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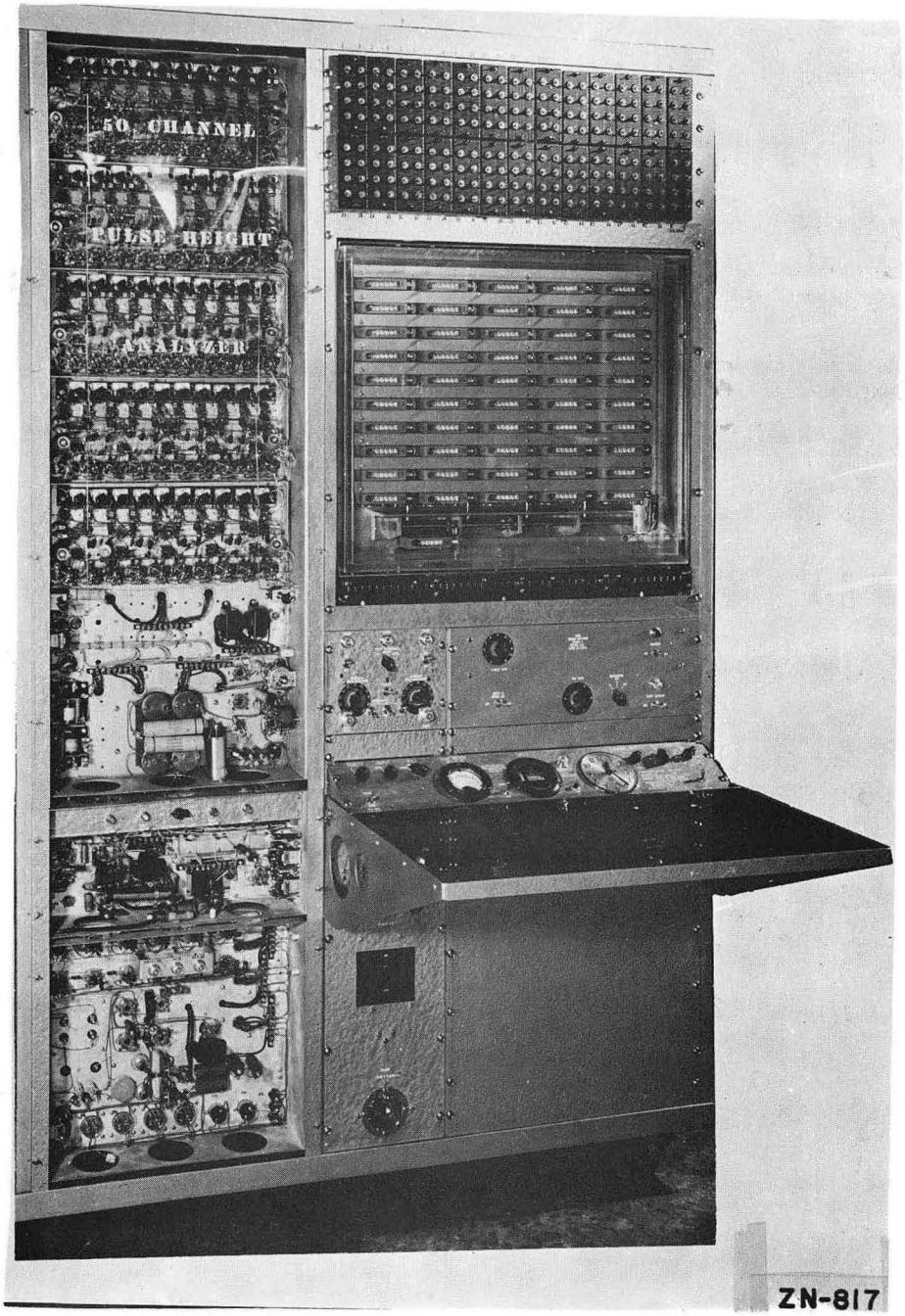
# 50-CHANNEL PULSE-HEIGHT ANALYZER ACCELERATOR TYPE

## MAINTENANCE MANUAL

Robert E. Heller
December 15, 1953

Berkeley, California




50-CHANNEL PULSE-HEIGHT ANALYZER, ACCELERATOR TYPE - MODEL I

## SPECIFICATIONS

### PULSE-HEIGHT ANALYZER - DWG. 6T5194
### ACCELERATOR TYPE - MODEL I

| | |
|---|---|
| Channels: | 50 |
| Channel Widths: | 0, 0.05, 1, 3, 5 volts |
| Resolution: | 3 microseconds, single channel<br>3 microseconds, adjacent channel |
| Channel Discrimination Stability: | ± 0.05 volts |
| Wall Sharing Error: | 1% |
| Register Scale Factor: | 2, 16 |
| Total Count Register Scaling Factor: | Either register scale factor or register scale factor squared. |
| Single Channel Counting Rates: | 30 pps max for scale of 2<br>240 pps max for scale of 16 |
| Random Analyzer Counting Rate: | 500 pps max. |
| Low-Level Discrimination: | 1-volt steps from 2 to 221 volts |
| Power: | 3 KW, 230 volts, 60 cycle, 3 phase |

# 50-CHANNEL PULSE-HEIGHT ANALYZER ACCELERATOR TYPE

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Radiation Laboratory, Department of Physics
University of California, Berkeley, California

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## INTRODUCTION

By use of ionization-chamber or scintillation equipment, radioactive particle energy can be transferred into electrical pulses. The pulse amplitudes, in turn, are proportional to particle energy. To establish a radioactivity energy spectrum, an instrument for determination of numerical pulse intensity as a function of particle energy is required. Such an instrument is the pulse-height analyzer.

This maintenance and operation manual for the UCRL 50-Channel Pulse-Height Analyzer, Accelerator Type, is by no means complete. It is intended primarily for use as an operational and maintenance aid.

## OPERATING INSTRUCTIONS

CAUTION - ONCE THE PULSE-HEIGHT ANALYZER HAS BEEN PLACED IN SERVICE BY PLUGGING IT INTO A 230-VOLT, 3-PHASE LINE, THE MAIN 3-PHASE BREAKER SHOULD ALWAYS BE LEFT IN THE "ON" POSITION. THIS NOT ONLY WILL PROVIDE POWER FOR THE RACK LIGHTS AND CLOCK, BUT WILL ALSO PROVIDE FOR A MINIMUM DRIFT OF THE SNAPPER STRING VOLTAGE AND PULSE AMPLITUDE OF THE SIMULATED ALPHA PULSER. IF POWER IS REMOVED FROM THESE CIRCUITS, SEVERAL HOURS TO SEVERAL DAYS MAY BE REQUIRED FOR STABILIZATION.

## Controls

The UCRL Model I Accelerator Type Pulse-Height Analyzer incorporates the latest electronic advances for high-speed pulse-height analysis, coupled with a mechanical design that makes the unit easy to operate and maintain.

All controls, within easy reach of the operator, are located on the Power Panel, the Control Panel, and the Linear Amplifier. The Simulated Alpha Pulser, although used for testing and calibration purposes, is not necessary for actual operation.

To apply power, after complying with "Caution" above, first actuate the 115-volt circuits with the upper breaker on the power panel. (This breaker is also used to turn off the power.) Next, press the power-push button for several seconds until cooling-fan air can actuate the air paddle switches. In event of a power or cooling failure, indicated by a neon light on the control panel, the analyzer power should be reset using this button.

Most of the designations on the Control Panel are self-evident, but a word of explanation may be in order. The input selector controls coaxial relay RE-1, located on the right wall of the rack. Either a source or the Simulated Alpha Pulser may be selected with this control. However, a second source may be substituted for the Simulated Alpha Pulser, if so desired. A separate gate input circuit is available for coincidence counting application.

The scale-factor selector controls the division rate of the 52 channels of plug-in scaling equipment. In one position a scale of 2 may be obtained, in the other position a scale of 16. The total-count "Squared Normal" switch has the facility of making the total-count scale factor either the same as the other scaling equipment or putting 2 scalers in tandem. This process, of course, squares the total-count scale factor. In the scale factor "2" position, a total count of 2 or 4 may be obtained. In the scale factor "16" position, a total count of 16 or 256 may be obtained.

The bias selector is used for a quick check on the important bias voltages of the snapper. Trim pots are located under the control desk and all voltages should be set to the red line on the meter. Unless the analyzer is subjected to extreme temperature changes, it is more than likely that these controls need never be touched after initial adjustment. However, it is good procedure to check these voltages when starting a run or when functional trouble is suspected.

The count switch is self-explanatory. It is used for putting the snapper gate and running-time meter into operation. When this switch is actuated, one may obtain the number of counts on the registers 1 through 50, and the total of all counts on the total-count register. Suitable scaling factors should be applied to registers. The elapsed period of time for the run is recorded on the running-time meter. To "clear" the analyzer after a run, it is necessary only to reset the running-time meter in the direction indicated by the arrow. An interlocking reset mechanism resets all scaler and register equipment. If it is desired to reset all scaler and register equipment without resetting the running-time meter, reset against the direction of the arrow.

For best accuracy, use the 5-volt channel width. The disrimination stability of a properly operating snapper circuit is within ± 0.05 volts. Under these conditions this provides for a 1 percent accuracy. The 3-volt and 1-volt channel widths are not as accurate, but are for use when more channels are needed over a smaller section of the energy spectrum. However, results equivalent to 1- and 3-volt channel widths may be obtained on 5-volt channel widths by increasing amplifier gain. This will provide better channel discrimination stability than the 1- or 3-volt settings.

High-level discrimination is controlled by the gain controls of the Linear Amplifier. All pulses over channel 50 will be recorded in this channel. However, low-level discrimination may be set on the control panel. By the use of three controls, two rotary switches and the plus-one toggle switch, any low-level discriminator voltage from 2 to 221 volts may be obtained in 1-volt steps.

Data Display

The 50 channels of the pulse-height analyzer output are readable on Veeder-Root registers, and a total-count Veeder-Root register is also included. All registers are motor resettable. The 50-channel scaler light display is mounted in two bays of 26 and 24 channels, and the scaler lights are set against a black background. All scaling lights read from top to bottom, and are relay reset. The scaler in the lower right-hand corner of the scaler frame is used to drive the total-count register, and the lights here are set against a dark red background.

Each register is equipped with a neon indicator to give an indication of pulse repetition. A neon display string is also used to give an indication of pulse repetition vs channel. This indicator can be very useful for a rough visual pulse-height analysis, and is of particular help in setting up an experiment or when the display system is photographed to record data.

## TESTING PROCEDURE

A number of simple tests can be placed upon the pulse-height analyzer to determine its reliability and accuracy.

1. Channel Test. Using either a Berkeley Scientific 903 or 904 Double Pulser, the Gate, Flattener, and Amplifier Unit (6T 5394) should be adjusted. The signal pulse should be adjusted to a length of 1-3/4 to 2-3/4 microseconds, and the gate pulse should be adjusted to a length of 3/4 to 1-1/4 microseconds. The leading edge of the gate pulse is delayed about one microsecond from the leading edge of the signal pulse. The front cover need not be removed from the snapper (6T3404) to check gate or signal-pulse positioning. Enough radiation may be picked up by a Tektronix oscilloscope probe through the lucite cover to make adjustments.

Adjust the pulse amplitude so that it falls in the center of a given channel. The Berkeley Scientific Pulser double-pulse time should be set about 1/2 microsecond longer than the minimum acceptable to the Gate, Flattener, and Amplifier Unit (6T 5394). The pulser repetition rate should be adjusted so the register repetition rate is between 15 and 17 pulses per second.

With total count in the "Squared" position, each channel count should equal the total count squared. In one run, gate, flattener, amplifiers, snappers, and scalers double-pulse time can be measured and registers can be checked.

2. Wall-Sharing Test. The next-- and most stringent -- test that can be imposed upon the analyzer is the wall-sharing test. Using pulser 6T 6094, pulses are placed on the wall between two channels and adjusted so that approximately half the pulses fall on each side of the wall. The total number of pulses in the two channels then, of course, should equal the pulses recorded on the analyzer total count. Perfect results are not always obtained in this test, but an accuracy of at least 1 percent should be expected, and sometimes accuracies as good as 0.1 percent have been observed.

3. Sliding-Pulser (Linearity) Test. After channel widths have been adjusted, using the 50-position switch of the Simulated Alpha Pulser, the third test placed upon the pulse-height analyzer is the sliding-pulser test. For this test the sliding pulser 6T 6094 is adjusted so that channel No. 50 of the analyzer fires in the high position and channel No. 1 fires in the low position. When the sliding pulser is placed in the sweep position, all the channels of the analyzer will be swept at the rate of one time per minute. A quick check on analyzer operation can be made by this test. The sum of the channel counts should check against the analyzer total count. If glaring irregularities are apparent in the channel-width adjustment, appropriate means may be taken for their correction, thus eliminating error-filled, time-consuming runs and erroneous data. This test, if conducted during two separate periods of time, can check channel discrimination stability (drift) between these two periods.

## CALIBRATION

For basic calibration of the analyzer and for obtaining an analyzer zero the following method is suggested: Provided the analyzer has been checked out by the testing procedure, a great deal of time can be saved by using radioactive samples for calibration. For gamma-ray work one may use:

| Element | Energy and Peak (mev) |
|---|---|
| $Na^{22}$ | 0.511 and 1.28 |
| $Cs^{137}$ | 0.667 |
| $U^{237}$ | 0.110 Neptunium K X-rays<br>0.060 |

From these peaks one can obtain an energy-vs-channel plot; and from this, an over-all analyzer zero. This calibration can be made in several minutes. A typical calibration curve is shown (Fig. 8) for $Cs^{137}$. Two curves were taken with a discriminator difference of 5 volts. This makes it easy to pick out slight channel misalignments.

Under some conditions it may be useful to incorporate radioactive calibration tracers during an actual run. This procedure not only saves analyzer calibration time, but is an additional check on discriminator drift and stability. It should be pointed out that drift is less a problem for this equipment than for a slow-speed analyzer, because data can be gathered with such rapidity that circuits have less chance to change with temperature, line voltage, and other phenomena.

## MAINTENANCE

Interconnect sheet 6T 5561 should be followed for system wiring. The fundamental electronics of the pulse-height analyzer may be generally divided into four main categories centered around the "Snapper," or heart of the analyzer.

| | |
|---|---|
| Power and Control Circuitry: | 6T 4194 Control Panel<br>6T 4782 Rectifier<br>6T 4802 Power Panel<br>6T 5094 300-v Regulator<br>6T 5202 Transformer Panel<br>6T 6881 Fan |
| Input Circuitry: | 2T 4404 Linear Amplifier, Model III<br>6T 5394 Gate, Flattener, and Amplifier |
| Snapper Circuitry: | 6T 3404 Snapper |
| Output Display Circuitry: | 5T 7852 Register Panel<br>6T 4204 Plug-in Scale of 2 or 16<br>6T 7494 Plug-in Scale of 2 or 16<br>Total Count |

This section is devoted to pointing out the salient features of each piece of equipment.

## Power Panel 6T 4802

Three-phase 230-volt power needed to operate the analyzer is fed through PG1 of this unit. Pin 4 of the plug serves as an equipment ground. A choke-capacitor filter is inserted in each leg of the three-phase line to eliminate extraneous pulses, rf, and hash that may be present on power lines near high-power particle accelerators.

A main breaker CB-1 is provided for the 3-phase line, and the lights 1, 2, and 3 indicate the condition of each of the three phases. The main breaker should be turned off only if work is to be pursued on the power circuits. All equipment, with the exception of the "always on" bus, can be turned off by use of ganged CB 2-3-4.

In order for RE-1 and RE-2 to operate and supply three-phase power to the analyzer circuits, the air-paddle interlock circuit must be complete. In order to start the analyzer and complete this interlock circuit, an air-paddle bypass push button PB-1 is located on control panel 6T 4194. Fuse F-1 is 5-ampere protection for the "always on" bus.

Control Panel 6T 4194

The purpose of the control panel is to bring all the analyzer controls within easy reach of the operator. Input selector S-9 of the unit actuates coaxial relay RE-1 on the rack, which selects either the source or pulser (6T 6094) for the analyzer input. Selector S-6 provides for a scale of 2 or 16. Deck A operates a killer circuit on the scaling equipment to extinguish unused scaler (6T 4204 and 6T 7494) lights during use in the scale-of-2 position. The network R76, R77 and C-1 is a click filter for this killer circuit. Deck B operates the scaler-switching relays RE-1 (6T 4204 and 6T 7494). Selector S-5 is used to provide metering positions for ME-1, and trimming of these positions may be made by the use of R-35 (Snapper String Current), R-64 (Snapper 6BN6 Quadrature Grid Bias), R-67 (Snapper On-turner Off-turner Bias), and R-66 (Snapper Blocking Oscillator Bias).

Count-stop switch S-7 is used to control the running-time meter ME-2 of this unit and RE-2 of 6T 5394 which grounds the suppressor grid of V-14.

The reset wheel of time meter ME-2 incorporates microswitch S-8, which is closed as the time meter is reset. This switch is in parallel with microswitch S-1 of 5T 7852, and functions to start the reset motor for the registers and actuates RE-1 of 5T 7852, which in turn resets plug-in scalers 6T 4204 and 6T 7494. Reset PB-1 of this unit actuates RE-1 and RE-2 of 6T 4802, and after the fans are pulling enough air to close the air-paddle circuit, power will be applied to analyzer circuitry and PB-1 may be released. The total-count "Squared-Normal" switch S-10 actuates RE-2 located on the right wall of the scaler compartment of the rack. Its purpose is to select either a single channel of scaling equipment (6T 7494) or to put two channels of scaling equipment in tandem for the total count. The result is either a normal or squared total count.

Precision resistors associated with S-4 of this unit are used to obtain proper current through the 6BN6 Snapper bias string for selection of channel width. However, design is such that a constant current is always drawn from the bias supply for maximum power-supply stability. By positioning S-4, channel widths of 1, 3, and 5 volts may be obtained, and test widths of 0.05 and 0 volts can be selected.

All fifty 6BN6 Snappers of the analyzer can be raised by use of discriminator switches S-1, S-2, and S-3 and their associated precision resistor circuitry. By combining the functions of these three switches, any voltage from 2 to 221 volts may be obtained in 1-volt steps. The control panel clock is wired to the "always on" bus.

Transformer Panel 6T 5202

Little need be said about the transformer panel except that the unit is used to provide 6.3 volts a.c. for the scaler filaments.

Rectifier 6T 4782

The recitifer unit is composed of a three-phase delta-wye transformer and a three-phase full-wave selenium bridge plus a control relay and an a.c. 3 amp 600-volt fuse. All 115-volt circuits for the analyzer are obtained from center-tap-leg connections on the delta side of the transformer, and therefore, caution should be used in loading the 115 volts available on the rack plug strips. Loads should be balanced within 500 volt-amps and phase relationships should be observed.

The 360-volt tap is used for the wye side of the transformer which supplies the rectifier bridge. However, if line voltage is high, the 320-volt wye connection may be used.

300 Volt Regulator 6T 5094

The purpose of this unit is to take the unregulated d-c output of 6T 4782 and regulate it at 300 volts for use by 2T 4404, 6T 3404, 6T 5394, 6T 7494, and 26 units of 6T 4204. It contains a time delay relay TE-1 (set to 45 seconds) which applies B+ only after filaments are up to temperature. R-53 should be adjusted for + 300 volts by metering TS 1-7 to ground.

The unregulated d-c is fed out on TS 1-5 and provides power to drive the 51 Veeder-Root registers. TS 1-6 and TS 1-8 supply power to actuate the coils of RE-1 of 6T 4204 and 6T 7494. Thirteen relays are connected in series on each of TS 1-6 and TS 1-8. Protection is provided to the analyzer circuitry by RE-1 of 6T 5094. If overvoltage is supplied to analyzer circuitry through the improper operation of the regulator tubes, this relay will drop out the 300-volt bus. Ripple voltage on the 300-volt bus (TS 1-7) should be less than 0.08 volts.

A minus-105-volt bias supply is also incorporated on this chassis to supply bias for the register drive tubes. A neon indicator light is incorporated for unregulated d.c., regulated d.c., and the bias supply for easy trouble-shooting.

Fan 6T 6881

This unit provides 1200 cfm cooling for the frame of plug-in scaler equipment composed of units 6T 4204 and 6T 7494. Air is pulled in from the filters at the rear of this unit and expelled through the scaler perforated front. Air-paddle switches are installed in each fan slip stream and are part of the analyzer interlock circuit. This fan and interlock-paddle-switch unit is of plug-in construction with Air-Loc fasteners for easy servicing of the scaler plug circuits.

All analyzer air filters should be kept free of dust and dirt. Excessive clogging will greatly reduce the volume of cooling air. Every three or four months all fans in this unit as well as other fans and blowers throughout the analyzer should be lubricated with several drops of SAE 20 oil.

Linear Amplifer 2t 4404

Two inputs are available to the Pulse-Height Analyzer, one from Simulated Alpha Pulser 6T 6094, the other input from a source. The input selector on 6T 4194 switches RE-1, located on the lower part of the right wall of the analyzer rack. One side of the relay is connected to the pulser, the other side is connected to the source. The swinger on this relay is the input to Linear Amplifier 2T 4404.

This unit, a standard piece of UCRL counting equipment, has an input impedance of 125 ohms and has been designed for negative-pulse-in, positive-pulse-out. It consists of three tandem three-tube feedback chains. Two identical cathode follower output stages are provided, and the bandwidth of the amplifier may be selected by use of S-2 for 0.5 Mc, 2 Mc, or 8 Mc. S-1 is a step gain attenuator which is augmented by use of R-26 sliding gain attenuator. The first feedback chain is shock mounted against tube microphonics.

Gate, Flattener, and Amplifer 6T 5394

One output of 2T 4404 is connected to this unit. The function of the unit is to lengthen, flatten, and amplify the scintillation pulses for use in the Snapper Unit (6T 3404) and to generate a gate pulse for each scintillation pulse used by the snapper.

Of the split input to the unit, one leg serves a positive pulse to the grid of V-6. However, it should be noted that this grid receives its bias from the lower end of the 6BN6 Bias String (6T 3404), and therefore will not trip on a pulse amplitude much under that set by the discriminator control on 6T 4194.

V-6 and V-7 are amplifiers and Xtal 3 serves as a clipper. The control R-36 should be set at the point where V-8 triggers reliably. The short pulse generated by single-shot multivibrator V-8 is amplified and stretched by V-9 and Xtal 4 circuitry. This system makes for a lengthened pulse with a sloping tail and a short dead time. The length of this slope determines the length of the signal pulse.

One branch of the input pulse from the linear amplifier is fed through Xtal 1, which charges C-2 only when the output pulse of the stretcher is used to cut off the grid of V-1. The signal pulse width is controlled by R-3. V-2, V-3, V-4, and V-5 form a three-stage feedback chain with a gain of 10 and a rated output of 500 volts. This chain feeds the grid signal bus of the 6BN6 snapper tubes (6T 3404).

Circuitry associated with V-10 is the gate generator. This single-shot multivibrator is subject to tripping by the signal only when the external gate coincidence circuit associated with V-14 is activated either by a plus-15-volt coincidence pulse or RE-2. RE-2 is controlled by the stop-count switch on 6T 4194. Referring to V-10, the control R-51 should be set at the point where V-10 triggers reliably, and gate length should be set by R-57. Clipping of the output pulse is accomplished in Xtal 6 with the voltage being set by V-11 and its circuitry, and a low-impedance output is obtained by use of cathode follower V-12. The gate pulse may be delayed with respect to the signal pulse in 1/4-microsecond steps up to 2 microseconds by use of the delay line and S-1.

RE-1 is a protection relay for the amplifier; high voltage from the self-contained power supply cannot be applied to the feedback amplifier without + 300-volt d.c.

Snapper 6T 3404

This unit is the heart of the Pulse-Height Analyzer. The current through a resistor string composed of fifty 250-ohm precision resistors, typical R-1, is controlled by the channel voltage width switch S-4 at the control panel 6T 4194. The power supply in the lower corner of schematic 6T 3404 supplies current from the string. The lower discrimination of the string may be lowered or raised in 1-volt steps between the limits of 2 and 221 volts by S-1, S-2, and S-3 of 6T 4194. Bias voltages on the grids of 6BN6 tubes caused by current flowing through the 250-ohm precision resistors determines the pulse height at which each 6BN6 snapper circuit fires.

