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INSTRUCTIONS

MODEL AV-155C-C-OP1-TITA 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.

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CAUTION

To avoid possible damage to the laser diode, the following start up and shut down sequences should be followed:

START UP SEQUENCE

1) POWER switch is OFF (i.e. button out).

2) Set amplitude controls fully CCW.

3) Set OPERATE-STANDBY switch to STANDBY position.

4) Solder connect the laser diode to the output terminals.

5) Apply prime power by setting the POWER switch in the ON position (i.e. push button in).

6) Set OPERATE-STANDBY switch to OPERATE position.

7) Set amplitude to desired level. Do not change the position of the OPERATE-STANDBY switch from OPERATE to STANDBY without first setting the amplitude controls to fully CCW.

SHUT DOWN SEQUENCE

1) Set amplitude controls fully CCW.

2) Set OPERATE-STANDBY switch to the STANDBY position.

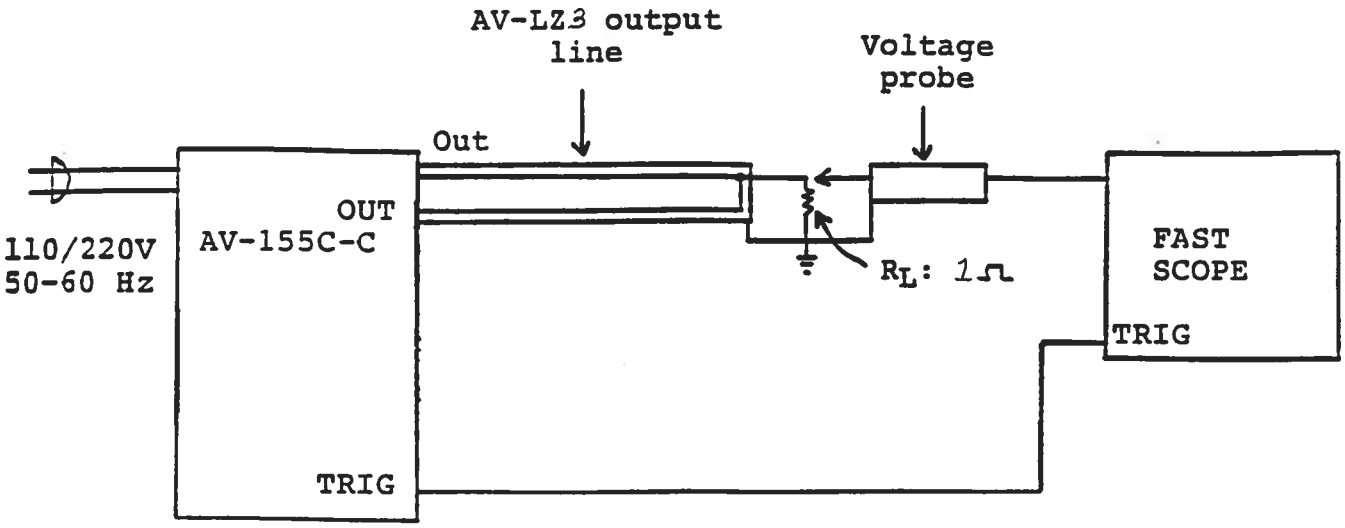
3) Turn off the prime power by pushing the POWER switch button.

4) Remove the laser diode from the output terminals.

Fig. 1

MODEL AV-155C-C PULSE GENERATOR TEST ARRANGEMENT

(RESISTIVE LOAD, NO DIODE)



Notes:

1) For front panel manual control of the output parameters, the rear panel LOCAL-REMOTE switch must be in the LOCAL position. For remote control using a personal computer, the switch should be in the REMOTE position. See the AN-101-AV-155C-C section at the back of this manual for the instructions for this mode of operation.

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

3) A low-inductance resistor should be used as the initial test load. Note that an inductance of 50 nh will yield an inductance spike of about one Volt. With a low-inductance one Ohm load, the overshoot may be as high as 10%. The overshoot will significantly decrease as the load resistance is increased to 2 or 3 Ohms. The load may be solder connected to the small PCB board at the end of the AV-LZ3 line. Alternatively, up to 30 cm of 50 Ohm cable may be connected to the SMA connector on the board and the 1 Ohm load placed at the end of the 50 Ohm cable (see our fax of November 12, 1996).

4) To control the unit via the internal clock, set the INT-EXTA-EXTB switch in the INT position. Set the PRF range switch in either the 10K or 100K position.

5) The output pulse width is controlled by means of the front panel ten turn PW control and the X1-X10 range switch. The control should initially be set mid range and the pulse width adjusted using an oscilloscope.

6) The output pulse amplitude is controlled by means of the front panel ten turn AMP control and the 0.2-2.0 Amp range switch. Note that the load voltage range (i.e. compliance voltage) of the unit is 4 Volts so the load resistance must be sufficiently low (ideally one Ohm) so that the load voltage does not exceed 4 Volts.

7) The output DC bias is controlled by the front panel DC bias control. The polarity of the bias is always the same as the output pulse polarity.

