AMPLIFIER RESEARCH

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EC Declaration of Conformity

We; Amplifier Research
160 School House Road
Souderton, Pa. 18964

declare that as of 1997, our product(s);

the Model 100A250 series amplifiers

to which this declaration relates is in compliance with the requirements of the EEC EMC Directive (89/336/EEC) and Low Voltage Directive (73/23/EEC) in accordance with the relative standards listed below:

EMC:

EN 50082-2 : 1995
Electromagnetic compatibility - Generic immunity standard
Part 2: Industrial environment

EN 55011 : 1991
Electromagnetic emissions requirements for Industrial, Scientific and Medical (ISM) Equipment
Group 1, Class A

Safety:

IEC 1010-1 : 1990 + A1, A2

The CE marking is affixed on the device according to the EC Directives.

Donald R. Shepherd
President

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SECTION I

GENERAL INFORMATION

1.1 GENERAL DESCRIPTION

The Amplifier Research (AR) Model 100A250A is a self-contained, broadband Radio Frequency (RF) amplifier designed for laboratory applications where instantaneous bandwidth, high gain, and moderate power output are required. Solid state technology is used exclusively to offer significant advantages in reliability and cost. When used with a frequency-swept signal source, the AR Model 100A250A will provide 100 watts of swept power output from .01 to 250 megahertz (MHz). Typical applications include antenna and component testing, wattmeter calibration, electromagnetic interference (EMI) susceptibility testing, use as a driver for frequency multipliers and higher power amplifiers, and use as an RF energy source for Magnetic Resonance Imaging (MRI) studies. The Model 100A250A can be operated locally by using the unit's front panel controls, or remotely by using its built-in IEEE-488 or RS-232 interfaces.

1.2 POWER SUPPLIES

The 100A250A contains three switching power supplies. The input voltage range to these supplies is 90-132 VAC and 180-264 VAC, 50/60 Hz universal or selected automatically. The operator does not have to switch or change anything on the 100A250A when changing the AC input voltage. The power consumption is a nominal 800 watts. A primary circuit breaker is provided. The output stage is protected by over current sensing and over temperature sensing circuits which shut down the power supplies under fault conditions.

1.3 SPECIFICATIONS

Refer to the Amplifier Research Data Sheet on the next page for detailed specifications.

SECTION II

OPERATING INSTRUCTIONS

2.1 GENERAL

Operation of the Model 100A250A broadband RF amplifier is simple. The input signal, whether swept or fixed in frequency, is fed into the jack marked "*INPUT*", and the amplifier's output signal is taken from the jack labeled "*OUTPUT*". The unit is turned on by activating the power switch marked "*POWER*". In the event of a unit malfunction, protection is provided by an internal circuit breaker. A polarized, three (3) wire AC power cord is also included with the unit to provide cabinet and chassis grounding to the power mains.

⚠ CAUTION:

THE 100A250A AMPLIFIER IS NOT CRITICAL IN REGARDS TO SOURCE AND LOAD VSWR AND WILL REMAIN UNCONDITIONALLY STABLE WITH ANY MAGNITUDE AND PHASE OF SOURCE AND LOAD VSWR. IT ALSO HAS BEEN DESIGNED TO WITHSTAND, WITHOUT DAMAGE, RF INPUT POWER UP TO TWENTY (20) TIMES ITS RATED INPUT OF 1mW. HOWEVER, SIGNAL LEVELS HIGHER THAN 20mW OR TRANSIENTS WITH HIGH PEAK VOLTAGES CAN DAMAGE THE AMPLIFIER. ALSO, ACCIDENTAL CONNECTION OF THE OUTPUT TO ITS INPUT CAUSES OSCILLATIONS WHICH WILL PERMANENTLY DAMAGE THE INPUT TRANSISTORS.