The 6BN6 and one-half of a 12AT7 form an excellent discriminator circuit. As the signal pulse approaches the grid bias voltage, all that is needed to make the 6BN6 – 12AT7 circuit into a one-shot multivibrator is a positive gate pulse on the quadrature grid. This gate pulse from 6T 5394 usually lasts for 3/4 to 1-1/4 microseconds and the leading edge of the gate pulse is delayed about one microsecond from the leading edge of the signal pulse. The flattened signal pulse is usually 1-3/4 to 2-3/4 microseconds long. The accelerator grid of the 6BN6 receives its d.c. voltage from the plate of the 12AT7. It is this connection that gives the circuit feedback for one-shot multivibrator action. C-26 and R-3 provide additional feedback through the 6BN6 grid circuit. It must be emphasized that in order to have good channel stability (the unit is capable of ± 50 millivolts) a snapping action is essential. This snapping action may easily be observed by

looking at the on-turner output pulse of the 12AT7 (V-2) with a Tektronix 514D oscilloscope. The on-turner is fed through delay network L-1 and C-27 (0.1 microseconds delay) and then C-6 to fire a blocking oscillator which supplies an output pulse for the scaling equipment. However, this output pulse is not supplied if the next higher channel has been tripped, because an off-turner pulse stops the blocking oscillator through C-4. Therefore, only the highest channel tripped will provide an output pulse.

Your attention is called to R-17, which is an impedance in the common blocking oscillator grid circuit. It is the pulse voltage generated across this impedance that permits only one blocking oscillator to fire at a time. R-21 is a slope control for the gate pulse. A slightly negative gate pulse slope is desirable. The output of each blocking oscillator is fed to analyzer scaling equipment (6T 4204). The output of PG-8 supplies a pulse when channel one 6BN6 circuit has been tripped. It is fed to the total count scaler. (6T 7454). The bias from the first 6BN6 circuit is applied to the grid of V-6 for the Gate Flattener and Amplifier unit (6T 5394). This helps the gate generator discriminate against noise, hash, and unwanted electrical impulses that would cause erroneous readings and unwanted dead time. RE-1, RE-2, and RE-3 are used as part of a bias interlock circuit. B+ cannot be applied without snapper bias.

For a rough alignment of the snapper discriminators, S-4 on the control panel (6T 4194) should be set to zero channel width, and all the 6BN6 cathode potentiometers R-5 (6T 3404) should be set to the off position. R-17 should be jumpered with a short clip lead. The pulse height from the Simulated Alpha Pulser (6T 6094) should be adjusted so as to just fire one discriminator circuit of the Snapper. Next set $R\text{-}5_1$ so channel one just fires, set $R\text{-}5_2$ so channel two just fires, channel three, channel four, and so on through channel fifty.

It will be noted that as the higher channel fires, it will turn off the previous channel. With R-17 shorted channels may not share too well. However, a seventy - to ninety-percent figure should be realized. If this is not the case, one would do well to check snapper circuitry; a weak 12AT7 or 6BN6 may impair discriminator stability.

After the analyzer has been rough-aligned, the short should be removed from R-17 of 6T 3404, and S-4 of 6T 4194 should be returned to the 1-, 3-, or 5-volt channel width. The channels should then be set with the 50-position switch of the Simulated Alpha Pulser 6T 6094 and aligned in a more precise manner by continued adjustments of R-5. Last, a sweeping pulser check should be run and data recorded for future analyzer "quick checks."

Plug-in Scale of 2 or 16 (6T 4204)

CAUTION: THESE UNITS ARE INTERLOCK PROTECTED TO PREVENT OPERATION WITHIN THE RACK WITHOUT ADEQUATE FAN COOLING. NEVER BYPASS INTERLOCKS OR SERIOUS DAMAGE TO THE IN39 DIODES COULD BE VERY COSTLY. ALL SCALER UNITS SHOULD BE IN THE RACK WHEN OPERATING, AS THEIR FILAMENTS HELP PROVIDE A THREE-PHASE POWER BALANCE, AND SCALER RELAY COILS ARE CONNECTED IN SERIES.

Twenty-five of these plug-in units are used to provide scaling and register-drive facilities for the analyzer. For servicing, remove from the rack and test with unit 6T 6393. Each unit incorporates two channels of the following: pulse-inverter-amplifier, four diode coupled binaries, and a register drive.

RE-1 of this unit serves as a scale-factor switch. When a scale of 16 is employed, four binaries in each channel are placed in tandem and pin 3 of PG-1 is tied to pin 4 of PG-1 through S-6 of 6T 4194. This circuit is in turn tied to ground RE-1 of 5T 7852 except when the scalers are being reset by this relay. When a scale of 2 is used, pin 3 of PG-1 is lifted from ground by S-6 of 6T 4194 to kill the last three binaries of each channel and RE-1 of the scaler selects the output of the first binary for the register drive tube grid. The double pulse time of each scaler should be about 2 microseconds, and they should operate on 15-volt positive input pulses of 0.5 microsecond width.

The regulated 300 volts, taken from unit 6T 5094, is dropped to 250 volts by decoupling filter R-1, C-1 of the rack, and is used for B + on 6T 4204 and 6T 7494 units.

Plug-in Scale of 2 or 16 Total Count (6T 7494)

The rack relay RE-2, controlled by S-10 of 6T 4194, is provided to connect two channels of the scaler with the red front in tandem to give a scale factor squared for the "total count." It should be noted that the total count scales the pulse output of the first 6BN6-12AT7 snapper circuit 6T 3404 before the off-turner is applied, and therefore should record every pulse falling above and including the first channel. If the analyzer is functioning properly, the total count should always equal the sum of the channel readings. When checking this scaler on test unit 6T 6394, it should be noted that input No. 1 has a double pulse time of 2 microseconds while input No. 2 has a double pulse time of 10 microseconds.

Register Panel 5T 7852

This unit provides registers for the fifty channels of the analyzer and one register for the total count. A neon flasher is placed across every register so a quick visual check on its rate may be observed. A neon indicator display is also provided to give a visual check of count intensity with channel. All neons are type NE-2.

A motor and gear-drive system is provided to reset all registers if the Running-Time Meter of 6T 4194 is reset. RE-1 serves to reset all scaling equipment 6T 4204 and 6T 7494 for the analyzer. A small glob of SAE No. 90 Hypoid grease is suggested for all worm gears and miter gears. Use no lubricant for bearings, as the ball races are grease-packed and need no attention.

Simulated Alpha Pulser 6T 6094

Every effort has been made to achieve a stable pulse output of voltage amplitude from this unit. The power supply is sola regulated. A 6Y6-G is used as a series tube, two 12AX7's are used as d.c. amplifiers, and an 85A2 is used as a voltage reference. Upon inserting a milliameter on the tip and ring of a jack plug for J-1, the meter should read 5 milliamperes ±20%. R-9 should be adjusted for smooth operation of RE-1. This may be adjusted by listening; however, it is better to use an oscilloscope.

CAUTION: WHEN PLACING THE PULSER IN OPERATION, THE POWER SUPPLY SHOULD BE PLUGGED INTO THE "ALWAYS ON" BUS OF THE ANALYZER. BECAUSE OF THE CHARACTERISTICS OF THE 85 A2 TUBE, IT MAY TAKE FROM SEVERAL HOURS TO SEVERAL DAYS TO STABILIZE, AND CONTINUAL OPERATION ALSO ADDS TO THE USEFUL LIFE OF THE TUBE.

Reorder Information

All reorder information may be obtained directly or from cross-reference data obtained on Master Assembly and Drawing List 6T 5194. This number has been engraved on the control panel face for convenience.

## 50-CHANNEL PULSE-HEIGHT ANALYZER, ACCELERATOR TYPE

Fig. 1 Front view - Showing Removal of Plug-in Scaler and Control Panel

Fig. 2 Rear view - Showing Removal of Fan for Scaling Equipment

Fig. 3 Operating Position - Note all Controls are within easy reach of operator with desk removed

Fig. 4 Two Channel Plug-in Scale of 2 or 16

Fig. 5 Plug-in Scaler on Test - Plug-in Scaler, Test Unit, and Berkeley 903 Pulser

Fig. 6 Front View - Control Panel

Fig. 7 Rear/Side View - Control Panel

Fig. 8 $C_s^{137}$ Plot

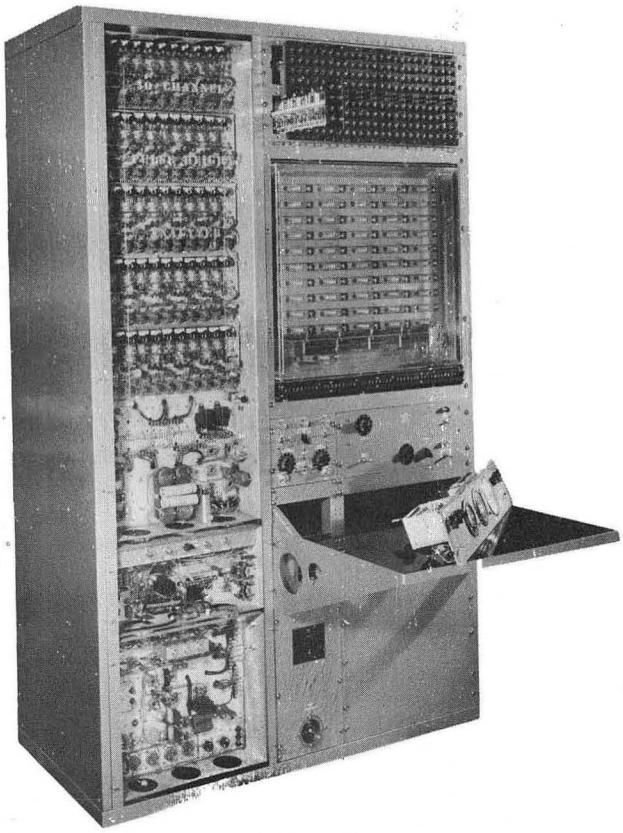


Fig. 1

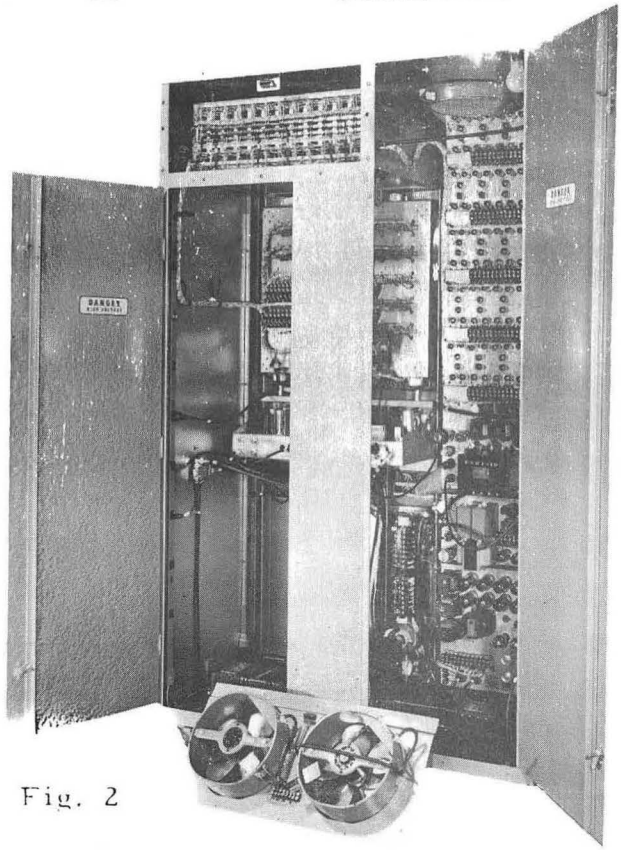


Fig. 2

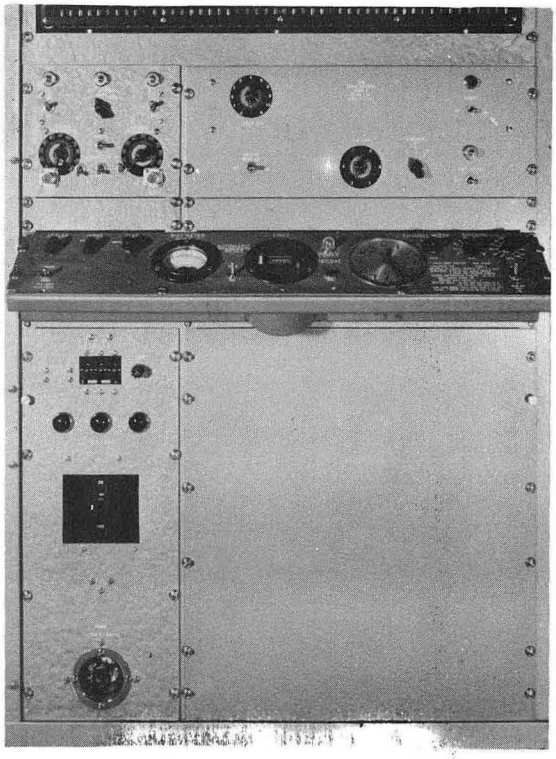


Fig. 3

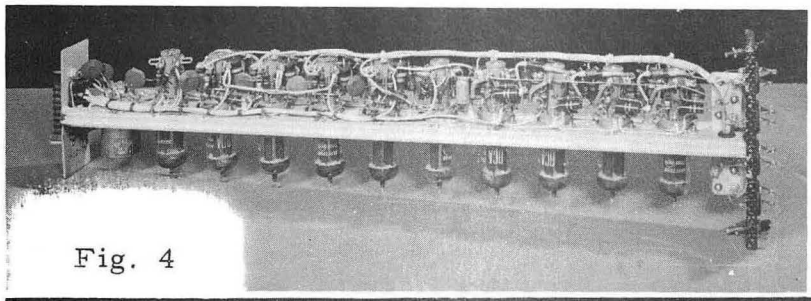


Fig. 4

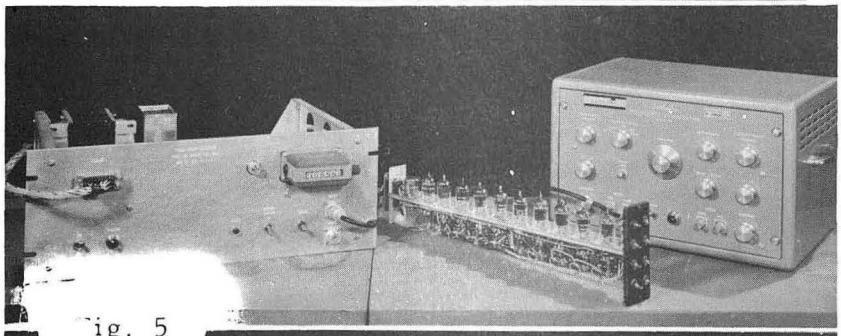


Fig. 5

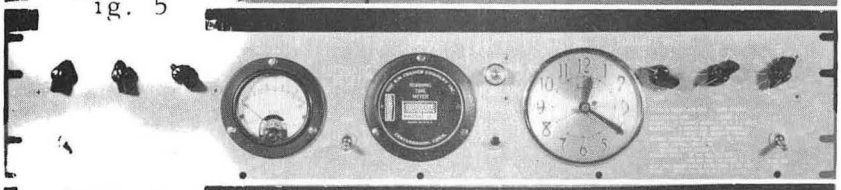


Fig. 6

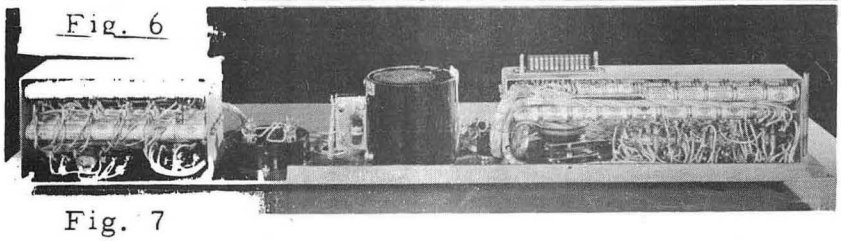


Fig. 7

7N-812

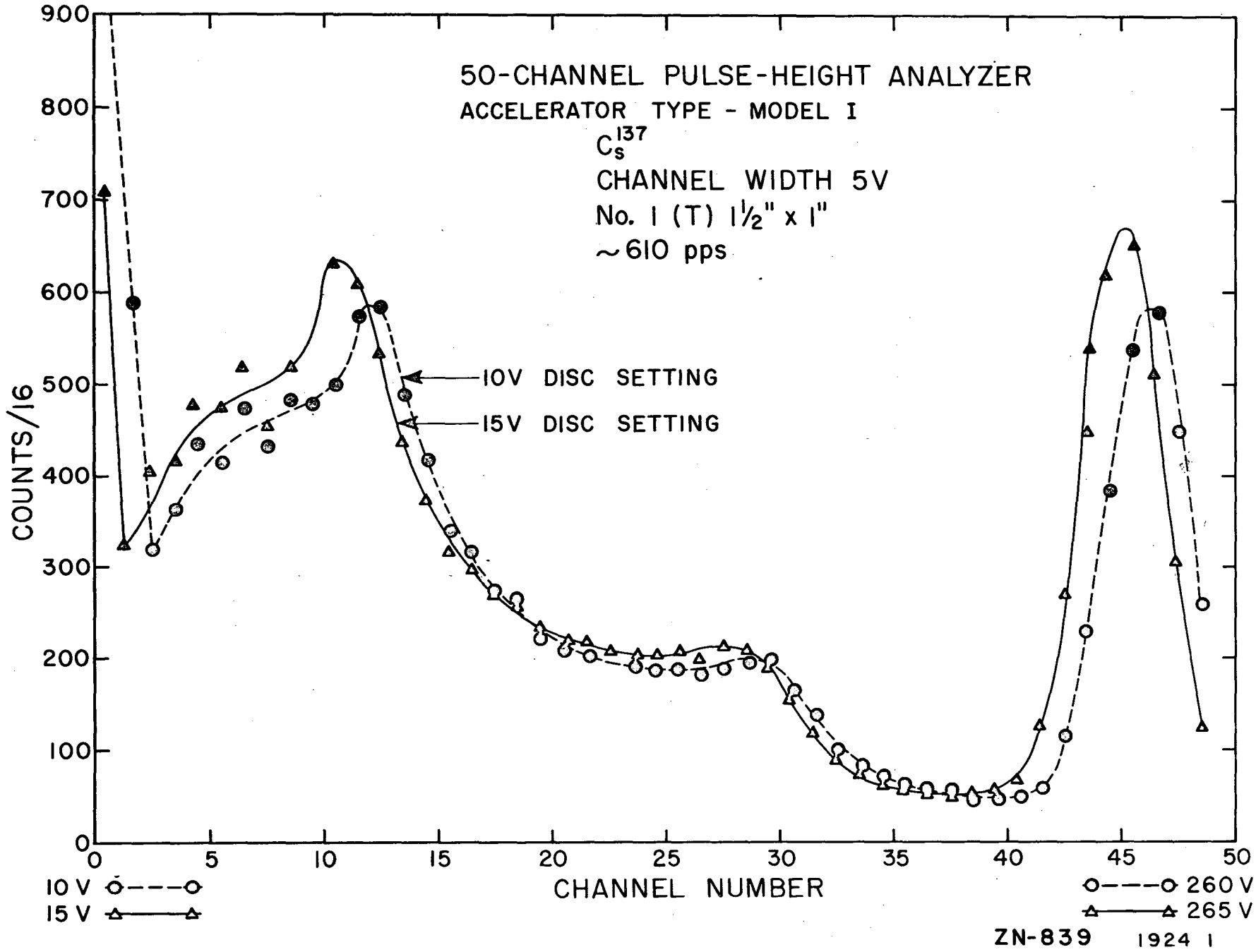

50-CHANNEL PULSE-HEIGHT ANALYZER
ACCELERATOR TYPE - MODEL I
$C_s^{137}$
CHANNEL WIDTH 5V
No. 1 (T) 1½" x 1"
~610 pps
10V DISC SETTING
15V DISC SETTING
COUNTS/16
CHANNEL NUMBER
0
100
200
300
400
500
600
700
800
900
0
5
10
15
20
25
30
35
40
45
50
10 V
15 V
260 V
265 V
ZN-839
1924 1

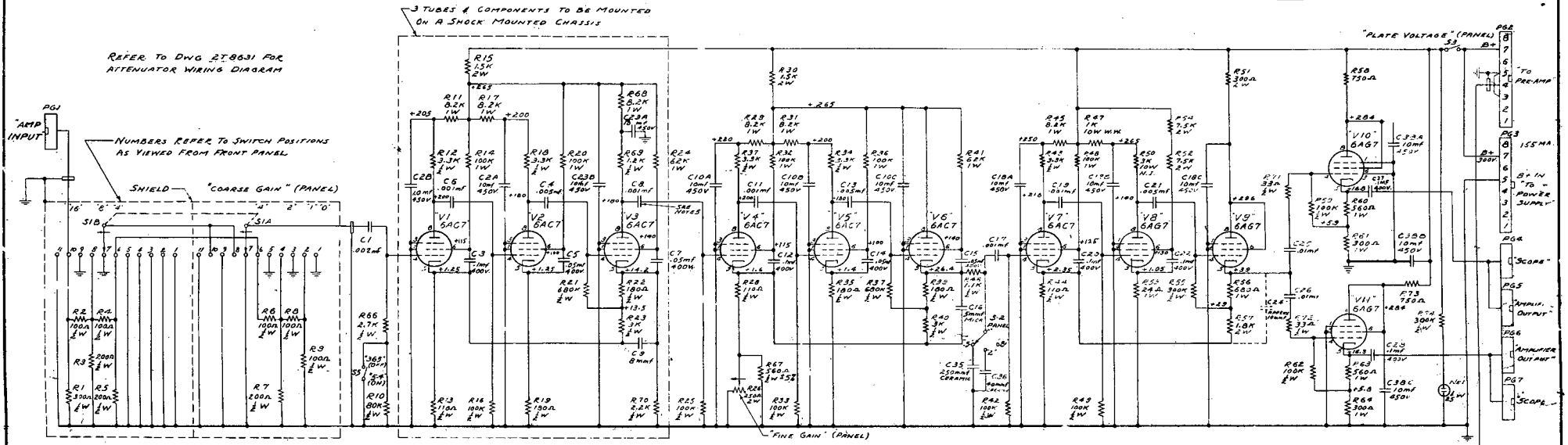
Fig. 8

## PRINT LIST

### PULSE HEIGHT ANALYZER - DWG. 6T 5194
### ACCELERATOR TYPE - MODEL I

| | |
|---|---|
| 2T 4404 | Linear Amplifier Model III (Schematic) |
| 5T 7852 | Register Panel (Schematic) |
| 5T 7861 | Register Panel (Parts List) |
| 5T 7874 | Register Panel (Assembly) |
| 6T 3404 | Snapper (Schematic) |
| 6T 4194 | Control Panel (Schematic) |
| 6T 4204 | Plug-in Scale of 2 or 16 (Schematic) |
| 6T 4673 | Portable Rack (Assembly) |
| 6T 4782 | Rectifier (Schematic) |
| 6T 4802 | Power Panel (Schematic) |
| 6T 5094 | 300 volt Regulator (Schematic) |
| 6T 5194 | Master Assembly and Dwg. List |
| 6T 5202 | Transformer Panel (Schematic) |
| 6T 5394 | Gate, Flattener, and Amplifier (Schematic) |
| 6T 5561 | Interconnect Data for Rack |
| 6T 6094 | Simulated Alpha Pulser (Schematic) |
| 6T 6393 | Plug-in Scaler Test Unit (Schematic) |
| 6T 6713 | Data Sheet |
| 6T 6723 | Calibration Sheet |
| 6T 6881 | Fan (Schematic) |
| 6T 7491 | Plug-in Scale of 2 or 16 Total Count (Schematic) |
| 6T 7585 | Plug-in Scaler Frame (Schematic) |
| 6T 7591 | Installation Data |
| 6T 7881 | Motor Driven Potentiometer |

| LIST OF MATERIAL | | |
|---|---|---|
| ITEM OR PART NUMBER | DESCRIPTION | |




## CHARACTERISTICS
(MEASURED FROM PG1 TO PG5 OR PG7)

INPUT PULSE POLARITY: NEGATIVE - (SEE NOTE #5)

INPUT IMPEDANCE: 120 OHMS

VOLTAGE GAIN APPROX 10,000 WITH GAIN CONTROLS SET AT MAX. FOR 1.0 VOLT (RMS) OUTPUT

BAND WIDTH (70.7% RESPONSE WITH SINE WAVES)
f1 = 3000 C.P.S. (INPUT ON 365 μsec.)
f2 = 39000 C.P.S. (INPUT ON 5 μsec.)
f2 = 9 Mc BAND WIDTH ON "0t"

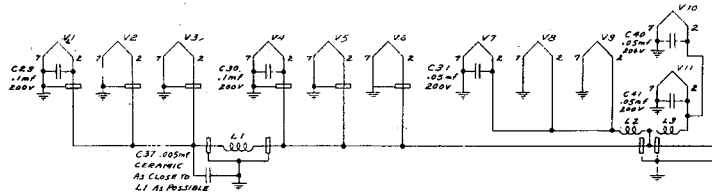
MAXIMUM PULSE OUTPUT = 30 VOLTS PEAK (POSITIVE)

RISE TIME (10% TO 90%) = .05 μsec. BANDWIDTH ON 0t MC
FALL TIME (100% TO 10%, = .15 μsec.) FOR 75 VOLT PULSE OUT

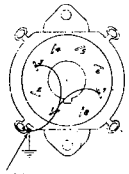
B+ POWER = 155 MA AT 300V

## NOTES

1. S5: OPEN FOR LONG TIME CONSTANT INPUT; CLOSED FOR SHORT TIME CONSTANT INPUT.
2. ITEMS IN QUOTATIONS STENCILLED ON CHASSIS OR MARKED ON ESCUTCHEON PLATE.
3. L1, L2 & L3 - 34 TURNS #22 ENAMEL, FOR FORM DIMEN. SEE DWG 376641.
4. SOCKET VOLTAGES ARE APPROXIMATE.
5. CONNECT C8 AS SHOWN FOR NEGATIVE INPUT PULSES. FOR POSITIVE INPUT PULSES CONNECT C8 TO CATHODE OF V3.
6. USE ALLEN HEAD SET SCREWS ON ALL SHAFT COUPLINGS & CONTROL KNOBS. MAKE FLAT ON SHAFT UNDER SET SCREWS.
7. STAMP "V" No's & TUBE TYPES ON TOP & BOTTOM OF CHASSIS.




