



AVTECH ELECTROSYSTEMS LTD.

NANOSECOND WAVEFORM ELECTRONICS
SINCE 1975

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INSTRUCTIONS

MODEL AVR-4B-PW-C-AF3 PULSE GENERATOR

S.N. :

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WARRANTY

Avtech Electrosystems Ltd. warrants products of its manufacture to be free from defects in material and workmanship under conditions of normal use. If, within one year after delivery to the original owner, and after prepaid return by the original owner, this Avtech product is found to be defective, Avtech shall at its option repair or replace said defective item. This warranty does not apply to units which have been disassembled, modified or subjected to conditions exceeding the applicable specifications or ratings. This warranty is the extent of the obligation or liability assumed by Avtech with respect to this product and no other warranty or guarantee is either expressed or implied.

A) SPECIFICATIONS



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March 26, 1993.

Randy Schrader
SM-ALC/LHHCZ
McClellan AFB
Sacramento, CA 95652

Tel: 916-643-2936
Fax: 916-643-2140

Dear Randy:

With reference to our telephone conversation of March 25, I am pleased to offer a price and delivery quotation for a special purpose pulse generator meeting the following specifications:

Model designation:	AVR-4B-PW-C-P-AF3.
Pulse repetition rate:	20 Hz to 20 kHz. 3-position range switch and ten turn control.
Pulse length:	15 us to 6.0 ms. 3-position range switch and ten turn control.
Pulse rise time:	≤ 50 ns.
Pulse fall time:	≤ 50 ns.
Amplitude:	0 to +250 Volts to 600 Ohms. Controlled by a ten turn control.
Maximum output power:	10 watts.
Duty cycle (max):	10%.
Monitor output:	Provides coincident TTL level replica of main output.

.../2

External trigger: MODE A: TTL input determines pulse
 repetition rate. Pulse length
 determined by front panel controls.

 MODE B: TTL input determines pulse
 repetition rate and pulse length.

 MANUAL: Includes manual push button for
 single pulse operation.

Operating temperature: +60 to 100⁰F.

Connectors: BNC.

Chassis size: 3.9" x 17" x 14.8" with 19" rack
 mount kit.

Weight: 10 lbs.

Prime power: 120/240V, 50-60 Hz.

Fuses: 0.5 Amp line fuse.

Other: See Model AVR-4B-PW-C-P,
 Cat. No. 8.

Price: Quantity of 1: \$4,443.00 US each,
 FOB destination (i.e. delivered on
 your doorstep).

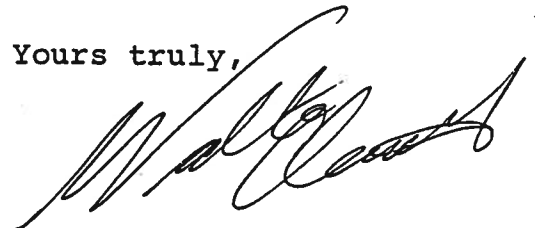
 Quantity of 5: \$3,998.00 US each,
 FOB destination (i.e. delivered on
 your doorstep).

Delivery: 30-45 days ARO.

Please note that this model is basically the same as the -AF2 unit, but without the TRAIN function, but modified to allow pulse width control either by the front panel controls or by the trigger pulse width when triggered externally.

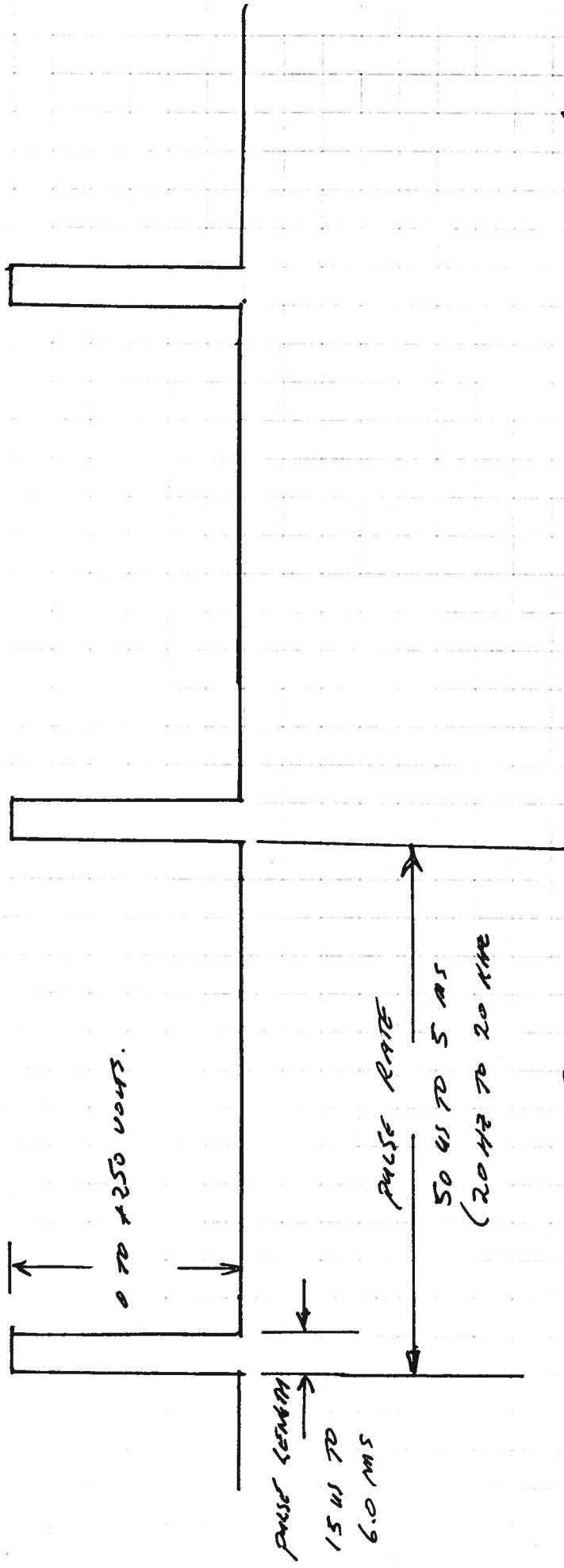
Thank you for your continuing interest in our products. Please call me again if you require any additional information or modifications to the above quotation.

