Spectra-Physics

Model 476 Scanning Interferometer Driver

Instruction Manual

The Model 476 Scanning Interferometer Driver provides a control voltage to regulate the expansion and contraction of the piezoelectric element contained within an electronically tunable interferometer. The Model 476 adjusts the air-spacing between interferometer mirrors, shifting the frequencies of optical transmission peaks of the interferometer.

The major electronic circuits of the Model 476 are:

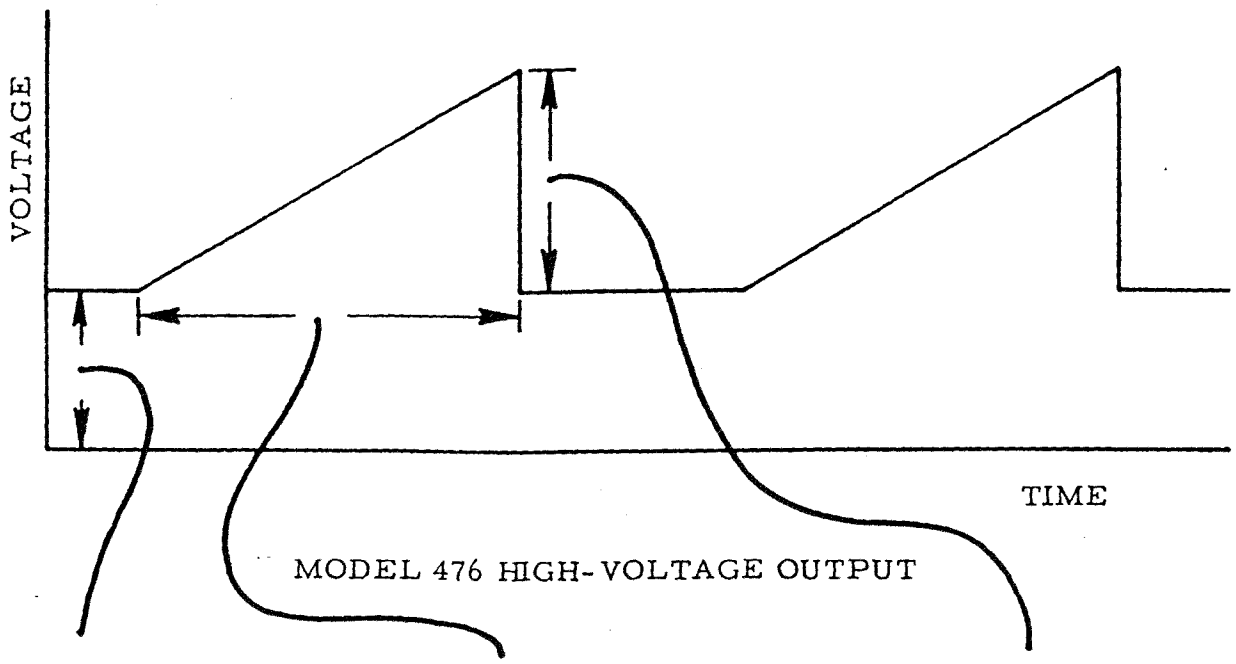
1. Scan Generator and Scan Amplifier
2. High-voltage Amplifier
3. Vertical Amplifier
4. Heater Control
5. Power Supplies

SCAN GENERATOR AND SCAN AMPLIFIER

The scan generator circuit (lower left corner of Figure 4) produces sawtooth waveforms of fixed amplitude but variable duration. The duration of each single sawtooth waveform is determined by the setting of the variable Sweep Time control on the front panel (see Figure 1).

The scan amplifier (lower center of Figure 4) amplifies the sawtooth waveforms generated by the scan generator. The output of the scan amplifier is available at the Horizontal Output jack at the back panel for controlling scope horizontal sweep. Horizontal sweep is designed to be proportional to the change in frequency of the interferometer transmission peaks. This is an indication of relative frequency, not absolute frequency.