TUBE FILAMENT CONNECTIONS

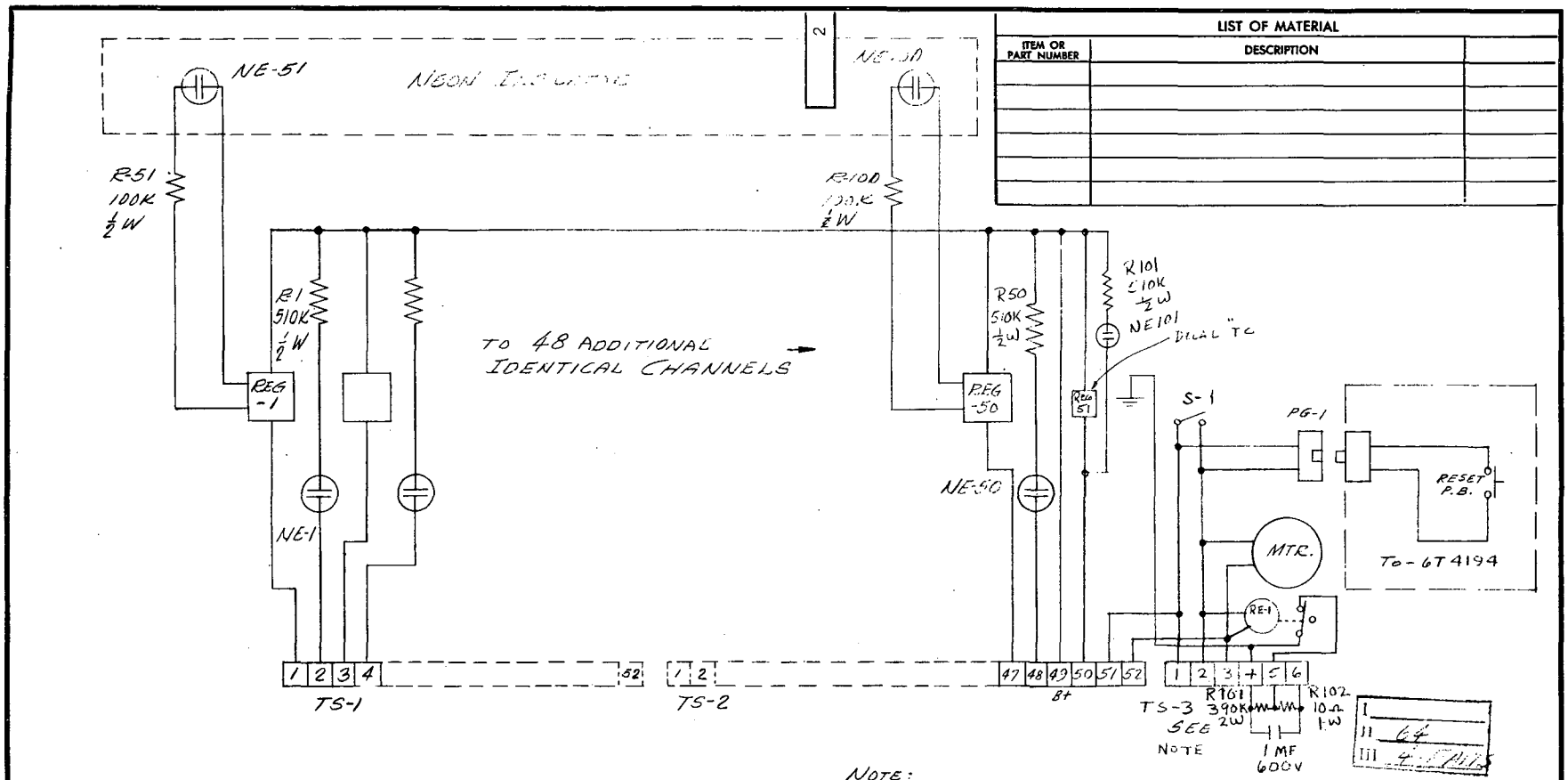



TYPICAL GROUNDING LAYOUT OF ALL TUBE SOCKETS (BOTTOM VIEW)

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | FINISHES | SHOP NOTES | SHOP ORDERS | DESIGN FOR NO. | A.C. LINEAR AMPLIFIER | |
| | | | | | SAW CUT, FLAME CUT, SHEAR | UNLESS OTHERWISE SPECIFIED 1. TOLERANCE ± ON DIMENSIONS | JOB NO. | | MODEL III | |
| | | | | | REGISH MACHINE | 2. BREAK EDGES 1/64 MAX. | SERIAL NO. | | SHOWN ON SCHEMATIC | |
| | | | | | AVERAGE MACHINE | 3. 30° CHAMFER EDGE OF ALL SCREW THREADS | DATE ISSUED | 278931 | SCALE | RADIATION LABORATORY UNIVERSITY OF CALIFORNIA—BERKELEY |
| 11 | 11-20-51 | | | CHANGED 22K TO 1M | SMOOTH MACHINE | 4. 1/4 PITCH THREAD RELIEF WITH ROUND NOSE TOOL ON MACH. CUT SCREW THREADS | DATE FINISH | | DO NOT SCALE THIS DRAWING | |
| 10 | 6-6-51 | | | K.S. GRAHAM | | | SEC. FINISH | | DRAWN G.D. | DATE 11-28-51 |
| Change No. | Chg. By | Chg. Date | Date | CHANGES | | | DIELECTRIC TEST | | CHECKED F.L. | APPR. BY H.D.T. |

274404 N

ZN-803




NOTE:
1.- TS-3 & RE-1 TO BE MOUNTED ON MOTOR MOUNT.

LIST OF MATERIAL

| ITEM OR PART NUMBER | DESCRIPTION | |
|---|---|---|
| | | |

| Change Letter | Drawn By | Check By | Date | CHANGES |
|---|---|---|---|---|
| F | | | | ADDED DWG NO |
| E | MEH | | 4-13-53 | CHANGE RESET CKT |
| D | JCT | JER | 4-1-53 | RUSE NE1-50 & R1-50 |
| C | JCT | MEH | 3-18-53 | ADD TS-3 & RE-1 |
| B | JCT | JDS | 3-17-53 | - DELETE ASSY DWG # |
| A | E/H | JCT | 3/5/53 | ADD PG-1 AND CONNECT TO P.B. |

| Change Ltr. | Drawn By | Check By | Date | CHANGES |
|---|---|---|---|---|
| G | GW | PD | 9-24-52 | ADDED "B+" |

FINISHES: SAW CUT, FLAME CUT, SHEAR; ROUGH MACHINE; AVERAGE MACHINE; SMOOTH MACHINE

SHOP NOTES: UNLESS OTHERWISE SPECIFIED
1. TOLERANCES ± ON DIMENSIONS
2. BREAK EDGES 1/64 MAX.
3. 30° CHAMFER ENDS OF ALL SCREW THREADS
4. 1½ PITCH THREAD RELIEF WITH ROUND NOSE TOOL ON MACH. CUT SCREW THREADS

SHOP ORDERS: JOB NO.; SERIAL NO.; DATE ISSUED; DATE REQD.; NO. REQD.; DELIVER TO

DESIGN JOB NO. 4360-02
SHOWN ON 5T7861; 5T7874; 5T8111 and 5T5194 ACC TYPE MASTER

DIFFERENTIAL PULSE HEIGHT ANALYZER
CHEMISTRY TYPE - REGISTER
SCHEMATIC

SCALE NONE
DO NOT SCALE THIS DRAWING
DRAWN BY JCT
CHECKED BY ✓
DATE 10/1/52
APPR. BY H.D.T.

RADIATION LABORATORY
UNIVERSITY OF CALIFORNIA—BERKELEY

5T7852G

ZN-797

## PARTS LIST FOR SCHEMATIC NO. 5T 7852

| Desig. | Quan. | Specifications |
|---|---|---|
| Mtr. | 1 | Speed Reducer Motor, Bodine Type NSY-12R<br>1/150 HP 115V 60 Cycle, 1800 RPM<br>Ratio 30:1 |
| C-1 | 1 | 1 MFD. 600 V METALITE CAPACITOR |
| NE-1 to 100 | 100 | Neon - Type NE-2 |
| PG-1 | 1 | 2 Pin Female Recept. Hubbell #7468 |
| R-1 to 50 | 50 | 510K 1/2W Carbon Resistor |
| R-51 to 100 | 50 | 100K 1W " " |
| *R-101 | 1 | 390K 2W " " |
| *R-102 | 1 | 10Ω 1W " " |
| Reg-1 to 5 | (ref) | Veeder Root Counter 6 Digit, Per Modification 5T 8141 |
| *RE-1 | 1 | RELAY - DPDT - ADVANCE Nº K-1504<br>NOTE: (TO BE USED ON ACCELERATOR TYPE ONLY) |
| S-1 | 1 | Micro Switch #BZ-2 RL 2 |
| TS-1,2 | 2 | 52 Point W.E. Terminal Strip |
| TS-3 | 1 | TERM. STRIP - JONES 2-142 |

### HARDWARE

| | |
|---|---|
| 51 | Bronz Worm Gears - Boston No. D1134 (See 5T8081-1 & 2) |
| 12 | Ball Bearings N.D. #77R4 |
| 50 | Steel Worms (DUH) Boston |
| 5 | Pr. Steel Miter Gears - Boston Gear No. L95Y (See 6T3871-1) |
| 1 | Motor Shaft Coupling - Boston J-62 (See 6T3901) |
| 5 | Lord Shock Mounts - No. 200 PH 35 |
| 15 | Torrington B-45 Needle Bearings |
| 1 | Pr. Steel Miter Gears - Boston Gear No. L-96Y (See 6T3871-2) |

### DRAWING LIST

| | | |
|---|---|---|
| 5T 7852 | - | Schematic |
| 5T 7861 | - | Parts List (This) |
| 5T 7874 | - | Assembly |
| 5T 7884 | 1 | Chassis |
| 5T 7894 | 1 | Outer Register Cover |
| 5T 7904 | 1 | Inner " " |
| 5T 8081-1 | 50 | Worm Gear Modification |
| 5T 8081-2 | 1 | " " " |
| 6T 3901 | 1 | Univ. Joint Modification Boston 140 |

| Change Letter | Drawn By | Check By | Date | Changes |
|---|---|---|---|---|
| C | VCT | | 3/9/53 | REVISED & RETYPED |

SAW CUT, FLAME CUT, SHEAR — ROUGH MACHINE — AVERAGE MACHINE — SMOOTH MACHINE

UNLESS OTHERWISE SPECIFIED: 1. TOLERANCES ± ON DIMENSIONS 2. BREAK EDGES 1/64 MAX. 3. 30° CHAMFER ENDS OF ALL SCREW THREADS 4. 1½ PITCH THREAD RELIEF WITH ROUND NOSE TOOL ON MACH. CUT SCREW THREADS

SCALE NONE — DESIGN JOB NO. 436042 — DRAWN BY VCT — CHECK BY — APPR. BY H.D.J. — DATE 3-9-53

DIFF. PULSE HEIGHT ANALYZER — REGISTER PANEL — PARTS LIST

RADIATION LABORATORY, UNIVERSITY OF CALIFORNIA, BERKELEY — 5T7861E SHEET 1 OF 2

SHOWN ON | JOB NO. | SER. NO. | DATE ISSUED | DATE REQ'D | NO. REQ'D | DELIVER TO | MATERIAL

Form

ZN-793

## PARTS LIST FOR SCHEMATIC NO. 5T 7852

| Desig. | Quan. | Specifications |
|---|---|---|
| 5T 7971 | 1 | Micro Switch Mount |
| 5T 8141 | 50 | Register Modification |
| 5T 8162 | 9 | Register Separator |
| 6T 1003 | 1 | Motor Mounting Plate |
| 6T 1011 | 1 | Motor Mounting Bearing Plate |
| 6T 1021 | 2 | Motor Mounting Bracket |
| 10Z 1003 | 2 | 17" Terminal Strip Support (Stock) |
| 10Z 5021-38 | 30 | Stud - 1 Male End & 1 Female End |
| 10Z 1703 | 2 | 52 Pt. Backing Plate (Stock) |
| 6T 3824 | 1 | Main Shaft Bracket |
| 6T 3833 | 5 | Worm Shaft Bracket |
| 6T 3842 | 1 | Main Shaft |
| 6T 3861 | 5 | Worm Shaft |
| 6T 3871-1 | 10 | Altered Miter Gear |
| 6T 3881 | 50 | Altered Worm Gear |
| 6T 3891 | 1 | Drive Shaft |
| 6T 3851 | 1 | Drive Shaft Housing |
| 6T 3901 | 1 | Altered Universal Joint BOSTON #J 62 |
| 6T 3871-2 | 2 | Altered Miter Gear |
| 6T 3291 | 1 | PG-1 MOUNT BRACKET |
| *6T 5842 | 1 | STAR WHEEL |
| *6T 5851 | 1 | FINGER |
| *6T 5861 | 1 | FINGER BLOCK |
| *6T 5871 | 1 | FILLER BLOCK |
| 6T 1044 | 1 | Neon Indicator Mounting STRIP |
| 6T 1054 | 1 | Neon Indicator Bracket |
| 6T 1314 | 1 | Neon Indicator TERMINAL STRIP |
| 5T 7985 | (ref) | Portable Reg. Rack Assembly |
| 5T 8111 | (ref) | O.A. Dwg. List CHEM TYPE |
| 6T 5194 | (REF) | " " " ACC TYPE |

* REMOVE FROM PL + SCHEMATIC FOR [illegible] UNIT.

| Change Letter | Drawn By | Check By | Date | CHANGES |
|---|---|---|---|---|
| C | JCT | | 3-9-53 | REVISED & REDRAWN |

SAW CUT, FLAME CUT, SHEAR — ROUGH MACHINE — AVERAGE MACHINE — SMOOTH MACHINE

UNLESS OTHERWISE SPECIFIED
1. TOLERANCES ON DIMENSIONS ±
2. BREAK EDGES 1/64 MAX.
3. 30° CHAMFER ENDS OF ALL SCREW THREADS
4. 1½ PITCH THREAD RELIEF WITH ROUND NOSE TOOL ON MACH. CUT SCREW THREADS

| | | | |
|---|---|---|---|
| SCALE | NONE | | |
| DESIGN JOB NO. | 436002 | | |
| DRAWN BY | JCT | DATE | 3-9-53 |
| CHECK BY | | | |
| APPR. BY | HDD | | |

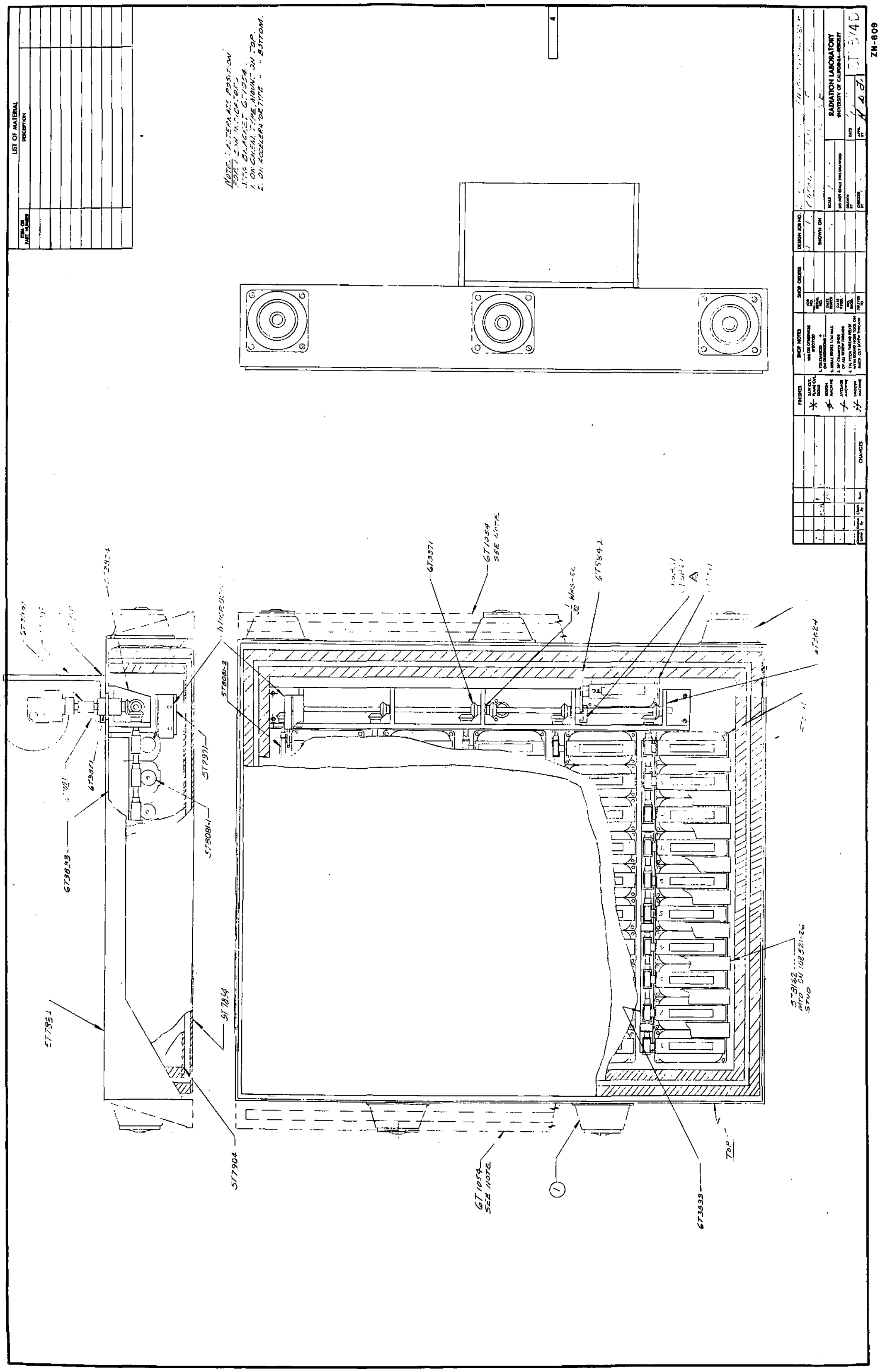
DIFF PULSE HEIGHT ANALYZER
REGISTER PANEL
PARTS LIST

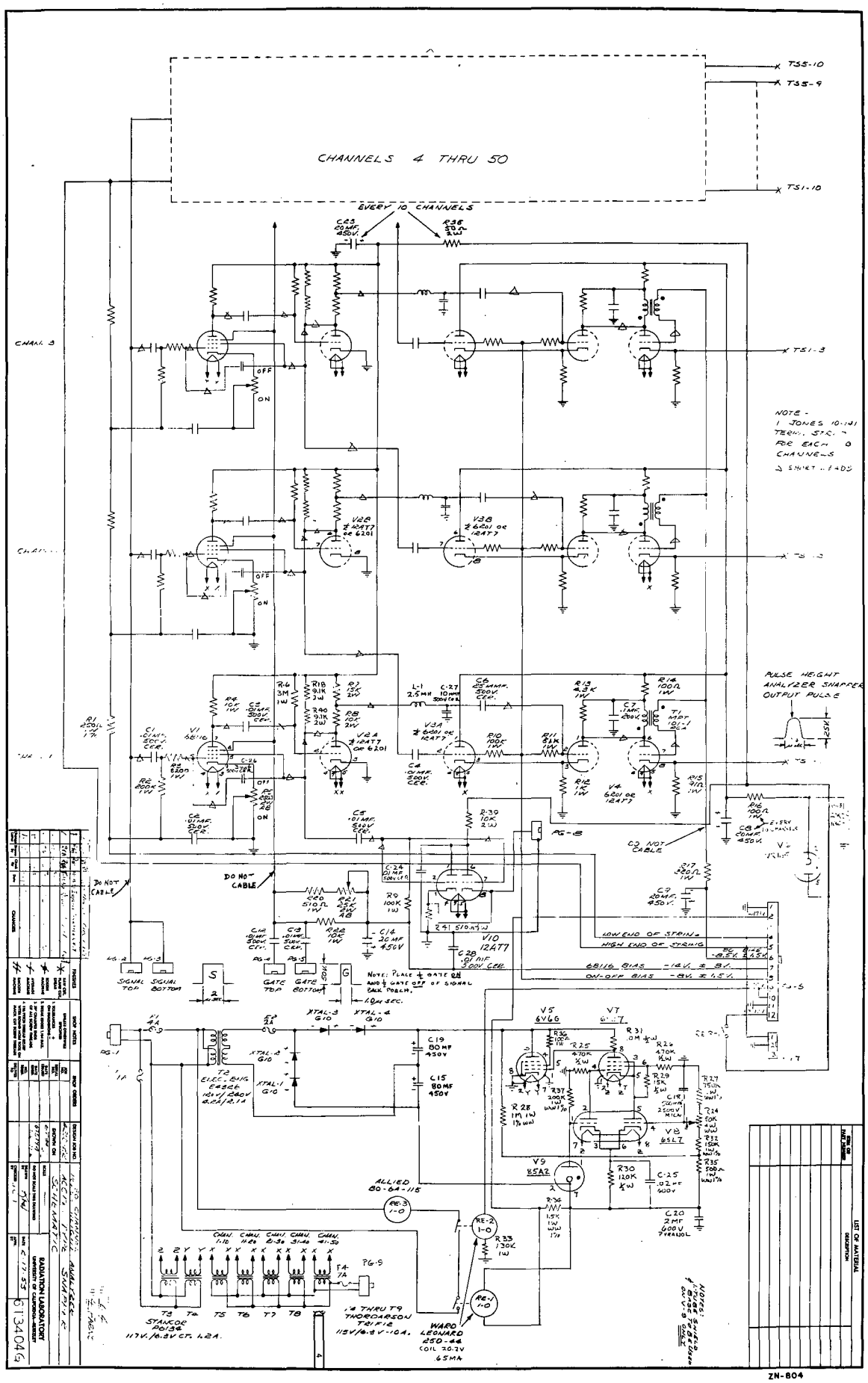
RADIATION LABORATORY
UNIVERSITY OF CALIFORNIA
BERKELEY

