following parameters:

1. Number of racks
2. Number of amplifiers
3. Amplifier channel number assignments
4. System Interconnections

RACKS:

One Master Controller is required per system. If a system has over 16 amplifier, one, or more, Slave Controllers must be added.

==========

The positions of switches SW1-1 -- SW1-5, on the CPU card in the Master Controller are factory set to a binary address equal to the number of Slave Controllers in the system. This sets the Last addressable channel address of the system equal to the number of amplifiers it can hold, and minimizes programming time.

If SW1-1 -- SW1-5 were set to 1s the controller would sequentially go through address 0 - 511 for any load all command. For a system with 64 amplifiers, this would increase command execution time by a factor of 8.

If SW1-1 -- SW1-5 were set to a number less than that of the amplifiers installed, some amplifiers would not be addressable. For a system with 64 amplifiers, only one half would be addressed if these switches were set for a binary 31.

==========

SWITCH	BIT WEIGHT	
SW1-1	1	LSB
SW1-2	2	
SW1-3	4	
SW1-4	8	
SW1-5	16	MSB

It is not possible to view these switch settings without removing the control drawer. If it is to make a visual inspection or change switch setting to expand the system, refer to Removal Procedure.

For a system with only a Master Controller, SW1-1 -- SW1-5 would all be set to 0s. For a system with 512 amplifiers (1 Master + 31 Slaves), these switches would all be set to 1s.

EXAMPLE: A system has 64 amplifiers, 1 Master Controller and 3 Slave Controller. The SW1 switches would be set as follows:

SW1-1	1	lsb
SW1-2	1	
SW1-3	0	
SW1-4	0	
SW1-5	0	msb

RACK NUMBERING IN SYSTEM:

The amplifier channel addresses are connected from the Master Controller to all Slave Controllers in a serial manner. REFERENCE FIGURE 91032-B. Each rack has a five digit switch (SW-1 -- SW1-5) mounted on the rear. The settings of these switches determine the system number of the rack, and therefore the addresses of the amplifiers in it. These switch positions should be verified before beginning.

Note that the control cable with address lines is connected in series to all racks in the system. A terminator plug is connected to J1B of the last rack. This plug may be connected to either J1A or J1B on a system with only a Master Controller.

EXAMPLE: For the 64 channel system in the previous example the SW1 switches would be set as follows:

CONTROLLER	SW1-5 (MSB)	SW1-4	SW1-3	SW1-2	SW1-1 (LSB)	AMPLIFIER ADDRESSES
1	0	0	0	0	0	0 - 15
2	0	0	0	0	1	16 - 31
3	0	0	0	1	0	32 - 47
4	0	0	0	1	1	48 - 63

AMPLIFIERS:

Up to 16 amplifiers may be installed in either a Master or Slave Controller. When viewing the rack from the front, the amplifier addresses begin at the left side. The addresses of the first rack in the preceding example are 0 - 15, and those in the last rack are 48 - 63. Reference FIGURE 91032-B.

AMPLIFIER ADDRESSES:

Amplifiers are addressed as binary integers from 0 to N, where N is equal to the maximum number of amplifiers in the system. N(max) = 511. The numbers beginning with 0 - 15 are in the first Controller (usually, but not always, the Master).

OPTIONS:

GAIN CODES:

Binary gain steps of 1 to 2048 are standard. Decimal gain steps of 1 to 1000 are optional. The Description section of the operation manual defines applicable codes.

BANDWIDTH CODES:

The programmable filter option is included in most 8300AU amplifiers. The Description section of the operation manual defines applicable codes along with associated filter type and cutoff frequencies.

OTHER:

Refer to the Description section of the Operation Manual to identify other optional features installed and sections 6 and 7 for associated programming information. A typical Description section is included for reference.

REFERENCE DOCUMENTS:

FRONT PANEL FIGURE 8
FIGURE 91032-B
MICRO CONTROLLER ASSEMBLY DRAWING
FIGURE 91040.WP
RACK REAR VIEW FIGURE SW1_LOC

FRONT VIEW

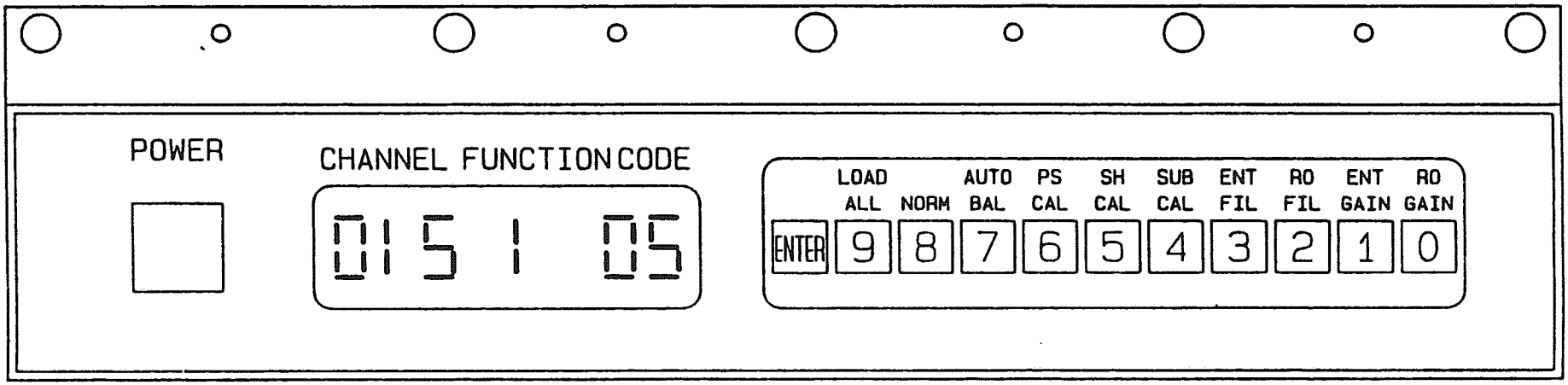
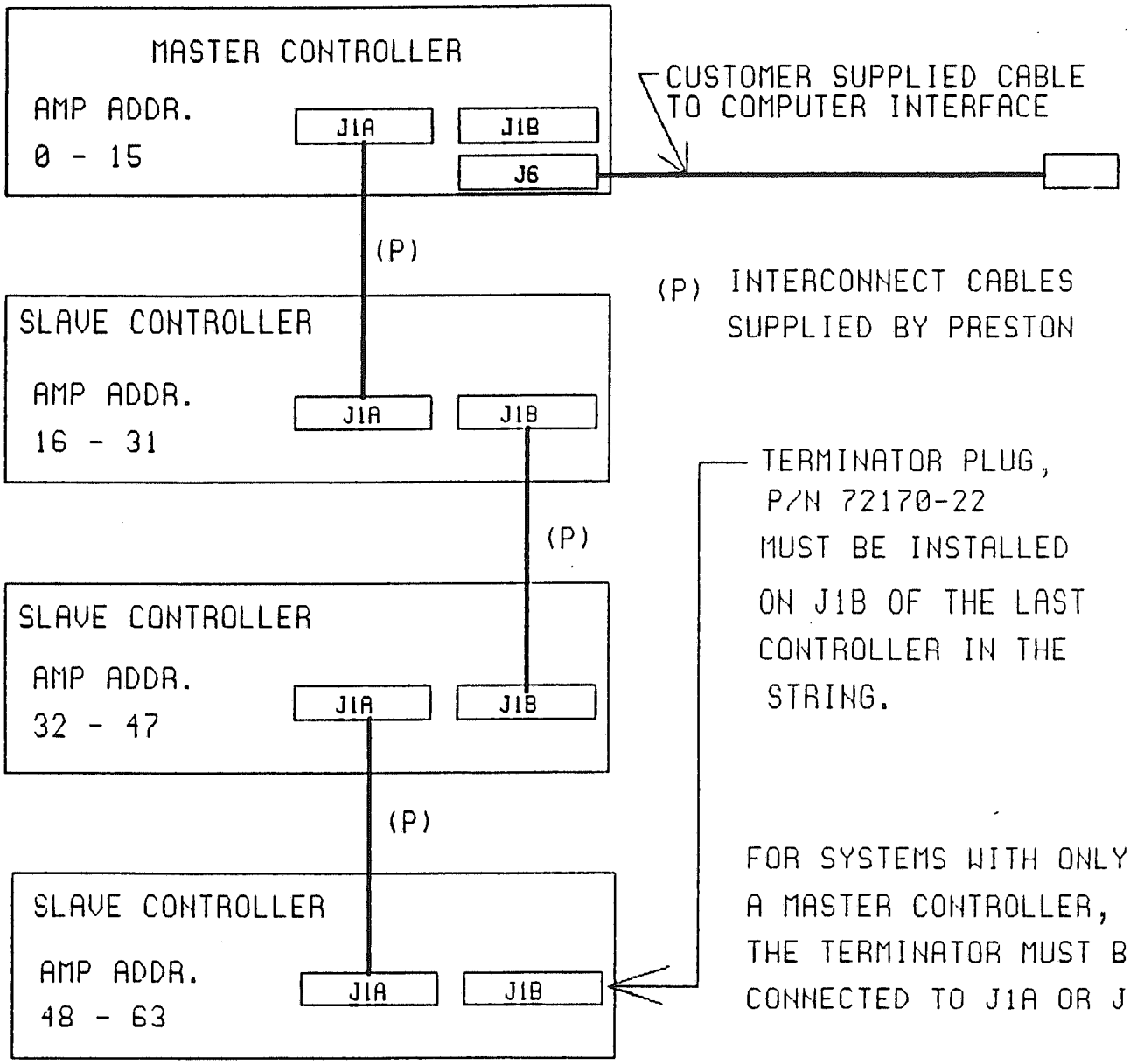