The Dispersion and Variable controls (see Figure 1) provide attenuation of the sawtooth signal before it is fed into the high-voltage amplifier. This voltage controls the frequency width of the scan. The scan amplifier also has a blanking switch on the back panel just above the vertical amplifier output jack which provides blanking of the vertical amplifier output at each end of a scan and during retrace.



The Centering Control adjusts the DC level of the output.

The Sweep Time Control adjusts the time to complete a scan.

The Dispersion Controls (Discrete and Variable) adjust how far in voltage (and therefore frequency) the scan goes.

FIGURE 1

HIGH-VOLTAGE AMPLIFIER

The input signal to this amplifier comes from the scan generator via the scan amplifier. The amplifier (right side of Figure 4) contains provision for setting the DC level of its input signal (Centering control) as well as provision for limiting the maximum output voltage to 300 V rather than 1000 V.

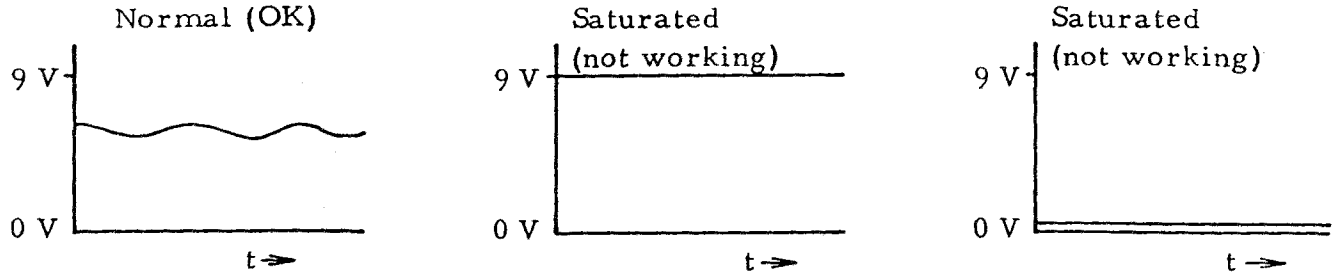
VERTICAL AMPLIFIER

The separate vertical amplifier (Figure 5) is designed to amplify signals from current sources such as silicon photodiodes and for display on an oscilloscope. Blanking is available to eliminate the initial, final, and retrace portions of a scan. The amplifier has a maximum sensitivity of 0.5 V/nA and can be driven by a voltage source through a series resistor.

The vertical amplifier can be used to sum two or more current sources at its input. For example, the outputs of two photodiodes can be connected directly to the input to generate a difference signal for two light beams. Voltage sources can be summed through externally mounted resistors as in conventional operational amplifiers.

HEATER CONTROL

The heater control circuit (Figure 6) provides temperature-regulated current to an interferometer heater to maintain air-spacing at a nearly constant value as ambient temperature changes. The adjustable potentiometer (R71, Figure 6) which sets the equilibrium temperature is inside the Model 476. To be sure that the potentiometer is set for proper regulation of heater voltage, check heater voltage at pin 8 (see Figure 2).



HEATER CONTROL OPERATION
FIGURE 2

POWER SUPPLIES

The Model 476 is capable of operation on either 115 or 230 V input and the power supply (top of Figure 4) provides high and low voltages for use by other circuits.

MODEL 476 FRONT PANEL CONTROLS

POWER:

ON/OFF	A slide switch that applies power to the Modei 476

VERTICAL GAIN:

A five-position switch that changes the gain of the vertical amplifier in steps of 10x. Maximum gain is 0.5 V/nA.

VARIABLE	A continuous control that varies the gain of the vertical amplifier from nil to the maximum setting of the Vertical Gain control switch.

SWEEP:

TIME	A continuous control for sweep speed. Full clockwise is maximum speed.
FREE RUN/ HOLD/ SINGLE SWEEP	A toggle switch that selects repetitive triggering in Free Run, a single trigger pulse in Single Sweep, and prevents triggering in Hold.

DISPERSION:

A six-position rotary switch that selects the maximum sweep amplitude to be a precise fraction of the minimum possible sweep amplitude (i.e. 2, 10, etc.)