Yours truly,



Dr. Walter Chudobiak
Chief Engineer

WC:pr



MODEL PWR-4B C-PW - PFS OUTPUT WAVEFORM

B) INSTALLATION

VISUAL CHECK

After unpacking the instrument, examine to ensure that it has not been damaged in shipment. Visually inspect all connectors, knobs and the handles. Confirm that a power cord and instruction manual are with the instrument. (If the instrument has been damaged in shipment, file a claim immediately with the company that transported the instrument).

PLUGGING IN THE INSTRUMENT

Examine the rear of the instrument. There will be a male power receptacle, a fuse holder and the edge of the power selector card will be visible. Confirm that the power selector is in the correct orientation - it should be marked either 120 or 240, indicating whether it expects 120V AC or 240V AC. If it is not set for the proper voltage, remove the fuse then grasp the card with a pair of pliers and remove it. Rotate horizontally through 180 degrees. Reinstall the card and the correct fuse. In the 120V setting, a 1/2A slow blow fuse is required. In the 240V setting, a 1/4A slow blow fuse is required.

OPERATIONAL CHECK

This check is to confirm that the instrument is fully functional. Set the controls to the following values:

FRONT PANEL

TRIGGER INT/EXT Switch: INT position

PULSE RATE RANGE Switch: 2.0 kHz

PULSE RATE FINE: MAX CW

PULSE LENGTH RANGE Switch: 60 us

PULSE LENGTH FINE: MAX CCW

AMPLITUDE Control: Set at 2.0

Connect a cable from the MONITOR OUT connector to the TRIG input of an oscilloscope (RIN > 1K). Connect a 10W (or higher) 600 Ohm load to the OUT connector and place the scope probe across this load.

Set the oscilloscope to trigger externally (on the rising edge of a TTL pulse) with the vertical setting at 20 Volts/div and the horizontal setting at 20 us/div. Then follow the instructions below and compare what is seen on the oscilloscope to what is described. Only approximate values are needed to confirm operation.

<u>STEP</u>	<u>CONTROL</u>	<u>OPERATION</u>	<u>RESULTS</u>
1)	POWER	Push in (ON)	+50V pulses at the main output, with a period of 0.5 ms, pulse width of 15 us, < 50 ns rise & fall times.
2)	AMPLITUDE CONTROL	Rotate clockwise to 10 and then back to 2.0	Output amplitude increases to 250 Volts and then decreases to 50 V.
3)	TRIGGER INT/EXT SWITCH	Set to EXT	No output.
4)	A-B SWITCH	Set to A	No output.
5)	TRIG BNC	Apply 2 kHz 60 us TTL pulse train	2 kHz 50 Volt output pulse. Pulse length controlled by pulse length control.
6)	A-B SWITCH	Set to B	2 kHz 60 ns 50 Volt output pulses. Pulse length controlled by input pulse length.
7)	TRIGGER INT/EXT SWITCH	Set to manual	No output.
8)	A-B SWITCH	Set to A	No output.
9)	SINGLE PULSE BUTTON	Push	Single 50 Volt pulse produced, pulse width controlled by front panel pulse length controls.

The successful completion of the above 9 steps should provide the operator with a basic familiarity of the operating characteristics of the instrument. If additional assistance is required, see Section C and if still necessary, then:

Tel: (613) 226-5772
 Fax: (613) 226-2802

C) FRONT PANEL CONTROLS

(1) POWER Switch. The POWER push button switch applies AC prime power to the primaries of the transformer, turning the instrument on. The push button lamp (#382 type) is connected to the +15V DC supply.

(2) PULSE RATE. 3-position range switch and ten turn fine potentiometer controls internal Pulse Rate as follows:

20 Hz	200 Hz
200 Hz	2 kHz
2 kHz	20 kHz

TRIGGER INT-EXT switch (6) must be in INT position for (2) to be active.

(3) PULSE LENGTH. 3-position range switch and a ten turn fine potentiometer controls internal pulse length as follows:

15 us to 60 us
60 us to 600 us
600 us to 6 ms

Mode A-B switch (7) must be in the A position for (3) to be active.