FIGURE 8

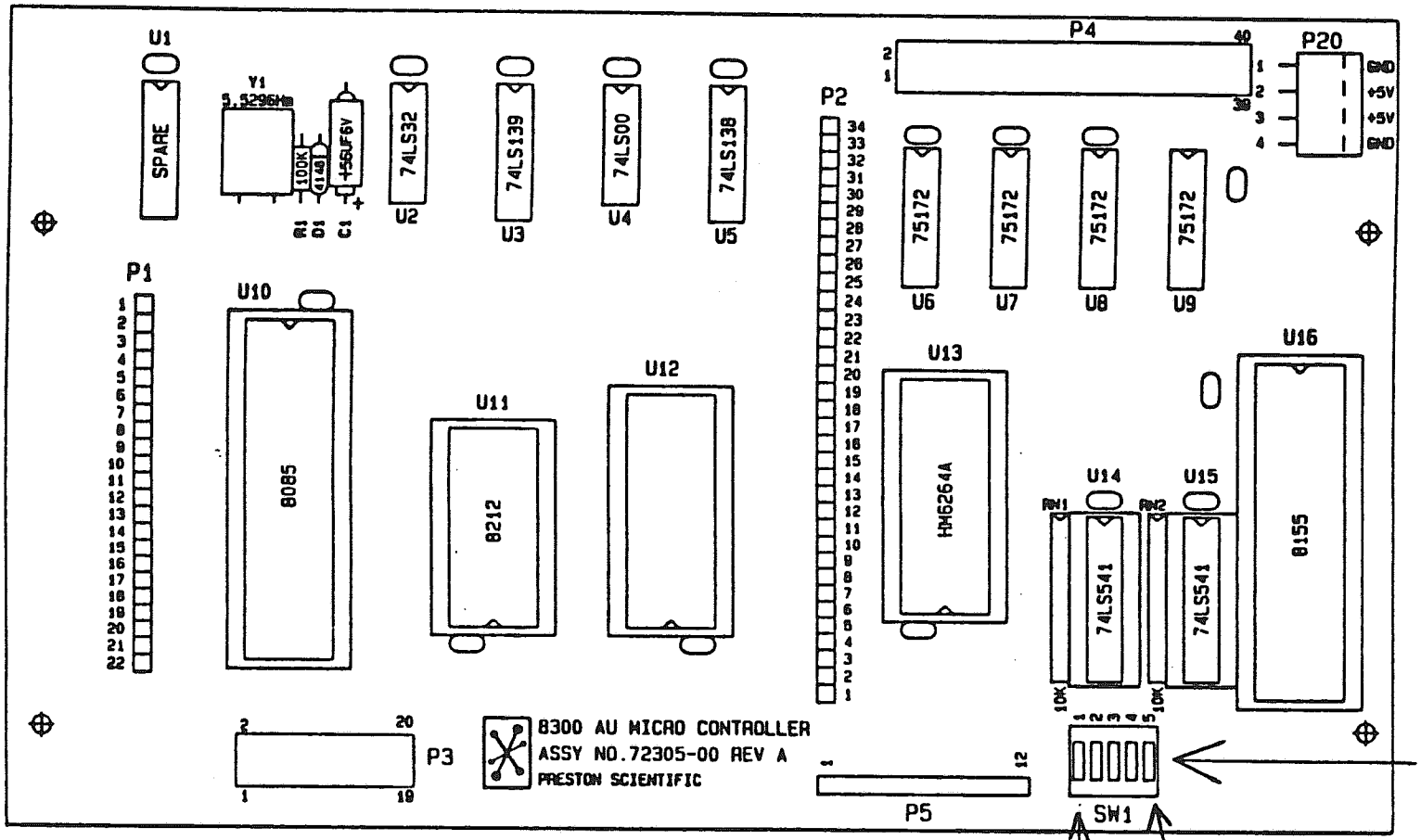
DA1

8300AU MASTER/SLAVE INTERCONNECT BLOCK DIAGRAM



NOTE: J1A AND J1B ARE WIRED IN PARALLEL.
EITHER MAY BE USED.