VARIABLE	A continuously variable control that adjusts the sweep amplitude (dispersion) from nil to the maximum set by the Dispersion (discrete) control.

CENTERING:

Controls the interferometer central frequency. It applies a DC bias to the interferometer piezoelectric element.

REAR PANEL CONTROLS AND CONNECTORS

POWER:

CORD	Permanently affixed three-pronged power cord for 115/230 V AC receptacles.
115 / 230	A slide switch to select 115 or 230 V AC operation.
FUSE	Fuse holder turns counterclockwise to remove the AC power line fuse.

HV SCAN AMP:

AUXILIARY INPUT — A BNC jack to apply an external control voltage to the high-voltage scan amplifier. It goes to pin 25 on the Scan Control PCB, the high-voltage amplifier input summing point. In "Hold" position you can put your own scan waveform into the input (eg. sine or triangular waves). One volt input lowers high voltage by about 235 volts.

MAXIMUM OUTPUT — A slide switch to provide maximum output of either 300 V or 1000 V from the high voltage scan amplifier to the interferometer piezoelectric element.

OUTPUT — A BNC connector for the cable from the interferometer assembly. Output of the high-voltage amplifier to the interferometer piezoelectric element.

HORIZONTAL:

OUTPUT — A BNC connector for oscilloscope display. Goes to the X-input of the oscilloscope. Output is a sawtooth signal whose amplitude is proportional to change in interferometer transmission frequency from initial frequency.

SIZE — A continuous adjustment for matching the Model 476 horizontal output amplitude to oscilloscope sensitivity. Scope should be set at 1 V/cm.

BLANKING:

OUTPUT — Blanking signal is a step from -15 to +15 V. Derived from the horizontal scan to blank the vertical amplifier during retrace. Can be used to gate other detectors (as used in integrating experiments, for example).

VERTICAL AMPLIFIER:

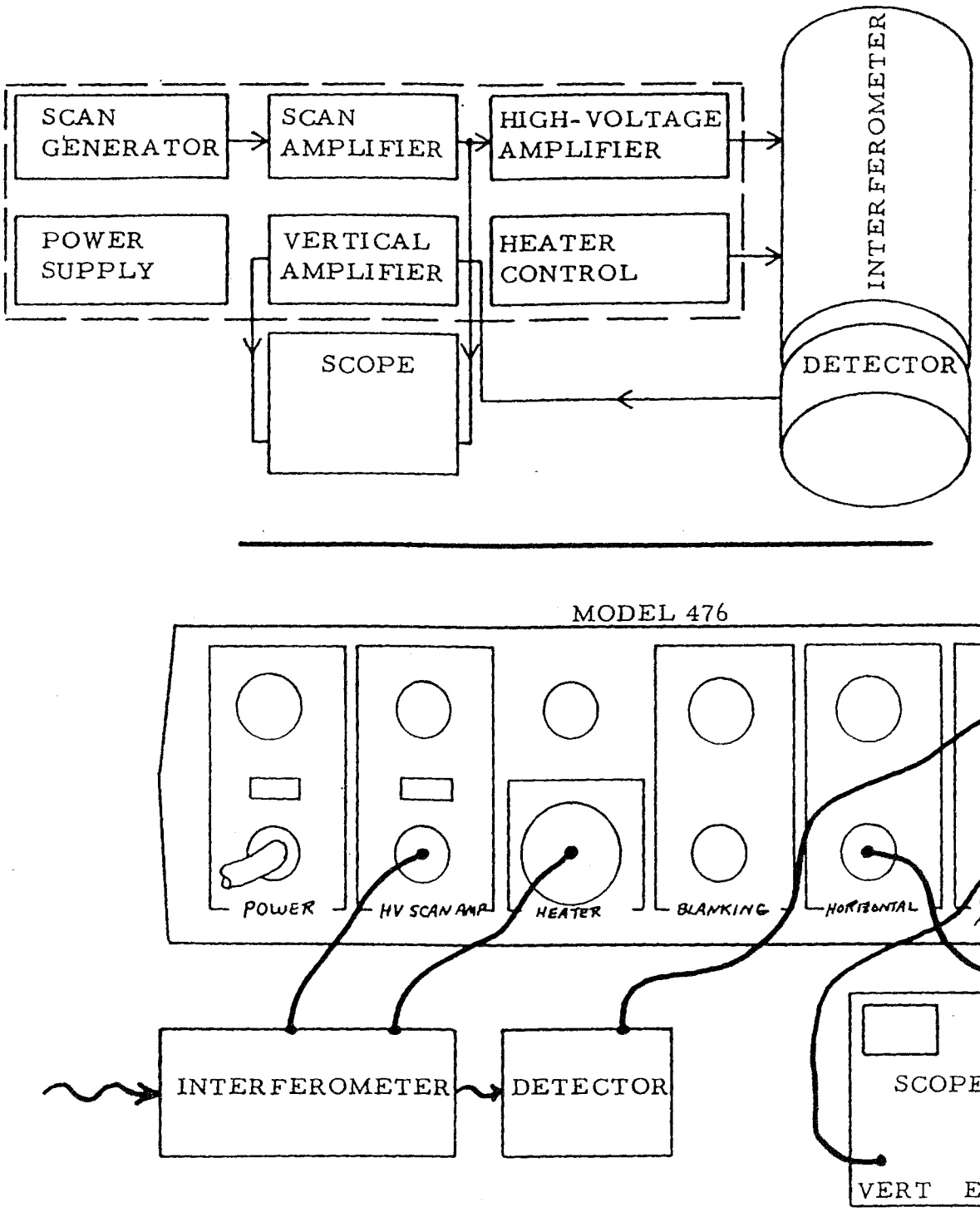
PHOTO-DETECTOR INPUT — Input jack for photodiodes or other detectors used to monitor laser output power. A current-amplifier that gives a positive voltage output for a positive current input. Will not respond to negative input. Vertical amplifier can sum several currents directly. Can be used as a general purpose amplifier. Maximum sensitivity is 0.5 V/nA.