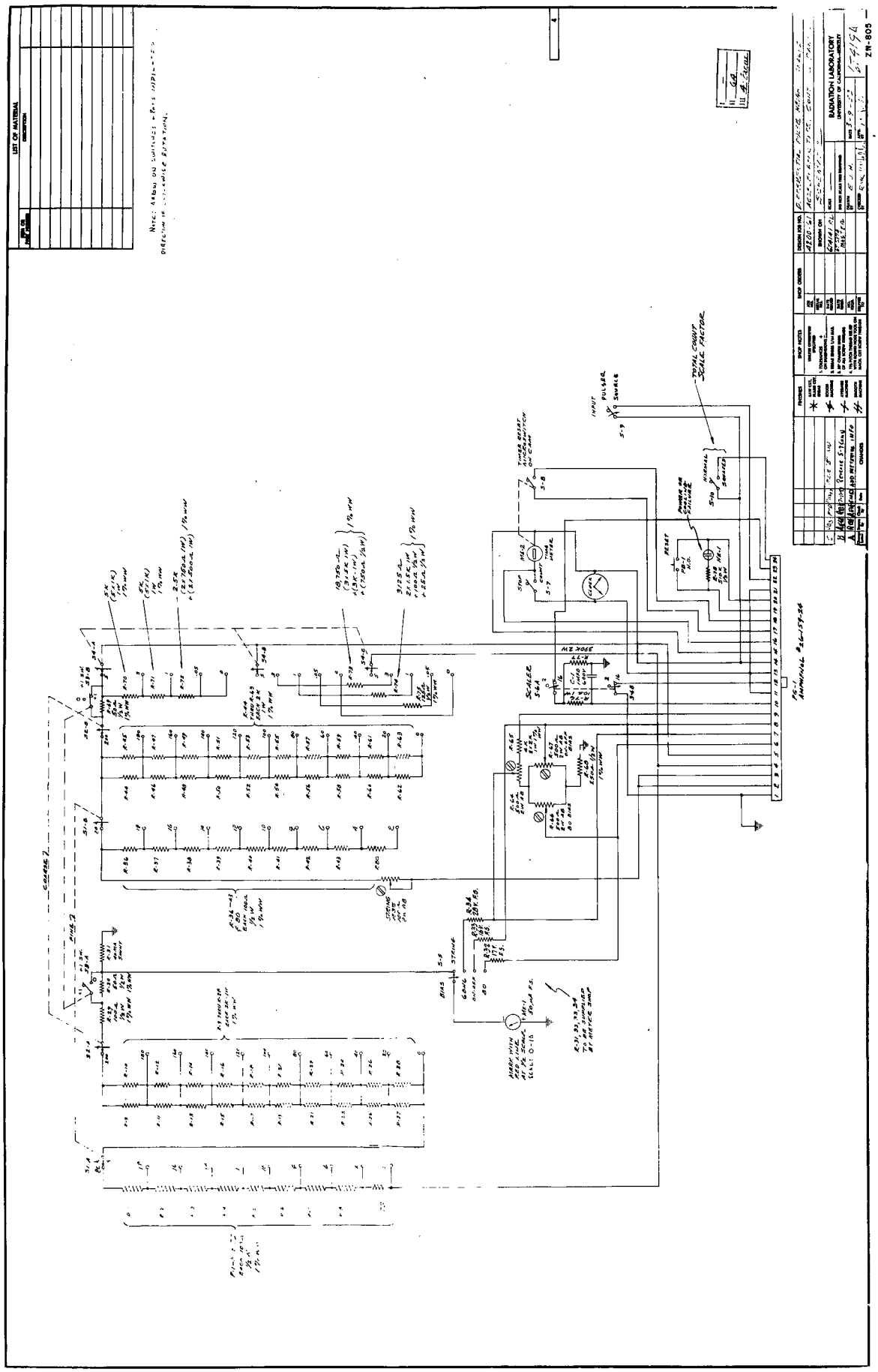
5T7861E
SHEET 2 OF 2

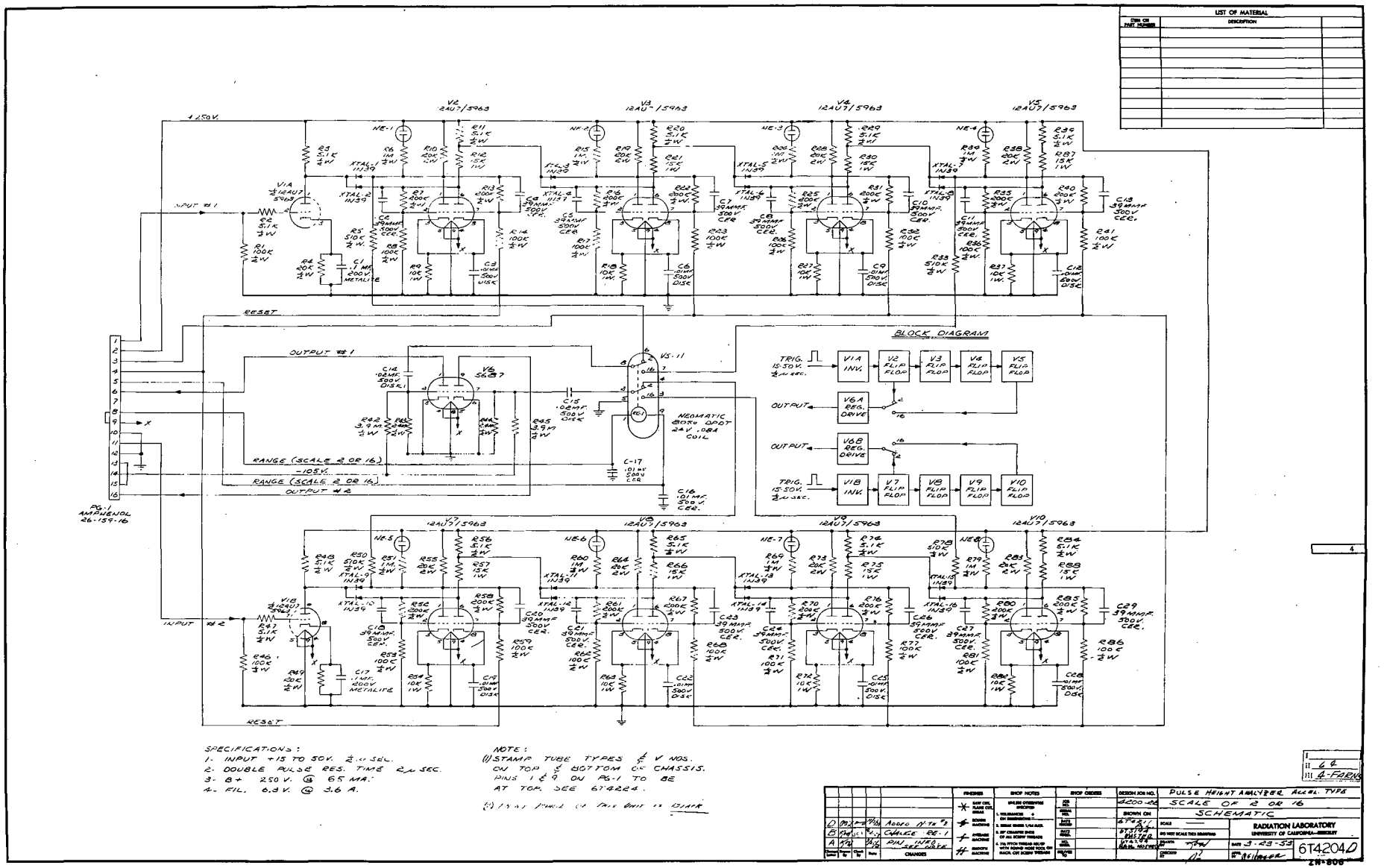
SHOWN ON | JOB NO. | SER. NO. | DATE ISSUED | DATE REQ'D | NO. REQ'D | DELIVER TO | MATERIAL

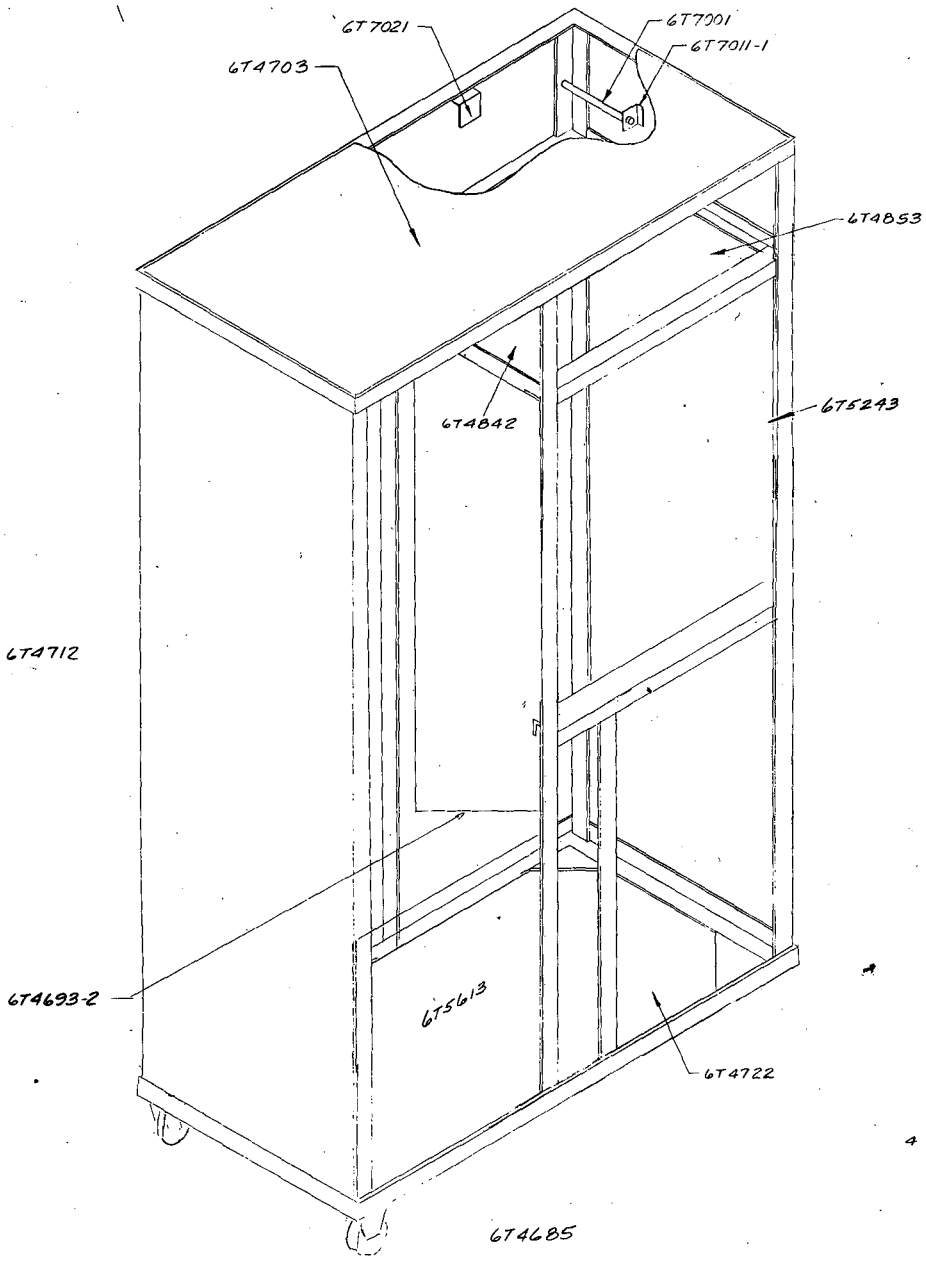
Forms.


LIST OF MATERIAL
RADIATION LABORATORY
UNIVERSITY OF CALIFORNIA—BERKELEY
GT 1054 SEE NOTE
GT 3833
ST 7904
ST 7834
ST 7971
ZN-809

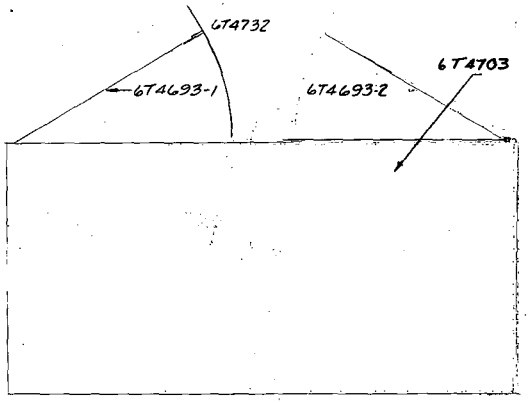

CHANNELS 4 THRU 50
TS5-10
TS5-9
TS1-10
EVERY 10 CHANNELS
C23 20 MF. 450V.
R36 50Ω 2W
CHAN. 3
TS1-3
NOTE - 1 JONES 10-141 TERM. STR. FOR EACH 10 CHANNELS
V2B ½ 12AT7 OR 6201
V3B ½ 6201 OR 12AT7
PULSE HEIGHT ANALYZER SHAPER OUTPUT PULSE
V1 6E10
V2A ½ 12AT7 OR 6201
V3A ½ 6201 OR 12AT7
V4 6201 OR 12AT7
DO NOT CABLE
V10 12AT7
LOW END OF STRING
HIGH END OF STRING
6E10 BIAS -14V. ± 8V.
ON-OFF BIAS -8V. ± 1.5V.
SIGNAL TOP
SIGNAL BOTTOM
GATE TOP
GATE BOTTOM
NOTE: PLACE ½ GATE ON AND ½ GATE OFF OF SIGNAL EACH PORCH.
10μ SEC.
XTAL-3 G10
XTAL-4 G10
XTAL-1 G10
T2 ELEC. ENG. E4326 120/240V 4.2A/2.1A
C19 80 MF 450V
C15 80 MF 450V
V5 6V6
V7 6SL7
V8 6SL7
V9 6SA2
ALLIED 80-64-115
RE-3 1-0
RE-2 1-0
RE-1 1-0
CHAN. 1-10 CHAN. 11-20 CHAN. 21-30 CHAN. 31-40 CHAN. 41-50
T3 T4 T5 T6 T7 T8
STANCOR P6138 117V/16.5V CT. 1.2A.
T4 THRU T9 THORDARSON T-01-12 115V/16.5V-1.0A.
WARD LEONARD 250-44 COIL 20.2V .65MA
ZN-804


LIST OF MATERIAL
RADIATION LABORATORY
ZN-805


LIST OF MATERIAL
DWG OR PART NUMBER
DESCRIPTION
+250V.
INPUT #1
INPUT #2
RESET
OUTPUT #1
OUTPUT #2
RANGE (SCALE 2 OR 16)
-105V.
NEOMATIC 8000 QADT 24V .08A COIL
BLOCK DIAGRAM
TRIG. 15-50V. ½μ SEC.
V1A INV.
V2 FLIP FLOP
V3 FLIP FLOP
V4 FLIP FLOP
V5 FLIP FLOP
V6A REG. DRIVE
V6B REG. DRIVE
V1B INV.
V7 FLIP FLOP
V8 FLIP FLOP
V9 FLIP FLOP
V10 FLIP FLOP
PS-1 AMPHENOL 26-159-16
12AU7/5963
SPECIFICATIONS:
1. INPUT +15 TO 50V. ½μ SEC.
2. DOUBLE PULSE RES. TIME 2μ SEC.
3. B+ 250 V. @ 65 MA.
4. FIL. 6.3 V. @ 3.6 A.
NOTE:
(1) STAMP TUBE TYPES & V NOS. ON TOP & BOTTOM OF CHASSIS.
PINS 1 & 9 ON PS-1 TO BE AT TOP. SEE 674224.
(2) INK PANEL OF THIS UNIT IS BLACK
PULSE HEIGHT ANALYZER ALL. TYPE
SCALE OF 2 OR 16
SCHEMATIC
RADIATION LABORATORY
UNIVERSITY OF CALIFORNIA—BERKELEY
6T4204D
ADDED N-16 #1
CHANGE RE-1
PIN INFO. SEE DATA
CHANGES
SHOP NOTES
SHOP ORDERS
DESIGN JOB NO.
SHOWN ON
DATE
3-23-53
ZN-806




| QUAN | | |
|---|---|---|
| 6 | Hinges Mc Kinney #721 | |
| 4 | Door Handles- Alladin # 439813 | |
| 4 | Casters - Colson (Swivel) # 3-308-43 | |
| 1 | 1" Adalet Bushing | |
| 26 | Airlock Receptacles # 99967-C.098 | |
| 3 | Fans, Broan 10" Ceiling Exhaust Fans Grainger # LE. 932 (Without Escutcheon & Shutter) | |
| 2 | Air Filters, Fiberglass Dust Stop Type B 11x11x1 | |
| 10 | AIRLOC WING TYPE ROUND HEAD STUDS # W98293-3- | .350 |
| 26 | AIRLOC CROSS PINS # 99785-2 | |
| 16 | AIRLOC WING TYPE ROUND HEAD STUDS # W98293-5- | .600 |
| PG-2 1 | AMPHENOL BLUE RIBBON RECEPT. 26-109-16 | |




6T467 3

DRAWING LIST

| | | |
|---|---|---|
| 10Z1212-152 | 2 | STND. SPACING BUSHING |
| 6T 4673 | (1) | Assembly (THIS) |
| 6T 4685 | 1 | Frame |
| 6T 4698-1 | 1 | Rack Rear Door ( Right Hand) |
| 6T 4693-2 | 1 | " " " ( Left Hand) |
| 6T 4703 | 1 | Rack Top |
| 6T 4712 | 2 | Rack Side Cover |
| 6T 4732 | 1 | Rack Center Cover |
| 6T 4722 | 1 | Air Filter Mount |
| 6T7382 | 8 | Fan Cover |
| 10Z 9053 | 2 | Filter Bracket |
| 10Z 9063-2 | 2 | Filter Plate |
| 10Z 9083 | 6 | Blower Fan Guards |
| 6T 1962 | 4 | Transformer Mounts |
| 6T 4853 | 1 | Scaler Compartment -Bottom |
| 6T 4842 | 1 | " " - Side |
| 6T5243 | 1 | REGISTER ESCUTCHEON |
| 10Z-1212-149 | 3 | SPACER BUSHING |
| 6T 6632 | 1 | CENTER STD PANEL |
| 6T5613 | 1 | GATE FLATTENER-AMP # 300K REGULATOR: PANEL |
| 6T6612 | 2 | PANEL CLIPS |
| 6T7001 | 2 | FAN GUIDE PIPE |
| 6T7011-1 | 1 | " " " BRKT. |
| 6T7011-2 | 1 | " " " " |
| 6T7021 | 1 | FEMALE PLUG SUPPORT |

N No 3-30B-43

4 PLACES

I
II 64
III 4 FANS

| | |
|---|---|
| 4200-61 | ACCELERATOR |
| 6T5194 MASTER | |

| | | | | |
|---|---|---|---|---|
| B | GW | 6-24-53 | ADDED 6T7382 TO DWG. LIST | |
| A | DR | | GEN. CHANGES | |

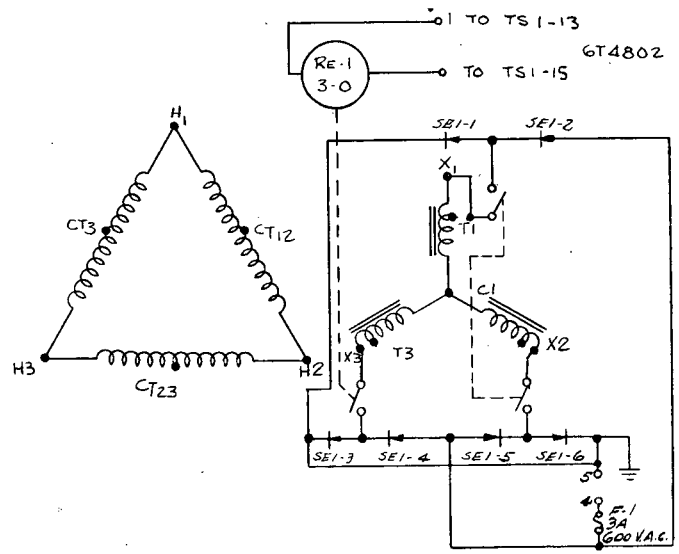
RADIATION LABORATORY
UNIVERSITY OF CALIFORNIA BERKELEY

6T4673B

ZN-801

2

| LIST OF MATERIAL | | |
|---|---|---|
| ITEM OR PART NUMBER | DESCRIPTION | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |




PARTS LIST

| DESIG | QUAN | DESCRIPTION |
|---|---|---|
| F-1 | 1 | 3 Amp. 600 V.(A.C.) Fuse w/Holder |
| T-1 | 1 | Transformer, Trans Rex Spec #1143<br>Pri. 220V CT/60 cyc. 2500 VA<br>Sec 360V to N, 320V Tap 2000 VA |
| SE1 | 1 | Rectifier 3 $\phi$ Bridge 6-22-1BM |
| RE1 | 1 | Allied PO-9A-115 3PDT Relay |

Drawing List

| | | |
|---|---|---|
| 6T4782 | - | Schematic & Parts List (this) |

NOTE: Install on floor of rack.

I
II 64
III 4 FARNS.

| Change Letter | Drawn By | Check By | Date | CHANGES |
|---|---|---|---|---|
| B | FW | DK | 6-23 | Reference & Remarks |

FINISHES: SAW CUT, FLAME CUT, SHEAR; ROUGH MACHINE; AVERAGE MACHINE; SMOOTH MACHINE

SHOP NOTES: UNLESS OTHERWISE SPECIFIED 1. TOLERANCES + ON DIMENSIONS — 2. BREAK EDGES 1/64 MAX. 3. 30° CHAMFER ENDS OF ALL SCREW THREADS 4. 1½ PITCH THREAD RELIEF WITH ROUND NOSE TOOL ON MACH. CUT SCREW THREADS

SHOP ORDERS: JOB NO. / SERIAL NO. / DATE ISSUED / DATE REQD. / NO. REQD. / DELIVER TO

DESIGN JOB NO. 4200-61

SHOWN ON 6T5194 MASTER

SCALE —

DO NOT SCALE THIS DRAWING

DRAWN BY G. Woo

CHECKED BY R. E. Hellen

DIFFERENTIAL PULSE HEIGHT ANALYZER
ACCELERATOR TYPE RECTIFIER
SCHEMATIC & P.L.