WHILE THE MODEL 100A250A WILL OPERATE INTO ANY LOAD IMPEDANCE, THE AMPLIFIER MAY DRAW EXCESSIVE CURRENT AND SHUT DOWN IF IT IS SIMULTANEOUSLY OVERDRIVEN WITH AN OPEN OR SHORT CIRCUITED LOAD. TO AVOID TRIPPING THE PROTECTION CIRCUIT, THE FOLLOWING PRACTICES ARE RECOMMENDED:

1. **DO NOT INTENTIONALLY OVERDRIVE THE AMPLIFIER AT ANY TIME. WHEN OPERATING INTO A MISMATCHED LOAD, TAKE SPECIAL PRECAUTIONS SO THAT THE INPUT CANNOT BE INADVERTENTLY OVERDRIVEN.**

2. **WHEN CONNECTING AND DISCONNECTING CABLES, TURN THE POWER SWITCH OFF. CARE MUST BE TAKEN TO PREVENT RESTRICTIONS OF THE COOLING FAN AIR INLET OPENING ON THE UNIT. RESTRICTIONS OF THE OPENING, FOR EXTENDED PERIODS, WILL CAUSE OVERHEATING OF THE UNIT AND POSSIBLE PREMATURE FAILURE.**

2.2 AMPLIFIER OPERATION

Figure 2.1 shows the Model 100A250A in pictorial form.

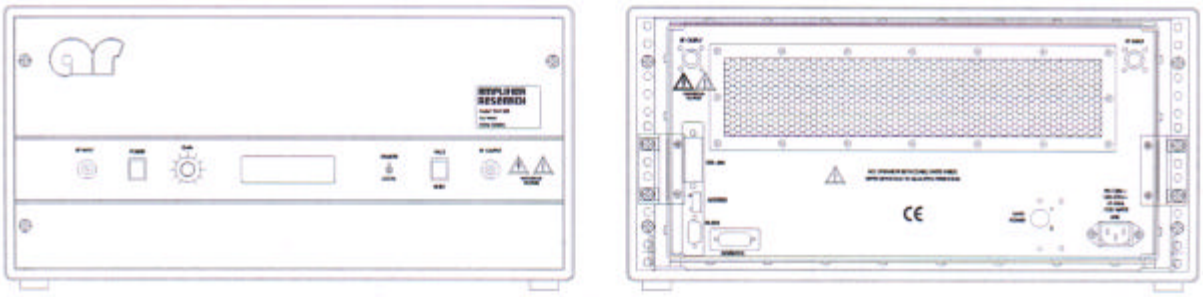

FIGURE 2.1

AMPLIFIER OPERATION

2.2.1 Local Operation

Power-up Sequence:

1. Connect the input signal to the unit's **RF INPUT** connector. **The input signal level should be 0dBm maximum.**

2. Connect the load to the unit's **RF OUTPUT** connector.

3. Check to see that the **MAIN POWER** switch (circuit breaker) on the unit's rear panel is set to the **1** ("on") position.

4. Press the **POWER** switch: the front panel vacuum fluorescent display (VFD) should read **POWER ON, STATUS OK** when power is applied.

   (NOTE: The amplifier changes state each time the POWER switch is depressed—if the unit is on when the POWER switch is depressed, it will turn off; if the unit is off when the POWER switch is depressed, it will turn on.)

5. In the event of a fault, press the **FAULT/RESET** switch; if the fault does not clear, refer to subsection **4.3** ("Troubleshooting") of this manual.

6. Adjust gain control if necessary.

2.2.2.1 Introduction

This subsection describes remote operation of the Model **100A250A** amplifier by utilizing either the IEEE-488 parallel interface or the RS-232 serial interface and a controlling device, such as a bus controller or a personal computer (PC).

2.2.2.2 Selecting Remote Operation

The Model 100A250A can be placed in the remote operation mode at any time by switching the **FUNCTION** switch on the front panel to the **REMOTE** position. In this mode, control is transferred to the selected remote interface and all front panel controls are inoperative with the exception of the **FUNCTION** switch. The amplifier's initial state will be **Power Off**. The front panel VFD will indicate **REMOTE** until the unit is returned to the local operation mode.

2.2.2.3 Interface Selection

The Model **100A250A** can be controlled via either the IEEE-488 or RS-232 interface; which interface is active is determined by the position of Switch 6 of the rear panel Dual In-Line Package (DIP) switch located between the two interface connectors. If Switch 6 is in the "on" (**1**) position, the RS-232 interface will be active; if Switch 6 is in the "off" (**0**) position, the IEEE-488 interface will be active.

2.2.2.4 Interface Set-up

Switches 1–5 of the rear panel DIP switch are used to select either the RS-232 communication (BAUD) rate or the IEEE-488 device address, depending upon which interface is active. (**Note:** These switches are only read at device power-up. In order for changes made in these switch settings to take place, AC power must be removed and then re-applied to the Model **100A250A**.)

