AVTECH ELECTROSYSTEMS LTD.
NANOSECOND WAVEFORM ELECTRONICS

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INSTRUCTIONS

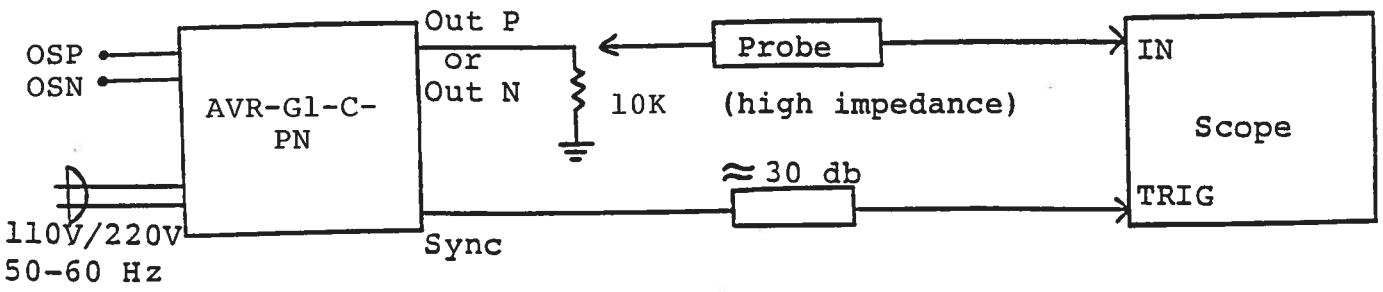
MODEL AVR-G1-C-PN-OT-TIB PULSE GENERATOR

S.N.:

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 dissembled, 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.

Fig. 1 PULSE GENERATOR TEST ARRANGEMENT



Notes:

1) The bandwidth capability of components and instruments used to display the pulse generator output signal (attenuators, cables, connectors, etc.) should exceed 100 MHz.

2) This unit was specifically designed to drive high impedance loads ($R_L \geq 10K$). The unit may fail if operated into low impedance loads (eg. 50 ohm) at very wide pulse width (eg. $\geq$ 100 us).

3) The TRIG output channel provides TTL level signals. To avoid overdriving the TRIG input channel of some scopes, a 30 db attenuator should be placed at the input to the scope trigger channel. The TRIG output precedes the main output when the front panel LEAD-LAG switch is in the LEAD position. The TRIG output lags the main output when the switch is in the LAG position.

4) With the MODE AB switch in the A position the output pulse widths for the positive and negative outputs are controlled by means of the front panel one turn PW control and by the PW RANGE control. The minimum and maximum PW for each range and the corresponding maximum PRF are as follows. Note that the unit may fail if operated at duty cycles exceeding 10%.

	PW min	PW max
0.1 us Range	10 ns PRF max 1 MHz	0.1 us PRF max 1 MHz
1.0 us Range	0.1 us PRF max 1 MHz	1.0 us PRF max 100 kHz

5) With the MODE AB switch in the B position the output pulse width equals the pulse width of a TTL pulse applied to the TRIG port (INT-EXT switch in the EXT position).

6) The output pulse amplitudes for the positive and negative outputs are controlled by means of the front panel AMP P and AMP N controls.

7) The P_{OUT} pulse may be offset by 0 to -50 Volts using the one turn P offset control when the offset two-position switch is in the ON position. Similarly, the N_{OUT} pulse may be offset by 0 to +50 Volts using the one turn N offset control when the offset two-position switch is in the ON position.

8) To obtain a stable output display the PRF control on the front panel should be set mid range. The front panel TRIG toggle switch should be in the INT position. The DELAY controls and the scope triggering controls are then adjusted to obtain a stable output. The scope may then be used to set the desired PRF by rotating the PRF controls.

9) An external clock may be used to control the output PRF of the AVR unit by setting the front panel TRIG toggle switch in the EXT position and applying a 0.2 us (approx.) TTL level pulse to the TRIG BNC connector input. For operation in this mode, the scope time base must also be triggered by the external clock rather than from the SYNC output.

10) The DELAY control controls the relative delay between the reference output pulse provided at the TRIG output and the main output. This delay is variable over the range of 100 ns to 1 us. The TRIG output precedes the main output when the LEAD-LAG switch is in the LEAD position and lags when the switch is in the LAG position.