(4A) AMPLITUDE/OUTPUT. Ten turn control (4A) varies output amplitude at BNC connector (4B) from 0 to +250 Volts to a load resistance of 600 Ohms or higher. CAUTION: Model AVR-4B-PW-C-AF3 will provide up to 10 Watts average power to a 600 Ohm load. If operating at or near maximum duty cycle (10%) with maximum output amplitude, ensure that the load is capable of dissipating the 10 Watts. An average output power of 10 Watts results when the duty cycle is 10% and the output amplitude is 250 Volts to a load resistance of 600 Ohms. If an attempt is made to operate with an average output power significantly in excess of 10 Watts, the automatic overload function (5) will function and protect the output stage against failure.

- (5) OVERLOAD. An automatic overload protective circuit controls the front panel overload light. If the unit is overloaded (by operating at an exceedingly high duty cycle or by operating into a short circuit), the protective circuit will turn the output of the instrument OFF and turn the indicator light ON. The light will stay ON (i.e. output OFF) for about 5 seconds after which the instrument will attempt to turn ON (i.e. light OFF) for about 1 second. If the overload condition persists, the instrument will turn OFF again (i.e. light ON) for another 5 seconds. If the overload condition has been removed, the instrument will turn on and resume normal operation. Overload conditions may be removed by:
- 1) Reducing pulse rate (i.e. switch to a lower range)
 - 2) Reducing pulse length (i.e. switch to a lower range)
 - 3) Reducing the output amplitude
 - 4) Removing output load short circuit (if any)
- (6) TRIGGER INT/EXT. With this three-position switch in the INT position, the pulse rate and length are controlled by (2) and (3). With this switch in the EXT position and the A-B switch (7) in the A position, (2) is inactive and the output pulse rate at (4A) is controlled by a TTL level pulse applied to the TRIG BNC connector at (8). The output pulse length at (4B) is controlled by (3). If the A-B switch (7) is in the B position, both (2) and (3) are inactive and the pulse rate and pulse length at (4B) are determined by a TTL level pulse applied to the TRIG BNC connector at (8). When the INT/EXT switch is in the MANUAL position, (2), (3) and (8) are inactive and an output pulse at (4B) is produced by manual pushing of the SINGLE pulse button (9). In this manual mode, the A-B switch (7) must be in the A position.
- (7) A-B MODE SWITCH. When the TRIGGER INT/EXT switch (6) is in the INT or manual position, the A-B switch must be in the A position. When the INT/EXT switch (6) is in the EXT position, the PULSE LENGTH switch (3) is functional if the A-B switch is in the A position. If the A-B switch is in the B position, the PULSE LENGTH switch is inactive and the pulse length at (4B) is controlled by the pulse length applied at (8).
- (8) TRIG BNC. Functional only when the TRIGGER INT/EXT switch (6) is in the EXT position. Apply TTL level pulse (RIN > 1K) at (8) to control output pulse rate and pulse length at (4B) when MODE A-B switch (7) is in the B position. When MODE A-B switch (7) is in the A position, TTL pulse determines pulse rate only.

- (9) SINGLE PULSE. Functional only when the TRIGGER INT/EXT switch (6) is in the MANUAL position and the MODE A-B switch (7) is in the A position. Produces an output pulse at (4B) for each push of the button.
- (10) MONITOR. A TTL level Volt pulse train which is a coincident replica of the output at (4B) is available at this BNC connector. The monitor output amplitude is fixed at +5 Volts for a load termination of $R_L > 1K$ Ohms and this output will withstand a short circuit condition. This output may be used to trigger the time base of an oscilloscope.