8) 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 0.1 us to 10 us. The TRIG output precedes the main output when the ADVANCE-DELAY switch is in the ADVANCE position and lags when the switch is in the DELAY position.

	MIN	MAX
Range 1	0.1 us	1.0 us
Range 2	1.0 us	10 us

9A) The unit may also be triggered externally by setting the INT-EXTA-EXTB switch in either the EXTA or EXTB position and applying a trigger pulse to the TRIG BNC.

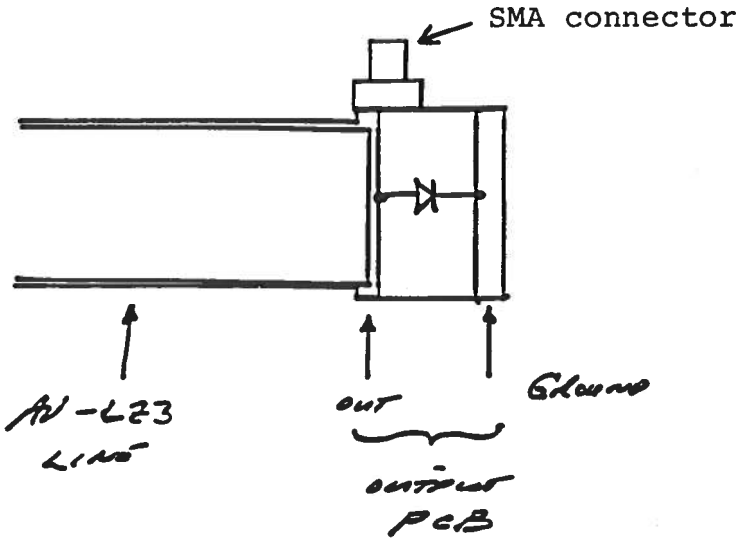
9B) When the switch is in the A position the unit operates as a voltage to current converter as follows:

$$I_{OUT} = 0.5\ V_{IN}$$

Note that in this mode, the input amplitude should not exceed +4 Volts and also note that the PRF pulse width, amplitude and DC bias controls on the front panel are inactive.

9C) When the switch is in the B position, the unit requires a TTL input trigger pulse (PW > 50 ns) and the output pulse width, amplitude and DC bias are controlled by the front panel controls. The input trigger rate should not exceed 1.0 MHz as this may result in damage to the unit.

10) The diode load may be solder connected (as shown below) to the end of the AV-LZ3 flexible line which protrudes from the front panel.



As with the resistive load, the laser diode may also be placed at the end of a 30 cm 50 Ohm cable which connects to the SMA connector on the small PCB output board.

11) If the diode impedance is less than one Ohm, the output waveform may exhibit severe overshoot. The addition of a small series resistor will serve to reduce the overshoot. Also, if the diode has significant induction (> 10 nh) overshoot will be observed and for this reason the diode lead lengths must be extremely short (≤ 0.5 inches).

12) The unit can be converted from 120 to 240V 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: (613) 226-5772
Fax: (613) 226-2802

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Fax Ref No: 985

From: Avtech Electrosystems Ltd.

To: National Taiwan Inst. of Technology

Our Fax No: (613) 226-2802

Date: November 12, 1996

Attn: Prof. San-Liang Lee

Receivers Fax No: 011 886 2 7376424

Subject: Your e-mail of Nov. 11/96

No. of pages: 2

1) Your IEEE 488.2 card is compatible with the OP1 option. We no longer recommend the OP2 option as we understand that the Pinnacle Instruments PC1 unit is no longer available.

2) For chip probing applications we could supply an AV-155C-C-P-OP1 unit with an AV-LZ3 output line (1 meter in length) with an SMA connector on the output PCB. You could connect up to 30 cm of miniature 50 Ohm cable (eg. RG174) and your probing station to this connector. I enclose an example of a waveform which simulates this arrangement. We used a one Ohm resistive load with 3 cm long leads to deliberately simulate inductance in your probing arrangement. With this arrangement, the overshoot and ringing is relatively low and the rise time is degraded only moderately. To specify this SMA feature, add the suffix -TITA to the model number and add $150.00 US to the price. Note that if the length of RG174 cable is increased beyond 30 cm, the rise time degrades further but the overshoot decreases. Also note that a copy of the waveform has been mailed to you.