11) AVR units with a serial number higher than 5600 are protected by an automatic overload protective circuit which 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 PRF (i.e. switch to a lower range)
    2) Reducing pulse width (i.e. switch to a lower range)
    3) Removing output load short circuit (if any)

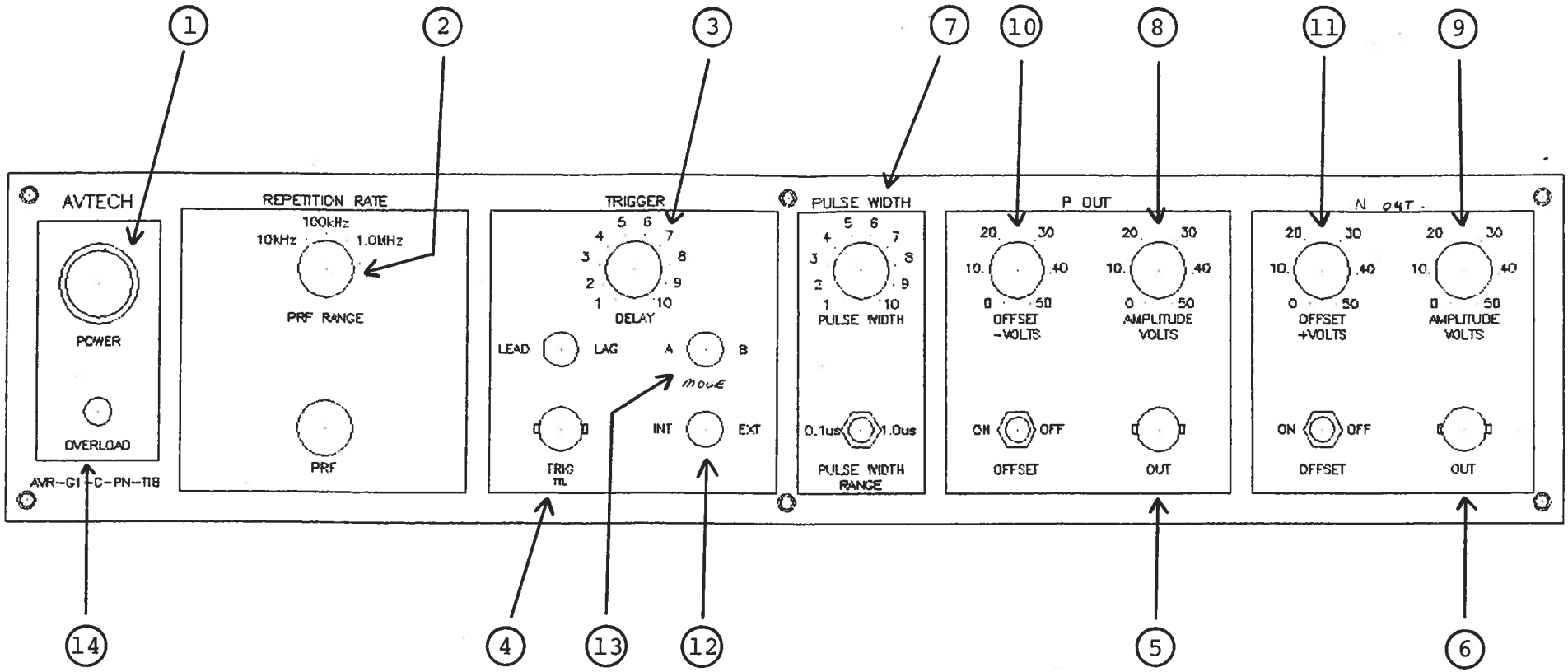
12) The unit can be converted from 110 to 220V 50-60 Hz operation by adjusting the voltage selector card in the rear panel fused voltage selector cable connector assembly.

13) For additional assistance:

    Tel: 1-800-265-6681
    Fax: 613-226-2802

Fig. 2

FRONT PANEL CONTROLS



(1) ON-OFF Switch. Applies basic prime power to all stages.

(2) PRF Control. Varies PRF from 1.0 Hz to 1 kHz as follows:

Range 1	1	to 10	kHz
Range 2	10	to 100	kHz
Range 3	0.1	to 1	MHz

(3) DELAY Control. Controls the relative delay between the reference output pulse provided at the TRIG output (4) the main output (5) and (6). This delay is variable over the range of 100 ns to about 1.0 us. Delay LEADS or LAGS depending on the position of the LEAD-LAG switch.

(4) TRIG Output. This output is used to trigger the scope time base. The output is a TTL level 100 ns (approx.) pulse capable of driving a fifty ohm load. This output precedes the output at (5) or (6) if the two position LEAD-LAG switch is in the LEAD position. This output follows the output at (5) or (6) if the switch is in the LAG position. The delay range is variable from 100 ns to 1.0 us. The external trigger signal is applied at this input when the EXT-INT toggle switch is in the EXT position.