RADIATION LABORATORY
UNIVERSITY OF CALIFORNIA—BERKELEY

DATE 3-25-53

APPR. BY R. E. Hellen

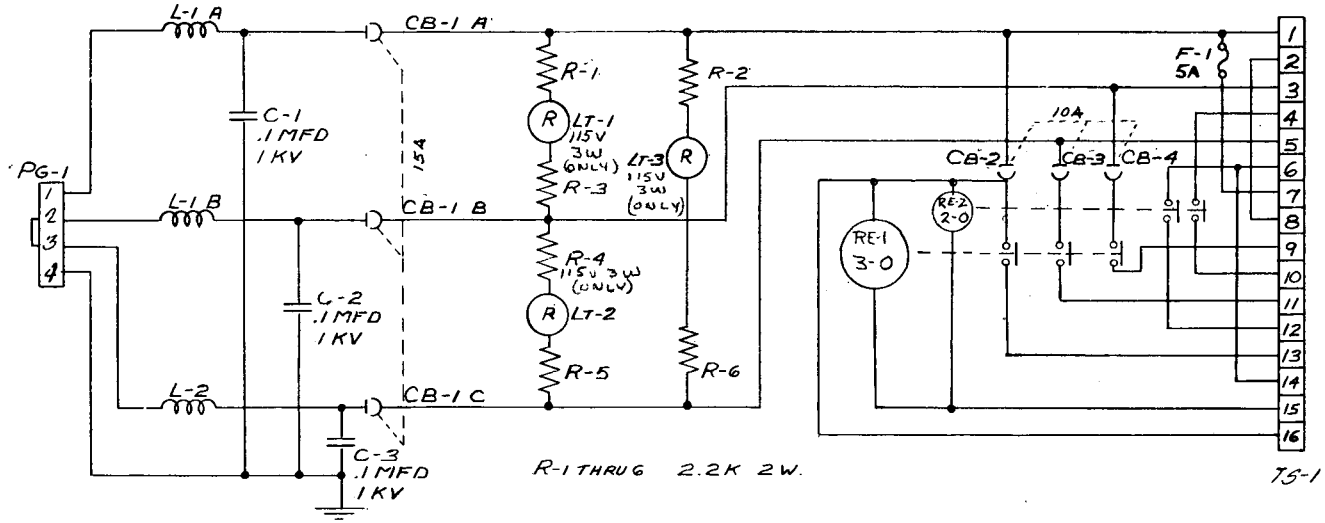
6T4782B

ZN-796

2

| LIST OF MATERIAL | | |
|---|---|---|
| ITEM OR PART NUMBER | DESCRIPTION | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

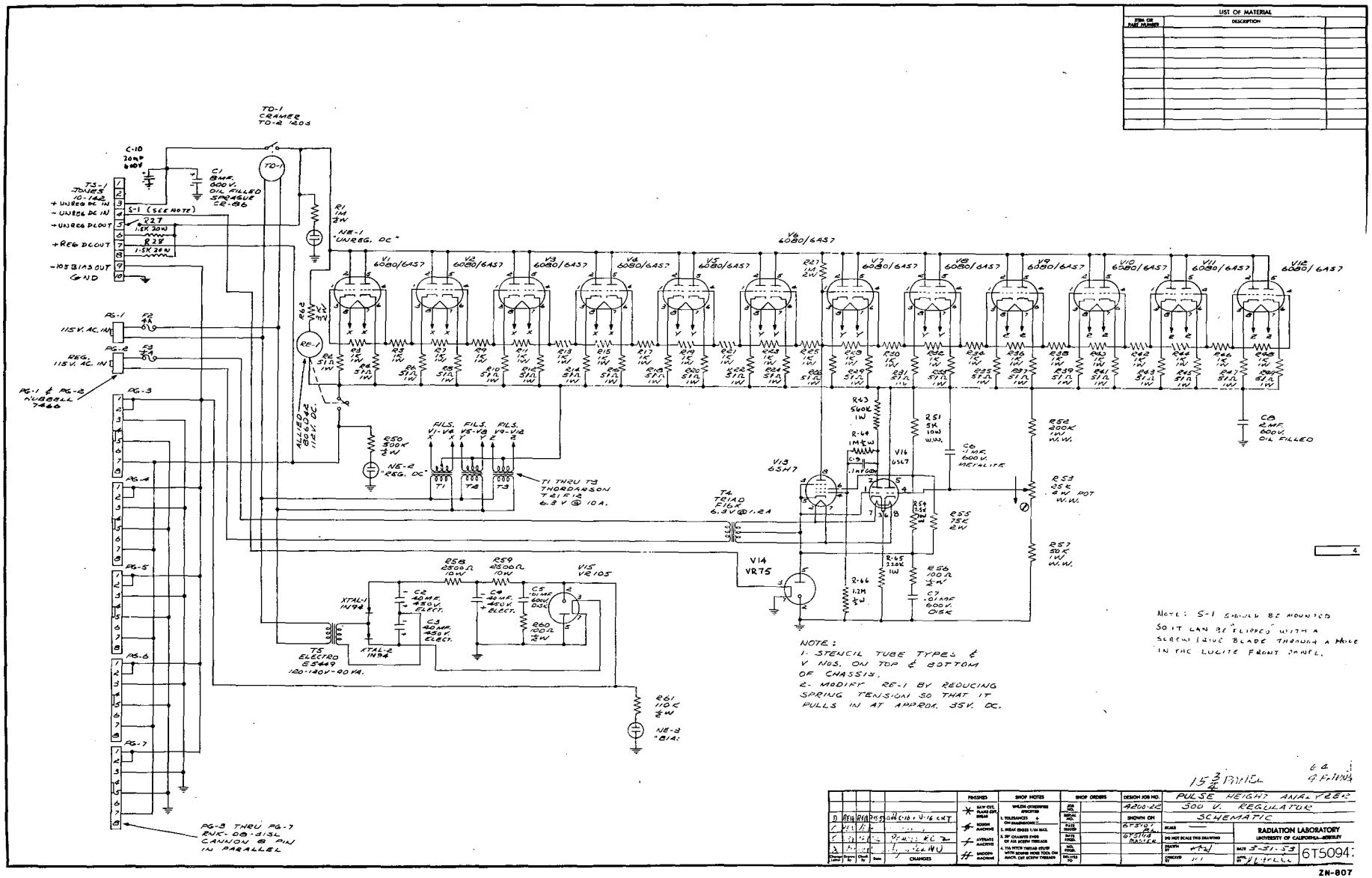
L-1 MILLER D-7829 .13MH ea. 30A ea
L-2 MILLER 7829 .13MH ea. 30A ea

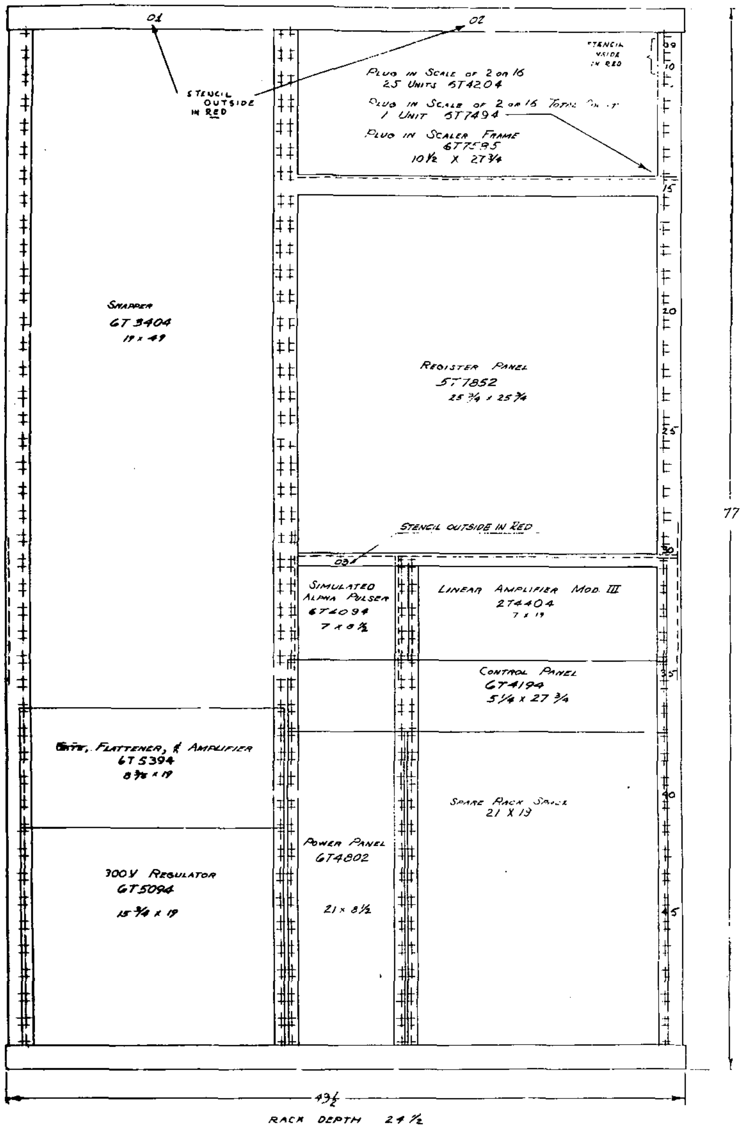



II 64
III 4 FARNS

| | | | | | FINISHES | SHOP NOTES | SHOP ORDERS | | DESIGN JOB NO. | DIFFERENTIAL PULSE HEIGHT ANALYZER |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SAW CUT, FLAME CUT, SHEAR | UNLESS OTHERWISE SPECIFIED | JOB NO. | | 4200-61 | ACCELERATOR TYPE |
| | | | | | ROUGH MACHINE | 1. TOLERANCES ± ON DIMENSIONS | SERIAL NO. | | SHOWN ON | POWER PANEL SCHEMATIC |
| | | | | | AVERAGE MACHINE | 2. BREAK EDGES 1/64 MAX. | DATE ISSUED | | 6T4831 PL 6T5194 MASTER | SCALE — RADIATION LABORATORY |
| | | | | | SMOOTH MACHINE | 3. 30° CHAMFER ENDS OF ALL SCREW THREADS | DATE REQD. | | | DO NOT SCALE THIS DRAWING — UNIVERSITY OF CALIFORNIA—BERKELEY |
| B | [illegible] | [illegible] | [illegible] | Add RE-2 | | 4. 1½ PITCH THREAD RELIEF WITH ROUND NOSE TOOL ON MACH. CUT SCREW THREADS | NO. REQD. | | | DRAWN BY D. SPROUL — DATE 3-26-53 |
| A | [illegible] | [illegible] | [illegible] | [illegible] | | | DELIVER TO | | | CHECKED BY [illegible] — APPR. BY [illegible] — 6T4802A |
| Change Letter | Drawn By | Check By | Date | CHANGES | | | | | | |

ZN-798


LIST OF MATERIAL
ITEM OR PART NUMBER
DESCRIPTION
TD-1 CRAMER TD-2 120S
C-10 20MF 600V
C1 8MF. 600V. OIL FILLED SPRAGUE CE-86
T3-1 JONES 10-142
+UNREG DC IN
-UNREG DC IN
+UNREG DC OUT
+REG DC OUT
-105 BIAS OUT GND
S-1 (SEE NOTE)
R27 1.5K 20W
R28 1.5K 20W
R1 1M ½W
NE-1 "UNREG. DC"
V1 6080/6AS7
V2 6080/6AS7
V3 6080/6AS7
V4 6080/6AS7
V5 6080/6AS7
V6 6080/6AS7
V7 6080/6AS7
V8 6080/6AS7
V9 6080/6AS7
V10 6080/6AS7
V11 6080/6AS7
V12 6080/6AS7
R27 1W 2W
R62 5K 1W
RE-1
ALLIED 86D42 115V. DC
PG-1 R2 8Ω
115 V. AC. IN
PG-2 R3 8Ω
REG. 115 V. AC. IN
PG-1 & PG-2 HUBBELL 7460
PG-3
PG-4
PG-5
PG-6
PG-7
PG-3 THRU PG-7 RJK-08-S15L CANNON @ PIN IN PARALLEL
R50 500K ½W
NE-2 "REG. DC"
FILS. V1-V4
FILS. V5-V8
FILS. V9-V12
T1 T2 T3
T1 THRU T3 THORDARSON T-81-F12 6.3 V @ 10 A.
T4 TRIAD F16X 6.3V @ 1.2A
V13 6SH7
V16 6SL7
R43 560K 1W
R-64 1M ½W
C-9 .1MFD
R51 5K 10W W.W.
C6 1MF. 600V. METALITE
R52 200K 1W W.W.
C8 2MF. 600V. OIL FILLED
R53 25K 8W POT W.W.
R54 25K 2W
R55 75K 2W
R57 50K 1W W.W.
R65 220K 1W
R56 100Ω ±1%
C7 .01MF 600V. DISC
R-66 1.2M ½W
V14 VR75
R58 2500Ω 10W
R59 2500Ω 10W
V15 VR105
C5 .01MF 600V. DISC
R60 100Ω 2W
XTAL-1 1N94
XTAL-2 1N94
C2 40MF. 450V. ELECT.
C3 40MF. 450V. ELECT.
C4 40MF. 450V. ELECT.
T5 ELECTRO 5449 120-120V-90VA.
R61 10K ½W
NE-3 "B1A"
NOTE:
1- STENCIL TUBE TYPES & V NOS. ON TOP & BOTTOM OF CHASSIS.
2- MODIFY RE-1 BY REDUCING SPRING TENSION SO THAT IT PULLS IN AT APPROX. 35V. DC.
NOTE: S-1 SHOULD BE MOUNTED SO IT CAN BE FLIPPED WITH A SCREW DRIVE BLADE THROUGH A HOLE IN THE LUCITE FRONT PANEL.
4
PULSE HEIGHT ANALYZER
300 V. REGULATOR
SCHEMATIC
4200-22
RADIATION LABORATORY
UNIVERSITY OF CALIFORNIA-BERKELEY
6T5094
ZN-807




## OVERALL DRAWING LIST

| Nº | QUAN. | TITLE |
|---|---|---|
| 6T5194 | — | MASTER ASSEMBLY & DWG LIST (THIS) |
| 6T4204 | 26 | PLUG-IN SCALE OF 2 OR 16 SCHEMATIC |
| 6T7585 | 1 | " " SCALER FRAME INTER PLUG DIAG |
| 6T3404 | 1 | SNAPPER SCHEMATIC |
| 6T5094 | 1 | 300V REGULATOR SCHEMATIC |
| 6T4802 | 1 | POWER PANEL SCHEMATIC |
| 5T7852 | 1 | REGISTER PANEL SCHEMATIC |
| 2T4404 | 1 | LINEAR AMPLIFIER MODEL III SCHEMATIC |
| 6T4194 | 1 | CONTROL PANEL SCHEMATIC |
| 6T5202 | 1 | FILAMENT PWR SPLY SCHEMATIC |
| 6T4782 | 1 | RECTIFIER SCHEMATIC |
| 6T4673 | 1 | PORTABLE REGISTER RACK ASSEMBLY |
| 6T5394 | 1 | GATE FLATTENER & AMPLIFIER SCHEMATIC |
| 6T5561 | — | INTER-CONNECT DATA FOR RACK |
| 6T6094 | 1 | SIMULATED ALPHA PULSER |
| 6T6393 | — | PLUG-IN SCALER TEST UNIT SCHEMATIC (USED TO TEST 6T4204 & 6T7494) |
| 5T7874 | — | REGISTER ASSEMBLY |
| 5T7861 | — | REGISTER PARTS LIST |
| 6T6713 | 10 | DATA SHEET |
| 6T6723 | 4 | CALIBRATION SHEET |
| 6T6881 | 1 | FAN SCHEMATIC |
| 6T7494 | 1 | PLUG IN SCALE OF 2 OR 16 TOTAL COUNT-SCH. |
| 6T7591 | — | INSTALLATION DATA |
| 6T7881 | 1 | 12" MOTOR DRIVEN POTENTIOMETER |

## PARTS LIST

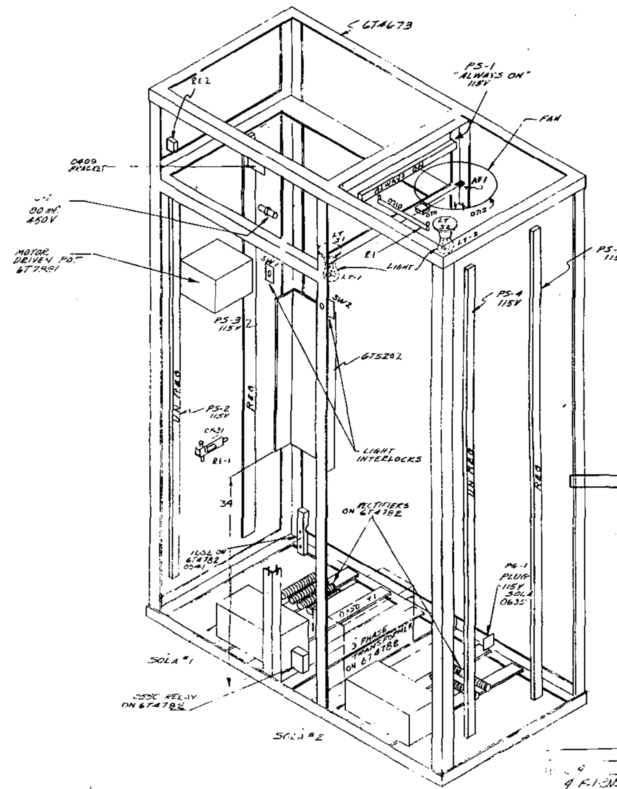
| DESIG. | QUAN. | DESCRIPTION |
|---|---|---|
| SOLA #1 | 1 | SOLA 250VA 117V |
| PS-2,3,4,5 | 4 | PLUG STRIP |
| PS-1 | 1 | " " |
| LT-1,2 | 2 | LIGHTS 60W 120V |
| LT-S-1,2 | 2 | " SOCKET |
| SW-1,2 | 2 | SWITCHES, INTERLOCK |
| PG-1 | 1 | 115V PLUG |
| SOLA #2 | 1 | SOLA 500VA 117V |
| RE1 | 1 | ADVANCE 7200 |
| AF1 | 1 | AIR FLOW SWITCH CORAL DESIGN 103A |
| RE2 | 1 | ALLIED BJ6A115 |
| C-1 | 1 | 80MFD. 450V. ELECT. COND. |
| R-1 | 1 | 50Ω 200W. WW RES. W/TAP |

## LIST OF MATERIAL

| ITEM OR PART NUMBER | DESCRIPTION | |
|---|---|---|
| | | |

NOTE:

(1) STENCIL DESIGNATIONS AS INDICATED
(2) COMPLETED RACK CLEARANCE AFTER REMOVING CONTROL DESK.
H=82½ W=49½ D=34½




| CHANGES | FINISHES | SHOP NOTES | SHOP ORDERS |
|---|---|---|---|
| | ROUGH MACHINE | UNLESS OTHERWISE SPECIFIED: 1. TOLERANCES ± ON DIMENSIONS | |
| | SMOOTH MACHINE | 2. BREAK EDGES 1/64 MAX. | |
| | | 3. 30° CHAMFER ENDS OF ALL SCREW THREADS | |
| | | 4. 1½ PITCH THREAD RELIEF WITH ROUND NOSE TOOL ON MACH. CUT SCREW THREADS | |

DESIGN JOB NO. 4200-61 — DIFFERENTIAL PULSE HEIGHT ANALYZER ACCELERATOR TYPE.
SHOWN ON — MASTER ASSEMBLY & DWG. LIST
SCALE AS NOTED — DO NOT SCALE THIS DRAWING
RADIATION LABORATORY
UNIVERSITY OF CALIFORNIA—BERKELEY
DRAWN BY E. J. H. — DATE 4-14-53
CHECKED BY — APPR. BY
6T5194C

ZN-810

2

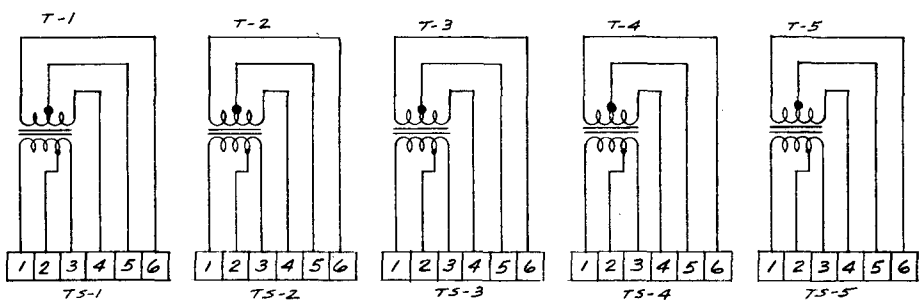
| LIST OF MATERIAL | | |
|---|---|---|
| ITEM OR PART NUMBER | DESCRIPTION | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

PARTS LIST

| DESIG. | QUAN. | DESCRIPTION |
|---|---|---|
| T-1,2,3,4,5 | 5 | FIL. TRANSFORMER STANCOR P-6309 107, 117V / 6.3 CT 20 A. |
| TS-1,2,3,4,5 | 5 | JONES TERMINAL STRIP TYPE 142 6PT 30A. |

DWAWING LIST

| | | |
|---|---|---|
| 6T 5202 | -- | SCHEMATIC & PARTS LIST (THIS) |
| 6T 5214 | 1 | FILAMENT TRANSF. CHASSIS |




I
II 64
III 4FARNS

| Change Letter | Drawn By | Check By | Date | CHANGES |
|---|---|---|---|---|
| | | | | |

FINISHES: SAW CUT, FLAME CUT, SHEAR; ROUGH MACHINE; AVERAGE MACHINE; SMOOTH MACHINE

SHOP NOTES: UNLESS OTHERWISE SPECIFIED
1. TOLERANCES ± ON DIMENSIONS
2. BREAK EDGES 1/64 MAX.
3. 30° CHAMFER ENDS OF ALL SCREW THREADS
4. 1½ PITCH THREAD RELIEF WITH ROUND NOSE TOOL ON MACH. CUT SCREW THREADS

SHOP ORDERS: JOB NO. / SERIAL NO. / DATE ISSUED / DATE REQD. / NO. REQD. / DELIVER TO

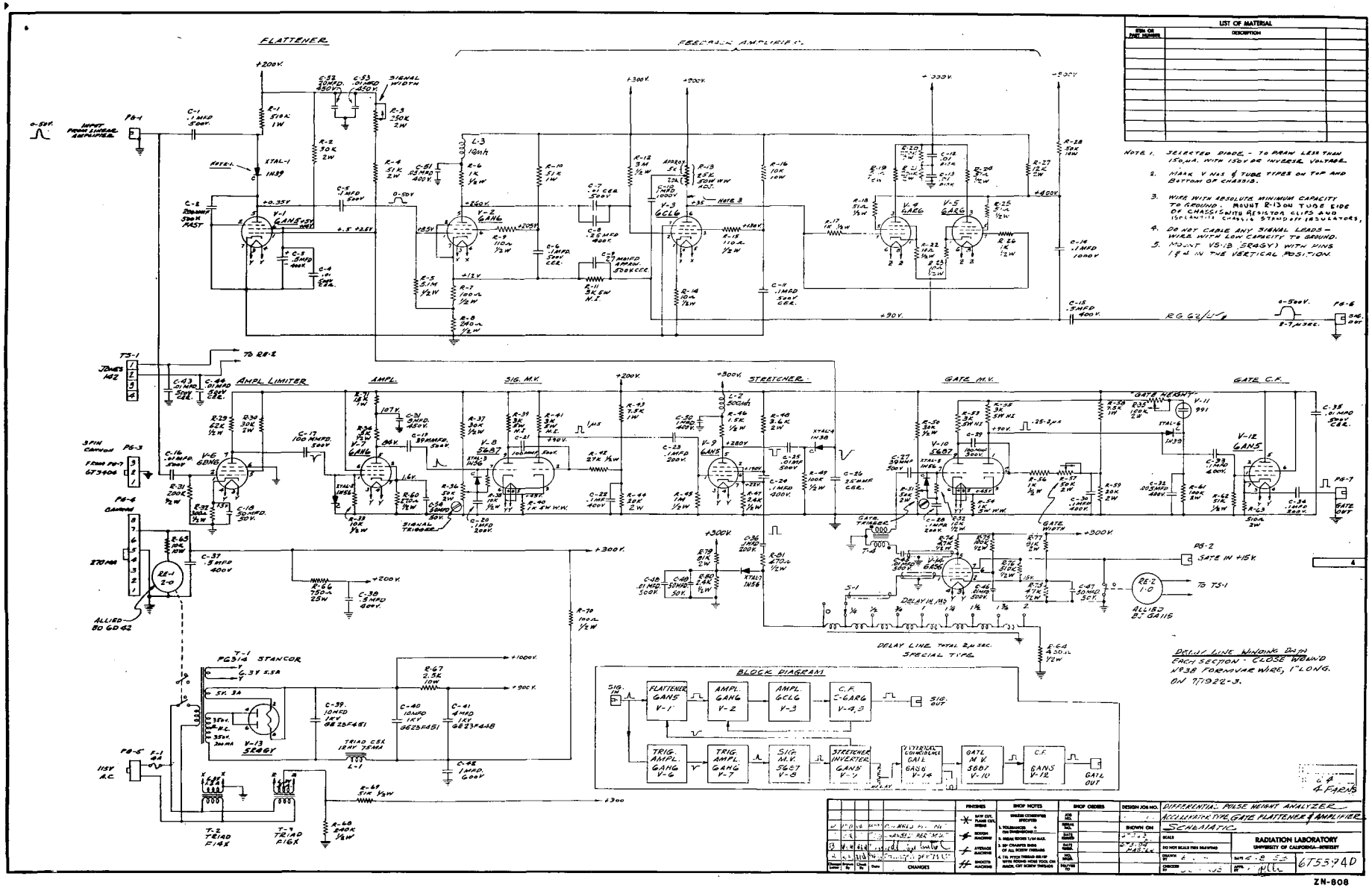
DESIGN JOB NO. 4200-61
SHOWN ON 6T5214 CHASSIS, 6T5194 MASTER

DIFFERENTIAL PULSE HEIGHT ANALYZER
ACCELERATOR TYPE. FILAMENT PWR SUPPLY
SCHEMATIC & P.L.