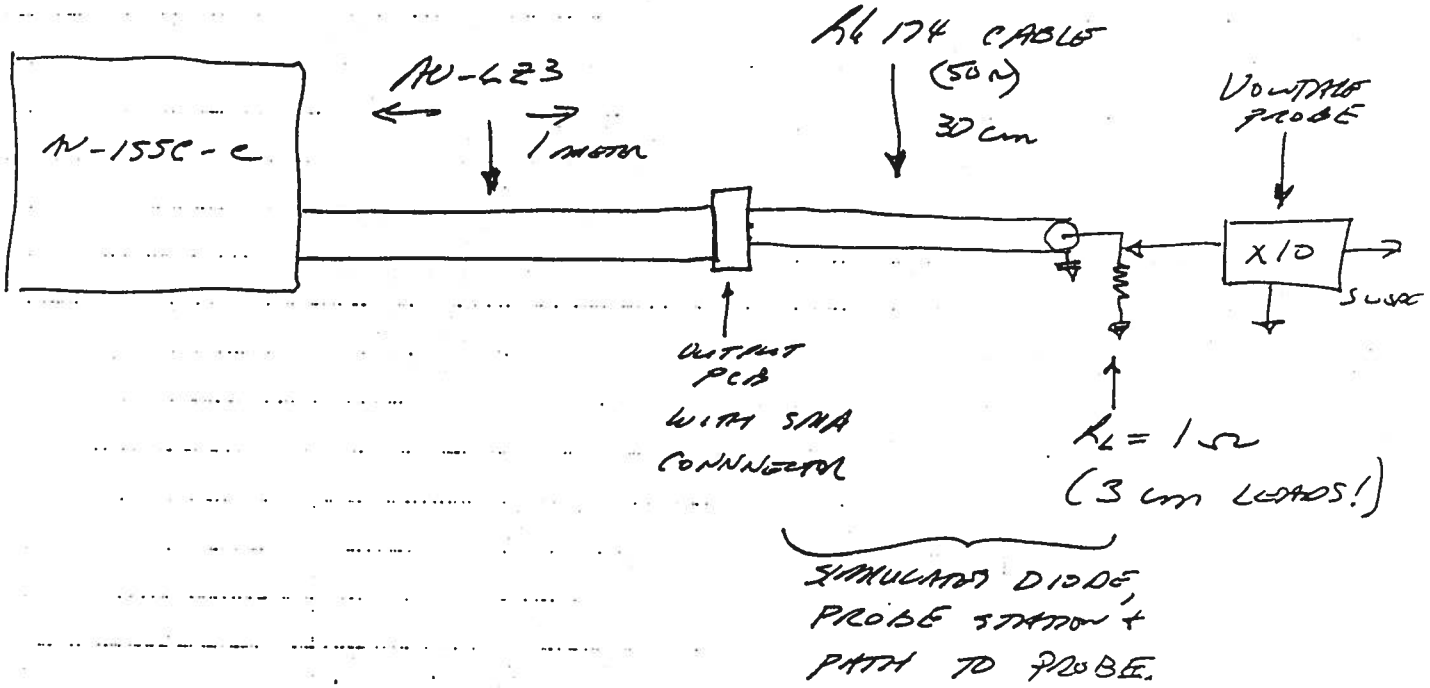
3) We do not have a lower noise version of the AV-155C-C (other than the AV-155A-C).

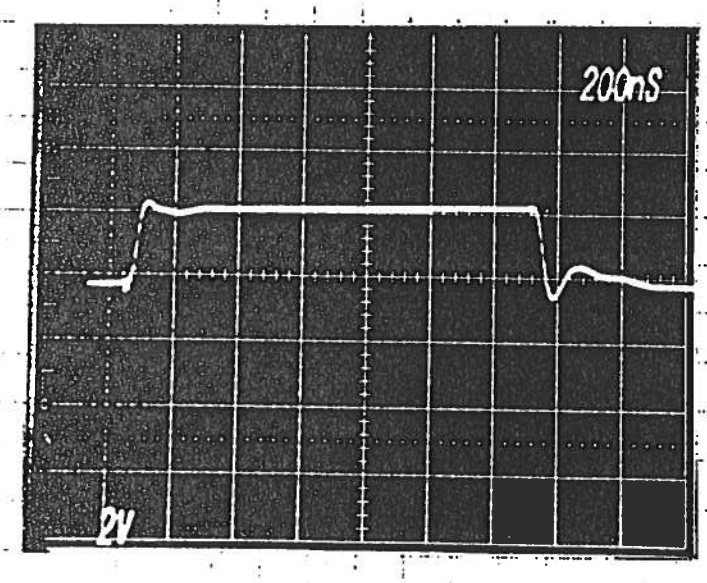
Regards

Dr. Walter Chudobiak
Chief Engineer

WC:pr

MODEL N-155C-C FOR CMP PROBE APPLICATION





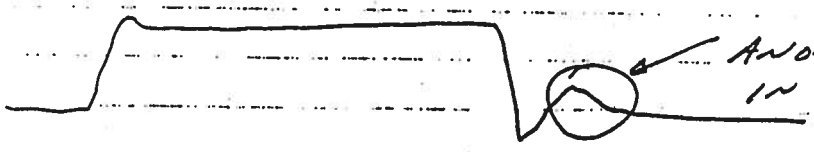
LOAD VOLTAGE (-: CURRENT)

200 NS/DIV

2 VOLTS/DIV

2 AMPS/DIV

PRF = 200 KHz.



ANOMALY IN PROTOTYPE TEST UNIT. NOT PRESENT IN PRODUCTION UNITS.

