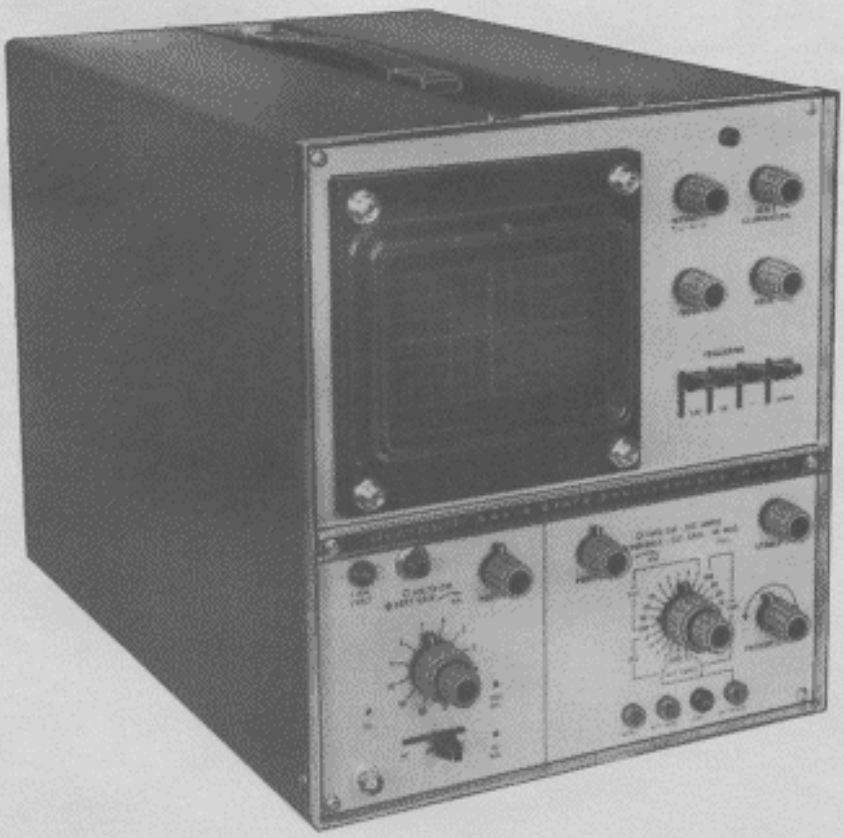
HEATHKIT

SPECIFICATIONS
MODEL IO-104

15 MHz
TRIGGERED-SWEEP
OSCILLOSCOPE



HEATHKIT
Schlumberger

HEATH COMPANY, BENTON HARBOR, MICHIGAN 49022
PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.
PRINTED IN U.S.A.

596-1490

SPECIFICATIONS

VERTICAL

Input Impedance	1 MΩ shunted by 40 pF.
Maximum Input Voltage	600 volts DC.
Sensitivity	10 millivolts/cm.
Frequency Response	DC to 15 MHz, ±3 dB with 4 cm deflection.
Rise Time	24 ns.
Attenuator	12 positions in a 1, 2, 5 sequence. .01 volt/cm to 50 volts/cm ±3%.

HORIZONTAL

Input Impedance	≈1 MΩ
Sensitivity	Less than .5 volt/cm.
Frequency Response	DC to 1 MHz, ±3 dB.
Attenuator	2 position, X1 and X10.

TIME BASE

Sweep	22 steps in a 1, 2, 5 sequence, 2 s/cm to .2 μs/cm, ±5%.
Horizontal Expansion	X5 ±5%.
Trigger Modes (switch selected)	AUTO/NORMAL + or − AC/DC INT/EXT

TRIGGER SENSITIVITY

Internal	1 cm display.
External	.5 volt peak-to-peak.

CALIBRATOR

Signal Source	4 MHz oscillator, crystal controlled ±.01%.

Outputs (TTL square wave, peak-to-peak)

Front panel	1 kHz, .4 volt ±5%.
Internal	1 kHz, 2.5 volts (approximately). 1 kHz, 5 volts (approximately). 10 kHz, 3 volts (approximately) 100 kHz, 3 volts (approximately). 1 MHz, 3 volts (approximately). 2 MHz, 3 volts (approximately).