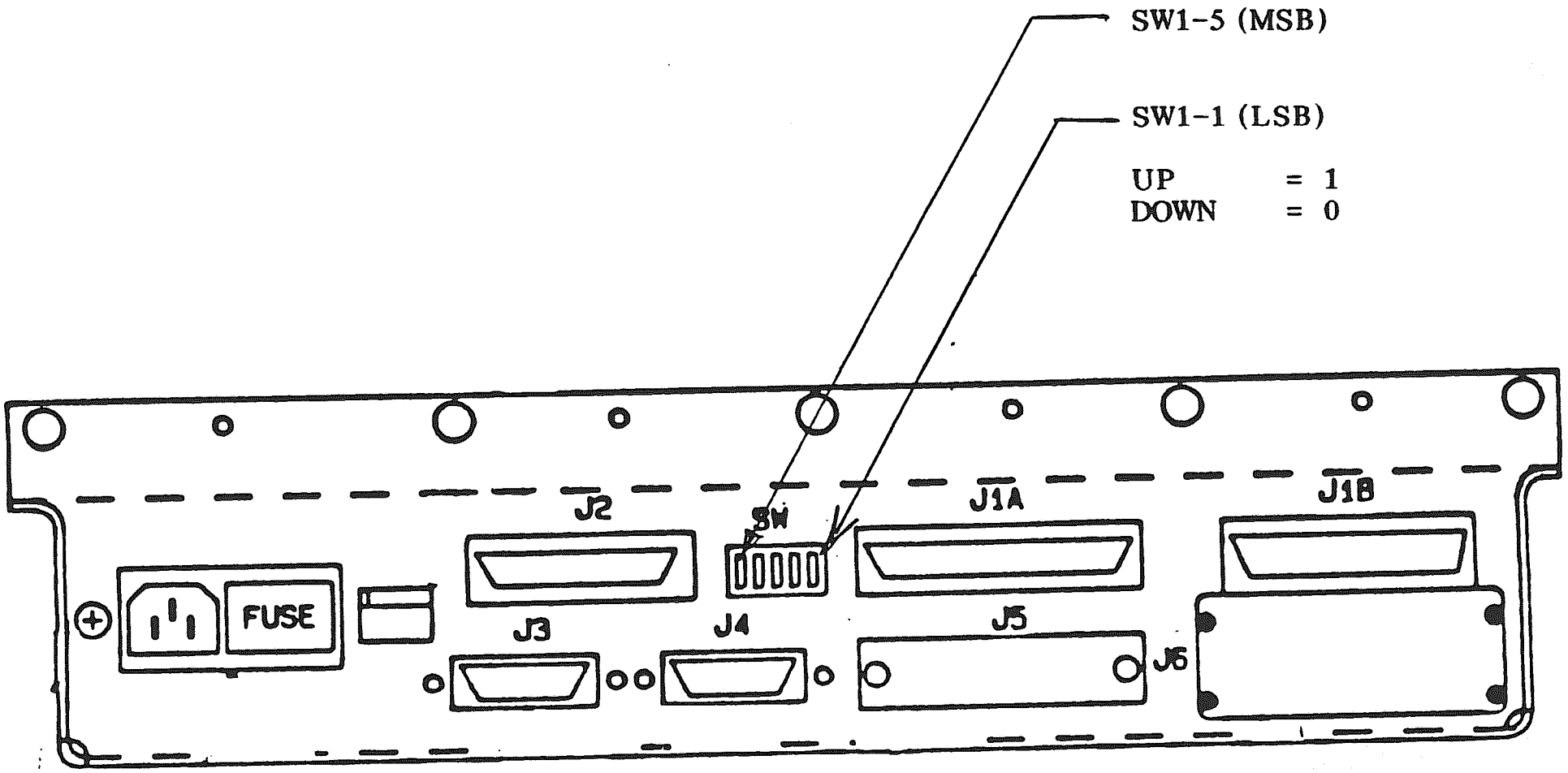
FIGURE 91032-B



NOTE: UNLESS OTHERWISE SPECIFIED.

1. FOR SCHEMATIC DIAGRAM SEE DWG NO.72306 (C SIZE)
2. FOR PARTS LIST SEE SHEET 2 OF 2
3. INSTALL HEADER P/N 210-04 ON P1 & P2.
4. INSTALL HEADER P/N 210-02 ON P3 & P4.
5. INSTALL HEADER P/N 210-05 ON P5.
6. INSTALL P1 THRU P5 & P20 ON COMPONENT SIDE.
7. DO NOT INSTALL U12. U12 IS TO BE INSTALLED DURING ASSEMBLY OF APPLICABLE TOP ASSY.
8. INSTALL SOCKETS ON U10 THRU U16.
10. ALL BYPASS CAPACITORS ARE .1UF.

MICRO CONTROLLER ASSEMBLY



8300AU CONTROL DRAWER / RACK

REAR VIEW

SW1_LOC

8300AU CONTROLLER

DESCRIPTIONS:

The 8300AU Controller is mounted in the amplifier rack below the amplifiers. Each amplifier system must contain one MASTER Controller and may contain up to 31 SLAVE Controllers. Only the MASTER Controller includes a computer interface.

Two interface options are available.

1: EIA RS-232

2: IEEE-488 (GPIB).

This section of the manual details the configuration and programming for each of these options. Refer to Controller options for the interface included in your system.

****

N O T E :

All of the standard controller functions are described in this section. Some of these only apply if specific options are included in the amplifiers in your system.

The "DESCRIPTION" section of the manual contains the applicable "GAIN" and "BANDWIDTH" codes applicable to the amplifier part number listed. Since, however, it is possible to install amplifiers with different options in the same rack it will be necessary to know this information for each amplifier.

For amplifiers with "SPECIAL" options some of the controller functions may be used for different purposes than are described in this section. Refer to the amplifier "OPTIONS" section to verify which options are included in your amplifiers.

****

REMOTE PROGRAMMING

SYSTEM SWITCH SETTINGS.

The following switches are set to the system. Settings depend upon the total number of amplifiers in the system.

1. Rear Panel Switches.

			Bit Weight
SW1 -	1	Set rack number. Zero for channels 0 to 15, one for channels 16 to 31, etc.	1
	2		2
	3		4
	4		8
	5		16

2. Main CPU board Switches.

SW1 -	1	Set total number of slave racks. Zero if only the master, 31 for 512 channels.	1	
	2		2	
	3		4	
	4			8
	5		16	

NOTE: For numeric entries: Closed = One
Open = Zero.

3. I/O Board jumper.

W8 - (if present)

Installed - for standard amplifiers.

Removed - if any amplifier has the Programmable variable Gain option. This option requires special control sequences for control.

FUNCTION CLARIFICATION:

The "DATA READ" function interrogates the data stored in the controller memory "NOT" the actual amplifier storage registers.

While the two locations should contain the same data it is possible that an amplifier malfunction could result in a condition where the amplifier mode, gain code, or bandwidth code is different than that programmed in the controller memory.

RS-232 CONFIGURATION:

As shipped, the RS-232 I/O board is configured as a DCE device. It is set to a baud rate of 1200 and is set for ASCII protocol. It will receive data on pin 2 and will send data on pin 3. It will control CTS (pin 5) and will monitor RTS (pin 4). This is accomplished with the following jumpers:

W1	A-B	Pin 2 - transmit data
	C-D	Pin 3 - receive data
W2	A-D	Pin 5 - CTS
	B-C	Pin 4 - RTS
W3	none	Pin 20 - DTR
	none	Pin 6 - DSR
W4	none	Pin 24 - external clock
	A-C	Jumper storage
	B-D	Jumper storage
W5	A-B	Internal transmit clock
W6	A-B	Internal receive clock

This DCE configuration permits connection to DTE equipment (PC computer) with a one-to-one cable (pin 1 to pin 1, pin 2 to pin 2, etc.). It is suggested that at least pins 1 through 8, 20 and 22 be connected.