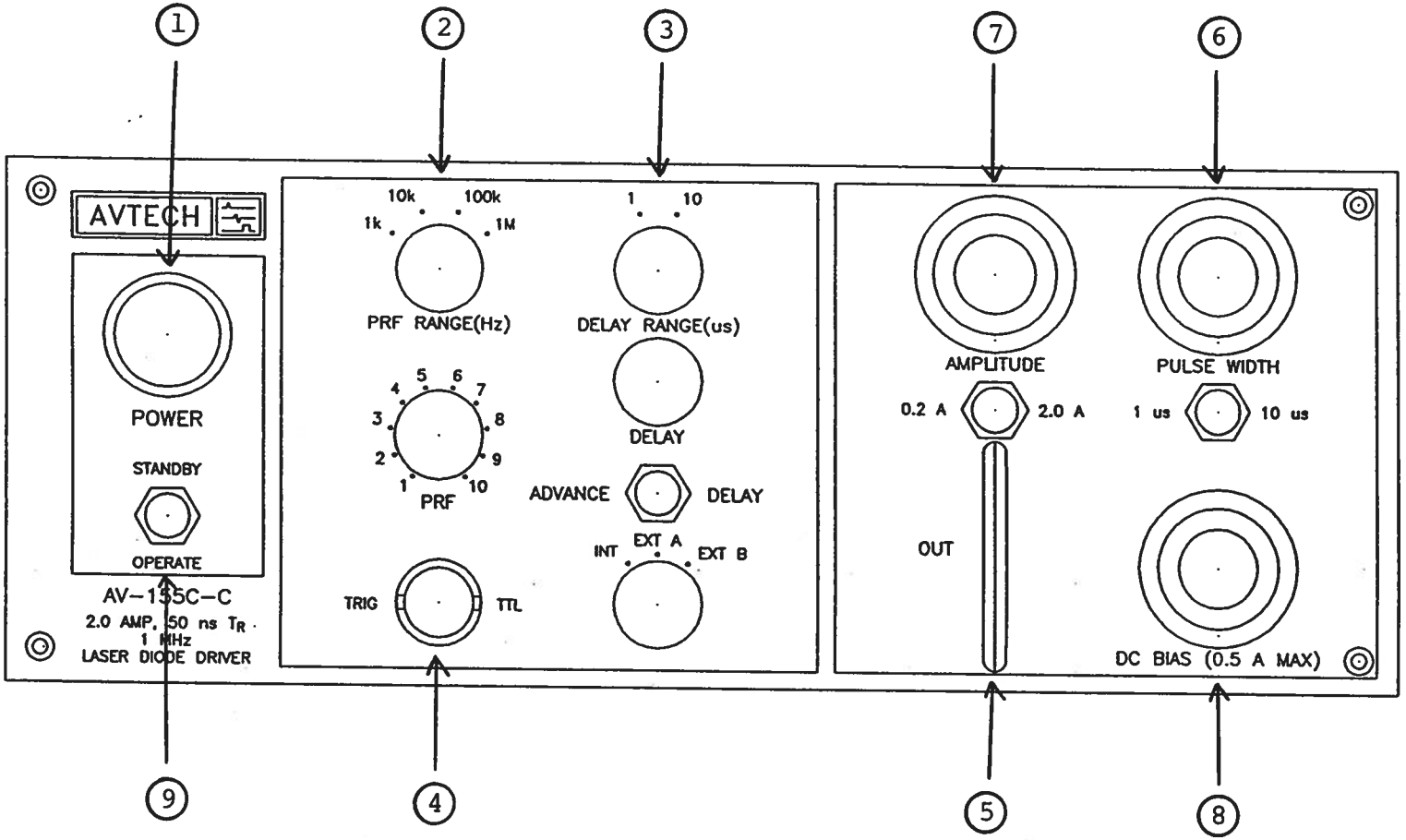


Fig. 2

FRONT PANEL CONTROLS

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

(2) PRF Control. Varies PRF from 100 Hz to 1 MHz as follows:

100	Hz	to	1	kHz
1	kHz	to	10	kHz
10	kHz	to	100	kHz
100	kHz	to	1	MHz

(3) DELAY Control. Controls the relative delay between the reference output pulse provided at the TRIG output (4) and the main output (5). This delay is variable over the range of 0.1 to about 100 us. Delay LEADS or LAGS depending on the position of the ADVANCE-DELAY switch.

	MIN	MAX
Range 1	0.1 us	1.0 us
Range 2	1.0 us	10 us

(4) TRIG. When the INT-EXTA-EXTB switch is in the INT position 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) if the two position ADVANCE-DELAY switch is in the ADVANCE position. This output follows the output at (5) if the switch is in the DELAY position. The delay range is variable from 0.1 us to 100 us. The external trigger signal is applied at this input when the toggle switch is in the EXTA or EXTB position. When the switch is in the A position the unit operates as a voltage to current converter as follows:

$$I_{OUT} = 0.5\ V_{IN}$$

Note that in this mode, the input amplitude should not exceed +4 Volts and also note that the PRF, pulse width, amplitude and DC bias controls on the front panel are inactive.

When the switch is in the B position, the unit requires a TTL input trigger pulse (PW > 50 ns) and the output pulse width, amplitude and DC bias are controlled by the front panel controls. The input trigger rate should not exceed 1.0 MHz as this may result in damage to the unit.

(5) OUT. 1 meter long AV-LZ3 flexible output line protrudes from the front panel. Diode load and series matching resistor to be solder connected to end of line.