(5) OUT P Connector. BNC connector provides output to a high impedance load ($\geq$ 10K).

(6) OUT N Connector. BNC connector provides output to a high impedance load ($\geq$ 10K).

(7) PW Control. A one turn control and 2-position range switch which varies the output pulse width from 10 ns to 1.0 us. The minimum and maximum PW for each range and the corresponding maximum PRF are as follows. Note that the unit may fail if operated at duty cycles exceeding 10%.

	PW min	PW max
0.1 us Range	10 ns PRF max 1 MHz	100 ns PRF max 1 MHz
1.0 us Range	100 ns PRF max 1 MHz	1 us PRF max 100 kHz

(8) P AMP Control. One turn control which varies the P output pulse amplitude from 0 to +50 V to a high impedance load (R_L > 10K).

(9) N AMP Control. One turn control which varies the N output pulse amplitudes from 0 to -50 V to a high impedance load (R_L > 10K).

(10) P OFFSET. The P_{OUT} pulse may be offset by 0 to -50 Volts using this one turn control when the offset two-position switch is in the ON position.

(11) N OFFSET. The N_{OUT} pulse may be offset by 0 to +50 Volts using this one turn control when the offset two-position switch is in the ON position.

(12) EXT-INT Control. With this toggle switch in the INT position, the PRF of the AVR unit is controlled via an internal clock which in turn is controlled by the PRF control. With the toggle switch in the EXT position, the AVR unit requires a 0.2 usec TTL level pulse applied at the TRIG input in order to trigger the output stages. In addition, in this mode, the scope time base must be triggered by the external trigger source. To obtain an output pulse width equal to the input trigger pulse width, set the MODE AB switch in the B position.

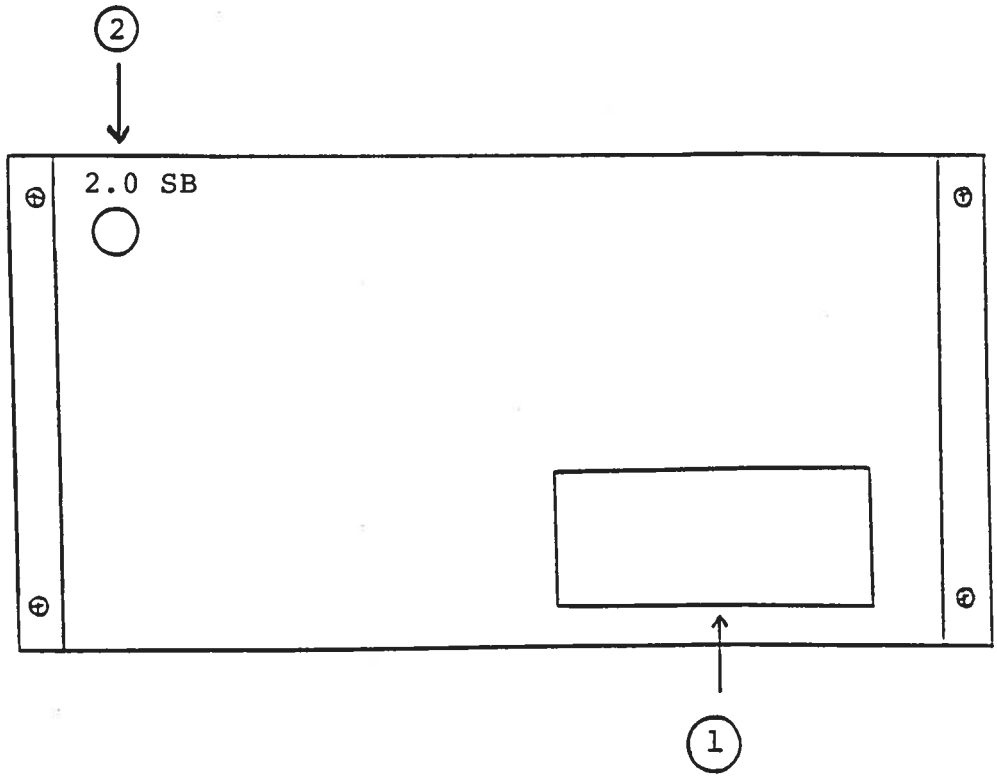
(13) MODE AB. With this switch in the A position, the output pulse width is controlled by the front panel PW controls (7) and (8). With the switch set in the B position and the INT-EXT switch (10) in the EXT position, the output pulse width is equal to a TTL level pulse width applied at the TRIG port (4).