SCALE —
DO NOT SCALE THIS DRAWING
DRAWN BY E. J. H.
CHECKED BY JCT
APPR. BY REHelle

RADIATION LABORATORY
UNIVERSITY OF CALIFORNIA—BERKELEY
DATE 4-3-53
6T5202

ZN-795


FLATTENER
FEEDBACK AMPLIFIER
AMPL. LIMITER
AMPL.
SIG. M.V.
STRETCHER
GATE M.V.
GATE C.F.
LIST OF MATERIAL
NOTE 1. SELECTED DIODE - TO DRAW LESS THAN 150 μA. WITH 150V DC INVERSE VOLTAGE.
2. MARK V HAS 6 TUBE TYPES ON TOP AND BOTTOM OF CHASSIS.
3. WIRE WITH ABSOLUTE MINIMUM CAPACITY TO GROUND. MOUNT R-130 ON TUBE SIDE OF CHASSIS WITH RESISTOR CLIPS AND ISOLANITE CHASSIS STANDOFF INSULATORS.
4. DO NOT CABLE ANY SIGNAL LEADS - WIRE WITH LOW CAPACITY TO GROUND.
5. MOUNT V5-B (SEAGY) WITH PINS 1 & 2 IN THE VERTICAL POSITION.
DELAY LINE WINDING DATA
EACH SECTION - CLOSE WOUND
#38 FORMVAR WIRE, 1" LONG.
ON 77922-3.
DELAY LINE TOTAL 2 μ SEC.
SPECIAL TYPE
BLOCK DIAGRAM
FLATTENER GA7S V-1
AMPL. GCL6 V-2
AMPL. GCL6 V-3
C.F. 6ARG V-4,5
TRIG. AMPL. GA7G V-6
TRIG. AMPL. GA7G V-7
SIG. M.V. 5687 V-8
STRETCHER INVERTER GA7S V-9
EXTENDED COINCIDENCE GA7B V-14
GATE M.V. 5687 V-10
C.F. GA7S V-12
SIG. IN
SIG. OUT
GATE OUT
DIFFERENTIAL PULSE HEIGHT ANALYZER
ACCELERATOR TYPE GATE FLATTENER & AMPLIFIER
SCHEMATIC
RADIATION LABORATORY
UNIVERSITY OF CALIFORNIA—BERKELEY
6T5574D
ZN-808

| Wire | Junction | Unit | Termination | Junction | Unit | Termination |
|---|---|---|---|---|---|---|
| | | | CABLE A #14 Solid 600V ins. | | | |
| A1 | TS1-1 | 6T4802 | Spade lug | H1 | 6T4782 | spade lug |
| A2 | TS1-2 | " | " | CT12 | " | " |
| A3 | TS1-3 | " | " | $H_2$ | " | " |
| A4 | TS1-4 | " | " | $CT_{23}$ | " | " |
| A5 | TS1-5 | " | " | $H_3$ | " | " |
| A6 | TS1-6 | " | " " | $CT_{31}$ | " | " |
| A7 | | | | | | |
| | | | CABLE B #14 Solid 600V ins. | | | |
| *B1 | TS1-7 | 6T4802 | spade lug | PG1-13 | 6T4194 | 26-190-24 |
| *B2 | TS1-8 | " | " | PG1-14 | " | " |
| B3 | TS1-7 | " | " | | | |
| B4 | TS1-8 | " | " | PS1 | Rack | PS |
| B5 | TS1-8 | " | " | PS2 | " | " |
| B6 | TS1-9 | " | " | | | |
| B7 | TS1-9 | " | | | | |
| B8 | TS1-10 | " | " | PS4 & Sola #1 in. Rack | | Sola |
| B9 | TS1-10 | " | " | | | |
| B10 | TS1-11 | " | " | Sola #2 ins. Rack | | Sola |
| B11 | TS1-11 | " | " | TS1-1,TS2-1,TS3-1 | 6T5202 | spade lug |
| B12 | TS1-12 | " | " | TS1-3,TS2-3,TS3-3 | 6T5202 | " |
| B13 | TS1-12 | " | " | TS4-1,TS5-1 | " | " |
| B14 | TS1-13 | " | " | TS4-3, TS5-3 | " | " |
| *B15 | TS1-14 | " | " | PG1-19 | 6T4194 | 26-190-24 |
| *B16 | TS1-15 | " | " | PG1-20 | " | " |
| **B17 | TS1-12 | " | " | PG1-16 | 6T6881 | 26-190-16 |
| **B18 | TS1-13 | " | " | PG1-15 | " | " |
| **B25 | TS1-14 | 6T4802 | Spade lug | | | Fan in Rack |
| **B26 | PG1-4in Scaler Comp't | | 26-190-16 | Fan in rack | | Splice |
| **B27 | TS1-15 | 6T4802 | spade lug | PG1-5 in Scaler Comp't | | 26-190-16 |
| **B28 | PG1-7 inScaler Comp't | | 26-190-16 | Air Flow Switch on Rack Fan | | |
| **B29 | PG1-8 | " | " | " " " | " | " " |
| | | | CABLE C #16 2 Cond. Tyrex | | | |
| C1,C2 | Sola #1 Output | Rack | Sola | PS3 & PS5 | Rack | PS |
| | | | CABLE D #16 2 cond. Tyrex | | | |
| D1,D2 | Sola #2 output | Rack | Sola | PG1 | Rack | PG |
| | | | CABLE E #18 2 Cond. Tyrex | | | |
| E1 | PG1-1 | 5T7852 | Hubb.7468 | PG1-17 | 6T4194 | 26-190-24 |
| E2 | PG1-2 | " | " | PG1-18 | " | " |
| | | | CABLE F #20 Stranded 600V ins. | | | |
| F1 | PG1-1-6 | 6T4204 | 26-190-16 | TS1-1&2 | 5T7852 | spade lug |
| F2 | PG1-1-16 | " | " | TS1-3&4 | " | " |
| F3 | PG1-2-6 | " | " | TS1-5&6 | " | " |

* #16 stranded 1KV ins.
** #16 solid 600V ins.

ZN-781

| Change Letter | Drawn By | Check By | Date | CHANGES |
|---|---|---|---|---|
| B | JA | CRW | 7-1-53 | Redrawn & Redrawn |
| A | MDKREH | | 5-6-53 | Cable 0 added 3W4774 changed to 6T5604 |

SAW CUT, FLAME CUT, SHEAR — ROUGH MACHINE — AVERAGE MACHINE — SMOOTH MACHINE

UNLESS OTHERWISE SPECIFIED
1. TOLERANCES ON DIMENSIONS ±
2. BREAK EDGES 1/64 MAX.
3. 30° CHAMFER ENDS OF ALL SCREW THREADS
4. 1½ PITCH THREAD RELIEF WITH ROUND NOSE TOOL ON MACH. CUT SCREW THREADS

SCALE None
DESIGN ACCT. NO. 4200-61
DRAWN BY J.A. DATE 4-14-53
CHECK BY G.F.W. DATE 7/1/53
APPR. BY

DIFFERENTIAL PULSE HEIGHT ANALYZER
ACCELERATOR TYPE
INTERCONNECT DATA FOR RACK

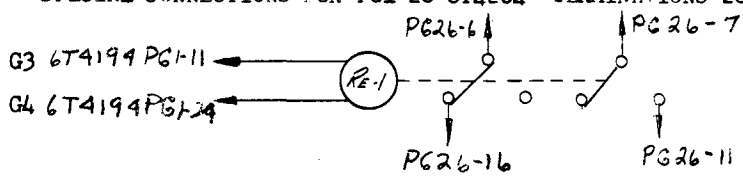
RADIATION LABORATORY
UNIVERSITY OF CALIFORNIA

6T5561B
Sheet 1 of 4

SHOWN ON | ACC'T NO. | SER. NO. | DATE ISSUED | DATE REQ'D | NO. REQ'D | DELIVER TO | MATERIAL

| Wire | Junction | Unit | Termination | Junction | Unit | Termination |
|---|---|---|---|---|---|---|
| | | | CABLE F #20 Stranded 600V ins., Cont'd | | | |
| F4 | PG1-2-16 | 6T4204 | 26-190-16 | TS1-7&8 | 5T7852 | spade lug |
| F5 | PG1-3-6 | " | " | TS1-9&10 | " | " |
| ----------typ. | | ----------typ. | | ----------typ. | | ----------typ.---------- |
| F49 | PG1-25-6 | " | " | TS2-45&46 | " | " |
| F50 | PG1-25-16 | " | " | TS2-47&48 | " | " |
| F51 | -PG1-26-16 | " | " | TS2-50 | " | " |
| F52 | PG-23 | 6T4194 | " | TS3-6 | " | " |
| | | | CABLE O #16 Solid 600V ins. | | | |
| O1 | TS1-5 | 6T5094 | spade lug | TS2-49 | 5T7852 | spade lug |
| O2 | TS1-10 | " | " | TS3-4 | " | " |
| | | | CABLE G #20 Stranded Suprenant | | | |
| G1 | PG1-1-4thru PG1-26-4 | 6T4204 | 26-190-16 | PG1-23 | 6T4194 | 26-190-24 |
| G2 | PG1-1-3thru PG1-26-3 | " | " | PG1-10 | " | " |

SPECIAL CONNECTIONS FOR PG1-26 6T4204 TERMINATIONS 26-190-16




| Wire | Junction | Unit | Termination | Junction | Unit | Termination |
|---|---|---|---|---|---|---|
| | | | CABLE H #20 Stranded 600v ins. | | | |
| H1 | TS1-6 | 6T5094 | spade lug | PG1-1-5 | 6T4204 | 26-190-16 |
| H2 | TS1-8 | " | " | PG1-14-5 | " | " |
| H3 | TS1-9 | " | " | PG1-1-14thruPG1-26-14 | 6T4204 | 26-190-16 |
| *H4 | TS1-10 | " | " | PG1-1-12thruPG1-26-12 | " | " |
| *H5 | TS1-7 | 6T5094 | " | PG1-1-2thruPG1-26-2 | 6T4204 | " |

SCALE SWITCH RUN 6T4204 #20 Stranded 600v ins.

PG1-12 6T4194 to PG1-13-8&PG1-26-8 6T4204, PG1-1-8 toPG1-2-5,PG1-2-8to PG1-3-5------typ.--------PG1-12-8toPG1-13-5, PG1-14-8to PG1-15-5,PG1-15-8 to PG1-16-5 ----type-------PG1-25-8toPG1-26-5

CABLE J #16 Stranded 1 KV ins.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| J1 | TS1-3 | 6T5094 | spade lug | #4 term. | 6T4782 | solder |
| J2 | TS1-10 | " | " | #5 " | " | " |

* #18 Rockbestos

ZN-780

| Change Letter | Drawn By | Check By | Date | CHANGES |
|---|---|---|---|---|
| A | RCK | REH | 5-6-53 | Cable O added 3W7T4 changed to 6T5094 |
| B | J.A. | CFW | 7-1-53 | Revised & Redrawn |

SAW CUT, FLAME CUT, SHEAR — ROUGH MACHINE — AVERAGE MACHINE — SMOOTH MACHINE

UNLESS OTHERWISE SPECIFIED: 1. TOLERANCES ON DIMENSIONS ± 2. BREAK EDGES 1/64 MAX. 3. 30° CHAMFER ENDS OF ALL SCREW THREADS 4. 1½ PITCH THREAD RELIEF WITH ROUND NOSE TOOL ON MACH. CUT SCREW THREADS

SCALE None — DESIGN ACCT NO. 4200-61 — DRAWN BY J.A. DATE 4-14-53 — CHECK BY C.F.W. DATE 7-1-53 — APPR. BY

DIFFERENTIAL PULSE HEIGHT ANALYZER
ACCELERATOR TYPE
INTERCONNECT DATA FOR RACK

RADIATION LABORATORY
UNIVERSITY OF CALIFORNIA

6T5568B
Sheet 2 of 4

SHOWN ON | ACC'T NO. | SER. NO. | DATE ISSUED | DATE REQ'D | NO. REQ'D | DELIVER TO | MATERIAL

| Wire | Junction | Unit | Termination | Junction | Unit | Termination |
|---|---|---|---|---|---|---|
| | | | CABLE K #20 stranded 600v ins. | | | |
| K1 | TS1-1 | 6T3404 | spade lug | PG1-1-1 | 6T4204 | 26-190-16 |
| K2 | TS1-2 | " | " | PG1-1-11 | " | " |
| K3 | TS1-3 | " | " | PG1-2-1 | " | " |
| | | ---------- typ | --------typ | ----------typ | ---------- | |
| K49 | TS5-9 | " | " | PG1-25-1 | " | " |
| K50 | TS5-10 | " | " | PG1-25-11 | " | " |
| | | | CABLE L #18 Rockbestos | | | |
| L1 | TS1-1 | 6T5394 | spade lug | PG1-15 | 6T4194 | 26-190-24 |
| L2 | TS1-2 | " | " | PG1-16 | " | " |
| | | | CABLE M #18 2 cond. Tyrex | | | |
| M1 | PG1-21 | 6T4194 | 26-190-24 | Coil of | | |
| M2 | PG1-22 | " | " | RE-1 in Rack | | |
| | | | CABLE N #16 12 cond. Patch | | | |
| N1 | PG61 | 6T3404 | NK-12-21C3/4 | PG1-1 | 6T4194 | 26-190-24 |
| N2 | PG6-2 | " | " | PG1-2 | " | " |
| N3 | PG6-3 | " | " | PG1-3 | " | " |
| N4 | PG6-4 | " | " | PG1-4 | " | " |
| N5 | PG6-5 | " | " | PG1-5 | " | " |
| N6 | PG6-6 | " | " | PG1-6 | " | " |
| N7 | PG6-7 | " | " | PG1-7 | " | " |
| N8 | PG6-8 | " | " | PG1-8 | " | " |
| N9 | PG6-9 | " | " | PG1-9 | " | " |
| N10 | PG6-10 | " | " | TS1-9 | 6T5094 | spade lug |
| N11 | PG6-11 | " | " | TS1-10 | " | " |
| N12 | PG6-12 | " | " | TS1-7 | " | " |
| R1 | TS1-4 | 6T5202 | spade lug | Buss #1 | 6T4204 | spade lug |
| R2 | TS1-6 | " | " | Gnd Buss | " | " |
| R3 | TS2-4 | " | " | Bus #2 | " | " |
| R4 | TS2-6 | " | " | Gnd.Bus | " | " |
| R5 | TS3-4 | " | " | Bus #3 | " | " |
| R6 | TS3-6 | " | " | Gnd. Bus | " | " |
| R7 | TS4-4 | " | " | Bus #4 | " | " |
| R8 | TS4-6 | " | " | Gnd Buss | " | " |
| R9 | TS5-4 | " | " | Buss#5 | " | " |
| R10 | TS5-6 | " | " | Gnd Bus | " | " |

| Change Letter | Drawn By | Check By | Date | CHANGES |
|---|---|---|---|---|
| B | JA | CFW | 7-1-53 | Revised & Redrawn |
| A | RCK | REH | 5-6-53 | Cable O added 3/4/74 changed to GT6094 |

SAW CUT, FLAME CUT, SHEAR — ROUGH MACHINE — AVERAGE MACHINE — SMOOTH MACHINE

UNLESS OTHERWISE SPECIFIED
1. TOLERANCES ON DIMENSIONS ±
2. BREAK EDGES 1/64 MAX.
3. 30° CHAMFER ENDS OF ALL SCREW THREADS
4. 1½ PITCH THREAD RELIEF WITH ROUND NOSE TOOL ON MACH. CUT SCREW THREADS

SCALE None
DESIGN ACC'T NO. 4200-61
DRAWN BY JA — DATE 4-14-53
CHECK: C.F.W. — DATE 7-1-53
APPR. BY

DIFFERENTIAL PULSE HEIGHT ANALYZER
ACCELERATOR TYPE
INTERCONNECT DATA FOR RACK

RADIATION LABORATORY
UNIVERSITY OF CALIFORNIA

6T5561B
Sheet 3 of 4

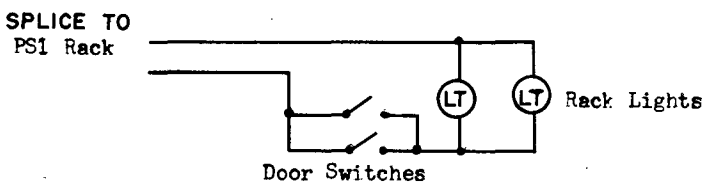
SHOWN ON | ACC'T NO. | SER. NO. | DATE ISSUED | DATE REQ'D | NO. REQ'D | DELIVER TO | MATERIAL

ZN-782

CABLE CHART

| No. | Junction | Unit | Termination | Junction | Unit | Termination | Cable |
|---|---|---|---|---|---|---|---|
| AA | PG7 | 6T3404 | RGK-M3-22C7/16 | PG3 | 6T5394 | GK-M3-21C7/16 | #16 3c Patch |
| BB | PG3 | " | 83-1SP | PG6 | " | 83-1SP | RG-63/U |
| CC | PG5 | " | " | PG7 | " | " | " |
| DD | PG3 | 6T5094 | RNK-D8-22C3/4 | PG4 | " | NK-D8-21C3/4 | #16 8cPatch |
| EE | PG5 | rack | 117v plug | PG5 | " | 7464 | #16 2c Tyrex |
| FF | PG1 | rack | " | PG1 | 6T3404 | " | " |
| GG | ccPG1-26-1 | 6T4204 | 26-190-16 | PG8 | " | 83-1SP | RG-63/U |
| | shield Gnd Buss | 6T4204 | | | | | |
| HH | PG5 | 2T4404 | 83-1SP | PG1 | 6T5394 | 83-1SP | RG-63/U |
| II | PS5 | rack | 117v plug | PG8 | 2T4404 | 7464 | #16 2cTyrex |
| JJ | PG4 | 6T5094 | RNK-8D-22C3/4 | PG3 | " | NK-8D-23C3/4 | #16 8cPatch |
| KK | swinger RE1 | rack | 83-1SP | PG1 | " | 83-1SP | RG-63/U |
| LL | PG2 | 6T5094 | 7464 | PS5 | rack | 117v plug | #16 2c Tyrex |
| MM | PG1 | " | " | PS4 | " | " | " |
| NN | TS3-1,3 | 5T7852 | spade lug | PS2 | " | " | " |
| OO | PG1 | 6T6094 | 7464 | PS2 | " | " | " |
| PP | PG3 | " | " | PS1 | " | " | " |
| QQ | PG2 | " | 83-1SP | N.C.Contact | RE1 Rack | X | RG-63/U |
| RR | Analyzer Input | | " | N.O.Contact | " | " | " |
| SS | PG6 | 6T6094 | RSK-5-22C 1/2 | PG1 | 6T7881 | SK-5-21C 1/2 | #16 5c Tyrex |

RACK LIGHTING CIRCUIT
#16 Solid 600V ins.




| Change Letter | Drawn By | Check By | Date | CHANGES |
|---|---|---|---|---|
| B | JA | CFW | 7-1-53 | Revised & Redrawn |
| A | RCK | REH | 5-6-53 | Cable U added 3W774 changed to 6T6094 |

SAW CUT, FLAME CUT, SHEAR — ROUGH MACHINE — AVERAGE MACHINE — SMOOTH MACHINE

UNLESS OTHERWISE SPECIFIED
1. TOLERANCES ON DIMENSIONS ±
2. BREAK EDGES 1/64 MAX.
3. 30° CHAMFER ENDS OF ALL SCREW THREADS
4. 1½ PITCH THREAD RELIEF WITH ROUND NOSE TOOL ON MACH. CUT SCREW THREADS

SCALE None
DESIGN ACCT NO. 4200-61
DRAWN BY J.A. DATE 4-14-53
CHECK BY C.F.W. DATE 7-1-53
APPR. BY

DIFFERENTIAL PULSE HEIGHT ANALYZER
ACCELERATOR TYPE
INTERCONNECT DATA FOR RACK

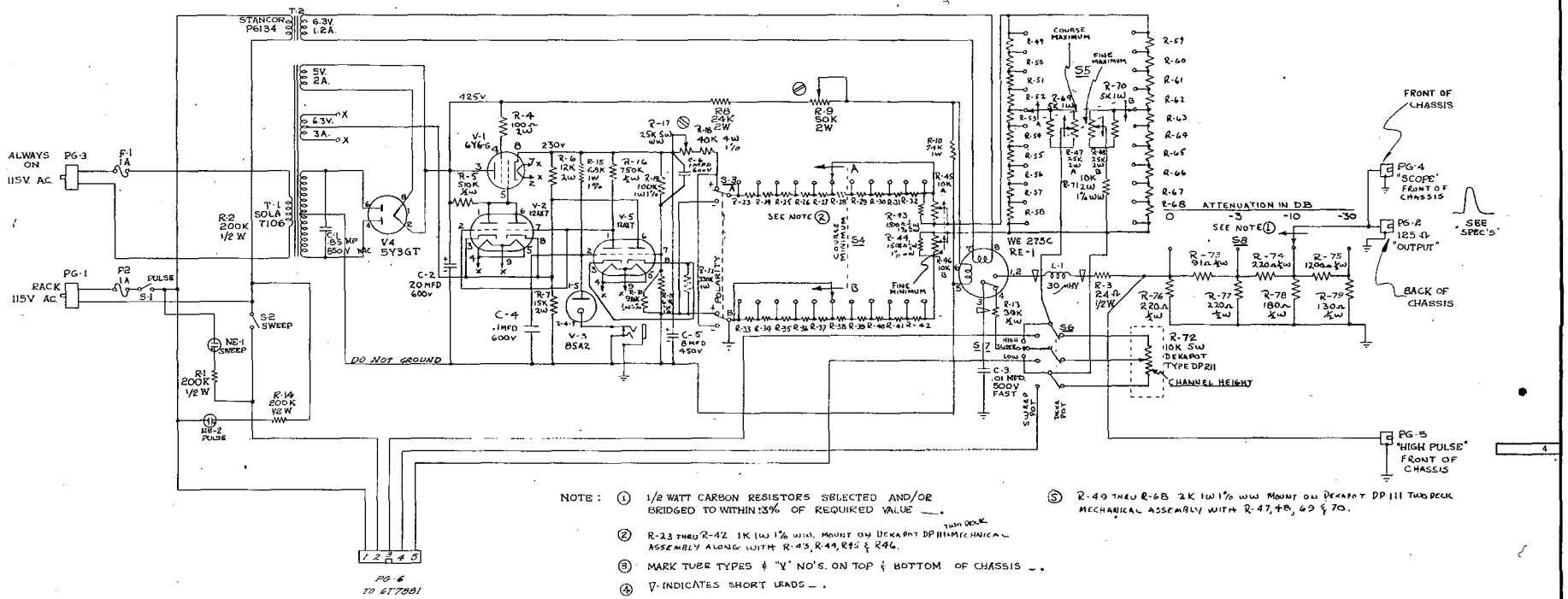
RADIATION LABORATORY
UNIVERSITY OF CALIFORNIA

615561C
Sheet 4 of 4

SHOWN ON | ACCT NO. | SER. NO. | DATE ISSUED | DATE REQ'D | NO. REQ'D | DELIVER TO | MATERIAL

ZN-783

| LIST OF MATERIAL | | |
|---|---|---|
| ITEM OR PART NUMBER | DESCRIPTION | |




NOTE:

① 1/2 WATT CARBON RESISTORS SELECTED AND/OR BRIDGED TO WITHIN ±3% OF REQUIRED VALUE.

② R-23 THRU R-42 1K 1W 1% WIW. MOUNT ON DEKAPOT DP111 TWIN DECK MECHANICAL ASSEMBLY ALONG WITH R-43, R-44, R45 & R46.

③ MARK TUBE TYPES & "V" NO'S. ON TOP & BOTTOM OF CHASSIS.

④ ▽ INDICATES SHORT LEADS.

⑤ R-49 THRU R-68 2K 1W 1% WW MOUNT ON DEKAPOT DP111 TWIN DECK MECHANICAL ASSEMBLY WITH R-47, 48, 69 & 70.