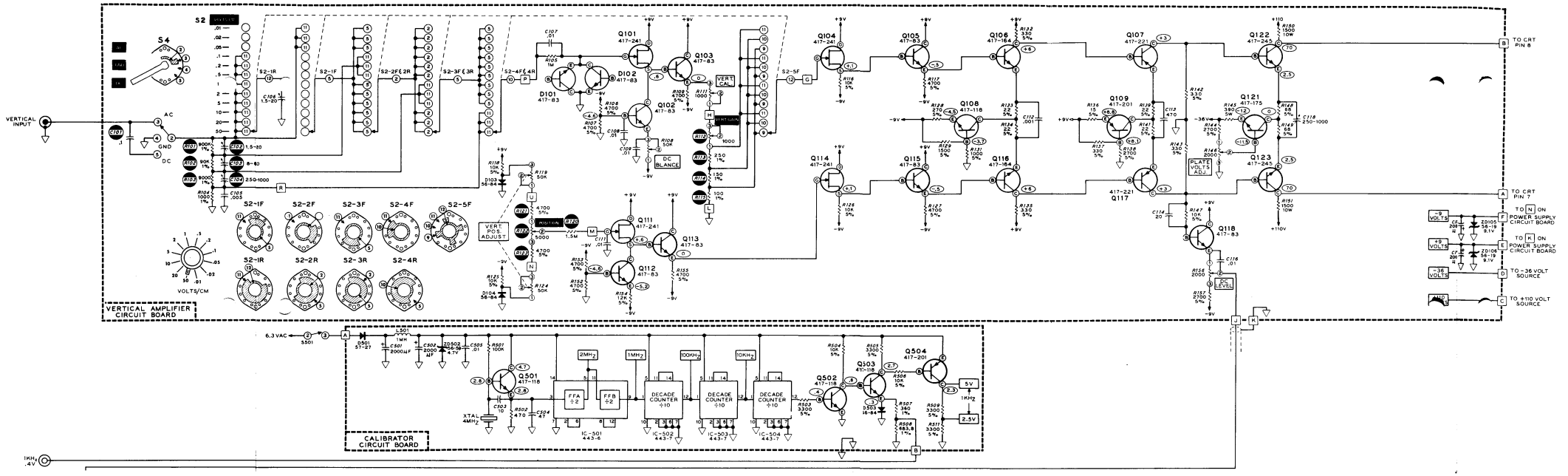
GENERAL

Input Connections

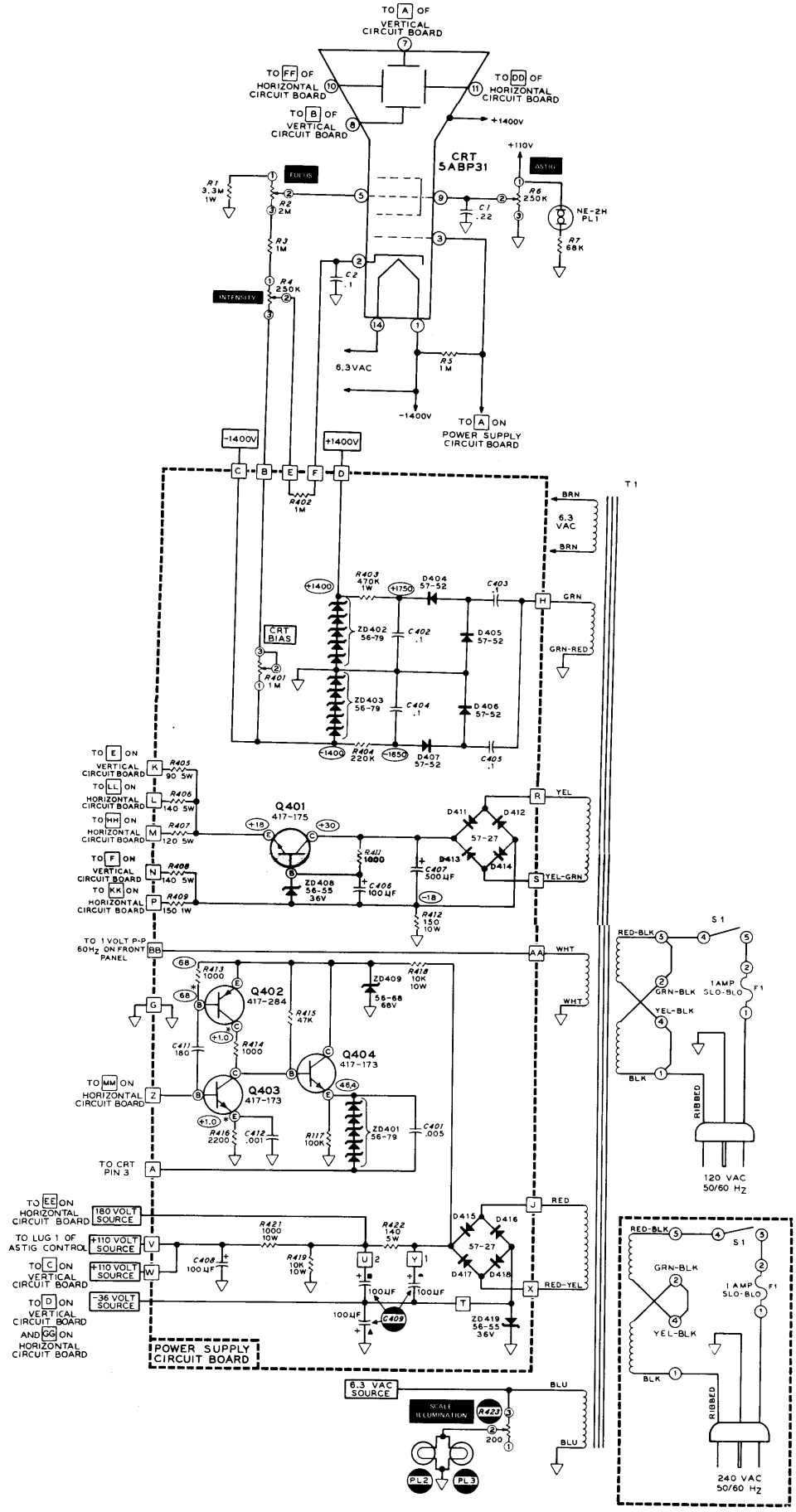
Vertical	Coaxial, BNC.
Horizontal	Banana jack.
Trigger	Banana jack.
CRT Accelerating Potential	2800 volts DC, regulated.
CRT Type	5ABP31, 6X10 cm viewing area; green, medium persistence phosphor.
Retrace Suppression	DC-coupled unblanking of the CRT.
Graticule	Engraved, 6X10 cm, edge lighted.
Power Requirements	110 to 130 VAC or 220 to 260 VAC, 50/60 Hz, 45 watts.