2.2.2.4.1 RS-232 BAUD rate selection

The serial communication (BAUD) rate can be set to five different levels. Selections are made by the positions of Switches 1–5 of the rear panel DIP switch. The following is a list of the available BAUD rates and the corresponding DIP switch positions:

BAUD Rate	**Switch On (1)**
1200	1 only
2400	2 only
9600	3 only
19,600	4 only
76,800	5 only

(**Note:** Any other combination of switch settings will result in a BAUD rate equal to 1200.)

2.2.2.4.2 IEEE-488 device address selection

The IEEE-488 device address can be set to any number between 1 and 30. This selection is made by setting Switches 1–5 of the rear panel DIP switch to the binary equivalent of the number. **Table 2-1** illustrates this switch selection.

2.2.2 Remote Operation *(continued)*

2.2.2.4.2 IEEE-488 device address selection *(continued)*

Table 2-1
IEEE-488 Device Address Selection

Device Address	Switch 5	Switch 4	Switch 3	Switch 2	Switch 1
1	off (0)	off (0)	off (0)	off (0)	on (1)
2	off (0)	off (0)	off (0)	on (1)	off (0)
3	off (0)	off (0)	off (0)	on (1)	on (1)
4	off (0)	off (0)	on (1)	off (0)	off (0)
5	off (0)	off (0)	on (1)	off (0)	on (1)
:					
:					
30	on (1)	on (1)	on (1)	on (1)	off (0)

2.2.2.5 Command Set Format

Each command is composed of one alpha character, up to four numeric parameters, and a command termination character. The command termination character is the "line feed" command, which is denoted and entered as <LF>. Commands are case-sensitive and must be entered in upper case only in order to be recognized.

2.2.2.6 IEEE-488 Communications

For IEEE-488 communications, the "End or Identify" (EOI) control line may also be used for command termination. When sending commands to the Model **100A250A** via the IEEE-488 bus, terminate each command with a <LF>, an EOI, or both. No characters are permitted after the <LF> or EOI; the **100A250A**interprets characters following the <LF> or EOI as the start of the next command. When an error condition is present at the Model **100A250A**, the "Service Request" (SRQ) line is asserted; the operator can then perform a serial poll operation. The Model **100A250A** error code (in binary) is contained in the returned serial poll status byte (STB). These error codes are defined in **Table 2-2**.

2.2.2 Remote Operation *(continued)*

2.2.2.6 IEEE-488 Communications *(continued)*

Table 2-2
Remote Error Codes/Messages

IEEE-488 Serial Poll Response (STB) (binary/decimal)	Model 100A250A FAULT	RS-232 Error Message
(01000001) 65	BPM FAULT	E1
(01000010) 66	THERMAL FAULT	E2
(01000100) 68	INTERLOCK FAULT	E3
(01001000) 72	PS1 FAULT	E4
(01010000) 80	PS2 FAULT	E5

2.2.2.7 RS-232 Communications

If the RS-232 interface is active, the Model **100A250A** will test for a properly connected RS-232 interface when it is switched into the remote operation mode. In order for the Model **100A250A** to recognize an RS-232 connection, the "Data Carrier Detect" (DCD) line must be asserted. This line is sampled continuously to determine if the RS-232 connection is broken; therefore, it must remain asserted in order for the RS-232 interface to function. The "Clear To Send" (CTS) line is also used to gate information from the Model **100A250A**. This line must be asserted in order to receive information from the Model **100A250A**. The CTS line can be used as a "handshake" line to inform the Model **100A250A** when it is permissible to send information. If the CTS line is de-asserted in the middle of a transmission, the character in the process of being transmitted will be completed and further transmission will halt until the CTS line is re-asserted. The Model **100A250A** itself asserts two lines: "Data Terminal Ready" (DTR) and "Request To Send" (RTS). The DTR line is continuously asserted, while the RTS line is used to gate information into the Model **100A250A**. Connector pin-out information is given in **Table 2-3**.