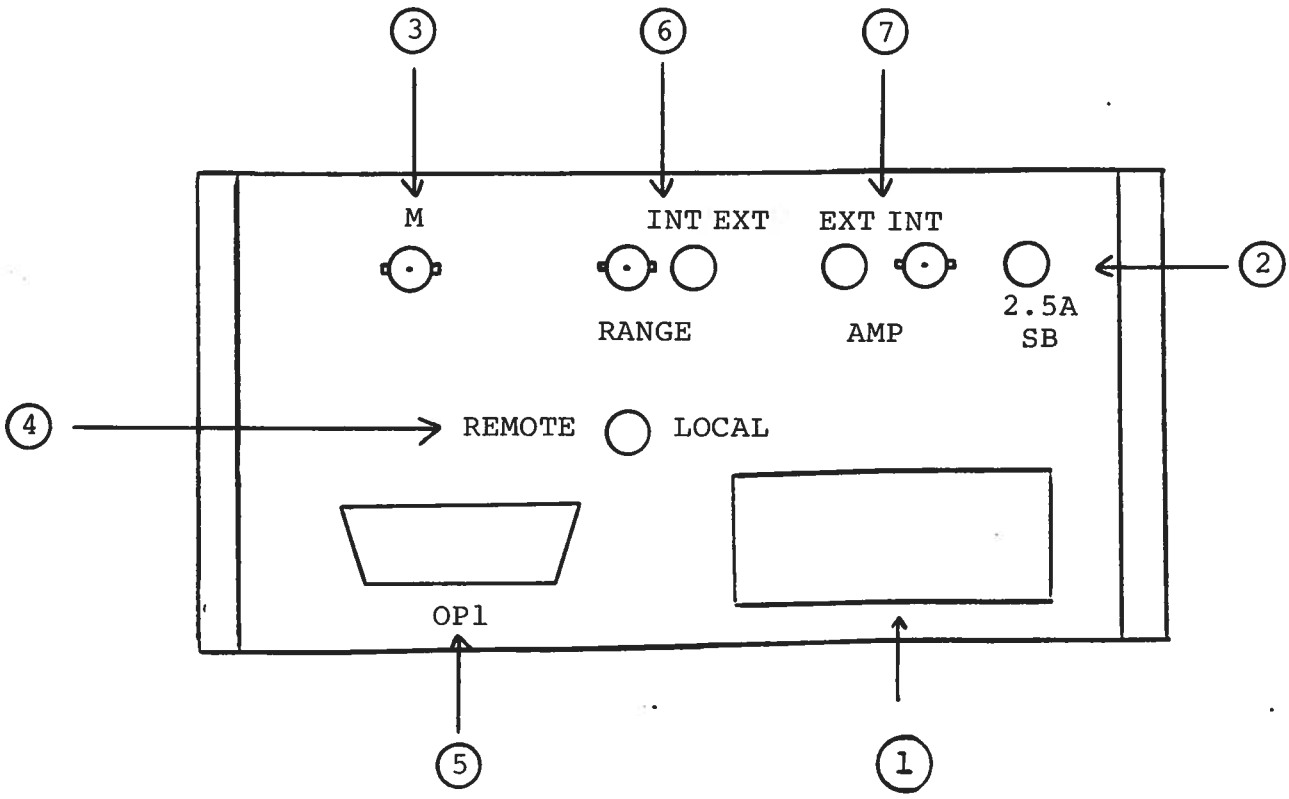
(6) PULSE WIDTH. Varies output pulse width as follows (INT and EXTB MODE only): 100 ns to 1.0 us
1.0 us to 10 us

(7) PULSE AMPLITUDE. Ten turn amplitude control and a two-position range switch varies output pulse amplitude from 0 to 200 mA and from 0 to 2.0 Amp (INT and EXTB mode only).

(8) DC BIAS AMPLITUDE. Ten turn offset control varies DC offset from 0 to 500 mA (INT and EXTB mode only). (Ten turn control for -OT option units).

(9) STANDBY-OPERATE. When this switch is in the STANDBY position, a set of relay controls shorts out the laser diode whether the prime power is ON or OFF. When the switch is in the OPERATE position, the relay contacts open, provided the prime power is on. See the START UP and SHUT DOWN SEQUENCE notes preceding Fig. 1 for a full discussion of the operation of this switch.

Fig. 3 BACK PANEL CONTROLS



BACK PANEL CONTROLS

1) Power Entry Module. Detachable line cord connects to this point. Also contains voltage selector card and line fuse (0.50 A SB).

2) 2.5 A SB Fuse. Limits current supplied to the output stage.

3) Monitor Option. BNC conncector provides a coincident replica of the output pulse. For $R_L \geq 1K$.

$$I_{LOAD} = 2\ V_M \text{ (Volts, Amp)}$$

For $R_L = 50$ Ohm

$$I_{LOAD} = 4\ V_M \text{ (Volts, Amp)}$$

V_M is the monitor output voltage, amplitude is determined using a scope.

4) LOCAL REMOTE SWITCH. This two-position switch must be in the LOCAL position to operate the instrument from the front panel controls. To control the instrument using your personal computer, the switch must be in the REMOTE position.