Before the 8300AU Controller can transmit data to the host controller, the host controller must assert RTS. The host controller can use the RTS line to start and stop data transmission by the 8300AU Controller. If the RTS line is cleared, the transmission will stop when the currently transmitting byte has completed.

The 8300AU Controller will assert CTS when it is ready for data to be sent by the host controller. If the 768 byte input buffer contains 512 bytes, the CTS will be cleared and will not be asserted again until the data in the input buffer has been processed and the buffer is empty. After the 8300AU controller clears CTS, the host controller may continue to send as many as 256 bytes before loss of data can occur.

REMOTE PROGRAMMING

RS-232 CONFIGURATION

If the DTE equipment uses a 9 pin connector, as on an IBM PC-AT, then connect the equipment as follows:

AU Controller (DCE) Pin	Computer (DTE)	
8	Carrier Detect	1
3	Receive Data	2
2	Transmit Data	3
20	Data Terminal Ready	4
7	Signal Ground	5
6	Data Set Ready	6
4	Request to Send	7
5	Clear to Send	8
22	Ring Indicator	9

SWITCH SETTINGS FOR RS-232 INTERFACE

NOTE: For all numeric entries: Closed = One; Open = Zero.

RS-232 I/O Board Switches (option)

SW1 -	1 >		1
	2 >		2
	3 >	Baud Rate	4
	4 >		8
	5	Closed - ASCII	Open - Binary
	6, 7, 8	Not Used	
	9	Closed - Parity ON	Open - Parity OFF
	10	Closed - Parity EVEN	Open - Parity ODD

NOTE: If SW1-5 is open, SW1-9 and SW1-10 are DON'T CARE.
If SW1-9 is open, SW1-10 is DON'T CARE.

Baud Code	Baud Rate	Baud Code	Baud Code
0	50	8	1200
1	75	9	1800
2	110	10	2400
3	134.5	11	3600
4	150	12	4800
5	200	13	7200
6	300	14	9600
7	600	15	19200

IEEE CONFIGURATIONS:

Refer to the "SWITCH SETTINGS" section (below) for information on setting the DIP switches on the IEEE-488 I/O board. As shipped, the IEEE-488 device address is set to "1" and the protocol to ASCII.

SWITCH SETTINGS:

IEEE-488 I/O Board Switches (option)

SW1 -	1	\		1
	2	¦		2
	3	>	Listen Address	4
	4	¦		8
	5	/		16

SW2 -	1	\		1
	2	¦		2
	3	>	Talk Address	4
	4	¦		8
	5	/		16
	6		Closed-ASCII	Open-Binary
	7		Closed-Parity ON	Open-Parity OFF
	8		Closed-Parity EVEN	Open-Parity ODD

NOTE: If SW2-6 is open; SW2-7 and SW2-8 are DON'T CARE.
If SW2-7 is open; SW2-8 is DON'T CARE.

ASCII CONTROL PROGRAMMING

A. COMMAND DEFINITIONS

1. "F nnn" - Enters the First Channel number where "nnn" is any number from 0 to 510 (do not set it to 511).

2. "L nnn" - Enters the Last Channel number where "nnn" is and number from 0 to 511.

3. "C nnn" - Enters a Channel number where "nnn" is any number from 0 to 511.

4. "G nn" - Enters the GAIN code where "nn" is any number from 0 to 11.

"nn"	BINARY GAIN	DECIMAL GAIN		OTHER GAINS
0	1	1		¦
1	2	2		¦
2	4	5		
3	8	10	(n/r)	SEE OPTIONS
4	16	10		DESCRIPTION
5	32	20		FOR AMPLIFIER
6	64	50		
7	128	100	(n/r)	¦
8	256	100		¦
9	512	200		¦
10	1024	500		¦
11	2048	1000		¦

(n/r) = not recommended

5. "B n" - Enters a BANDWIDTH code where "n" is any number from 0 to 7.

"n"	BINARY BW	DECIMAL BW 1	DECIMAL BW 7	OTHER BW5
0	1 Hz	1 Hz	5 Hz	¦
1	4 Hz	3 Hz	15 Hz	¦
2	16 Hz	10 Hz	25 Hz	¦
3	64 Hz	30 Hz	100 Hz	SEE AMPLIFIER
4	256 Hz	100 Hz	50 Hz	OPTIONS
5	1024 Hz	300 Hz	150 Hz	¦
6	4096 Hz	1000 Hz	250 Hz	¦
7	WIDE BAND	WIDE BAND	WIDE BAND	¦

6. "A" - Enters previously stored data and control codes into all channels.

7. "E" - Connects amplifier to external calibration bus. Sets +/-100MV Mode Card to ZERO VOLT output state.

8. "H" - Switches shunt calibration resistor across leg of bridge or switches relay on "SPECIAL" mode card.
   - Sets output of +/-100MV Mode Card to voltage state and connects output to amplifier input.

   *** APPLICABLE ONLY WITH STRAIN GAGE MODE CARD ***
   *** OR SPECIAL MODE CARD INSTALLED ***

9. "K" - Local Lockout prevents front panel switches from changing any parameters. Front panel display is still active.

10. "M" - Manual permits front panel controls on the controller to change parameters.

11. "N" - Returns amplifier to normal mode after calibration or autobalance.

12. "O" - Enters the OPTION code where nnn = 0 to 255. Entering the OPTION code disables the autobalance.

*** APPLICABLE ONLY WITH SPECIAL MODE CARD INSTALLED ***

13. "V nnnnn" - Enters the VARIABLE GAIN code where "nnnnn" is any number from "0 to 65536".

   Kn = 62261 * ((Ka / Ks) - 1) for binary gain steps.
   Kn = 39321 * ((Ka / Ks) - 1) for decimal gain steps.

   Where:

   Kn = "nnnnn"
   Ka = Desired overall amplifier gain.
   Ks = Programmed gain step (definition 4).

   * * APPLICABLE ONLY IF JUMPER W8 IS REMOVED ON THE I/O BOARD TO ENABLE THE PROGRAMMABLE GAIN OPTION **

14."R" - Reads the stored control parameters and sends them to the controlling device. The format is:

```
¦ C nnn G nn B n O nnn NEHZ  M¦
                        S    K
          (28 characters plus line feed)
```

If the jumper W8 is removed to enable the PROGRAMMABLE VARIABLE GAIN option then the format is:

```
¦ C nnn G nn V nnnnn B nn O nnn  NESHZ M¦
                                       K
               (38 characters plus line feed)
```

One line of data for each channel from the previously entered First Channel to the previously entered Last Channel is output. After 24 channels have been output, the transmission will pause until an "R" is sent, whereupon the next 24 channels will be outputed.