SPECIFICATIONS:

1. RISE TIME - 0.3 μSEC.
2. FALL TIME 3 μSEC.
3. REP RATE 60 ~
4. OUTPUT VARIABLE 0 ± 30V. INTO 125 Ω.

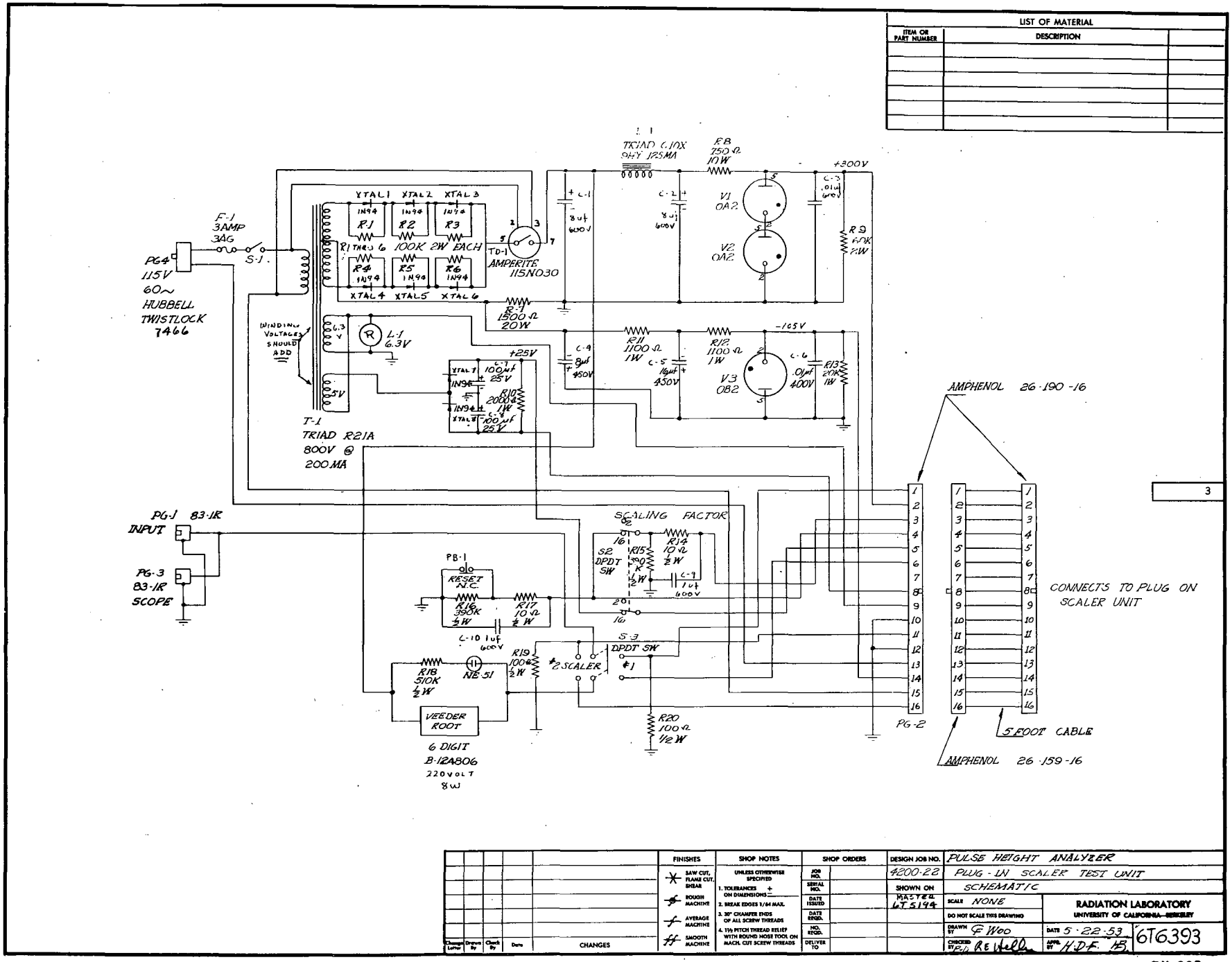
I. HELLER

PANEL 8¾" HIGH WITH STANDARD NEW HOLES 8½" WIDE

64 4T-1-NS

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | FINISHES | SHOP NOTES | SHOP ORDERS | DESIGN ACCT No. | PULSE HEIGHT ANALYZER SWEEP GEN. | | |
| | | | | | BLACK OXIDE, SPRAY | UNLESS OTHERWISE SPECIFIED | ACCT NO. | 4200-61 | SIMULATED ALPHA PULSER | | |
| | | | | | | 1. TOLERANCES ON DIMENSIONS ± | SERIAL NO. | SHOWN ON | (LINEARITY 0.15%) ~ SCHEMATIC | | |
| C | | | | REDRAWN IN NUMBERS | ROUGH MACHINE | 2. BREAK EDGES 1/64 MAX. | DATE FINISHED | 6/6/61 | SCALE ~ | RADIATION LABORATORY | |
| B | 8/5/ | 1-14 | 1/26/54 | REVISED AS NOTED | | 3. 30° CHAMFER ENDS OF ALL SCREW THREADS | DATE ISSUED | 8/22/61 MASTER | DO NOT SCALE THIS DRAWING | UNIVERSITY OF CALIFORNIA | |
| A | 10/1 | 17-1 | 1/5/53 | MODIFIED R-15 | AVERAGE MACHINE | 4. 1% PITCH THREAD RELIEF WITH BORING HONE TOOL ON MACH. CUT SCREW THREADS | MOD. ORDER | | DRAWN BY C. W. | DATE 4-24-53 | |
| Change No. | By | Check By | Date | CHANGES | SMOOTH MACHINE | | MODIFICATION NO. | | CHECKED BY J. F. | APPR. BY | 6T6094C |

ZN-842


LIST OF MATERIAL
ITEM OR PART NUMBER
DESCRIPTION
F-1 3AMP 3AG
S-1
PG4 115V 60~ HUBBELL TWISTLOCK 7466
XTAL1 XTAL2 XTAL3
XTAL4 XTAL5 XTAL6
R1 R2 R3 R4 R5 R6 1N94
R1 THRU 6 100K 2W EACH
TD-1 AMPERITE 115N030
TRIAD C-10X 9HY 125MA
R8 750Ω 10W
+300V
V1 OA2
V2 OA2
C-3 .01μf 600V
R9 60K 2W
R-1 1500Ω 20W
C-1 8μf 600V
C-2 8μf 600V
C-4 8μf 450V
R11 1100Ω 1W
R12 1100Ω 1W
C-5 16μf 450V
-165V
V3 OB2
C-6 .01μf 400V
R13 270K 1W
L-1 6.3V
6.3V
5V
WINDING VOLTAGES SHOULD ADD
T-1 TRIAD R21A 800V @ 200MA
+25V
C-7 100μf 25V
R10 2000Ω 1W
C-8 100μf 25V
AMPHENOL 26-190-16
AMPHENOL 26-159-16
CONNECTS TO PLUG ON SCALER UNIT
5 FOOT CABLE
PG-2
PG-1 83-1R INPUT
PG-3 83-1R SCOPE
SCALING FACTOR
S2 DPDT SW
R15 50K ½W
R14 10Ω ½W
C-9 1μf 600V
PB-1 RESET N.C.
R16 390K ½W
R17 10Ω ½W
C-10 1μf 600V
S-3 DPDT SW
#2 SCALER
#1
R19 100Ω ½W
R18 510K ½W
NE-51
VEEDER ROOT
6 DIGIT B-12A806 220 VOLT 8W
R20 100Ω 1/2W
3
FINISHES
SAW CUT, FLAME CUT, SHEAR
ROUGH MACHINE
AVERAGE MACHINE
SMOOTH MACHINE
SHOP NOTES
UNLESS OTHERWISE SPECIFIED
1. TOLERANCES + ON DIMENSIONS −
2. BREAK EDGES 1/64 MAX.
3. 30° CHAMFER ENDS OF ALL SCREW THREADS
4. 1½ PITCH THREAD RELIEF WITH ROUND NOSE TOOL ON MACH. CUT SCREW THREADS
SHOP ORDERS
JOB NO.
SERIAL NO.
DATE ISSUED
DATE REQD.
NO. REQD.
DELIVER TO
DESIGN JOB NO. 4200-22
SHOWN ON MASTER LT 5194
PULSE HEIGHT ANALYZER
PLUG-IN SCALER TEST UNIT
SCHEMATIC
SCALE NONE
DO NOT SCALE THIS DRAWING
RADIATION LABORATORY
UNIVERSITY OF CALIFORNIA—BERKELEY
DRAWN BY F. Woo
DATE 5-22-53
CHECKED BY R.E. Hellen
APPR. BY H.D.F.
6T6393
CHANGES
ZN-802

Page _____
Date _____
Calibration _____

DATA SHEET

50 CHANNEL PULSE HEIGHT ANALYZER

ACCELERATOR TYPE

6T5194

EXPERIMENT: _____

SCALE FACTOR: _____

| | RUN | RUN | RUN | RUN | RUN | RUN |
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| Total Count | N S | N S | N S | N S | N S | N S |
| Running Time (Minutes) | | | | | | |

Operator _____
Date _____

ZN-799

Page _____
Date _____

CALIBRATION SHEET
50 CHANNEL PULSE HEIGHT ANALYZER
ACCELERATOR TYPE
6T5194

CONTROL PANEL SETTINGS

Scale Factor _____
Total Count _____ Squared _____ Normal
Channel Width _____ volts
Discriminator _____ volts

LINEAR AMPLIFIER SETTINGS

Coarse Gain _____
Fine Gain _____
Input TC _____ Microseconds
Band Width _____ mc

SIMULATED ALPHA PULSER

Polarity (-)
Maximum Amplitude _____
Minimum Amplitude _____
Attenuator _____

| Channel Number | Double Pulse Resolution Microseconds | Register Check 15-17 pps | Counts for Each Channel | Wall Sharing: Adjacent Chan. Sum | Wall Sharing: Total Count | Wall Sharing: Percent Error | Sweep: Number of Counts | Sweep: Percent Error From TC/50 | Source #1 | Source #2 | Source #3 |
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| 50 | | | | | | | | | | | |
| Total Count | | | | | | | | Sum TC<br>Diff TC/50 | | | |
| Running Time Minutes | | | | | | | | | | | |

Analyzer Zero _____ mev

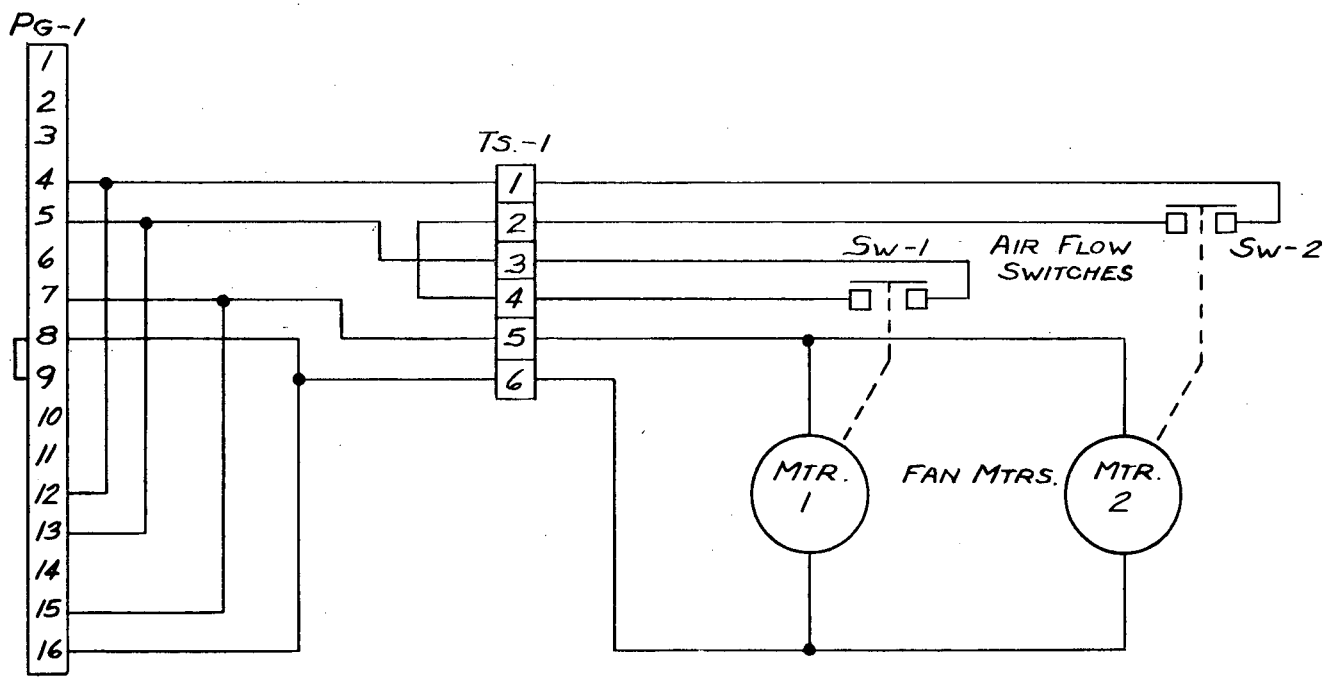
Data Sheet Reference _____ _____ _____
_____ _____ _____
_____ _____ _____

Operator _____
Date _____

ZN-800

| SHOWN ON | ACC'T NO. | SER. NO. | DATE ISSUED | DATE REQ'D | NO. REQ'D | DELIVER TO |
|---|---|---|---|---|---|---|
| 6T6901 P.L. / 6T5194 MASTER | | | | | 1 | |

MATERIAL




I
II 64
III 4 FANS

| Change Letter | Drawn By | Check By | Date | CHANGES |
|---|---|---|---|---|
| | | | | |

SAW CUT, FLAME CUT, SHEAR
ROUGH MACHINE
AVERAGE MACHINE
SMOOTH MACHINE

UNLESS OTHERWISE SPECIFIED
1. TOLERANCES ± ON DIMENSIONS
2. BREAK EDGES 1/64 MAX.
3. 30° CHAMFER ENDS OF ALL SCREW THREADS
4. 1½ PITCH THREAD RELIEF WITH ROUND NOSE TOOL ON MACH. CUT SCREW THREADS

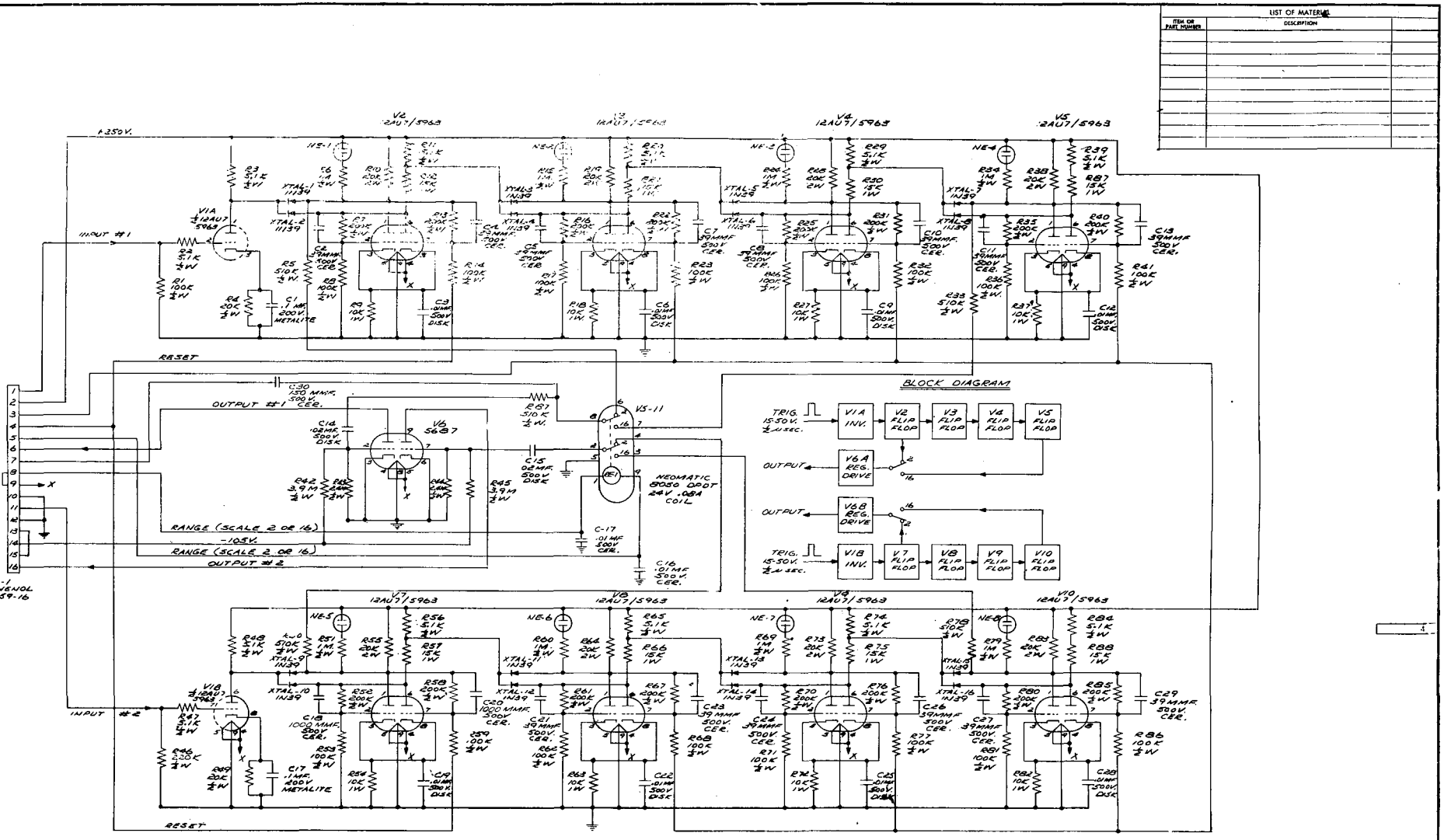
| | | |
|---|---|---|
| SCALE | | |
| DESIGN ACC'T NO. 4200-61 | DATE | |
| DRAWN BY D.P.S. | 6-1-53 | |
| CHECK BY P.V.D. | | |
| APPR. BY H.D.L. | 6-8-53 | |

DIFF. PULSE HEIGHT ANALYZER
ACC. TYPE PORTABLE REG. RACK
FAN SCHEMATIC

RADIATION LABORATORY
UNIVERSITY OF CALIFORNIA

6T6881

ZN-794

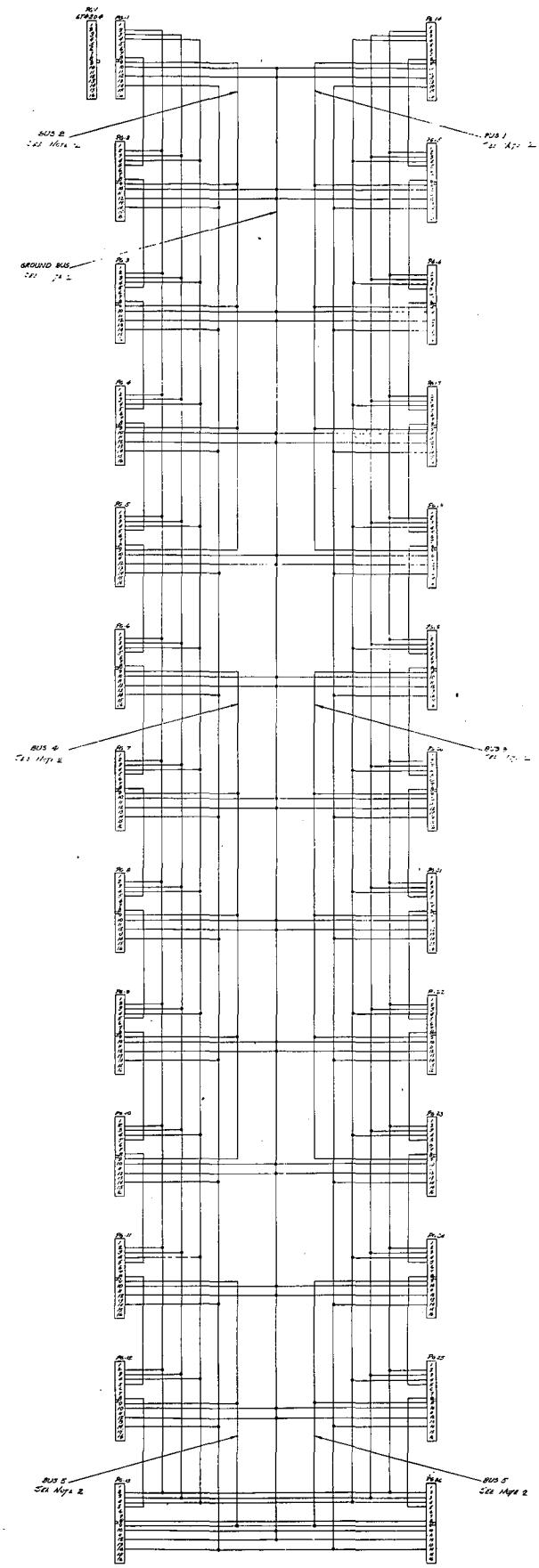



SPECIFICATIONS:
1- INPUT +15 TO 50V. ½μ SEC.
2- DOUBLE PULSE RES. TIME OF INPUT #1 2μ SEC. OF INPUT #2 10μ SEC.

NOTE:
(1) STAMP TUBE TYPES & V NOS. ON TOP & BOTTOM OF CHASSIS. PINS 1 & 9 ON PG-1 TO BE AT TOP. SEE 6T4224
(2) FRONT PANEL OF THIS UNIT IS RED

| | | | | | |
|---|---|---|---|---|---|
| FINISHES | SHOP NOTES | SHOP ORDERS | DESIGN JOB NO. | PULSE HEIGHT ANALYZER ACCEL. TUBE | |
| SAW CUT, FLAME CUT, SHEAR | UNLESS OTHERWISE SPECIFIED 1. TOLERANCES ON DIMENSIONS ± | JOB NO. | 4400-22 | SCALE OF 2 OR 16 (TOTAL COUNT) | |
| ROUGH MACHINE | 2. BREAK EDGES 1/64 MAX. | SERIAL NO. | SHOWN ON | SCHEMATIC | |
| AVERAGE MACHINE | 3. 90° CHAMFER ENDS OF ALL SCREW THREADS | DATE 1/20/49 | SCALE — | RADIATION LABORATORY UNIVERSITY OF CALIFORNIA—BERKELEY | |
| SMOOTH MACHINE | 4. 1/16 PITCH THREAD FILLET WITH ROUND NOSE TOOL ON MACH. CUT SCREW THREADS | DATE REQD. | DO NOT SCALE THIS DRAWING | | |
| | | NO. REQD. | DRAWN BY | DATE 3-23-55 | 6T7494A |
| | | DATE VERIFIED | CHECKED BY | APPR. BY | |
| CHANGES | | | | | |

ZN-841




NOTE: 1. ALL WIRES ARE #8 STRANDED SUPPRESSANTS EXCEPT WIRE [illegible] WHICH ARE #16 [illegible]

DRAWING LIST

| | QUANTITY REQUIRED | TITLE |
|---|---|---|
| [illegible] | — | SCHEMATIC |
| [illegible] | 1 | TOP INSULATING STRIP |
| [illegible] | 1 | CENTER INSULATING STRIP |
| [illegible] | 1 | BOTTOM INSULATING STRIP |
| [illegible] | 1 | TOP LEFT BUSS |
| [illegible] | 1 | TOP CENTER BUSS |
| [illegible] | 1 | TOP RIGHT BUSS |
| [illegible] | 1 | CROSS CONNECT BUS |
| [illegible] | 1 | CENTER BUSS |
| [illegible] | 1 | LOWER LEFT BUSS |
| [illegible] | 1 | LOWER CENTER BUSS |
| [illegible] | 1 | LOWER RIGHT BUSS |
| [illegible] | 2 | SPACER |
| [illegible] | | INTER WIRING EXPLODED ASSEMBLY |

| Wire No. | CONNECTION | To | CONNECTION | Wire Size | REMARKS |
|---|---|---|---|---|---|
| A-1 | 0342-1 | | 0350T1-H1 | #12 | Flaminol |
| A-2 | 0342-2 | | 0350T1-CT12 | #12 | Flaminol |
| A-3 | 0342-3 | | 0350T1-H2 | #12 | Flaminol |
| A-4 | 0342-4 | | 0350T1-CT23 | #12 | Flaminol |
| A-5 | 0342-5 | | 0350T1-H3 | #12 | Flaminol |
| A-6 | 0342-6 | | 0350T1-CT31 | #12 | Flaminol |
| B-1 | 0342-7 | | 0238-13 | #16 | Rockbestos |
| B-2 | 0342-8 | | 0238-14 | #16 | Rockbestos |
| B-3 | 0342-7 | | Plug Strip #1 | #14 | Flaminol |
| B-4 | 0342-8 | | Plug Strip #1 | #14 | Flaminol |
| B-5 | 0342-8 | | Plug Strip #2 | #14 | Flaminol |
| B-6 | 0342-9 | | Plug Strip #2 | #14 | Flaminol |
| B-7 | 0342-9 | | Plug Strip #4 | #14 | Flaminol |
| B-8 | 0342-10 | | Plug Strip #4 | #14 | Flaminol |
| B-7A | 0342-9 | | Sola #1 Input | #14 | Flaminol |
| B-8A | 0342-10 | | Sola #1 Input | #14 | Flaminol |
| B-9 | 0342-10 | | Sola #2 Input | #14 | Flaminol |
| B-10 | 0342-11 | | Sola #2 Input | #14 | Flaminol |
| B-11 | 0342-11 | | 0520-1 | #14 | Flaminol |
| B-12 | 0342-12 | | 0520-3 | #14 | Flaminol |
| B-13 | 0342-12 | | 0526-1 | #14 | Flaminol |
| B-14 | 0342-13 | | 0526-3 | #14 | Flaminol |
| B-15 | 0342-14 | | 0238-19 | #16 | Rockbestos |
| B-16 | 0342-15 | | 0238-20 | #16 | Rockbestos |
| B-17 | 0342-12 | | 0409-16 | #16 | Flaminol |
| B-18 | 0342-13 | | 0409-15 | #16 | Flaminol |