2.2.2 Remote Operation *(continued)*

2.2.2.7 RS-232 Communications *(continued)*

Table 2-3
RS-232 Connector Pin-Outs

Pin No.	Signal	Data Direction*	Description
1	DCD	<	Device Carrier Detect
2	RD	<	Receive Data
3	TD	>	Transmit Data
4	DTR	>	Data Terminal Ready
5	GND	N/A	Ground
6	NC	N/A	No Connection
7	RTS	>	Ready To Send
8	CTS	<	Clear To Send
9	NC	N/A	No Connection

***Note:**
> = Output from Model 100A250A
< = Input to Model 100A250A

Special Note: A null modem cable or adapter is required in order to properly interface the Model 100A250A to a standard serial port on a computer.

Once the RS-232 interface is established, commands are processed in the same manner as that of the IEEE-488 interface. The command structure is identical, except that there is no EOI line. Therefore, all commands are terminated with a line feed (<LF>). Since this is a full-duplex asynchronous interface, if the Model 100A250A detects an error, the error message is immediately transmitted to the host controller. These error messages are defined in **Table 2-2.**

2.2.2.7.1 RS-232 port settings

The RS-232 port settings used for communication with the Model 100A250A are as follows.

Word Length: 8 bits

Stop Bits: 1

Baud Rate: 1200–76,800 (switch-selectable)

Parity: None

2.2.2.8 Remote Commands

The following commands are available to the user for remote communication and operation of the Model 100A250A. In the descriptions of these commands, a lower-case “x” is used to signify a numeric value or parameter.

2.2.2 Remote Operation *(continued)*

2.2.2.8 Remote Commands *(continued)*

2.2.2.8.1 Power On/Off

Controls the power on/off state of the Model 100A250A.

Syntax: Px

Parameters: 0 = power off

1 = power on

Example: To turn the power on, send the following command:

P1<LF>

2.2.2.8.2 Gain Set

Sets the gain in steps of (Max Gain)/4096 W.

Syntax: Gxxxx

Parameters: 0000 = Minimum Gain
4095 = Maximum Gain

2.2.2.8.3 Reset

Resets the Model 100A250A, clearing all faults, if possible.

Syntax: R

Parameters: None

Example: To clear a fault, send the following command:

R<LF>

SECTION III

THEORY OF OPERATION

3.1 INTRODUCTION

The Model 100A250A amplifier consists essentially of a push-pull output stage of broadband MOSFET transistors driven by a 10 watt driver amplifier. Overall power gain of the amplifier is a minimum of +50dB for 1 milliwatt input. Input and output impedance matching circuits are utilized to provide optimum power transfer of the RF signal when the amplifier is connected to source and load impedance of 50 ohms. Combined with negative feedback at each stage and factory aligned equalizers, this provides an overall flat frequency response.

The self contained power supply consists of three switching power supplies. Two of the supplies are connected in series to provide 30 volts for the final amplifier. This voltage is further regulated down to 28 volts for the driver amplifier. The third supply is used to supplies ± 12VDC and +5VDC to power the operate/control and the gain control. The three power supplies operate at line voltages of 90 to 132 VAC and 180 to 264 VAC, 50/60 Hz selected automatically.

3.2 DRIVER AMPLIFIER SECTION

Refer to *"Schematic Diagram Number 1003958, RF Board Assembly".*

The input signal is fed through the gain control assy to the gate of Q1, which is limited by diodes CR2 and CR3. Gate bias for Q1 is supplied through R14 and adjusted by R10. The output of Q1 is coupled through C8 to the equalizing network R32, R33, R34 L15 and C36. The output of the equalizing network is coupled through C4 to the gate of Q3. Resistor R12 and capacitor C12 provide adjustments for response tuning. Gate bias for Q3 is supplied through R13 and adjusted by R8.

The output of Q3 is coupled through transformer T1, which drives the push-pull stage Q4 and Q5. Resistor R22 is used to adjust the bias voltage for both Q4 and Q5, in conjunction with R23 which is used to balance the push-pull operation. The output of Q4 and Q5 are coupled through matching transformer T2 to a coaxial connector, which is the driver's output.

3.3 FINAL AMPLIFIER SECTION

Refer to *"Schematic Diagram Number 1007520, RF Board Assembly, Final Amp".*

The input signal is applied to coax connector J1. The signal then goes to an equalizer network consisting of C1, C2 and L1 which is used for adjusting the flatness. The signal is then conducted to transformers T1 and T2 which provide impedance matching to the push pull transistors Q1A and Q1B. The bias voltage is adjusted with R12, while the balance between the transistors is adjusted with R10. The output of Q1A and Q1B are coupled through matching transformers T3 and T4 to the output connector on the front panel.