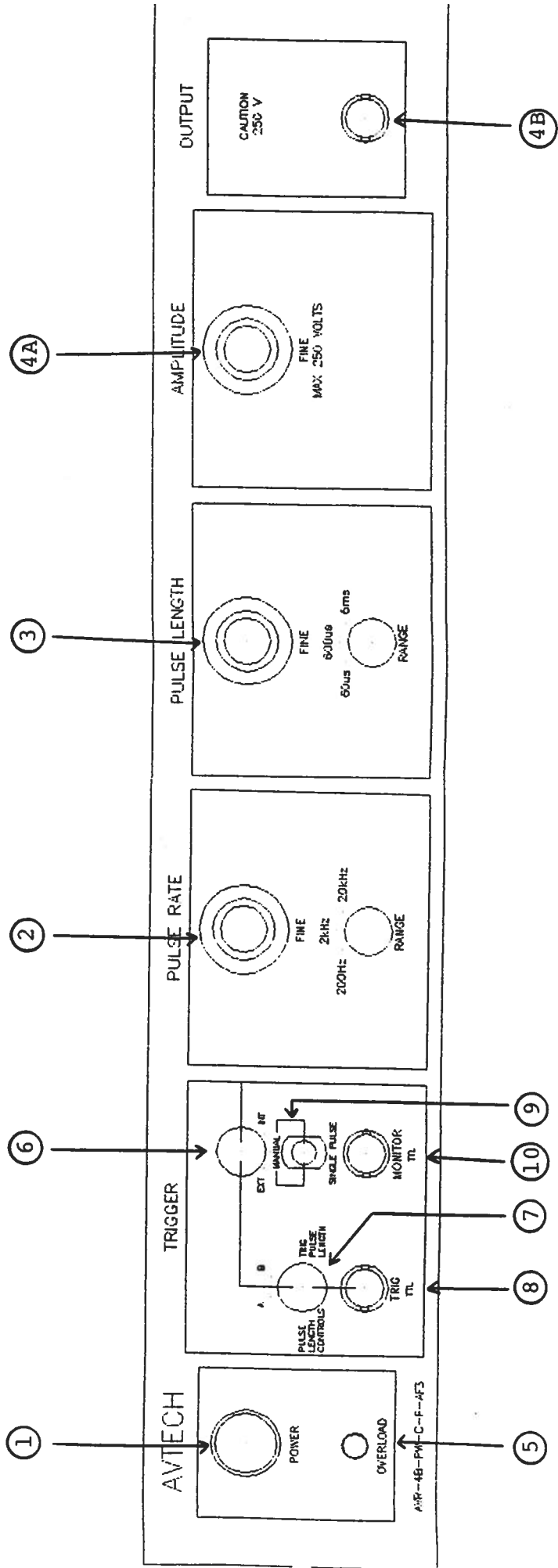


Fig. 1 FRONT PANEL CONTROLS

D) REAR PANEL CONTROLS

- (1) AC POWER INPUT. A three-pronged recessed male connector is provided on the back panel for AC power connection to the instrument. Also contained in this assembly is a 1/2A slow blow fuse and a removable card that can be removed and repositioned to switch between 120V AC in and 240V AC in.
- (2) 2.0A SB. This fuse protects the output stage if the output duty cycle rating is exceeded (a back-up function for the automatic overload feature).

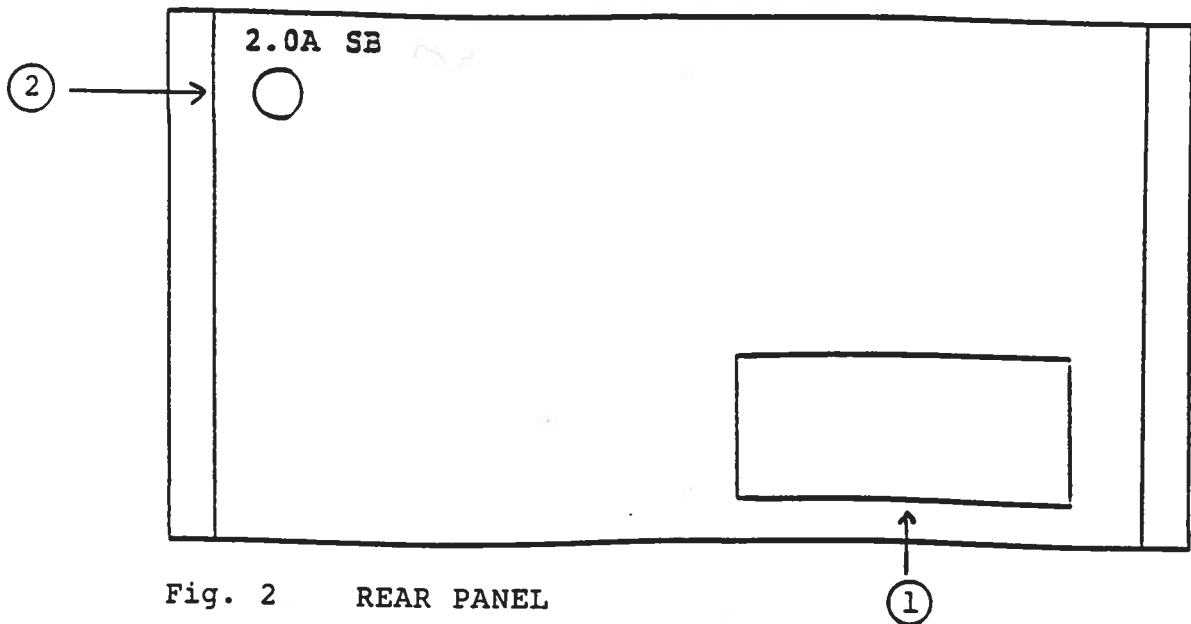


Fig. 2 REAR PANEL

E) TOP COVER REMOVAL AND RACK MOUNTING

- 1) The interior of the instrument may be accessed by removing the four Phillips screws on the top panel. With the four screws removed, the top cover may be slid back (and off).
- 2) The -R5 rack mount kit may be installed after first removing the one Phillips screw on the side panel adjacent to the front handle.

F) BLOCK DIAGRAM DESCRIPTION AND MODULE FUNCTION
DESCRIPTION

Model AVR-4B-PW-C-AF3 consists of the following eight basic modules (see Fig. 3):

- 1) -AF3-PG output pulse module
- 2) -AF3-PS 0 to +260 Volt DC power supply module
- 3) -AF3-CL2 clock module
- 4) -AF3-PW2 pulse width module
- 5) -AF3-DP2 single pulse module
- 6) -AF3-MON monitor module
- 7) -AF3-OL overload module
- 8) +24 V DC power supply board

The various modules are located in the instrument interior as shown in Fig 3 and are interconnected as shown in Fig 4. The waveforms and or signal levels at key terminals are described in Fig 4 along with a description of the wiring lead colours. A description of the function of each module is given in Section F1 to F8 and the 24 V DC power supply is described in Fig. 5.