If an "R nnn" is sent from the controlling device, then the 24 channel default will be changed to "nnn". The maximum value for "nnn" is 254. If a zero is sent, the data will output continuously from First to Last channel without pausing.

The characters "R" or "R nnn" may be preceded by the "C nnn" or "F nnn" and "L nnn" commands. No other commands should appear on the same line with the "R" command. The "R nnn" should not be used to continue from a pause since it will always cause the reading to begin with the First channel.

When using the IEEE-488 interface, an RSV command will be sent at the beginning of each line of data.

15."S" - Switches input of amplifier onto the signal conditioner power supply.

*** APPLICABLE ONLY WITH SIGNAL CONDITIONER ***
*** POWER SUPPLY AND V-CAL RELAYS INSTALLED. ***

16. "Z" - Causes autobalance to occur in the signal conditioner and disables the OPTION byte.

** APPLICABLE ONLY WITH AUTOBALANCE MODE CARD **
** AND SIGNAL CONDITIONER POWER SUPPLY INSTALLED **

B. CONTROL DETAILS.

1. Commands may be entered in any order with the exception that the "A" command should not be combined with any other command. Also only one of the commands "E", "H", "N" , and "S" should be sent on the same line. If more than one are sent, only the last on the line will be used. Also "O" and "Z" should not be used on the same line. If they are, only the last one on the line will be used.

2. Terminate each command line with a line feed. The line feed will cause the previously entered command to be executed.

3. If a "F nnn", "L nnn", or "C nnn" command is omitted, then the value entered in a previous command will be used.

4. If a "C nnn" command is used, only channel "nnn" will be changed. If an "F nnn" and "L nnn" is used then all channels from first to last will be changed.

5. In the event that conflicting commands are entered, then the last entered command will take precedence.

6. Spaces or other delimiters (any character that is not a numeral or an alphabetic character listed above) may be used or omitted as desired. Upper or lower case may be used for commands.

7. A backspace (08H) will delete the last character in the line. A series of n backspaces will delete the last n characters in the line. When the first character of the line has been deleted, no further characters will be deleted. After a line feed, no characters in that line may be deleted. Only the alphanumeric characters listed above will be deleted, spaces and other delimiters will not be deleted.

C. EXAMPLES

The following examples are all identical and will perform the same function. Each line will have been terminated with a line feed. A carriage return may precede the line feed.

1. F 2 L 27 G 3 B 5 N
2. F!2"L#27$G%3&B'5(N)*=~¦\-:@+(BACKSPACE)(BACKSPACE)5N
3. C 13 F 2 L 27 G 3 B 5 N
4. L 27 F 2 N B 5 G 3
5. F 002 L 027 G 00003 B 05 N

BINARY CONTROL PROGRAMMING:

A. DEFINITIONS:

1. RESET BYTE: A byte of all ones (255)

2. MODE BYTE:

BIT	ZERO	ONE
7(MSB)	GANG ENTER	SEQUENTIAL ENTER
6	CHANNELS 0-255	CHANNELS 256-511
5	ENTER DATAA	READ DATA
4	NOT LOAD ALL AMPS	LOAD ALL AMPS OR READ OPTION BYTE
3	ANO CTRL BYTE	CTRL BYTE
2	ANO BW BYTE	BW BYTE
1	ANO GAIN BYTE	GAIN BYTE
0(LSB)	CHANNEL SELECT	FST & LST CHAN SEL

3. NUMBER OF CHANNELS BYTE OR FIRST CHANNEL BYTE:
Binary code 0-255

4. CHANNEL BYTE OR LAST CHANNEL BYTE: Binary code 0-255

5. CTRL BYTE:

BIT	ZERO	ONE
7(MSB)***	AUTO BALANCE OFF	AUTO BALANCE ON
6	REGULAR CONTROL	LOCAL LOCK ONLY
5	LOCAL LOCK OFF	LOCAL LOCK ON
4	0	
3 ***	NO OPTION BYTE	OPTION BYTE
2	SHUNT CAL OFF	SHUNT CAL ON
1 ***	EXTERNAL CAL	SG EXCITATION CAL
0 (LSB)***A	SUBSTITUTE CAL OFF	SUBSTITUTE CAL ON

*** ONLY APPLICABLE WITH CORRESPONDING OPTIONS
INSTALLED OR FOR SPECIAL USE.
(REFERENCE AMPLIFIER OPTIONS.)

6. BW BYTE: (00000NNN)

NNN	BINARY BW	DECIMAL BW 1	DECIMAL BW 7	OTHER
000	1 Hz	1 Hz	5 Hz	
001	4 Hz	3 Hz	15 Hz	
010	16 Hz	10 Hz	25 Hz	SEE
011	64 Hz	30 Hz	100 Hz	AMPLIFIER
100	256 Hz	100 Hz	50 Hz	OPTIONS
101	1024 Hz	300 Hz	150 Hz	
110	4096 Hz	1000 Hz	250 Hz	
111	WIDE BAND	1000 Hz	WIDEBAND	

7. GAIN BYTE 1: (0000NNNN) **** REFER TO NEXT PAGE ****

NNN	BINARY GAIN	DECIMAL GAIN	OTHER
0000	1	1	
0001	2	2	
0010	4	5	
0011	8	10 (n/r)	SEE
0100	16	20	AMPLIFIER
0101	32	20	OPTIONS
0110	64	50	
0111	128	100 (n/r)	
1000	256	100	
1001	512	200	
1010	1024	500	
1011	2048	1000	

(n/r) = not recommended

GAIN BYTE 2:

Most significant byte of the 16 bit word representing the PROGRAMMABLE VARIABLE GAIN CODE.

GAIN BYTE 3:.

Least significant byte of the 16 bit word representing the PROGRAMMABLE VARIABLE GAIN CODE.

Kn = 62261 * ((Ka / Ks) - 1) for binary gain steps.
Kn = 39321 * ((Ka / Ks) - 1) for decimal gain steps.

Where:
Kn = 16 bit gain code with values 0 to 65535.
Ka = Desired overall amplifier gain.
Ks = Programmed gain step (definition 4).

* * GAIN BYTES 2 AND 3 ARE ONLY USED IF JUMPER W8 IS * *
* * REMOVED ON THE I/O BOARD TO ENABLE THE PROGRAMMABLE * *
* * VARIABLE GAIN OPTION * *

8. OPTION BYTE: (NNNNNNNN) Maximum value is 254.

B. CONTROL DETAILS:

1. MODE BYTE:

BIT DESCRIPTION

7 GANG ENTER / SEQUENTIAL ENTER

GANG ENTER: (ZERO)

The same CTRL, BW, and/or GAIN byte will be entered into each channel number entered or into the first through last channels.

SEQUENTIAL ENTER: (ONE)

A separate CTRL, BW, and/or GAIN byte will be entered into each channel number entered or into the first through last channels.

6 CHANNELS 0-255 / CHANNELS 256-511

For systems with more than 256 channels, set this bit to a 1 to address channels over 255.

5 ENTER DATA / READ DATA

ENTER DATA: (ZERO)
Permits computer to set the control parameters.

READ DATA: (ONE)

Transmits the previously-stored control parameters to the computer. Bits 6, 3, 2, 1, and 0 determine the data returned. If bit 0 is a zero, only the data for one channel will be returned.