Over current protection is provided by U1, U2, U3 and U4, by sensing the input current and lowering the bias voltage if the current goes above the normal operating level.

3.4 POWER SUPPLY

Refer to *"Schematic Diagram Number 1010659, Power Supply".*

Input AC power is fed through RFI Filter FL1 before being switched by the circuit breaker CB1. The AC input power is fed from CB1 to the three switching power supplies, PS1, PS2, PS3.

The three switching supplies work on line voltages of 90 to 132 VAC and 180 to 264 VAC 50/60 Hz. The input voltage is selected automatically to conform to the supplied line voltage. No manual changes are required when switching from one supply voltage to another.

The outputs of PS1 and PS2 are connected in series to supply 30 VDC to the amplifier circuits. The output of PS3 supplies ±12VDC and +5VDC to the operate/control circuits and the gain control circuit. All the supplies have current limited outputs to protect them from shorts or over dissipation.

The 30VDC is fed through L1, which keeps switching transients from the supplies out of the amplifier circuits, to the amplifier circuits.

If the currents in the output amplifiers get too high for the on board circuits to control, or if the heat sink temperature gets too high, a fault signal is generated to shut down PS1 and PS2.

3.5 A4 OPERATE/CONTROL BOARD (SCHEMATIC DIAGRAM No. 1008597)

The A4 Operate/Control Board is a microcontroller-based printed wiring board (PWB) assembly that allows sensing and control of internal signals as well as remote personal computer (PC) control via on-board RS-232 and IEEE-488 data communications ports. The A4 Operate/Control Board utilizes a state-of-the-art, Reduced Instruction Set Computing (RISC) microcontroller that can quickly and reliably perform all front panel control and monitoring tasks, thereby allowing real-time control to the Model 100A250A via either remote bus. Besides being reported remotely, all amplifier faults are continuously monitored and indicated via the unit's front panel VFD.

3.5 A3 GAIN CONTROL (SCHEMATIC DIAGRAM NO 1009914)

The gain control allows for gain adjustment either from the front panel or from the RS-232 Port or the IEEE-488 Port. U4 and U5 are 2 electronic attenuators connected in series to give a minimum adjustment range of 18 dB. U1 is a switch that selects front panel control or remote control.

SECTION IV

MAINTENANCE

4.1 GENERAL MAINTENANCE INFORMATION

The Model 100A250A should require very little maintenance, since it is a relatively simple instrument. It is built with etched circuit wiring and solid state devices which should ensure long, trouble-free life. However, should trouble occur, special care must be taken in servicing to avoid damage to the devices or the etched circuit board.

Since the components are soldered in place, substitution of components should be a last resort unless there is some indication that they are faulty. In addition, take care when troubleshooting not to short voltages across the amplifier. Small bias changes may ruin the amplifier due to excessive dissipation or transients.

Components within Amplifier Research instruments are conservatively operated to provide maximum instrument reliability. In spite of this, parts within an instrument may fail. Usually, the instrument must be immediately repaired with a minimum of *"down time"*. A systematic approach can greatly simplify and thereby speed up the repair.

However, due to the importance of the amplifier's alignment, it is recommended that when failure is caused by breakdown of any of the components in the signal circuits, the amplifier be returned to the factory for part replacement and amplifier realignment. Shipping instructions are as follows.

Ship: PREPAID

Via: UNITED PARCEL SERVICE

To: AMPLIFIER RESEARCH CORPORATION
160 SCHOOL HOUSE ROAD
SOUDERTON, PA 18964

See Warranty Statement at rear of panel.

4.2 DISASSEMBLY PROCEDURE

CAUTION:

REMOVE POWER CORD FROM RECEPTACLE BEFORE SERVICING.

4.2.1 Remove top cover by removing the screws.

4.2.2 Remove circuit board and heat sink by removing the screws around the perimeter of the heat sink.

4.3 TROUBLESHOOTING

The techniques used in troubleshooting solid state instruments are similar to those used in vacuum tube instruments. For instance, a good way to start troubleshooting is to check the supply voltage at the amplifier supply voltage terminal. If it is low or nonexistent, check the power supply components starting with the AC fuse.