(14) AVR units with a serial number higher than 5600 are protected by an automatic overload protective circuit which 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 PRF (i.e. switch to a lower range)
2) Reducing pulse width (i.e. switch to a lower range)
3) Removing output load short circuit (if any)

Fig. 3

BACK PANEL CONTROLS



(1) FUSED CONNECTOR, VOLTAGE SELECTOR. The detachable power cord is connected at this point. In addition, the removable cord is adjusted to select the desired input operating voltage. The unit also contains the main power fuse (0.5 Amp SB).

(2) 2.0 SB. Fuse which protects the output stage if the output duty cycle rating is exceeded.

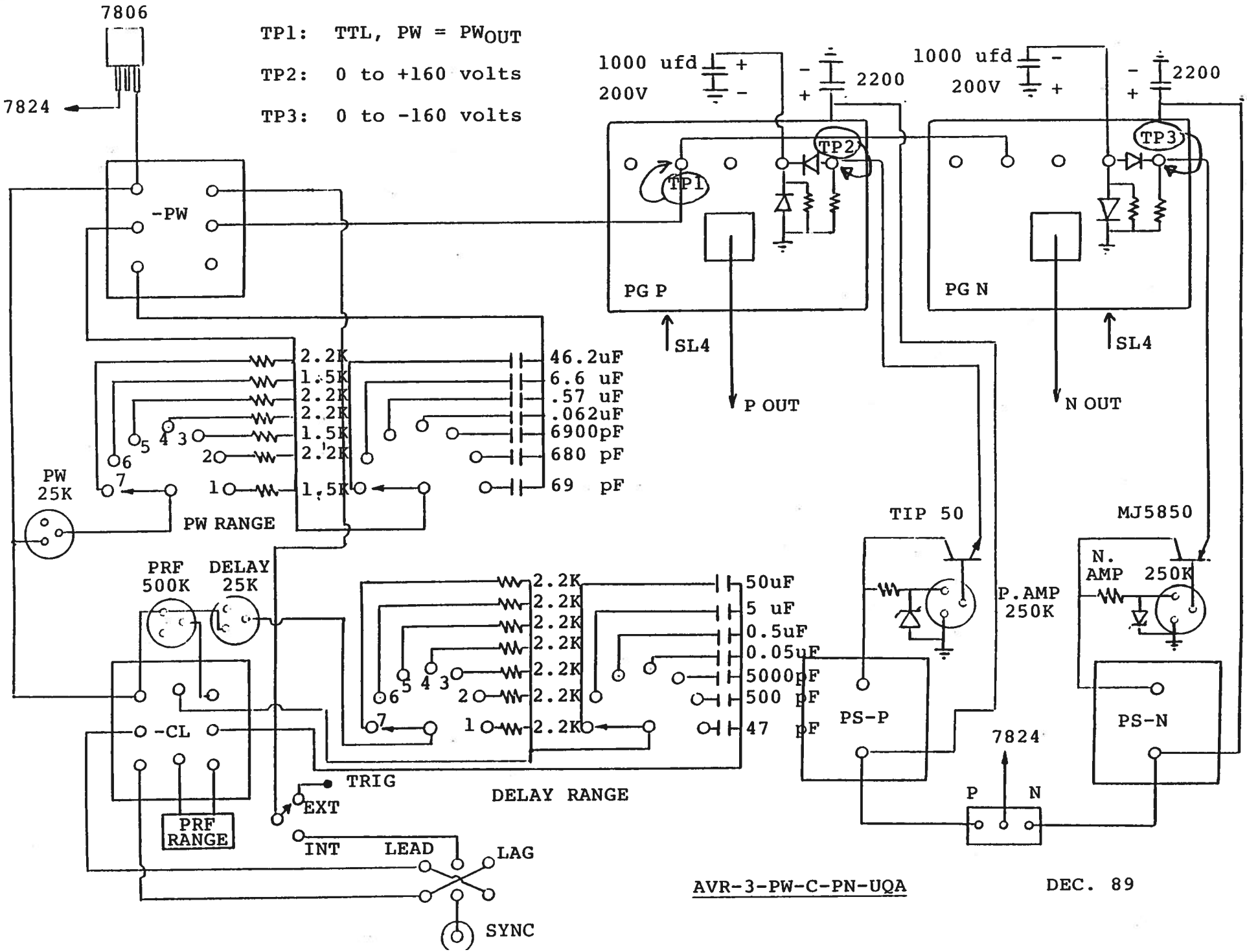

7806
7824
TP1: TTL, PW = PWOUT
TP2: 0 to +160 volts
TP3: 0 to -160 volts
1000 ufd
200V
2200
1000 ufd
200V
2200
TP1
TP2
TP3
PG P
PG N
SL4
SL4
P OUT
N OUT
-PW
2.2K
1.5K
2.2K
2.2K
1.5K
2.2K
1.5K
46.2uF
6.6 uF
.57 uF
.062uF
6900pF
680 pF
69 pF
PW
25K
PW RANGE
TIP 50
MJ5850
N.
AMP
250K
P.AMP
250K
PRF
500K
DELAY
25K
2.2K
2.2K
2.2K
2.2K
2.2K
2.2K
2.2K
50uF
5 uF
0.5uF
0.05uF
5000pF
500 pF
47 pF
-CL
PS-P
PS-N
7824
P
N
TRIG
EXT
DELAY RANGE
PRF
RANGE
INT
LEAD
LAG
SYNC
AVR-3-PW-C-PN-UQA
DEC. 89

Fig. 4a

POWER SUPPLY

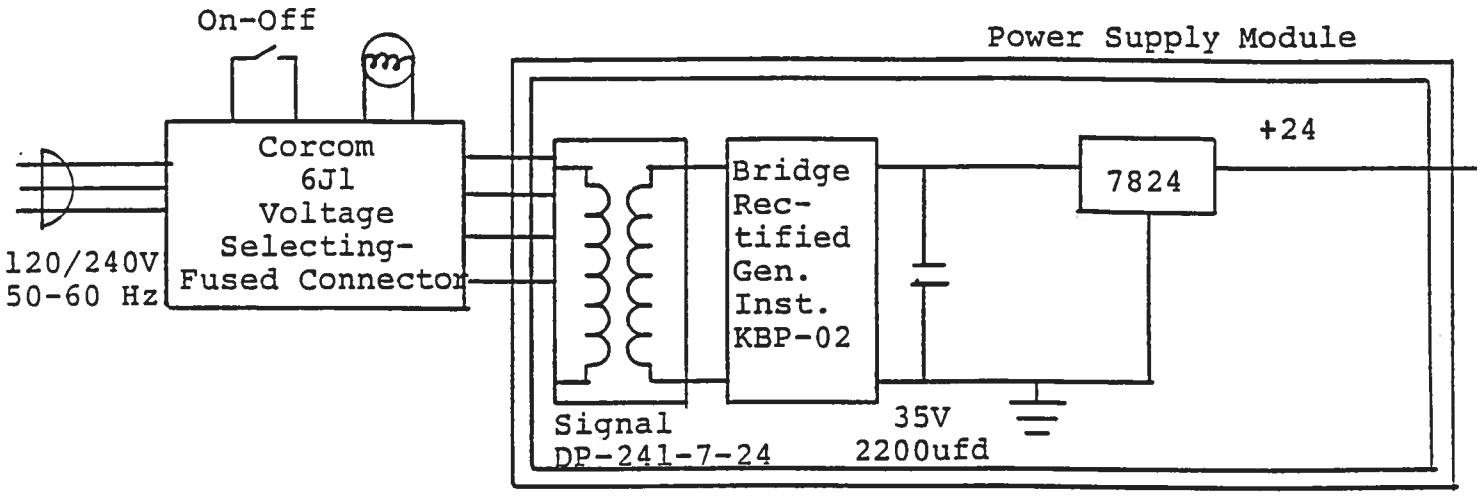


Fig. 4b

SYSTEM DESCRIPTION AND REPAIR PROCEDURE

The AVR-G1-C consists of the following basic modules:

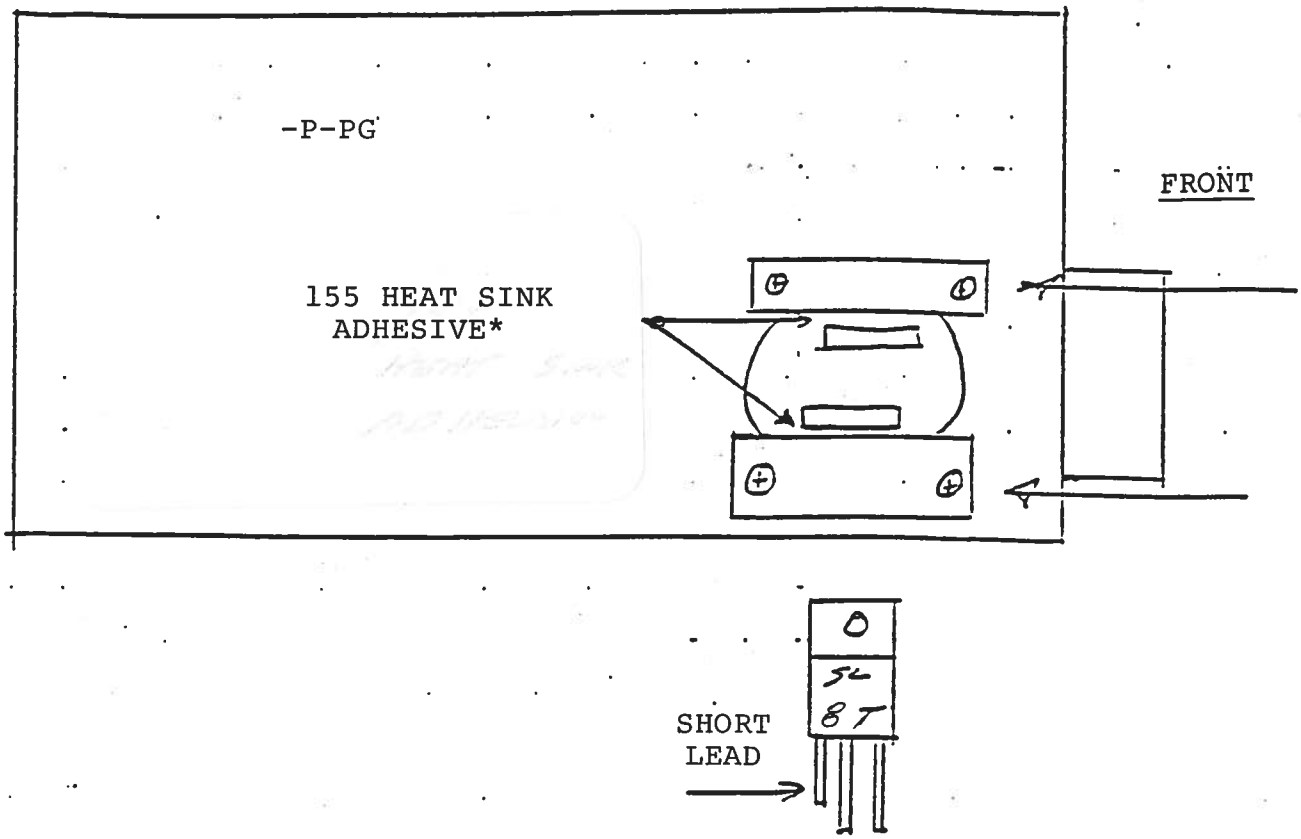
1) AVR-G1-PG pulse generator module (P and N)
2) AVR-G1-CL clock module
3) +24V power supply board
4) AVR-G1-PS-OS power supply module
5) AVR-G1-PW pulse width module
6) AVR-OL overload module

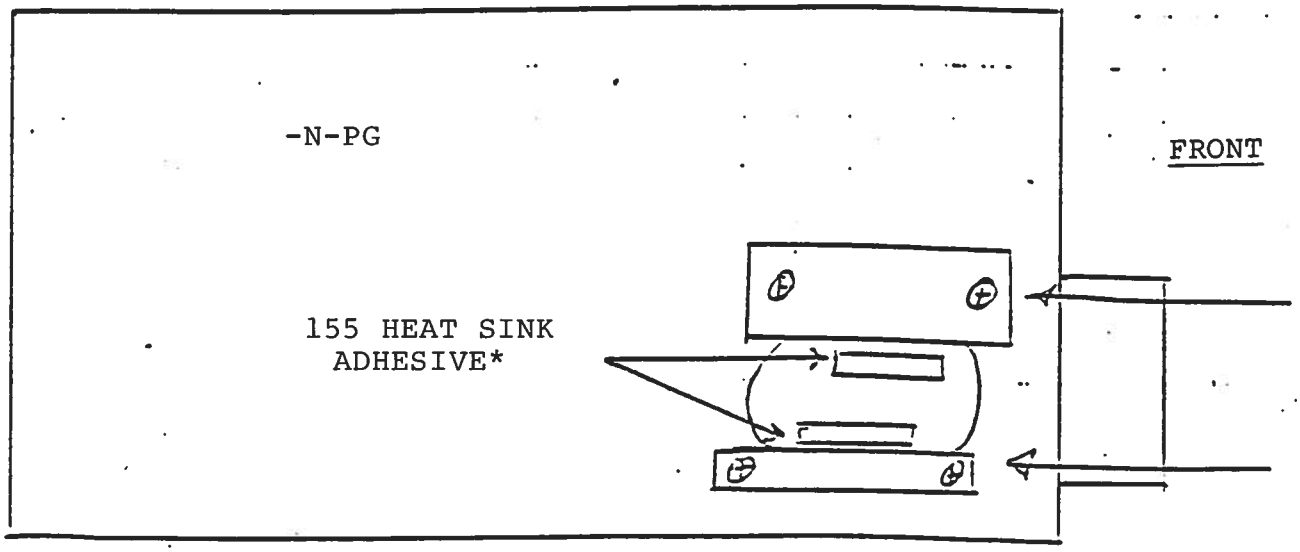
The modules are interconnected as shown in Fig. 4. The clock module controls the output PRF and the relative delay between the main output and the SYNC outputs. The PG pulse generator modules generate the output pulse. The PS-OS module generates 0 to ±50 volts to provide the pulse DC offsets. The PW module controls the output pulse width. In the event of an instrument malfunction, it is most likely that the rear panel 2.0A SB fuse or some of the output switching elements (SL8T) may have failed due to an output short circuit condition or to a high duty cycle condition. The switching elements may be accessed by removing the cover plate on the bottom side of the instrument. NOTE: First turn off the prime power. CAUTION: Briefly ground the SL8T tabs to discharge the 50 volts power supply potential. The elements may be removed from their sockets by means of a needle nosed pliers after removing the four counter sunk 2-56 Phillips screws which attach the small aluminum heat sinks to the chassis. The SL8T is a selected VMOS power transistor in a TO 220 package and may be checked on a curve tracer. If defective, replacement units should be ordered directly from Avtech. When replacing the SL8T switching elements, take care to insure that the short lead (of the three leads) is adjacent to the back of the chassis. (See following Fig.). The SL8T elements are electrically isolated from the small aluminum heat sinks but are bonded to the heat sinks using WAKEFIELD TYPE 155 HEAT SINK ADHESIVE. If the switching elements are not defective, then the four Phillips screws on the back panel should be removed. The top cover may then be slid off and the operation of the clock and power supply modules checked. The clock module is functioning properly if:

a) 0.1 us TTL level outputs are observed at pins 2 and 3.
b) The PRF of the outputs can be varied over the range of 1 kHz to 1 MHz using the PRF controls.
c) The relative delay between the pin 2 and 3 outputs can be varied by at least 1 us by the DELAY control.

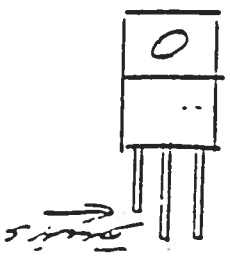
The sealed clock module must be returned to Avtech for repair or replacement if the above conditions are not observed.

SL8T HEAT SINKING





*CAUTION: INSURE THAT TABS OF SL8T DO NOT CONTACT H.S. BARS



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February 5, 1993.

Tom Moore MS 147
Texas Instruments Inc.
13588 North Central Expressway
Dallas, TX 75243

Dear Tom:

Following our telephone conversation of February 4, I am pleased to provide a revised price and delivery quotation for a special purpose pulse generator meeting the following specifications:

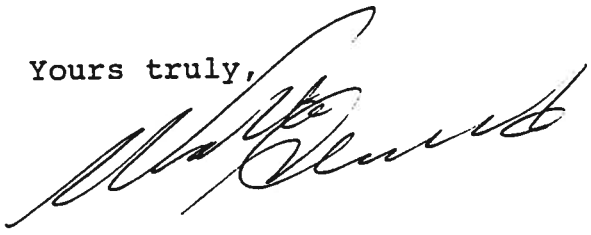
Model designation:	AVR-G1-PN-OT-C-TIB.	
Output format:	See enclosed sketch.	
	P OUT	N OUT
Output amplitude: (R_L 10K)	0 to +50 Volts. Controlled by a one turn control.	0 to -50 Volts. Controlled by a one turn control.
DC offset:	0 to -50 Volts. Controlled by a one turn control.	0 to +50 Volts. Controlled by a one turn control.
Output pulse width:	10 ns to 1.0 us. Controlled by a two-position switch and a one turn control.	
Rise, fall time:	$\leq$ 7 ns.	
PRF:	1 kHz to 1.0 MHz via a 3-position range switch and a one turn fine control.	
Max. duty cycle:	10%.	

.../2

Other:	See standard AVR-G1-C, pages 54 and 55, Cat. No. 8.
Price:	$3,998.00 US each, FOB destination.
Delivery:	30 days.
Available options:	-ATP option: Ten turn locking dial control of positive pulse amplitude; $50.00 US.
	-ATN option: Ten turn locking dial control of negative pulse amplitude; $50.00 US.
	-OTP: Ten turn locking dial control of positive out DC offset; $50.00 US.
	-OTN: Ten turn locking dial control of negative out DC offset; $50.00 US.
	-PWT: Ten turn locking dial control of pulse width; $50.00 US.
	-EW: Electronic pulse width control (0 to +10 Volts, see page 9, Cat. No. 8); $350.00 US.
	-EA: Electronic amplitude control (0 to +10 Volts, see page 9, Cat. No. 8); $350.00 US.
	-EO: Electronic DC offset control (0 to +10 Volts, see page 9, Cat. No. 8); $350.00 US.