Bits 3, 2, & 1 determine how many bytes of data will be returned for each channel. At least one of these bits must be a one. When using the IEEE-488 interface, an "RSV" will be sent prior to sending data for each channel.

4 (a) LOAD ALL

When bit 5 is set to a zero and bit 4 set to a one, all amplifiers are loaded with data stored in the Controller Memory. Other bits are disregarded.(Do not send all one's).

4 (b) READ OPTION BYTE

When bits 4 and 5 are set to a one, controller will return the OPTION BYTE value.

3 CNRL BYTE

Set to one when CTRL bytes are to be entered or read.

2 IW BYTE

Set to one when BW bytes are to be entered or read.

1 GAIN BYTE

Set to one when GAIN bytes are to be entered or read.

0 CHANNEL SELECT / FIRST & LAST CHANNEL SELECT

CHANNEL SELECT: (ZERO)

The address of the channel to be read or have data entered must be sent from the computer.

FIRST & LAST CHANNEL SELECT: (ONE)

The first and last channel addresses permit data to be entered or read for the entire group. If first and last channels are equal, then entry is equivalent to using channel select. (Must not be equal if address is 255)

2. CTRL BYTE:

7. AUTO BALANCE:

Setting this bit to a ONE will cause the addressed channel to begin the auto balance routine if the necessary hardware is installed and will disable the OPTION BYTE for that channel.

** APPLICABLE ONLY WITH AUTOBALANCE MODE CARD **
** AND SIGNAL CONDITIONER POWER SUPPLY INSTALLED **

6. LOCAL LOCK ONLY:

Setting this bit to a one will cause all other bits except bit 5 to be disregarded.

5. LOCAL LOCK CONTROL:

Active only if bit 6 is a one. Setting this bit to a one will set the local lockout, preventing the front panel controls from changing the setup. Setting this bit to a zero will permit controlling the setup from the front panel.

4. 0

3. OPTION BYTE:

If bit 3 of the CTRL BYTE is a one, an OPTION BYTE will be entered. The effect of this OPTION BYTE is dependent on the particular system. This bit will also turn off the autobalance for the addressed channel.

** APPLICABLE ONLY WITH SPECIAL MODE CARD INSTALLED **

2. SHUNT CAL:

Setting this bit to a one will cause the selected channel to have a resistor placed across one of the arms of a bridge if the necessary hardware is installed.

* * * APPLICABLE ONLY WITH STRAIN GAGE MODE CARD * * *
* * * OR SPECIAL MODE CARD INSTALLED * * *

1. EXTERNAL CALIBRATION / SG EXCITATION CALIBRATION

EXTERNAL CALIBRATION: (ZERO)

The substitute calibration source is switched onto a set of leads which may be connected to an external voltage source.

SG EXCITATION CALIBRATION: (ONE)

The substitute calibration source is switched onto the output of the signal conditioner power supply.

* * * APPLICABLE ONLY WITH SIGNAL CONDITIONER * * *
* * * POWER SUPPLY AND V-CAL RELAYS INSTALLED. * * *

0. SUBSTITUTE CALIBRATION:

A zero connects the input of the amplifier to its normal signal input.

A one connects the input of the amplifier to the calibrate signal, either external or the signal conditioner power supply.

* * * APPLICABLE ONLY WITH V-CAL RELAY OPTION * * *

C. PROGRAMMING SEQUENCE:

STEP	BYTE	NOTES
1.0	RESET	RESET Two RESET bytes are always required.
2.0	RESET	RESET Two additional RESET bytes are required jumper W8 is removed to enable the PROGRAMMABLE VARIABLE GAIN option.
3.0	MODE	The MODE byte always follows RESET. If MODE bit 4 is 1, skip to step 7.0.
4.0A	CHAN	If MODE bit 0 is 0.
4.1A	CHAN	If MODE bit 0 is 0.
4.0B	CHAN	If MODE bit 0 is 1.
4.1B	CHAN	If MODE bit 0 is 1. If MODE bit 5 is set, skip to step 6.0
5.0	CTRL	If MODE bit 3 is 1. If CTRL bit 6 is 1, skip to step 7.0.
5.1	BW	If MODE bit 2 is 1.
5.2	GAIN1	If MODE bit 1 is 1.
	GAIN2	If jumper W8 is removed.
	GAIN3	If jumper W8 is removed.
5.3	OPTION	If CTRL bit 3 is 1
5.4	CHAN	If MODE bit 0 is 0 and additional entries are desired.

If MODE bit 0 is 0 and
If MODE bit 7 is 0 then repeat step 5.3 until complete then skip to step 7.0.
If MODE bit 7 is 1 then skip to step 5.0 until complete then skip to step 7.0.

If MODE bit 0 is 1 and
If MODE bit 7 is 0 then skip to step 7.0.
If MODE bit 7 is 1 then skip to step 5.0 until complete then skip to step 7.0.

6.0 If MODE bit 3 is 1 then CTRL byte will return to computer.

6.1 If MODE bit 2 is 1 then BW byte will return to computer.
6.2 If MODE bit 1 is 1 then GAIN byte will return to computer.
6.3 If MODE bit 4 is 1 then OPTION byte will return to computer.

If MODE bit 0 is 0, then skip to step 7.0.
If MODE bit 0 is 1, controller will cycle through steps 6.0 through 6.2 for channels First through Last, then skip to step 7.0.

7.0 CYCLE COMPLETE - Skip to step 1.0 to start next cycle.

REMOTE PROGRAMMING

FRONT PANEL OPERATION:

Front panel switches and visual display allow local programming of all 8300AU amplifier functions. Reference FIGURE 91040.

Since the controller can address multiple amplifiers, the amplifier channel number must be included with the function to be programmed. The maximum possible number of channels for the controller is 511 but the number in a given system is set by dip switches as specified in interface section.

NOTE: Addresses and other codes are in "DECIMAL" format.

(1) Depress ("0") switch as many times as required to blank the front panel display (4 times maximum). This step is not an absolute requirement but provides a known starting point.

(2) Press three digit CODE for the desired channel address. Use leading zeros.

Example: (Enter 0 0 3 for channel 3).
Display will indicate 0 0 3.

OR

Press ("9") to enter same data into all amplifiers.
Display will indicate "LLL".

(3) Press a single digit CODE ("0" through "8") to select the desired function. Reference FIGURE 91040.

If CODE is ("0"), ("2"), ("4"), ("5"), ("6"), or ("8") press "ENTER" switch.

If CODE = ("7") AUTOBALANCE, and OPTION BYTE function is desired, enter 3 digit number and press "ENTER".