The power supply for the driver should be a nominal 28 volts, and the power supply for the output stage should be a nominal 30 volts. Incorrect voltage can result in over-dissipation in the transistors or severe distortion and non-linearity of the amplifier. The power supplies may be disconnected from the RF board to enable troubleshooting without danger of damaging the RF circuitry.

Finally, determine if the individual amplifier stages are operational by injecting a signal into the transistor gate and looking for an indication of output.

CAUTION:

BEWARE OF VOLTAGES APPLIED TO THE GATE OF A MOSFET TRANSISTOR IN EXCESS OF ±20 VOLTS, THIS WILL RESULT IN TRANSISTOR GAT FAILURE.

4.3 Troubleshooting

Troubleshooting the Model 100A250A in a logical manner can speed the solution to a problem. The settings of potentiometers ("pots"), capacitors ("caps"), or other variables should not be disturbed until other problems have been eliminated. Comparing the measured DC voltages to those shown on the schematics can solve many problems. Before measuring circuit voltages, first verify that the voltages to the circuits are correct.

Model 100A250A Troubleshooting Categories:

Subsection 4.3.1—Front Panel Vacuum Fluorescent Display (VFD) Doesn't Indicate **"Power On"** when the **POWER** Switch is Depressed

Subsection 4.3.2—The Unit Cannot be Operated Remotely

Subsection 4.3.3—Thermal Fault

Subsection 4.3.4—Interlock Fault

Subsection 4.3.5—Voltage Faults

Subsection 4.3.6—Low or No Power Output (DC Tests**)**

4.3.1 Front Panel Vacuum Fluorescent Display (VFD) Doesn't Indicate "Power On" when the POWER Switch is Depressed (Schematic Diagram No. 1010659)

4.3.1.1 If the Model **100A250A** is operating in an otherwise normal fashion, the unit's front panel vacuum fluorescent display (VFD) or the wiring to it could be defective.

4.3.1.2 Check the **FUNCTION** switch on the unit's front panel; it must be set to the **LOCAL** position in order to operate the front panel **POWER** switch. Check the circuit breaker on the unit's rear panel; it must be set to the "**1**" ("ON") position.

4.3.1.3 4.3.1.3 If the **"Power On"** indication is not displayed and the cooling fan (Blower B1) is not running, check to see that the unit is plugged into a live outlet and that the AC line cord is plugged securely into the unit.

4.3.1.4 Check the output voltages from PS3; these voltages should be as follows:

PS3 J2, Pin 1	+12.0 ± 0.3VDC
PS3 J2, Pin 2	+ 5.0 ± 0.2VDC
PS3 J2, Pin 6	-12.0 ± 0.3VDC

If output voltages are not present on PS3, check the AC input to PS3.

4.3.1.5 Check the voltages to the A4 Operate/Control Board on connector A4 J3; the voltages should be as follows:

A4 J3, Pin 16	-12.0 ± 0.3VDC
A4 J3, Pin 29	+ 5.0 ± 0.2VDC
A4 J3, Pin 31	+12.0 ± 0.3VDC

4.3.1.6 Check the voltage on A4 J3, Pin 3; it should be ≥4V when the **POWER** switch (S1) is in the normal position and <0.1V when S1 is depressed. S1 is normally open; it is closed only when it is depressed. The amplifier should change state every time the **POWER** switch is depressed.

4.3.1.7 If all voltages are correct and the unit still does not operate, contact Amplifier Research to arrange for repair or replacement of the A4 Operate/Control Board.

4.3.2 The Unit Cannot be Operated Remotely

4.3.2.1 Verify that the front panel **FUNCTION** switch is set to the **REMOTE** position.

4.3.2.2 Verify that the unit operates locally by resetting the **FUNCTION** switch to the **LOCAL** position; if the unit does not operate locally, see subsection **4.3.1** of this manual.

4.3.2.3 Check the position of the **"ADDRESS"** switch assembly (SW1) on the A4 Operate/Control Board; this assembly can be accessed through the unit's rear panel. Check to see that these switches are properly set for either RS-232 or IEEE-488 operation, as desired. (See subsection **2.2.2** of this manual for the proper **"ADDRESS"** switch settings.) (**Note:** Address switches are only read at unit power-up; remove and re-apply AC power (i.e., reset the circuit breaker) after changes are made.)