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.

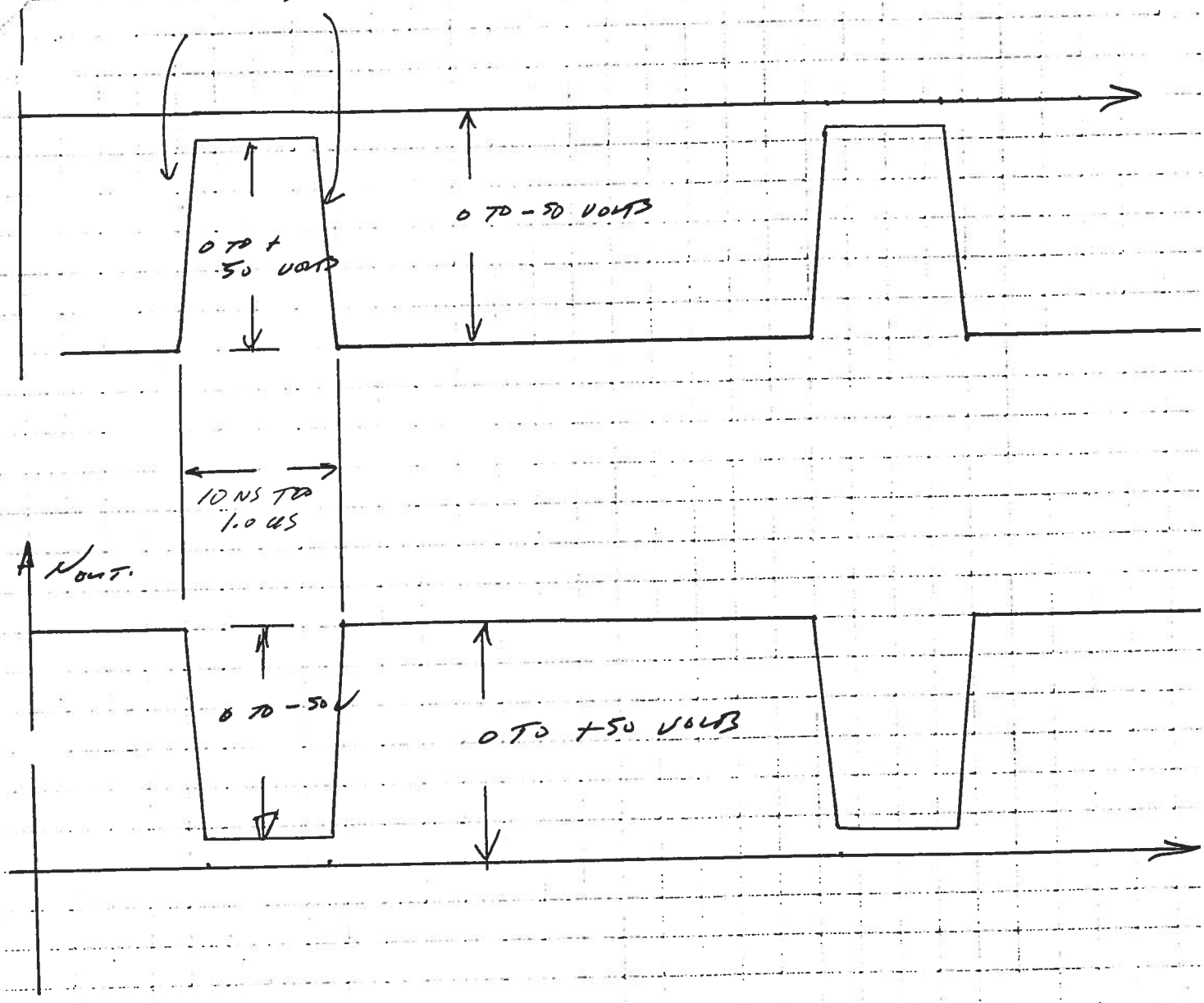
Yours truly,



Dr. Walter Chudobiak
Chief Engineer

WC:pr
Encl. Sketch

P_{OUT} RISE, FALL TIME ≤ 7ns.



HRR-GI-PN-OT-C-IIB OUTPUT

WAVEFORMS

03.04.93