#### SPECIFICATIONS:

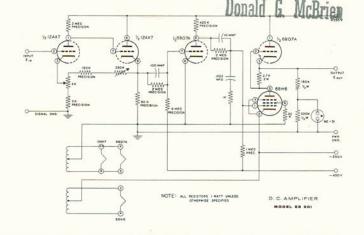
#### This unit will contain the following:

- 15 Amplifiers
- 30 Coefficient potentiometers
- 2 Auxiliary 10 turn potentiometers
- 6 filoating initial conditions
- 4 dual bias diodes
- 1 metering circuit with dividing network
- 2 operational relays
- 1 Amplifier power supply
- 1 Repetitive oscillator
- 1 Reference power supply

#### Outstanding Features:

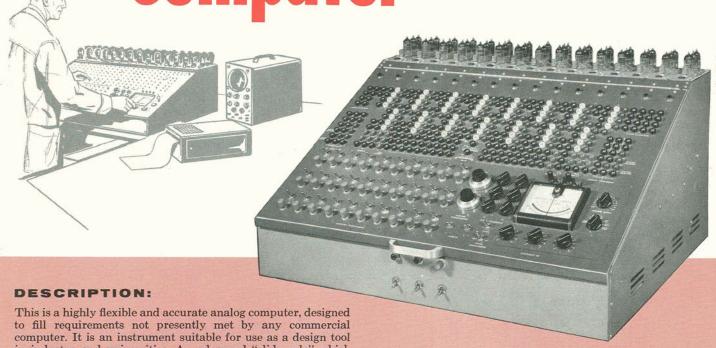
This unit is unique in its ability to calibrate for high accuracy. By means of a null meter the following functions may be accurately measured:

- 1—Coefficient setting
- 2-Overall gain from input to output of the amplifier 3—Initial Condition Set
- 4—Bias diode setting
- 5—Set up of a function generator
- -Throw voltages for operational



# HEATH INEXPENSIVE ELECTRONIC ANALOG





in industry and universities. An advanced "slide rule" which permits engineering or research personnel to electronically simulate equations or physical problems and save many hours of calculation or experimentation. Ideal for solving practical problems in industry, and equally valuable for research, or instructional demonstration, in colleges and universities.

Because it is a kit, and the labor and overhead costs found in present day computers are eliminated, the Heath Computer can be obtained for use in situations where a computer was ruled out in the past because of cost. Definitely not a "gadget," but a high-quality, flexible, high-accuracy device designed to work for you. Incorporates such features as:

- 30 coefficient potentiometers, each capable of being set to an accuracy better than 1/10 of 1%.
- One standard reference supply for amplifier DC voltages.
- A nulling meter for accurate setting of computer voltages.
- A unique patch-board panel which enables the operator to "see" his computer block layout.

# CABINET: ES-400

The computer cabinet houses power supplies, amplifiers, and computing components. It includes an accurate dividing network which introduces voltages to a null meter with an accuracy of better than 1/10 of 1%. By means of a switch, a potentiometer may be connected to the meter and read. This eliminates inaccuracy due to potentiometer nonlinearity, or loading.

The dividing network and meter may also be used to set up the initial conditions, to off-set bias diodes, and to read any voltage which appears at the amplifier. The meter may be switched to any of the 15 amplifiers so they may be set to give full scale deflection of plus or minus 2, 20 and 100 volts. The board also has the plus and minus 100-volt standard available, which is used in the dividing network.

# HEATH ELECTRONIC ANALOG COMPUTET KIT

# AMPLIFIER POWER SUPPLY

# MODEL ES-2

**PURPOSE:** To supply power to the amplifiers and function generators.

**OUTSTANDING FEATURES:** The plus and minus voltages are referenced from one standard and are so interconnected as to null or cancel power supply drift to the amplifiers.

**POWER OUTPUT:** Plus 250 V. at 250 mills, minus 250 V. at 250 mills, minus 450 V. at 50 mills, 6.3 V.A.C. at 12 amps, and 6.3 V.A.C. at 2.5 amps.

**TUBE COMPLEMENT:** 1–5651, 3–12AX7, 3–6U8, 2–6080, 1–6BX7, 2–5R4GY, 1–5U4GB.

**MOUNTING:** This unit may be mounted in the computer cabinet or on a rack for special purpose computers.



This power supply is a highly stable unit which features voltage regulation by a single 5651 tube. It is well rated for its use.

# INITIAL CONDITIONS

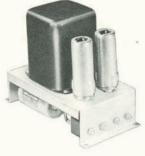
MODEL ES-100

PURPOSE: To supply initial condition voltage to integrators.

**OUTSTANDING FEATURES:** Low drift rate, ungrounded, floating supply, highly shielded.

TUBE COMPLEMENT: 2-OB2.

**MOUNTING:** Three of these dual initial conditions power supplies mount inside the computer cabinet. This makes a total of six floating power supplies available.



This unit contains two separate supplies both of which can be varied from zero to 100 volts. Since they are floating supplies, they may be used for offsetting amplifiers and biasing diodes.

# AMPLIFIER

MODEL ES-201

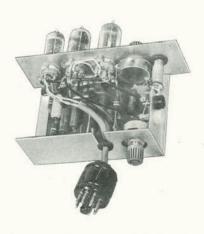
**PURPOSE:** To provide an amplifier for integration, sign changing, addition, and multiplication by a constant.