4.3.3 Thermal Fault (Schematic Diagram No 1010659)

During a Thermal Fault, the front panel VFD should read **"THERMAL FAULT."**

4.3.3 Thermal Fault (Schematic Diagram No 1010659) *(continued)*

4.3.3.1 Try to reset the unit; if the unit resets and operates normally, check to see that the cooling fan (B1) is operating normally and that the air inlet on the bottom of the unit and the air outlets on the rear of the unit are not blocked.

4.3.3.2 If the unit does not reset and the cooling fan is operating normally, check the voltage at the A4 Operate/Control Board, J3, Pin 21; it should be ≤0.1V.

4.3.3.3 If the voltage on A4 J3, Pin 21 is high, check the thermal daisy chain through A2S1 to ground.

4.3.4 Interlock Fault (Schematic Diagram No. 1010659)

The Model **100A250A** is equipped with an interlock connector, which is located on the rear panel. The interlock circuit can be used to sense the openings of doors to screen rooms, test chambers, and so forth, and to turn off RF energy when these doors are opened.

Note: The Model 100A250A is shipped with a mating connector, which has a jumper between Pins 1 and 8, installed in the rear panel interlock connector. The unit will not operate unless the interlock circuit is closed.

4.3.4.1 In the event of an Interlock Fault, the unit's front panel VFD should indicate **"INTERLOCK FAULT."**

4.3.4.2 Check to see if it is safe to power up the unit—are there personnel present in the screen room, or are doors to the screen room open?

4.3.4.3 After checking for safety, try to clear the Interlock Fault from the front panel by using the **RESET** switch.

4.3.4.4 If the Interlock Fault will not clear, check for continuity in the External Interlock Circuit (Pin 1 to Pin 8 in the connector, which mates with J2 in the rear panel).

4.3.4.5 Check the voltage on A4 J3, Pin 5; it should be ≤0.1V.

4.3.4.6 If all of the above voltages are correct and the unit still will not reset, check for defective wiring and/or PWB connections, then try the **RESET** switch again. If the unit still will not reset, the A4 Operate/Control Board is defective. Contact Amplifier Research to arrange for repair or replacement of the A4 Operate/Control Board.

4.3.5 Voltage/Amplifier Faults (Schematic Diagram Nos. 1010659)

The model 100A250A fault circuits sense voltage faults from PS1 (+15V) and PS2 (+15V). They also sense an over current fault in the final amplifier stage.

4.3.5.1 Power Supply Faults (Schematic Diagram 1010659). PS1 and PS2 send BUSS OK signals to the operate/control board (A4). These signals give an early indication of over voltage or over current conditions. If either condition occurs the power supplies send a fault signal to the operate/control board which in turn sends a disable signal to the power supplies turning off the outputs.

4.3.5.2 The Final Amplifier Assy Faults. (Schematic Diagram 1010659 and 1007520). The final amplifier incorporates two stage protection for the output transistors. U1 monitors the device current which is normally 7.4 amps. If the amplifier is over driven so that the current rises to 10.5 amps U1 will decrease the bias voltage thereby decreasing the current. If the amplifier is over driven to the point that the active bias cannot control the current to less than 11.5 amps U4 will generate a fault signal which will turn the power supplies off.

4.3.6 Low or No Power Output (DC Tests) (Schematic Diagram No. 1010659)

All indicators on the Model **100A250A** VFD are normal, the VFD indicates **"POWER ON"** and **"STATUS OK,"** and the cooling fan (Blower B1) is operating.

4.3.6.1 Check the RF input to the unit—is it the correct amplitude and frequency?

4.3.6.2 Check the RF output connection from the unit—is it correctly connected to the load? Is the coaxial cable okay?

4.3.6.3 Check the voltages at the following locations. Troubleshoot any incorrect voltages.

Feed-through Cap.	**Normal Voltage**	**Remarks**
A3 C9	+12V	Gain Control
A3 C12	-12V	Gain Control
A1 C1	+30V	Driver Stage
A2 C1	+30V	Final Amp
A2 C2	+30V	Final Amp

Note: The locations of the feed-through capacitors can be found on the RF Assembly Drawing (Schematic Diagram No. **1010657**).