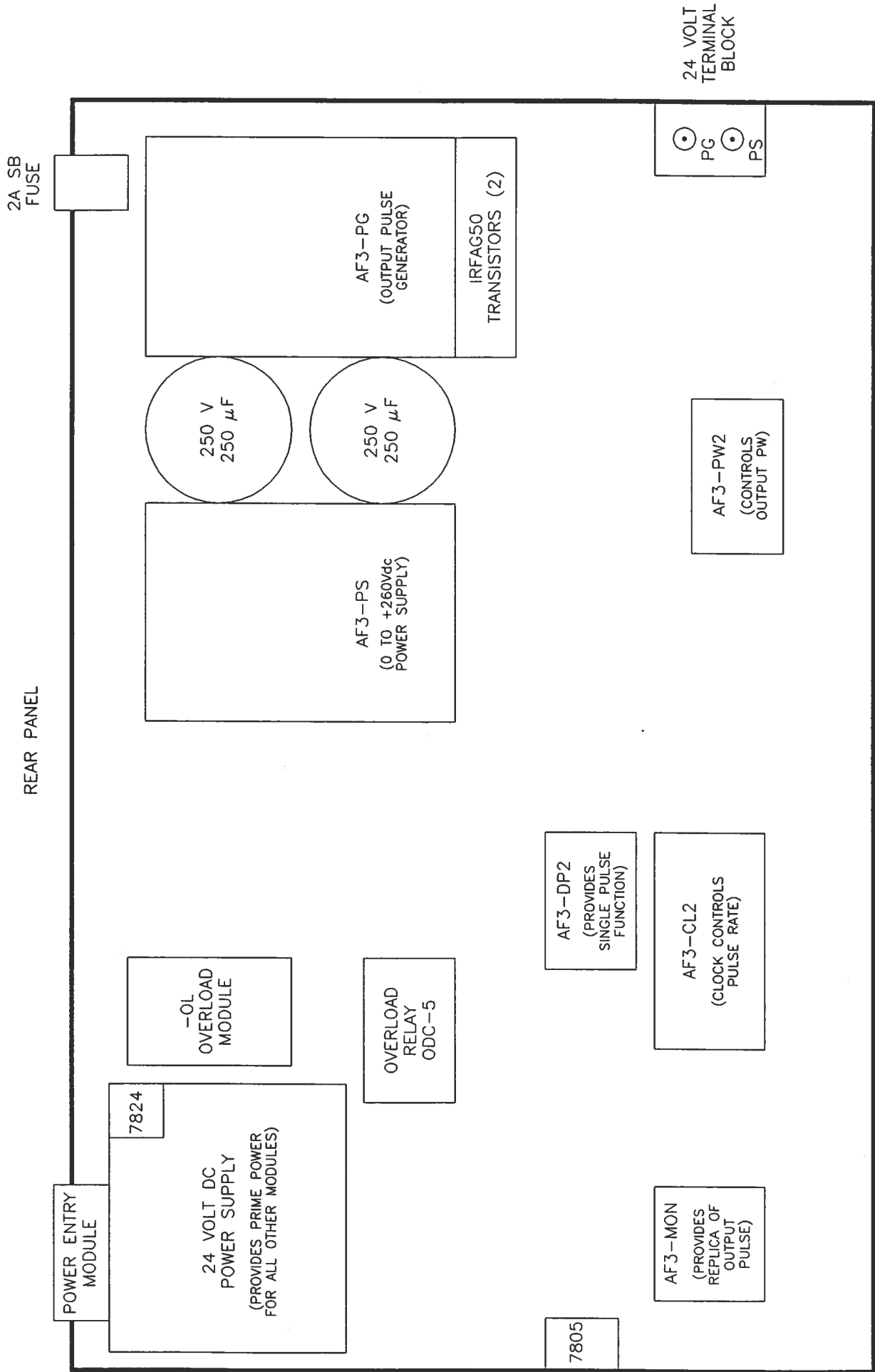


FIG. 3 FLOOR PLAN LOCATION OF KEY MODULES

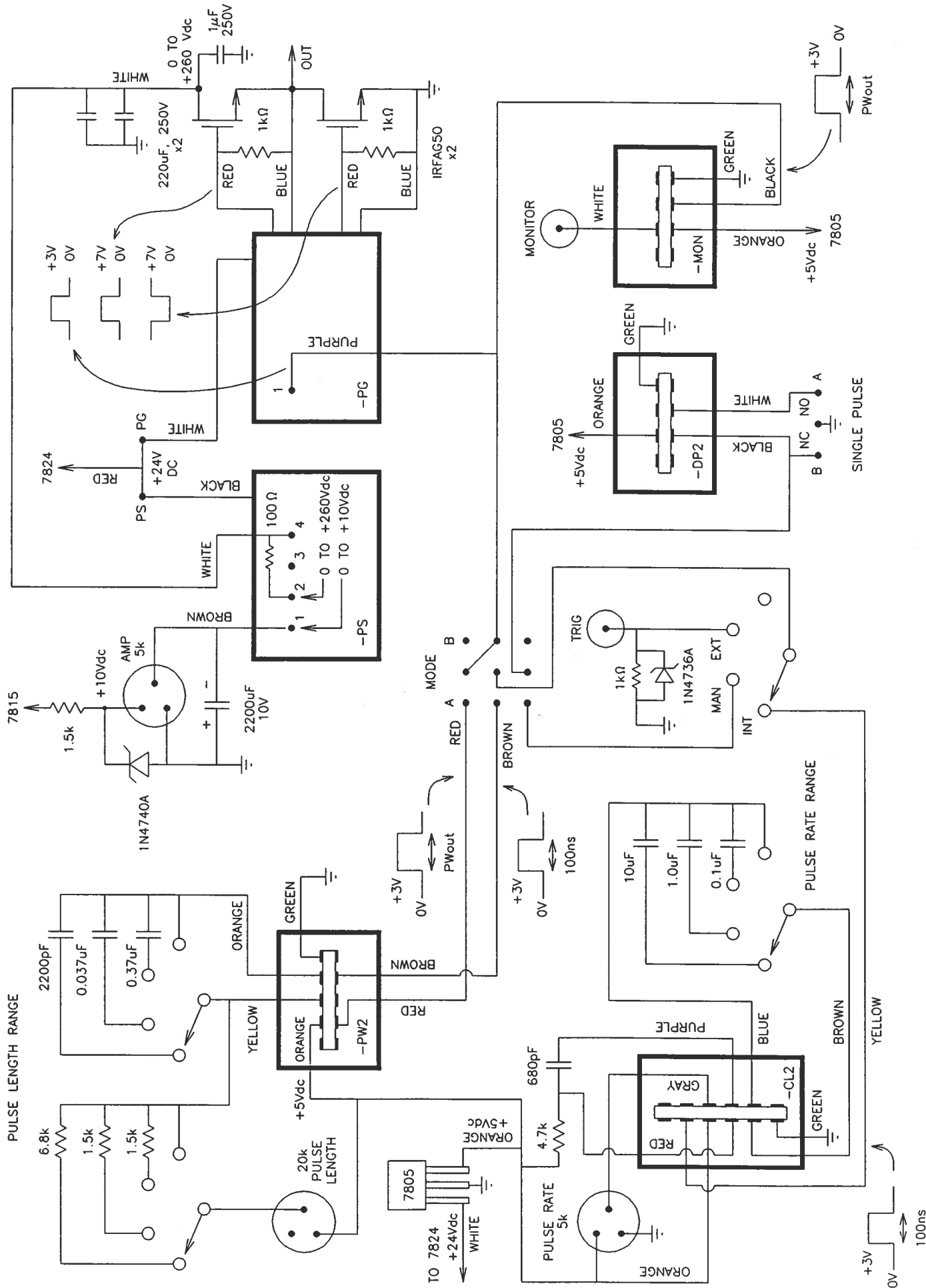


FIGURE 4 AVR-4B-PW-C-AF3 BLOCK DIAGRAM

F1) -AF3-PG OUTPUT PULSE MODULE

This module generates the 0 to +250 Volt output pulse and is supplied with a +3 Volt pulse train at PIN (1), a 0 to +260 Volt DC supply on the drain of the top IRFAG50 and +24 V DC to a rear panel solder terminal. The 0 to +260 Volts controls the output pulse amplitude and the +3 Volt pulse at (1) determines the output pulse timing (coincident replicas). In the case of instrument malfunction, first check the rear panel fuses and then check that the 0 to +260 Volt DC amplitude is functioning. If the DC amplitude is not functioning, then the -AF3-PS module is probably defective. If the DC level is functioning then check the waveforms at (1) and at the gates of the two IRFAG50. If the waveform at (1) is not correct, then it is most likely that the -AF3-PW2 module is defective (assuming that the front panel controls are set properly). If the waveform at (1) is correct and the waveforms on the gates are not correct, then turn off the power and desolder the two red leads to the gates. Recheck the waveforms. If the waveforms are now pulses having amplitudes of about 13 Volts, then the IRFAG50's are defective and should be replaced (order AVTECH PART NO. -AF3-IRFAG50). If 13 Volt waveforms are not detected then the -AF3-PG module should be returned to AVTECH for repair.

F2) -AF3-PS-DC POWER SUPPLY MODULE

This module accepts a 0 to +10 Volt DC control voltage at (1), a +24V DC supply on a rear panel solder terminal and provides a 0 to +260 Volt DC level at (2) which feeds the drain of the top IRFAG50 in the -AF3-PG module and therefore controls the output pulse amplitude. This sealed module must be replaced if the specified output level is not provided.

F3) -AF3-CL2 CLOCK MODULE

This sealed module controls the pulse rate when the TRIGGER INT-EXT switch is in the INT position.

F4) -AF3-PW2 PULSE WIDTH MODULE

This sealed module controls the output pulse length when the TRIGGER A-B switch is in the A position.

F5) -AF3-DP2-SINGLE PULSE MODULE

Provides a single output pulse when the INT-EXT switch is in the MANUAL position and the SINGLE PULSE button is pushed.

G) REPAIR PROCEDURE

If the instrument provides a defective output, or no output or repeatedly blows fuses (even though the load impedance is greater than 600 Ohms and the duty cycle limit is not exceeded), the flow chart in Fig. 6 (along with Figs 3, 4, 5) may be used to diagnosis the problem and to define the necessary repair procedure.