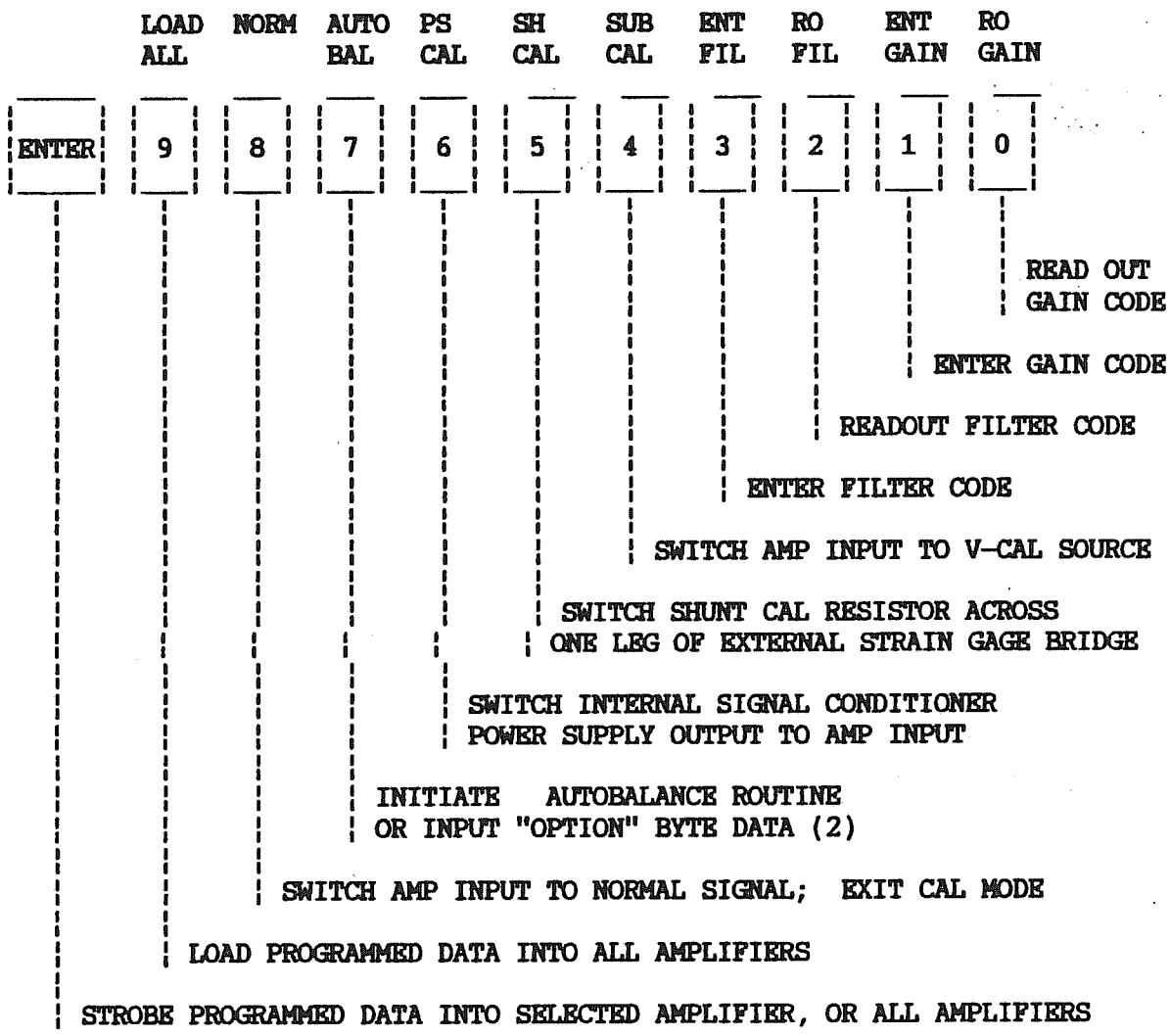
A. If a MODE has been selected, it will be entered into memory and loaded into the selected channel amplifier(s).

B: If READOUT GAIN ("0") or READOUT BANDWIDTH ("2") were selected, the gain or bandwidth code of the selected channel, or ALL channels will be displayed. If jumper W8 is removed to enable the PROGRAMMABLE VARIABLE GAIN then the gain code will display for approximately 3 seconds before the display will switch the VARIABLE GAIN code.

C: ENTER GAIN ("1") or ENTER BANDWIDTH ("3") were selected, enter the desired GAIN or BANDWIDTH code, and press "ENTER". If jumper W8 is removed to enable the PROGRAMMABLE VARIABLE GAIN then when "ENTER" is pressed the display will switch to the display of the VARIABLE GAIN code. The new VARIABLE GAIN code may be entered and then "ENTER" pressed a second time.

Pressing "ENTER" will load the code into memories in both the controller and amplifier channel(s) displayed.

FRONT PANEL CONTROLS



(1) USABLE FUNCTIONS DEPEND UPON OPTIONS INSTALLED IN AMPLIFIERS.

(2) "OPTION BYTE" ONLY APPLICABLE TO COMPATIBLE MODE CARDS.

(3) REFER TO SECTION 6 FOR OPTION BYTE PROGRAMMING DATA. THE MODE CARDS DETERMINES THE FUNCTION OF THE DATA.

(4) FOR SPECIAL MODE CARDS OR AMPLIFIERS SOME OF THE STANDARD FUNCTIONS LISTED ABOVE MAY BE USED FOR OTHER PURPOSES. THE OPTIONS SECTION WILL INCLUDE THIS INFORMATION, IF APPLICABLE.

FIGURE 91040

N O T E :

Each time "ENTER" is pressed, the channel address will increment by one and the operation will repeat. If the operation reaches the last channel in the system (as set on the "SLAVES" switch on the microprocessor), the next operation will occur on channel zero.

If "ENTER" is held down for approximately 1/2 second, data entry will occur for each channel, starting with the selected channel, at a rate of about 5 per second, until "ENTER" is released. When the last channel is reached, the next channel will be channel zero.

If an error, such as too many digits or out of range entries(**), is detected in data entry, the field or fields of the display will blank, and correct data may be re-entered.

(**) Refer to amplifier options section for legal gain codes. These are limited to 0 - 11, but for some special amplifiers all of these may not be included. The controller will accept codes of 0 - 15 without generating an error indication. If a code of 12 - 15 is entered it will be stored in the controller memory and acknowledged on the display but the "actual" GAIN CODE in the amplifier memory will remain unchanged.

Legal bandwidth codes are 0 - 7, but for some special amplifiers all of these may not apply. If codes of 8 -15 are entered they will be stored in the controller memory and acknowledged on the display but the "actual" BANDWIDTH CODE in the amplifier memory will remain unchanged.

To avoid possible damage, power to the rack should be turned off before removing or installing an amplifier. The standard memory in the Master Controller is volatile. When power is first applied to a Master Controller, the amplifiers will typically come up in states with GAIN CODE = 0, BANDWIDTH CODE = 7, and MODE = NORM, the as shipped, factory settings. This is not, however, guaranteed so they should be programmed to desired states via front panel controls or remotely, each time power is applied.

As an option, the Master Controller may be ordered with non-volatile memory. The amplifiers will then be set to the previously programmed states, whenever power is applied.

If a SLAVE CONTROLLER rack is powered "down" normally only the amplifiers in that rack need to be re-programmed, however re-programming all amplifiers in the system is good practice.

If an error occurs upon pressing "ENTER", while attempting to enter a GAIN or BANDWIDTH or setting a calibration mode while "Local lockout" is in effect, the display will show an "—E—".