OUTPUT — Output jack for vertical amplifier. Should be connected to the oscilloscope Y-axis input. Scopes should be set at 1 V/cm.

BLANKING OFF/ON — A slide switch that unblanks the vertical amplifier in the OFF position. It does not affect the Blanking Output signal.

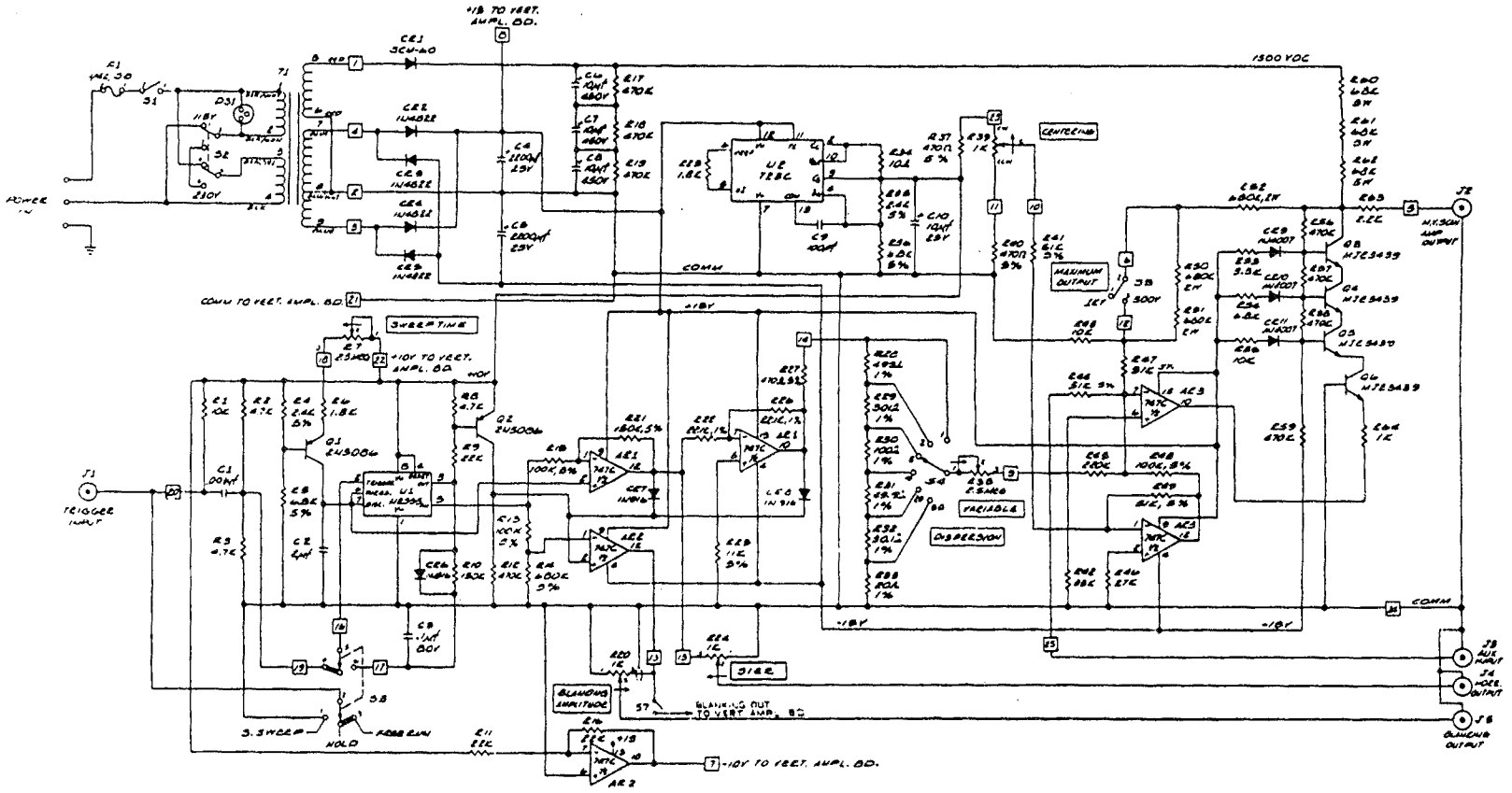
TRIGGER:

INPUT — A BNC jack for external trigger pulses. Operates on a switch closure or a 5 V negative-going edge. Front panel toggle switch must be in Hold position.