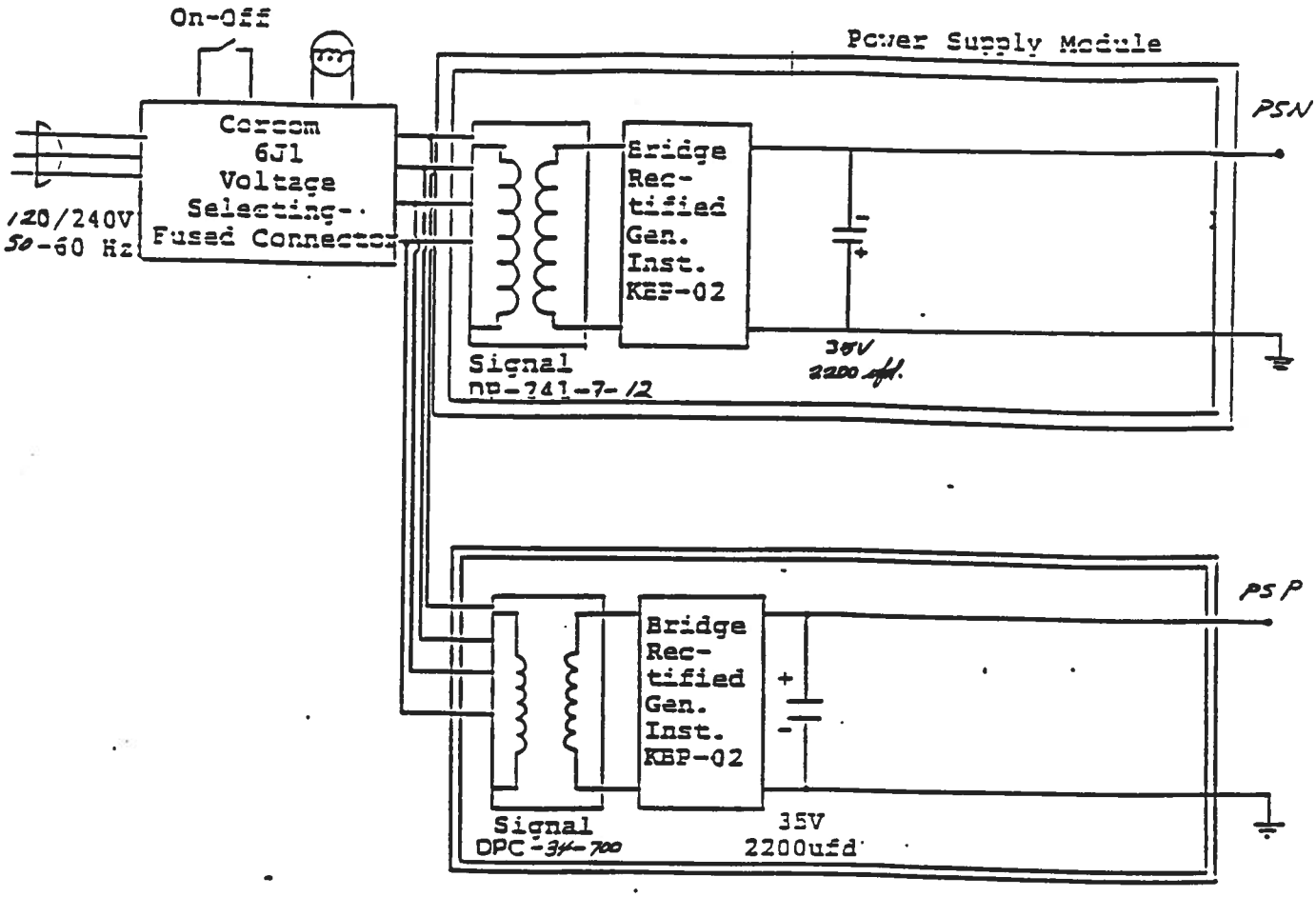
5) OP1 CONNECTOR. GPIB cable (supplied) connects between this connector and your personal computer.

6) RANGE. For remote control of pulse amplitude range, set the two-position switch in the EXT position and apply to the BNC connector, +5 Volts for 200 mA or 0 Volts for 2.0 Ampere.

7) AMP. For remote control of pulse amplitude, set the two-position switch in the EXT position and apply 0 to +10 VDC ($R_{IN} > 10K$) to the BNC connector.