FRONT PANEL ERROR CODES:

DISPLAY	ERROR CONDITION
E- 1	I/O board not identified.
E- 2	IEEE-488 error.
E- 3	I/O parity error.
E- 4	RS-232 overrun error.
E- 5	RS-232 frame error.
—E—	A front panel entry has been attempted while in the local lockout mode.

TEST MODE (FRONT PANEL)

A. ENTER TEST MODE

To enter the test mode, depress any button 0 though 7 while turning on power to the controller. When the display shows "PPPPPPPP", release the depressed button and select the desired test by pressing the button associated with that test.

To exit the test mode, turn off the power to the control module for 5 seconds and then turn power on again. The display will show "HHHHHHHH" while the amplifiers are loaded with the current memory contents. When the display then blanks, the system is ready for operation.

	BUTTON	TEST FUNCTION
A	0	All digit positions of front panel readout display a repetitive pattern.
	1	Data input from the controlling device is displayed In octal format on the front panel. Each input byte is displayed for approximately two seconds.
	2	If the binary mode is selected, the interface outputs to the controlling device a sequential byte pattern 00H to FFH. If the ASCII mode is selected, the output will be the byte pattern 20H to 7FH, transmitted in blocks of 23 characters followed by the byte 10H (line feed). When using the IEEE-488 Interface, an RSV will be sent at the beginning of each line.
	3	Data output on the data lines to the amplifiers in box zero is a repeating pattern of 00H to 0FH.
	4	Data output on the address lines to the amplifiers in box zero is a repeating pattern of 00H to 0FH.
	5	Data output on the function lines to the amplifiers in box zero is a repeating pattern of 00H to 03H (complemented).
	6	The enable line to the amplifier will have a 10 millisecond pulse occurring every 320 milliseconds. The strobe signal will be a 6 millisecond pulse occurring 10 microseconds after the leading edge of the enable signal. A sequential pattern of 00H to 1FH will appear on the rack address lines.
	7	The readout displays the bit pattern of I/O dip switch number 1 of the IEEE I/O board, and of the first five bits of I/O dip switch number 1 of the RS232 I\O board.
	8	The readout displays the bit pattern of I/O dip switch #2 of the IEEE I/O board, and the bit pattern of the second five bits of I/O dip switch #1 of the RS232 I/O board.
	9	The readout displays the bit pattern of the SLAVES dip switch on the microprocessor board.
	ENTER	The readout displays "ttrrmmyy". Where: tt = Prom part number 9981 rr = Revision number. mm = Month of manufacture. YY = Year of manufacture.

REMOTE PROGRAMMING

TEST PROGRAMS

Four programs are available for operating the 8300AU amplifier system from an IBM PC/XT/AT or equivalent. Two programs use the RS232 I/O assembly in the 8300AU controller, and two programs use the IEEE-488 I/O assembly.

If the 8300AU controller has an RS232 interface installed, it must be connected to a PC having an RS232 port configured as "COM1:".

If the 8300AU controller has an IEEE-488 interface installed then the PC must have the National Instruments GPIB-PC2A or GPIB-PCIIÍ Interface Board installed with software. Prior to running these programs, the National Instruments hardware should be installed in the computer and tested as described in the National Instruments documentation.

The file BIB.M should be in the same directory or same diskette as the Preston programs, the statement DEVICE=GPIB.COM should have been included in the CONFIG.SYS file when the system was booted. The program IBCONF should be run to insure that the GPIB parameters are as shown in the two following tables:

Board: GPIB0

Primary GPIB Address	0
Secondary GPIB Address	NONE
Timeout setting	T10s
EOS byte	00H
Terminate Read on EOS	no
Set EOI with EOS on Write	no
Type of compare on EOS	7-bit
Set EOI w/last byte of Write ..	yes
Board is System Controller	yes
Disable Auto Serial Polling ...	no
High-speed timing	yes
Interrupt jumper setting	7
Base I/O Address	0280H
DMA channel	31H

Device: DEV1 Access: GPIB0

Primary GPIB Address	1
Secondary GPIB Address	NONE
Timeout setting	T10s
EOS byte	00H
Terminate Read on EOS	no
Set EOI with EOS on Write	no
Type of compare on EOS	7-bit
Set EOI w/last byte of Write ..	no

REMOTE PROGRAMMING

Connect the 8300AU Controller to the PC using a standard IEEE-488 cable.

Also, a basic interpreter equivalent to the IBM BASICA must be available. To use these programs, start up the BASIC Interpreter to be used, and load and start one of the following programs:

AURSAS

This program controls the 8300AU system using RS-232 ASCII protocol. The cable connecting the PC to the 8300AU system should be 1 to 1 (pin 2 of one end connects to pin 2 of the other end etc.). The I/O board in the system should have the following switch settings:

SW1 -	1	Open
	2	Open
	3	Open
	4	Closed
	5	Closed
	6	Open
	7	Open
	9	Open
	10	Open

AURSBI

This program controls the 8300AU system using RS-232 BINARY protocol. The cable connecting the PC to the 8300AU system should be 1 to 1 (pin 2 of one end connects to pin 2 of the other end etc.). The I/O board in the system should have the following switch settings:

SW1 -	1	Open
	2	Open
	3	Open
	4	Closed
	5	Open
	6	Open
	7	Open
	9	Open
	10	Open

AUIEAS

This program controls the 8300AU system using IEEE-488 ASCII protocol. The system should be connected to the computer using a standard IEEE-488 cable. The I/O board in the system should have the following switch settings:

SW1 -	1	Closed	SW2 -	1	Closed
	2	Open		2	Open
	3	Open		3	Open
	4	Open		4	Open
	5	Open		5	Open
				6	Closed
				7	Open
				8	Open

AUIEBI

This program controls the 8300AU system using IEEE-488 Binary protocol. The system should be connected to the computer using a standard IEEE-488 cable. The I/O board in the system should have the following switch settings:

SW1 -	1	Closed	SW2 -	1	Closed
	2	Open		2	Open
	3	Open		3	Open
	4	Open		4	Open
	5	Open		5	Open
				6	Open
				7	Open
				8	Open

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KineticSystems will, at its option, either repair or replace products that prove to be defective in materials or workmanship during the warranty period.

Transportation charges for shipping products to KineticSystems shall be prepaid by the purchaser, while charges for returning the repaired warranty product to the purchaser, if located in the United States, shall be paid by KineticSystems. Return shipment will be made by UPS, where available, unless the purchaser requests a premium method of shipment at their expense. The selected carrier shall not be construed to be the agent of KineticSystems, nor will KineticSystems assume any liability in connection with the services provided by the carrier.

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1. Contact KineticSystems and discuss the problem with a Technical Service Engineer.
2. Obtain a Return Authorization (RA) Number.
3. Initiate a purchase order for the estimated repair charge if the product is out of warranty.
4. Include a description of the problem and your technical contact person with the product.
5. Ship the product prepaid with the RA Number marked on the outside of the package to:

KineticSystems Company, LLC
Repair Service Center
900 North State Street
Lockport, IL 60441

Telephone: (815) 838-0005
Facsimile: (815) 838-4424
Email: tech-serv@kscorp.com