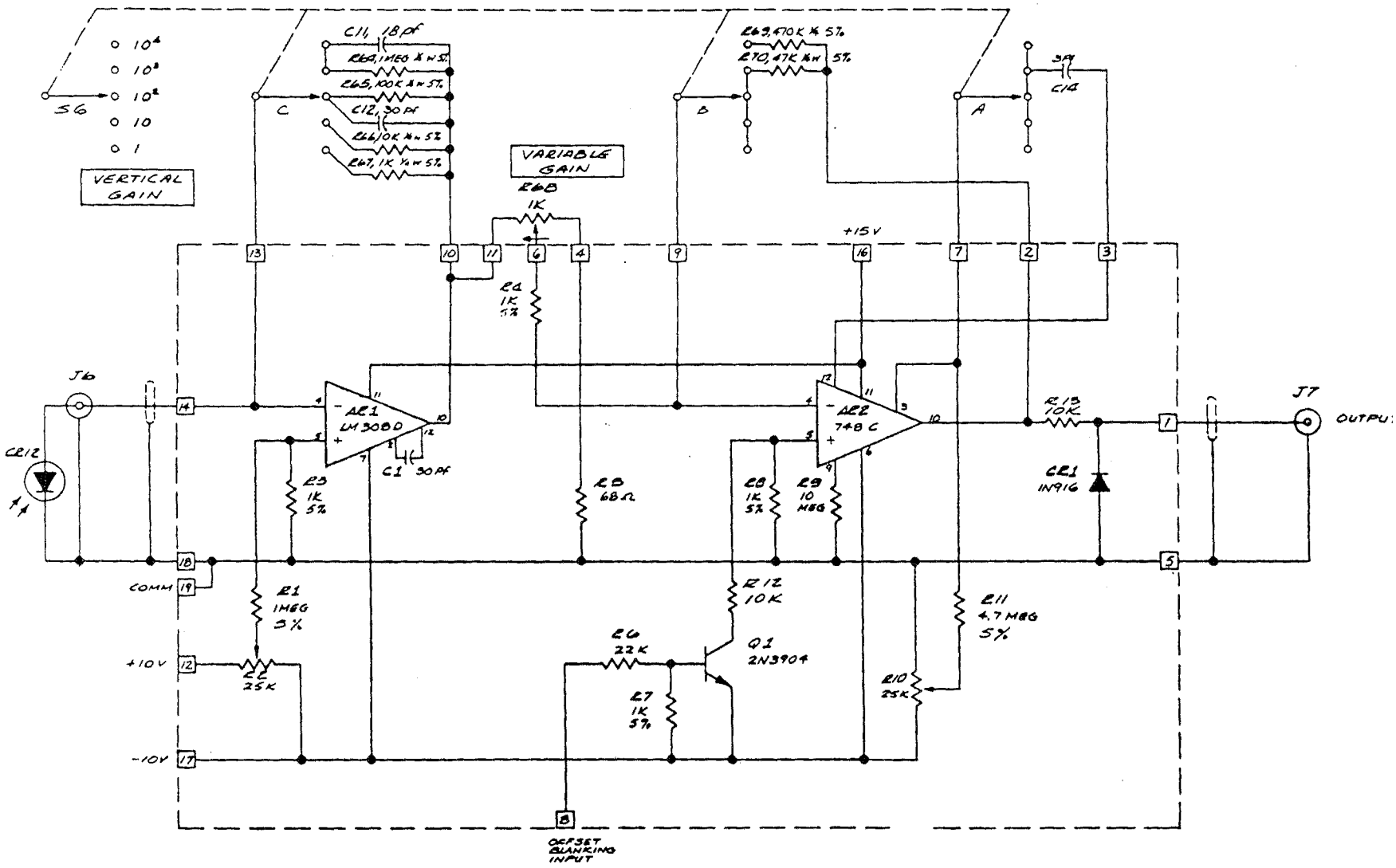
MODEL 476 - BLOCK DIAGRAM AND REAR PANEL CONNECTIONS