Fig. 4

POWER SUPPLY



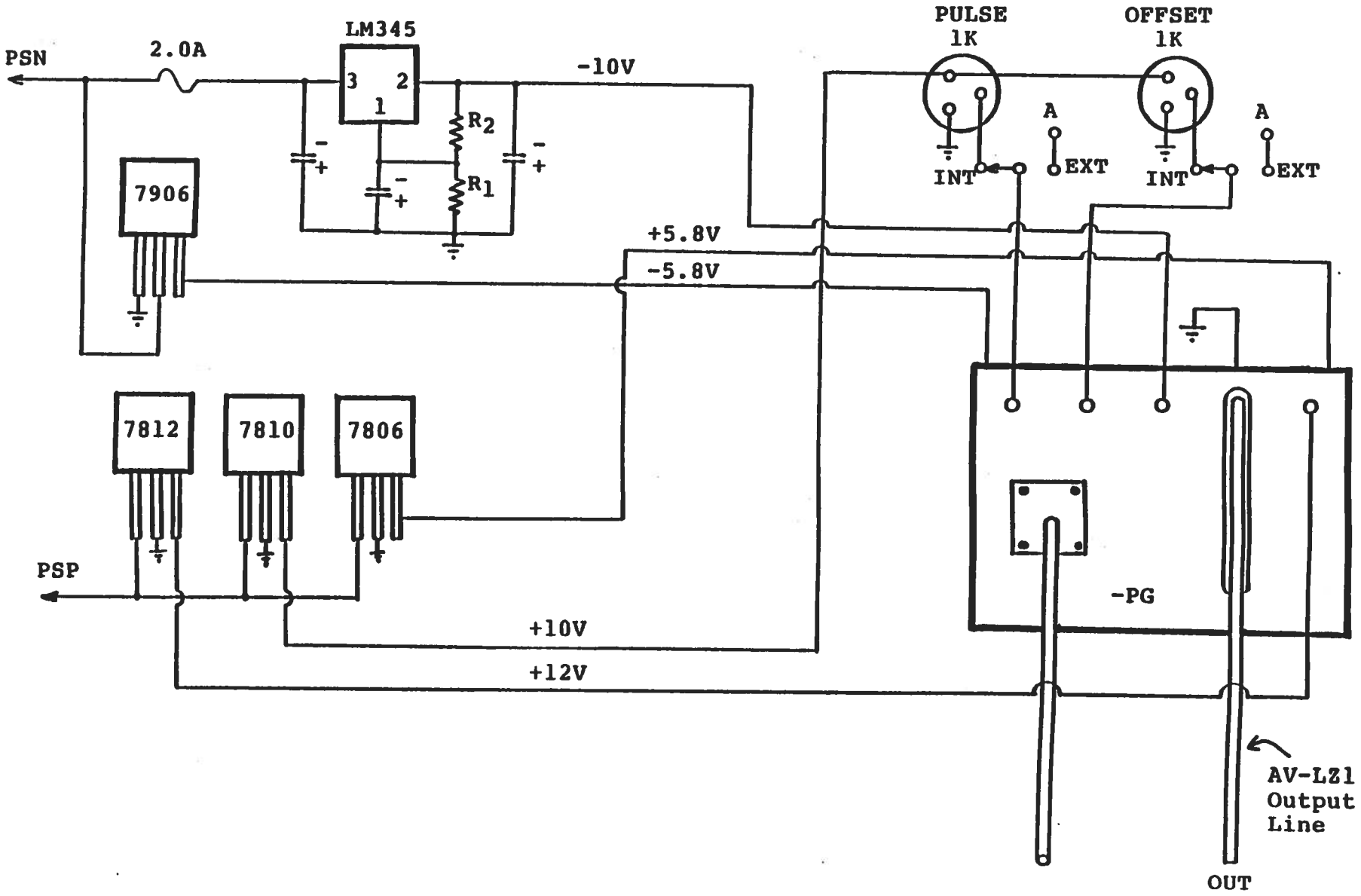


Fig. 5: AV-155-PS-DUP3 BLOCK DIAGRAM

SYSTEM DESCRIPTION AND REPAIR

Model AV-155C-C consists of a clock module (-CL2), a pulse generator module (AV-155C-PG) and a power supply which supplies -10V, -5.8V, +12V and +5.8 Volts to the modules. The power supply and block diagram are shown in Figs. 4 and 5.

If the instrument does not provide an output, check the line fuse and the 2.5 A SB fuses. If the fuses are not at fault, remove the top cover and check the -10V, -5.8V, +12V and +5.8 voltage levels. If the voltage levels are correct then the -PG module is defective. The sealed -PG module must then be returned to AVTECH for repair and replacement.

1.0 Introduction

This section describes how to use the OP-1 GPIB Bus Listener interface for remote computer control of the Avtech pulse generator, by means of the IEEE 488 General Purpose Interface Bus (GPIB).

The available commands and their structure, a typical command sequence and a sample program are included.

In addition, possible methods of incorporating remote duty cycle limit checking and instructions on how to change the GPIB address are provided

2.0 Interface to the GPIB

The IEEE 488 compatible Bus functions available to the user for GPIB control are as follows: The listed functions define a Bus Listener capability:

- SH0, AH1, T0, TE0, L2, LE0, SR0, RL0, PP0, DC1, DT0, C0.

2.1 Available Commands

The OP-1 GPIB user interface is designed to be used to remotely program the Avtech pulse generator to control the pulse repetition rate, pulse width, pulse amplitude and delayed (or advanced) trigger output.