Sheet 1 of 9

Wire Connection Record—1½m—12,'50(8544)542

ZN-784

DIFFERENTIAL PULSE HEIGHT ANALYZER
ACCELERATOR TYPE
INSTALLATION DATA

| Wire No. | CONNECTION | To | CONNECTION | Wire Size | REMARKS |
|---|---|---|---|---|---|
| B-19 | 0520-1 | | 0522-1 | #14 | Flaminol |
| B-20 | 0522-1 | | 0524-1 | #14 | Flaminol |
| B-21 | 0520-3 | | 0522-3 | #14 | Flaminol |
| B-22 | 0522-3 | | 0524-3 | #14 | Flaminol |
| B-23 | 0526-1 | | 0528-1 | #14 | Flaminol |
| B-24 | 0526-3 | | 0528-3 | #14 | Flaminol |
| B-25 | 0342-14 | | 0711-1 | #16 | Flaminol |
| B-26 | 0711-2 | | 0409-4 | #16 | Flaminol |
| B-27 | 0342-15 | | 0409-5 | #16 | Flaminol |
| B-28 | 0409-7 | | 0712-1 | #16 | Flaminol |
| B-29 | 0409-8 | | 0712-2 | #16 | Flaminol |
| C-1 | Sola #1 | | Plug | #16 | 2 Cond |
| C-2 | Output | | Strip #3 | | Tyrex |
| C-3 | Sola #1 | | Plug | #16 | 2 Cond |
| C-4 | Output | | Strip #5 | | Tyrex |
| D-1 | Sola #2 | | 0635-1 | #16 | 2 Cond |
| D-2 | Output | | 0635-2 | | Tyrex |
| E-1 | 0227 PG1-1 | | 0238-17 | #16 | 2 Cond |
| E-2 | 0227 PG1-2 | | 0238-18 | | Tyrex |
| F-1 | 0411 PG1-6 | | 0222-1 | #20 | Strand Suprenant |
| F-2 | 0411 PG1-16 | | 0222-3 | #20 | Strand Suprenant |
| F-3 | 0411 PG2-6 | | 0222-5 | #20 | Strand Suprenant |
| F-4 | 0411 PG2-16 | | 0222-7 | #20 | Strand Suprenant |
| F-5 | 0411 PG3-6 | | 0222-9 | #20 | Strand Suprenant |
| F-6 | 0411 PG3-16 | | 0222-11 | #20 | Strand Suprenant |
| F-7 | 0411 PG4-6 | | 0222-13 | #20 | Strand Suprenant |

Sheet 2 of 9

Wire Connection Record—11m—12,'50(8544)542

ZN-785

DIFFERENTIAL PULSE HEIGHT ANALYZER
ACCELERATOR TYPE
INSTALLATION DATA

| Wire No. | CONNECTION | To | CONNECTION | Wire Size | REMARKS |
|---|---|---|---|---|---|
| F-8 | 0411 PG4-16 | | 0222-15 | #20 | Strand Suprenant |
| F-9 | 0411 PG5-6 | | 0222-17 | #20 | Strand Suprenant |
| F-10 | 0411 PG5-16 | | 0222-19 | #20 | Strand Suprenant |
| F-11 | 0411 PG6-6 | | 0222-21 | #20 | Strand Suprenant |
| F-12 | 0411 PG6-16 | | 0222-23 | #20 | Strand Suprenant |
| F-13 | 0411 PG7-6 | | 0222-25 | #20 | Strand Suprenant |
| F-14 | 0411 PG7-16 | | 0222-27 | #20 | Strand Suprenant |
| F-15 | 0411 PG8-6 | | 0222-29 | #20 | Strand Suprenant |
| F-16 | 0411 PG8-16 | | 0222-31 | #20 | Strand Suprenant |
| F-17 | 0411 PG9-6 | | 0222-33 | #20 | Strand Suprenant |
| F-18 | 0411 PG9-16 | | 0222-35 | #20 | Strand Suprenant |
| F-19 | 0411 PG10-6 | | 0222-37 | #20 | Strand Suprenant |
| F-20 | 0411 PG10-16 | | 0222-39 | #20 | Strand Suprenant |
| F-21 | 0411 PG11-6 | | 0222-41 | #20 | Strand Suprenant |
| F-22 | 0411 PG11-16 | | 0222-43 | #20 | Strand Suprenant |
| F-23 | 0411 PG12-6 | | 0222-45 | #20 | Strand Suprenant |
| F-24 | 0411 PG12-16 | | 0222-47 | #20 | Strand Suprenant |
| F-25 | 0411 PG13-6 | | 0222-49 | #20 | Strand Suprenant |
| F-26 | 0411 PG13-16 | | 0222-51 | #20 | Strand Suprenant |
| F-27 | 0411 PG14-6 | | 0224-1 | #20 | Strand Suprenant |
| F-28 | 0411 PG14-16 | | 0224-3 | #20 | Strand Suprenant |
| F-29 | 0411 PG15-6 | | 0224-5 | #20 | Strand Suprenant |
| F-30 | 0411 PG15-16 | | 0224-7 | #20 | Strand Suprenant |
| F-31 | 0411 PG16-6 | | 0224-9 | #20 | Strand Suprenant |
| F-32 | 0411 PG16-16 | | 0224-11 | #20 | Strand Suprenant |
| F-33 | 0411 PG17-6 | | 0244-13 | #20 | Strand Suprenant |

Sheet 3 of 9

DIFFERENTIAL PULSE HEIGHT ANALYZER
ACCELERATOR TYPE
INSTALLATION DATA

Wire Connection Record-1, m-12,'50(3544)542

ZN-786

| Wire No. | CONNECTION | To | CONNECTION | Wire Size | REMARKS |
|---|---|---|---|---|---|
| F-34 | 0411 PG17-16 | | 0224-15 | #20 | Strand Suprenant |
| F-35 | 0411 PG18-6 | | 0224-17 | #20 | Strand Suprenant |
| F-36 | 0411 PG18-16 | | 0224-19 | #20 | Strand Suprenant |
| F-37 | 0411 PG19-6 | | 0224-21 | #20 | Strand Suprenant |
| F-38 | 0411 PG19-16 | | 0224-23 | #20 | Strand Suprenant |
| F-39 | 0411 PG20-6 | | 0224-25 | #20 | Strand Suprenant |
| F-40 | 0411 PG20-16 | | 0224-27 | #20 | Strand Suprenant |
| F-41 | 0411 PG21-6 | | 0224-29 | #20 | Strand Suprenant |
| F-42 | 0411 PG21-16 | | 0224-31 | #20 | Strand Suprenant |
| F-43 | 0411 PG22-6 | | 0224-33 | #20 | Strand Suprenant |
| F-44 | 0411 PG22-16 | | 0224-35 | #20 | Strand Suprenant |
| F-45 | 0411 PG23-6 | | 0224-37 | #20 | Strand Suprenant |
| F-46 | 0411 PG23-16 | | 0224-39 | #20 | Strand Suprenant |
| F-47 | 0411 PG24-6 | | 0224-41 | #20 | Strand Suprenant |
| F-48 | 0411 PG24-16 | | 0224-43 | #20 | Strand Suprenant |
| F-49 | 0411 PG25-6 | | 0224-45 | #20 | Strand Suprenant |
| F-50 | 0411 PG25-16 | | 0224-47 | #20 | Strand Suprenant |
| F-51 | 0411 PG26-16 | | 0224-50 | #20 | Strand Suprenant |
| F-52 | 0238-23 | | 0226-6 | #20 | Strand Suprenant |
| G-1 | 0411 PG14-4 | | 0238-23 | #20 | Strand Suprenant |
| G-2 | 0411 PG14-3 | | 0238-10 | #20 | Strand Suprenant |
| G-3 | 0238-11 | | 0411 RE1-Coil | #20 | Strand Suprenant |
| G4 | 0238-24 | | 0411 RE1-Coil | #20 | Strand Suprenant |
| H-1 | 0145-6 | | 0411 PG14-5 | #20 | Strand Suprenant |
| H-2 | 0145-8 | | 0411 PG14-5 | #20 | Strand Suprenant |
| H-3 | 0145-9 | | 0411 PG14-14 | #20 | Strand Suprenant |

DIFFERENTIAL PULSE HEIGHT ANALYZER
ACCELERATOR TYPE
INSTALLATION DATA

Sheet 4 of 9

Wire Connection Record-1½m-12,'50(3544)542

ZN-787

| Wire No. | CONNECTION | To | CONNECTION | Wire Size | REMARKS |
|---|---|---|---|---|---|
| H-4 | 0145-10 | | 0411 Gnd Buss | #18 | Rockbestos |
| H-5 | 0145-7 | | 0710-1 | #18 | Rockbestos |
| H-6 | 0238-12 | | 0411 PG26-8 | #20 | Strand Suprenant |
| H-7 | 0411 PG26-8 | | 0411 PG13-8 | #20 | Strand Suprenant |
| H-8 | 0710-2 | | 0411 PG14-2 | #18 | Rockbestos |
| H-9 | 0411 PG26-6 | | 0411RE1-1 Swinger | #20 | Strand Suprenant |
| H-10 | 0411 PG26-7 | | 0411RE1-2 Swinger | #20 | Strand Suprenant |
| H-11 | 0411 PG26-11 | | 0411RE1-2 N.O. Contact | #20 | Strand Suprenant |
| H-12 | 0411 PG26-16 | | 0411RE1-1 N.C. Contact | #20 | Strand Suprenant |
| K-1 | 0113-1 | | 0411 PG1-1 | #20 | Strand Suprenant |
| K-2 | 0113-2 | | 0411 PG1-11 | #20 | Strand Suprenant |
| K-3 | 0113-3 | | 0411 PG2-1 | #20 | Strand Suprenant |
| K-4 | 0113-4 | | 0411 PG2-11 | #20 | Strand Suprenant |
| K-5 | 0113-5 | | 0411 PG3-1 | #20 | Strand Suprenant |
| K-6 | 0113-6 | | 0411 PG3-11 | #20 | Strand Suprenant |
| K-7 | 0113-7 | | 0411 PG4-1 | #20 | Strand Suprenant |
| K-8 | 0113-8 | | 0411 PG4-11 | #20 | Strand Suprenant |
| K-9 | 0113-9 | | 0411 PG5-1 | #20 | Strand Suprenant |
| K-10 | 0113-10 | | 0411 PG5-11 | #20 | Strand Suprenant |
| K-11 | 0117-1 | | 0411 PG6-1 | #20 | Strand Suprenant |
| K-12 | 0117-2 | | 0411 PG6-11 | #20 | Strand Suprenant |
| K-13 | 0117-3 | | 0411 PG7-1 | #20 | Strand Suprenant |
| K-14 | 0117-4 | | 0411 PG7-11 | #20 | Strand Suprenant |
| K-15 | 0117-5 | | 0411 PG8-1 | #20 | Strand Suprenant |
| K-16 | 0117-6 | | 0411 PG8-11 | #20 | Strand Suprenant |
| K-17 | 0117-7 | | 0411 PG 9-1 | #20 | Strand Suprenant |

DIFFERENTIAL PULSE HEIGHT ANALYZER
ACCELERATOR TYPE
INSTALLATION DATA

Sheet 5 of 9

Wire Connection Record—1½m—12,'50(3544)542

ZN-788

| Wire No. | CONNECTION | To | CONNECTION | Wire Size | REMARKS |
|---|---|---|---|---|---|
| K-18 | 0117-8 | | 0411 PG9-11 | #20 | Strand Suprenant |
| K-19 | 0117-9 | | 0411 PG10-1 | #20 | Strand Suprenant |
| K-20 | 0117-10 | | 0411 PG10-11 | #20 | Strand Suprenant |
| K-21 | 0121-1 | | 0411 PG11-1 | #20 | Strand Suprenant |
| K-22 | 0121-2 | | 0411 PG11-11 | #20 | Strand Suprenant |
| K-23 | 0121-3 | | 0411 PG12-1 | #20 | Strand Suprenant |
| K-24 | 0121-4 | | 0411 PG12-11 | #20 | Strand Suprenant |
| K-25 | 0121-5 | | 0411 PG13-1 | #20 | Strand Suprenant |
| K-26 | 0121-6 | | 0411 PG13-11 | #20 | Strand Suprenant |
| K-27 | 0121-7 | | 0411 PG14-1 | #20 | Strand Suprenant |
| K-28 | 0121-8 | | 0411 PG14-11 | #20 | Strand Suprenant |
| K-29 | 0121-9 | | 0411 PG15-1 | #20 | Strand Suprenant |
| K-30 | 0121-10 | | 0411 PG15-11 | #20 | Strand Suprenant |
| K-31 | 0125-1 | | 0411 PG16-1 | #20 | Strand Suprenant |
| K-32 | 0125-2 | | 0411 PG16-11 | #20 | Strand Suprenant |
| K-33 | 0125-3 | | 0411 PG17-1 | #20 | Strand Suprenant |
| K-34 | 0125-4 | | 0411 PG17-11 | #20 | Strand Suprenant |
| K-35 | 0125-5 | | 0411 PG18-1 | #20 | Strand Suprenant |
| K-36 | 0125-6 | | 0411 PG18-11 | #20 | Strand Suprenant |
| K-37 | 0125-7 | | 0411 PG19-1 | #20 | Strand Suprenant |
| K-38 | 0125-8 | | 0411 PG19-11 | #20 | Strand Suprenant |
| K-39 | 0125-9 | | 0411 PG20-1 | #20 | Strand Suprenant |
| K-40 | 0125-10 | | 0411 PG20-11 | #20 | Strand Suprenant |
| K-41 | 0129-1 | | 0411 PG21-1 | #20 | Strand Suprenant |
| K-42 | 0129-2 | | 0411 PG21-11 | #20 | Strand Suprenant |
| K-43 | 0129-3 | | 0411 PG22-1 | #20 | Strand Suprenant |

DIFFERENTIAL PULSE HEIGHT ANALYZER
ACCELERATOR TYPE
INSTALLATION DATA

Sheet 6 of 9

Wire Connection Record—1½m—12,'50(3544)542

ZN-789

| Wire No. | CONNECTION | To | CONNECTION | Wire Size | REMARKS |
|---|---|---|---|---|---|
| K-44 | 0129-4 | | 0411 PG22-11 | #20 | Strand Suprenant |
| K-45 | 0129-5 | | 0411 PG23-1 | #20 | Strand Suprenant |
| K-46 | 0129-6 | | 0411 PG23-11 | #20 | Strand Suprenant |
| K-47 | 0129-7 | | 0411 PG14-1 | #20 | Strand Suprenant |
| K-48 | 0129-8 | | 0411 PG24-11 | #20 | Strand Suprenant |
| K-49 | 0129-9 | | 0411 PG25-1 | #20 | Strand Suprenant |
| K-50 | 0129-10 | | 0411 PG25-11 | #20 | Strand Suprenant |
| L-1 | 0139-1 | | 0238-15 | #18 | Rockbestos |
| L-2 | 0139-2 | | 0238-16 | #18 | Rockbestos |
| M-1 | 0238-21 | | 0831 RE1 Coil | #18 | 2 Cond |
| M-2 | 0238-22 | | 0831 RE1 Coil | | Tyrex |
| N-1 | 0131PG6-1 | | 0238-1 | #16 | 12 Cond Patch |
| N-2 | 0131 PG6-2 | | 0238-2 | #16 | 12 Cond Patch |
| N-3 | 0131 PG6-3 | | 0238-3 | #16 | 12 Cond Patch |
| N-4 | 0131 PG6-4 | | 0238-4 | #16 | 12 Cond Patch |
| N-5 | 0131 PG6-5 | | 0238-5 | #16 | 12 Cond Patch |
| N-6 | 0131 PG6-6 | | 0238-6 | #16 | 12 Cond Patch |
| N-7 | 0131 PG6-7 | | 0238-7 | #16 | 12 Cond Patch |
| N-8 | 0131 PG6-8 | | 0238-8 | #16 | 12 Cond Patch |
| N-9 | 0131 PG6-9 | | 0238-9 | #16 | 12 Cond Patch |
| N-10 | 0131PG6-10 | | 0145-9 | #16 | 12 Cond Patch |
| N-11 | 0131 PG6-11 | | 0145-10 | #16 | 12 Cond Patch |
| N-12 | 0131 PG6-12 | | 0145-7 | #16 | 12 Cond Patch |
| O-1 | 0145-5 | | 0224-49 | #16 | Flaminol |
| O-2 | 0145-10 | | 0226-4 | #16 | Flaminol |
| R-1 | 0520-4 | | 0411 Buss #1 | #12 | Flaminol |

Sheet 7 of 9

Wire Connection Record-1½m-12,'50(3544)542

ZN-790

DIFFERENTIAL PULSE HEIGHT ANALYZER
ACCELERATOR TYPE
INSTALLATION DATA

| Wire No. | CONNECTION | To | CONNECTION | Wire Size | REMARKS |
|---|---|---|---|---|---|
| R-2 | 0520-6 | | 0411 Gnd Buss | #12 | Flaminol |
| R-3 | 0522-4 | | 0411 Buss #2 | #12 | Flaminol |
| R-4 | 0522-6 | | 0411 Gnd Buss | #12 | Flaminol |
| R-5 | 0524-4 | | 0411 Buss #3 | #12 | Flaminol |
| R-6 | 0524-6 | | 0411 Gnd Buss | #12 | Flaminol |
| R-7 | 0526-4 | | 0411 Buss #4 | #12 | Flaminol |
| R-8 | 0526-6 | | 0411 Gnd Buss | #12 | Flaminol |
| R-9 | 0528-4 | | 0411 Buss #5 | #12 | Flaminol |
| R-10 | 0528-6 | | 0411 Gnd Buss | #12 | Flaminol |
| J-1 | 0145-3 | | 0635-1 | #18 | Rockbestos |
| J-2 | 0145-4 | | Selenium Gnd | #18 | Rockbestos |
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DIFFERENTIAL PULSE HEIGHT ANALYZER
ACCELERATOR TYPE
INSTALLATION DATA

Sheet 8 of 9

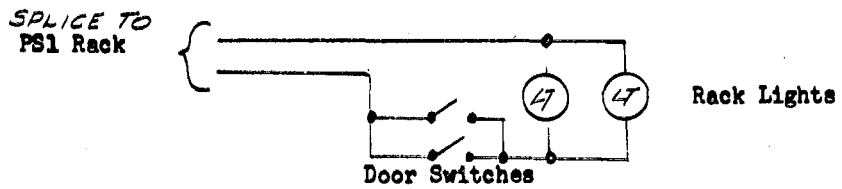
Wire Connection Record–1½m–12,'50(3544)542

ZN-791

CABLE CHART

| No. | Junction | Unit | Termination | Junction | Unit | Termination | Cable |
|---|---|---|---|---|---|---|---|
| AA | PG7 | 6T3404 | RGK-M3-22C7/16 | PG3 | 6T5394 | GK-M3-21C7/16 | #16 3c Patch |
| BB | PG3 | " | 83-1SP | PG6 | " | 83-1SP | RG-63/U |
| CC | PG5 | " | " | PG7 | " | " | " |
| DD | PG3 | 6T5094 | RNK-D8-22C3/4 | PG4 | " | NK-D8-21C3/4 | #16 8c Patch |
| EE | PG5 | Rack | 117v plug | PG5 | " | 7464 | #16 2c Tyrex |
| FF | PG1 | Rack | 117v plug | PG1 | 6T3404 | " | #16 2c Tyrex |
| GG | cc PG1-26-1 | 6T4204 | 26-190-16 | PG8 | " | 83-1SP | RG-63/U |
| | shield Gnd Buss | 6T4204 | | | | | |
| HH | PG5 | 2T4404 | 83-1Sp | PG1 | 6T5394 | 83-1SP | RG-63/U |
| II | PS5 | rack | 117v plug | PG8 | 2T4404 | 7464 | #16 2c Tyrex |
| JJ | PG4 | 6T5094 | RNK-8D-22C3/4 | PG3 | " | NK-8D-23C3/4 | #16 8c Patch |
| KK | swinger RE1 | rack | 83-1SP | PG1 | " | 83-1SP | RG-63/U |
| LL | PG2 | 6T5094 | 7464 | PS5 | Rack | 117v plug | #16 2c Tyrex |
| MM | PG1 | " | " | PS4 | " | " | " |
| NN | TS3-1,3 | 5T7852 | spade lug | PS2 | " | " | " |
| OO | PG1 | 6T6094 | 7464 | PS2 | " | " | " |
| PP | PG3 | " | " | PS1 | " | " | " |
| QQ | PG2 | " | 83-1SP | N.C.Contact | RE1 | Rack X | RG-63/U |
| RR | Analyzer Input | | " | N.O. | " | " " | " |
| SS | PG6 | 6T6094 | RSK-5-22C 1/2 | PG1 | 6T7881 | SK-5-21C 1/2 | #16 5c Tyrex |

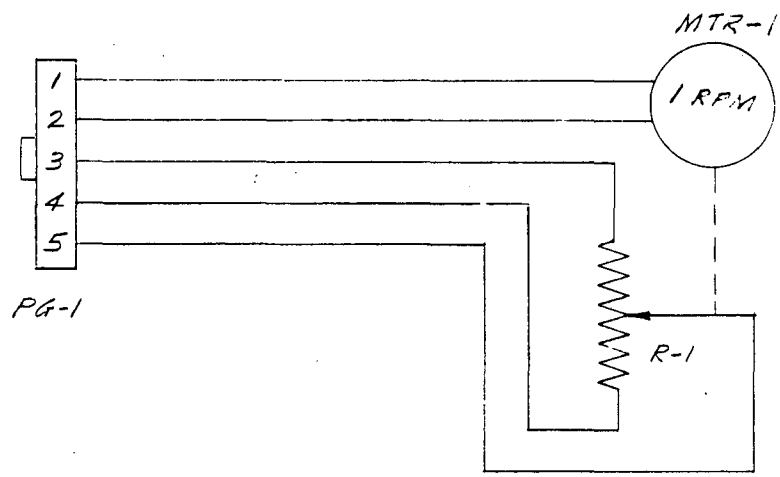
RACK LIGHTING CIRCUIT
#16 Solid 600V ins.




DIFFERENTIAL PULSE HEIGHT ANALYZER
ACCELERATOR TYPE
INSTALLATION DATA

Sheet 9 of 9

ZN-792




PARTS LIST

| Desig. | Quan. | Description |
|---|---|---|
| MTR-1 | 1 | Telechron Synchronous Motor 1 RPM Type B8 |
| PG-1 | 1 | Cannon SK-5-32-SL Male Receptacle |
| R-1 | 1 | 10K 5W ±.05% Linearity (Helipot Corp) To be furnished by R.E. Heller |
| | | MISC. |
| | 1 | 1/4 D. x 3-3/4 Long Drill Rod |
| | 2 | New Departure Ball Bearing Type 77-R-4 |
| | 2 | 4-40 × 1" Long Brass Stud |

DRAWING LIST

| | | |
|---|---|---|
| 6T 7881 | – | Schematic & Parts List (This) |
| 6T 8933 | – | Assembly |
| 6T 8943 | 1 | Support Frame |
| 6T 8953 | 1 | Stationary Resistor Mount |
| 6T 8962 | 1 | Swinger |
| 6T 8971 | 1 | Hub |
| 6T 8981 | 2 | Bearing Holder |
| 6T 8991 | 1 | Motor Mounting Bracket |
| 6T 9011 | 1 | Slider Contact Mtg. Bracket |
| 6T 9021 | 2 | Slider Contact |
| 6T 9031 | 1 | Slip Ring Contact Mtg. Bracket |
| 6T 9001 | 1 | Slip Ring |
| 6T 9041 | 1 | Coupling Modification |
| 10Z 9381-1 | 1 | Std. Set Screw Collar |
| 10Z 9381-2 | 1 | " " " " |
| 10Z 1212-164 | 2 | Std. Spacing Bushing |
| 10Z 1212-165 | 1 | " " " |
| 10Z 1212-166 | 1 | " " " |

I
II 64
III 4 FARNS.

SHOWN ON | ACC'T NO. | SER. NO. | DATE ISSUED | DATE REQ'D | REQ'D NO. | DELIVER TO | MATERIAL

| Change Letter | Drawn By | Check By | Date | CHANGES |
|---|---|---|---|---|
| A | E.J.H. | | | REVISED SCHEMATIC |

SAW CUT, FLAME CUT, SHEAR — ROUGH MACHINE — AVERAGE MACHINE — SMOOTH MACHINE

UNLESS OTHERWISE SPECIFIED
1. TOLERANCES ON DIMENSIONS ±
2. BREAK EDGES 1/64 MAX.
3. 30° CHAMFER ENDS OF ALL SCREW THREADS
4. 1½ PITCH THREAD RELIEF WITH ROUND NOSE TOOL ON MACH. CUT SCREW THREADS

| | | DATE |
|---|---|---|
| SCALE | — | |
| DESIGN ACCT NO. | 4200 22 | |
| DRAWN BY | E.J.H. | 8/14/53 |
| CHECK BY | R.W. Keen | 8/19/53 |
| APPR. BY | [illegible] | [illegible] |

DIFFERENTIAL PULSE HEIGHT ANALYZER
ACCELERATOR TYPE, 12" DIA. MOTOR DRIVEN-
POTENTIOMETER - SCHEM & PARTS LIST

RADIATION LABORATORY
UNIVERSITY OF CALIFORNIA

6T7881 A

ZN-840