FIGURE 3



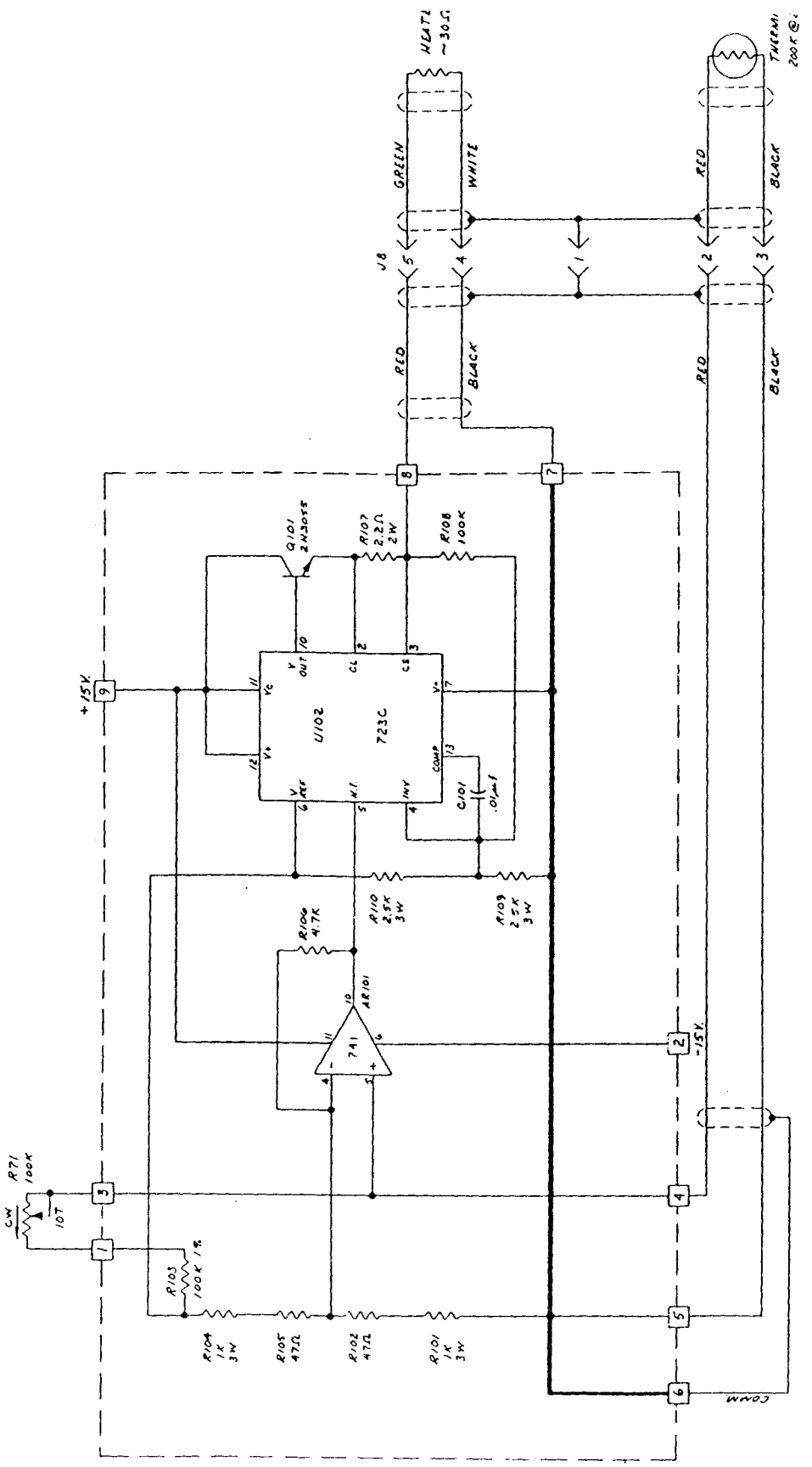
MODEL 476 - SCANNING INTERFEROMETER DRIVER SCHEMATIC

FIGURE 4



MODEL 476 - VERTICAL AMPLIFIER

FIGURE 5



MODEL 476 - HEATER CONTROL

FIGURE 6

CUSTOMER SERVICE

At Spectra-Physics, we take great pride in the durability of our products. Considerable emphasis has been placed on controlled manufacturing methods and on quality control throughout the manufacturing process. Despite this fact, instruments do break down in operation. We feel that our instruments have favorable service records when compared to competitive products and we hope to demonstrate, in the long run, that we provide above-average service to our customers—not only in providing the best equipment for the money, but, in addition, service facilities that get your instrument back into operation as soon as possible.

WARRANTY

Unless otherwise specified, all Spectra-Physics products are warranted to be free from defects in workmanship and materials for one year from date of shipment. Spectra-Physics will repair or replace instruments which prove to be defective during the warranty period without charge for parts or labor. The obligation of Spectra-Physics is limited to such repair and does not extend to consequential damages.

The customer must ship the instrument to a Spectra-Physics service facility prepaid; Spectra-Physics pays the return shipment charges. The customer may have warranty repair performed at his facility, upon request, for an additional charge.

Frequent causes of failure are simple maladjustments of reflectors or contaminated optical surfaces. The warranty does not cover the cleaning, adjustment, or return of the instrument if these are the cause of failure. A charge will be made in the event that a returned instrument requires cleaning and adjustment only.

The warranty of instruments purchased within the United States normally only covers repairs performed within the United States. Extension of warranty to cover instruments transferred outside the United States is available. Contact the Mountain View service center for details.

RETURN OF THE INSTRUMENT FOR REPAIR

Contact your nearest Spectra-Physics service facility for shipping instructions and forward the instrument prepaid to the destination indicated. Special Spectra-Physics packing boxes designed to securely hold instruments during shipment should be used. If shipping boxes have been lost or destroyed, we recommend that new ones be obtained from Spectra-Physics. Include a description of the problem and the address and telephone number of the person to be contacted for repair authorization.

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