**OUTSTANDING FEATURES:** This unit is a highly stable unit with low drift. It is linear from plus 100 to minus 100 volts, will deliver 10 mills, and has an open loop gain of 50,000. Its phase shift when connected as a unity inverter is less than one degree at 1200 cycles.

TUBE COMPLEMENT: 1-12AX7, 1-6BQ7A, 1-6BH6.

**POWER REQUIREMENTS:** Plus 250 V., minus 250 V., minus 450 V. Quiescent power is less than 5 watts.

**MOUNTING:** This unit may be mounted at the rear of the computer or on a standard rack mounting for special purpose computer.



This unit has a shielded chassis and makes use of printed circuits for ease of construction and uniformity. It is mounted at the top rear of the computer where it is shielded thermally and electrically from the rest of the computer.

# RELAY POWER SUPPLY

MODEL ES-151

**PURPOSE:** To supply power to operate the functional relays.

OUTSTANDING FEATURES: Has built in voltage surge network to insure simultaneous operation of the relays.

POWER OUTPUT: Designed to supply 50 volts across four 10,000 ohm relays.

MOUNTING: This unit may be mounted in the computer cabinet or in a special purpose computer.



This unit supplies a high surge voltage for rapid simultaneous operation of the relays, then the voltage drops to that necessary to hold the relays.

### REFERENCE POWER SUPPLY

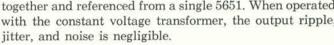
MODEL ES-50

PURPOSE: To supply highly stable and accurate reference voltages.

**OUTPUT:** Plus 100 volts and minus 100 volts. TUBE COMPLEMENT: 2-6X4, 2-6U8, 1-5651.

MOUNTING: This unit may be mounted in the computer cabinet or in a special purpose computer.

In this supply the positive and negative voltages are slaved together and referenced from a single 5651. When operated with the constant voltage transformer, the output ripple,



# REPETITIVE OSCILLATOR

MODEL ES-505

**PURPOSE:** To provide repetitive operation of the functional relays.

**OUTSTANDING FEATURES:** Has an adjustable repetition rate of 0.6 to 6.0 times per second.

TUBE COMPLEMENT: 1-6-16.

MOUNTING: This unit may be mounted in the front of the computer cabinet or in a special purpose computer.



The repetitive oscillator allows problem solutions to be displayed on an oscilloscope.

102646297

# price list

# SMALL COMPUTER—GROUP A \$495

#### GROUP CONTAINS:

Or	e ES	2	Amplifier power supply kit
Or	e ES	100	Initial condition power supply kit
Or	e ES	151	Relay power supply kit
Fi	ve ES	201	Operational amplifier kits
Or	e ES	400	Cabinet kit
Or	e ES	405	Patch cord kit

# MEDIUM COMPUTER—GROUP B \$775

#### GROUP CONTAINS:

One	ES	2	Amplifier power supply kit
One	ES	50	Reference power supply kit
Two	ES	100	Initial condition power supply kits
One	ES	151	Relay power supply kit
Ten	ES	201	Operational amplifier kits
One	ES	400	Cabinet kit
One	ES	401	Voltage regulator transformer kit
Two	ES	405	Patch cord kits
One	ES	447	Coefficient potentiometer kit
One	ES	505	Repetitive oscillator kit

# FULL COMPUTER—GROUP C \$945

### GROUP CONTAINS:

One	ES	2	Amplifier power supply kit
One	ES	50	Reference power supply kit
Three	ES	100	Initial condition power supply kits
One	ES	151	Relay power supply kit
Fifteen	ES	201	Operational amplifier kits
One	ES	400	Cabinet kit
One	ES	401	Voltage regulator transformer kit
Three	$\mathbf{E}\mathbf{S}$	405	Patch cord kits
Two	ES	447	Coefficient potentiometer kits
One	ES	450	Auxiliary coefficient potentiometer kit
One	ES	505	Repetitive oscillator kit

# FUNCTION GENERATOR

Model ES-600



#### PURPOSE:

To provide a function of "X" for any input of "X". Power Requirements: +250 volts at 16 ma.

-250 volts at 16 ma. -117 volts AC at 100 ma.

Input: ..... A voltage which varies with

respect to time.

Output: .........Approximation of functions by straight line segments.

## **OUTSTANDING FEATURES:**

Variable breakpoint voltages. High static accuracy (.5%).

### TUBE COMPLEMENT:

5-6AL5

2-OB2

### MOUNTING:

This unit is in a separate portable cabinet and is connected to the computer by means of varicon connectors.

This unit approximates curves or functions by straight line segments. The unit has a total of ten segments, five in the plus X direction and five in the minus X direction. The break voltage and slope of the segments are set by controls on the front panel.

The break voltages may be varied from zero to 100. The maximum slope per breakpoint is approximately one to one. The output voltage F(x) has a range of  $\pm 100v$ .

# INDIVIDUAL COMPONENT PARTS LIST

Model No.	Description	Price	
ES 2	Amplifier power supply kit	\$132.95	
ES 50	Reference power supply kit	22.95	
ES 100	Initial condition power supply kit	19.95	
ES 151	Relay power supply kit	11.95	
ES 201	Operational amplifier kit	14.95	
ES 400	Cabinet kit	247.95	
ES 401	Voltage regulator transformer kit	96.95	
ES 405	Patch cord kit (contains 12 patch cords)	16.95	
ES 447	Coefficient potentiometer kit	26.95	
ES 450	Auxiliary coefficient potentiometer kit	36.95	
ES 505	Repetitive oscillator kit	16.95	
ES 600	Function generator	69.95	