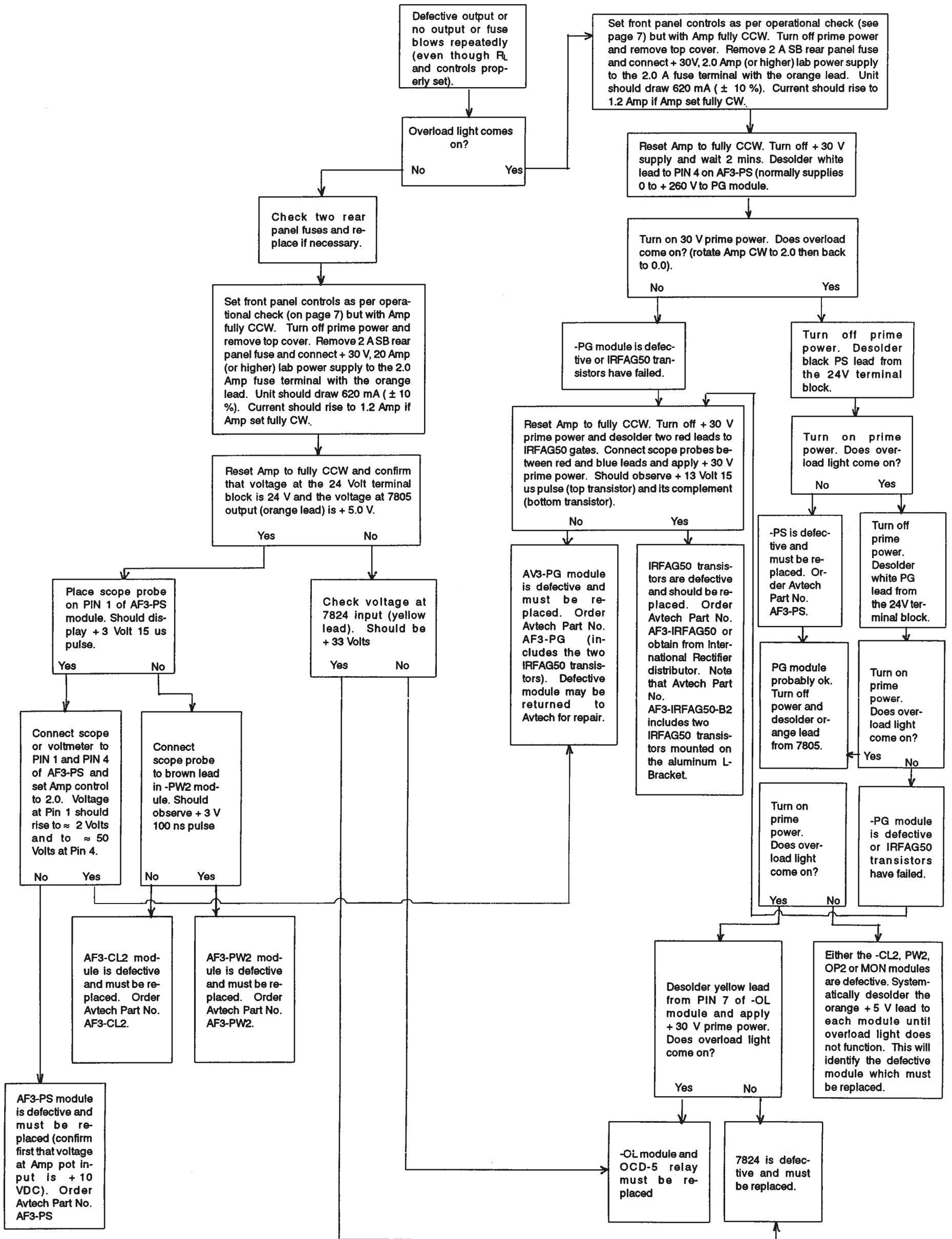
If additional assistance is required:

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Fig. 6.