The available command acronyms, outputs, units and range of acceptable values for the AV155C-C-P generator are defined in the table below:

Acronym	Output	Units	Range	Decades
I	I (current) amplitude	Amps	0 to 2	
R	Repetition rate	Hertz	100 to 1000000	4
W	Width of pulse	micro-sec	0.1 to 10	2
D	Delay (trigger)	micro-sec	0.1 to 10	2
A	Advance (trigger)	micro-sec	0.1 to 10	2

2.2 Command Interpretation

The command may utilize the defined single letter acronym, or may be expanded to a longer word to make the control program easier to understand. This is because letters following the defined acronym letter are ignored. For example, a command of "I=0.2" will cause exactly the same result if the command is sent as "I (current) level of output pulse = 0.2". However, it is mandatory that the first letter of each command be one of the five defined acronyms.

Acronyms are case insensitive, for example, "R" or "r" are the same.

The number following the acronym letter may be any number in the range specified, however, the number of significant digits are limited to one part in 255 (for 8 bits of output resolution). For example, rep rate values of 128.2, 128.3 or 128.2145 will all result in the same output. (Note that output resolution and accuracy are not necessarily the same).

Leading or trailing zeros in numbers will be ignored.

Numbers expressed in "exponential" format will NOT be interpreted correctly. For example, 3e+2 will be interpreted as 3, not as 300.

The range of the specified values must be as specified for the equipment. Numbers outside the range will be ignored.

If desired, trailing text may be added to make the control program easier to understand, since it will be ignored. For example, a command of "delay=2" will result in the same output as the command "delay = 2 microseconds".

The term "Delay" is used to specify the duration of the delay between the trigger output pulse and the occurrence of the actual output pulse. The term "Advance" similarly refers to the amount of time the trigger pulse will occur prior to the output pulse.

If an invalid command is sent, the unit will ignore the command and the previous value will remain unchanged. If an "out-of-range" value is sent, the unit will also ignore the command.

2.3 Typical Command Sequence Interpretation

Assume the following commands are sent using the computer, using the appropriate command structure as specified for the user's GPIB controller. Note that the default GPIB address is eight.

R=100
I= 1
A=1
W=2

For example, for a GPIB controller from National Instruments, the following set of commands would be sent:

```
ibwrt "r=100"
ibwrt "i=1"
ibwrt "a=1"
ibwrt "w=2"
```

This command sequence will cause the generator to produce an output pulse of width 2 micro-sec and an amplitude of 1 amp peak, repeated at a rate of 100 pulses per second. An oscilloscope attached to the generator output will confirm the result. If the generator output trigger port is used, it will be noted that each output pulse will occur 1 micro-sec after the trigger pulse occurs.

2.4 Sample Program

To illustrate the remote control process by means of the GPIB, a sample program written in BASIC is provided. While this example is prepared for use with the B&C MicroSystems PC488 circuit card, the general principles of control apply to any IEEE 488 GPIB Controller.

```
'TEST of Pulser Controller
OPEN "PC488" FOR OUTPUT AS #1
PRINT #1, "ABORT"
PRINT #1, "CLEAR"
PRINT #1, "OUTPUT 8;I", 1
PRINT #1, "OUTPUT 8;R", 100
PRINT #1, "OUTPUT 8;A", 1
PRINT #1, "OUTPUT 8;W",2
END
```

3.0 Duty Cycle Limits

Typically, Avtech pulse generators are limited to a maximum duty cycle because of thermal constraints, where duty cycle is the ratio of Pulse Width to the reciprocal of the Repetition Rate (i.e.; R times W). Although the generator contains automatic protection against an excessive duty cycle, whenever this protection is activated, the output is inhibited. Therefore, it may be desirable to have the control computer calculate the duty ratio, then generate a warning message to the operator whenever the limits are exceeded (preferably prior to actually sending the command sequence).

This message could caution the user either to reduce the repetition rate or the pulse width, to avoid thermal overload.

While this calculation is not mandatory, it could avoid the annoyance of automatic inhibiting of the generator output.

4.0 Changing the Unit GPIB Address

Since the GPIB data bus address for the pulse generator has been preset to "8" in the factory, commands are required to be sent to this address. However, the user may wish to change the address to any address in the allowed range of 0 to 30. This address may be easily changed by re-setting the GPIB address switch on the GPIB Interface board located inside the pulse generator chassis.

The address is set by means of a five position "Dipswitch " located on the top of a small circuit card located inside the enclosure near the top rear. The switch may observed to be set to the default address by noting that the Dipswitch position 4 is set in the OFF position, defining a binary address of 8.

The switch setting is calculated as the sum of the switch weights in the OFF position, calculated as follows: (a switch in the ON position it has a weight of zero):

Switch Number	OFF Weight
1	1
2	2
3	4
4	8
5	16

For example, a switch with positions 1, 4 and 5 set to OFF will result in an address setting of 25 (16 plus 8 plus 1 = 25).

5.0 Trouble-Shooting Aid

In the event that difficulties are encountered communicating via the GPIB interface, two auxiliary communications status indicators have been included on the GPIB interface circuit card. These status indicators are small LED lamps, one which flashes briefly whenever a properly addressed command is received. The second LED will light whenever an out-of-range value or invalid command is received, and will remain lit until a valid command with a valid in-range value is subsequently received.

March 14/97

Disk: AV-150

-M

Name: 55CCTITA.INS