REPAIR FLOW CHART



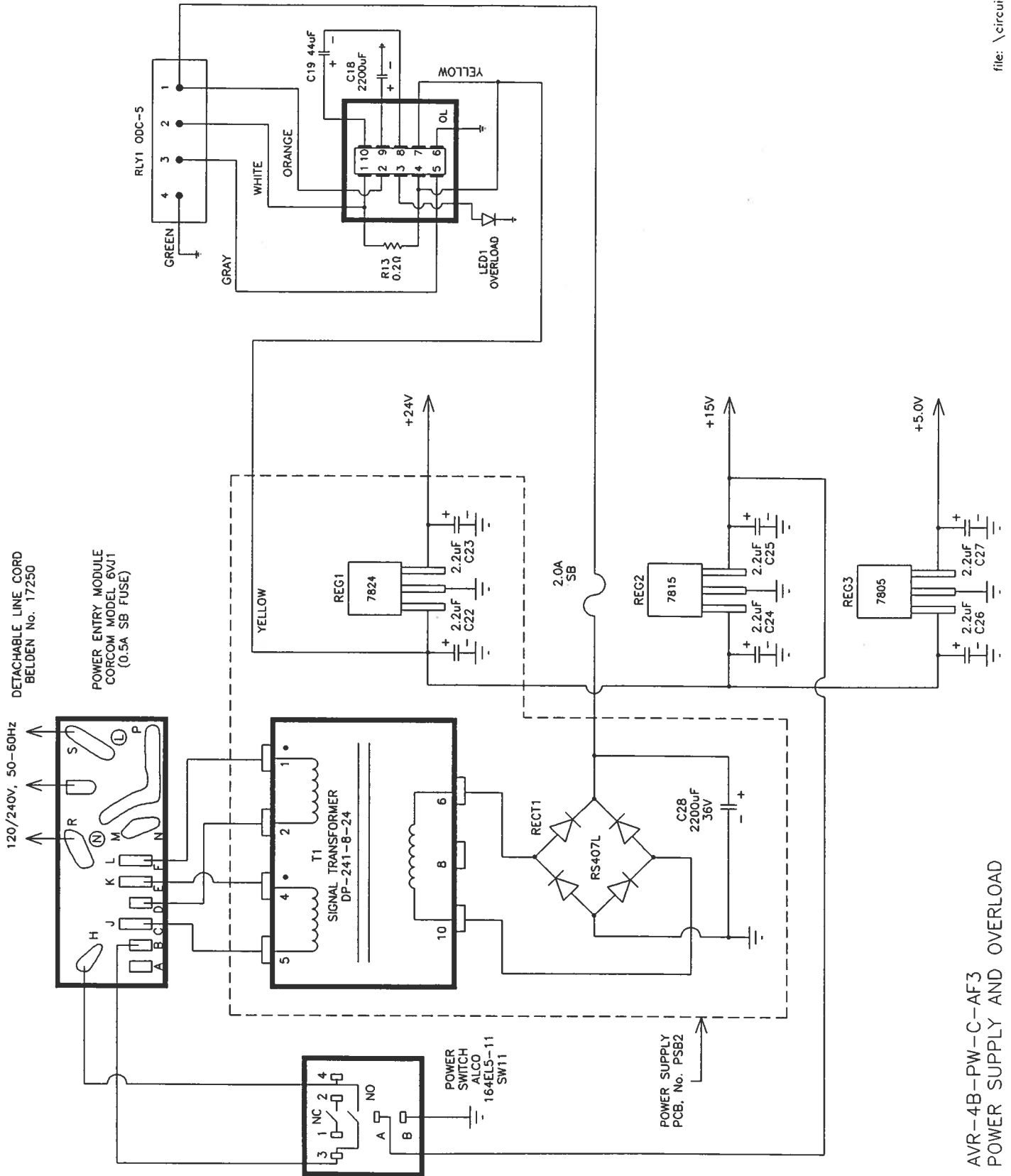


FIG. 5 AVR-4B-PW-C-AF3
POWER SUPPLY AND OVERLOAD

F6) -AF3-MON MONITOR MODULE

This sealed module provides a coincident TTL replica of the main output and may be used to trigger the time base of an oscilloscope (RL > 1K).

F7) -AF3-OL OVERLOAD MODULE

This sealed module controls the +24 V DC prime power supplied to the entire instrument and in the event of an overloading of the output, interrupts the +24 V supply to produce the operating symptoms described in the FRONT PANEL CONTROL SECTION.

F8) +24 V DC POWER SUPPLY

See Fig. 5.

H) PARTS LIST

<u>Item No.</u>	<u>Description</u>	<u>Avtech Part No.</u>	<u>Manufacturer and Part No.</u>
<u>MODULES</u>			
1	Pulse generator module	AF3-PG (includes 2 IRFAG50 transistors installed on aluminum L bracket)	Avtech
2	Output transistors	AF3-IRFAG50	International Rectifier IRFAG50
3	Output transistors mounted on L bracket	AF3-IRFAG50-B2	Avtech
4	Power supply module	AF3-PS	Avtech
5	Clock module	AF3-CL2	Avtech
6	Pulse width module	AF3-PW2	Avtech
7	Overload module	AF3-OL	Avtech
8	Single pulse module	AF3-DP2	Avtech
9	Monitor module	AF3-MON	Avtech
10	24 Volt power supply	AF3-24V-PS includes: a) 7824 b) PCB c) Signal transformer DP-241-8-24 d) Rectifier RS407L e) 2200 ufd 35 V capacitor f) 22 ufd 25 V capacitor	Avtech
11	Solid state relay		Potter & Brumfield No. ODC-5

FRONT PANEL COMPONENTS

12	Power switch	Alcoswitch No. 164EL5-11 with 64E-2 lens and lamp No. 382
13	Single pulse switch	Alcoswitch No. MPA-103F
14	A-B switch	Microswitch No. 8A3011
15	PRF switch	Alcoswitch No. MRC-1-10S
16	INT-EXT switch	Alcoswitch No. MRC-1-10S
17	Pulse length switch	Grayhill No. 71AD36-02-2- AJN
18	Pulse rate pot	Bourns No. 3540S-1-502
19	Pulse rate knob	Kilo International No. 3462
20	Pulse length pot	Bourns No. 3540S-1-203
21	Pulse length knob	Kilo International No. 3462
22	Amplitude pot	Bourns No. 3540S-1-502
23	Amplitude knob	Kilo International No. 3462
24	Overload LED	Dialight E 559-0101-001

REAR PANEL COMPONENTS

25	Power entry module	Corcom No. 6VJ1
26	Line cord	Belden No. 17250
27	2.0 A fuse holder	Littlefuse No. 345611
28	Line fuse (0.5 A8, SB)	Littlefuse No. 313.500 (or Equiv)
29	2.0 Amp fuse (SB)	Littlefuse No. 313002 (or Equiv)

CHASSIS

30	Chassis	TDJ No. B-350-13-1700H
31	Rack mount kit	-R5 TDJ No. 16-07500-1

MISCELLANEOUS COMPONENTS

32	7805 5V regulator	National No. 7085C (or Equiv)
33	7815 15V regulator	National No. 7815ACT (or Equiv)
34	250V, 250 ufd capacitors	Mallory No. CGS251T250R2C

July 29/94