NOTE: Specifications measured at 25°C with 120 VAC line voltage.

Overall Dimensions	12-3/8" high x 10-3/4" wide x 20" long. (These dimensions include all protruding surfaces; knobs, handle, feet, etc.)
Net Weight	32 lbs.


VERTICAL INPUT
AC
GND
DC
S2
S4
VOLTS/CM
S2-1F
S2-2F
S2-3F
S2-4F
S2-5F
S2-1R
S2-2R
S2-3R
S2-4R
VERTICAL AMPLIFIER CIRCUIT BOARD
VERT POS ADJUST
VERT CAL
DC BALANCE
PLATE VOLTS ADJ
DC LEVEL
Q101 417-241
Q102 417-83
Q103 417-83
Q104 417-241
Q105 417-83
Q106 417-164
Q107 417-221
Q108 417-118
Q109 417-201
Q114 417-241
Q115 417-83
Q116 417-164
Q117 417-221
Q118 417-83
Q121 417-175
Q122 417-245
Q123 417-245
D101 417-83
D102 417-83
D103 56-84
D104 56-84
TO CRT PIN 8
TO CRT PIN 7
TO N ON POWER SUPPLY CIRCUIT BOARD
TO K ON POWER SUPPLY CIRCUIT BOARD
TO -36 VOLT SOURCE
TO +110 VOLT SOURCE
-9 VOLTS
+9 VOLTS
-36 VOLTS
+110
1KHz .4V
6.3 VAC
CALIBRATOR CIRCUIT BOARD
Q501 417-118
Q502 417-118
Q503 431-118
Q504 417-201
XTAL 4MHz
2MHz
1MHz
100KHz
10KHz
FFA ÷2
FFB ÷2
DECADE COUNTER ÷10
IC-501 443-6
IC-502 443-7
IC-503 443-7
IC-504 443-7
5V
1KHz
2.5V

SECTION 1 FRONT
SECTION 1 REAR
SECTION 2 FRONT
SECTION 2 REAR
SECTION 3 FRONT
SECTION 3 REAR
SECTION 4 FRONT
SECTION 4 REAR
SECTION 5 FRONT
SECTION 5 REAR
S3
EXT HORIZONTAL INPUT
EXT TRIGGER INPUT
GND
S301
S302
S303
S304
Q301
Q302
Q303
Q304
Q305
Q306
Q307
Q308
Q309
Q310
Q311
Q312
Q313
Q314
Q315
Q316
Q317
Q318
Q319
Q320
Q321
Q322
Q323
Q324
Q325
Q326
Q327
Q328
IC301
SECTION 1
SECTION 2
SECTION 3
SECTION 4
SECTION 5
HORIZONTAL AMPLIFIER CIRCUIT BOARD
TO -2K VOLT SOURCE
TO +180 VOLT SOURCE
TO CRT CIRCUIT BOARD
TO POWER SUPPLY BOARD


TO A OF VERTICAL CIRCUIT BOARD
TO FF OF HORIZONTAL CIRCUIT BOARD
TO DD OF HORIZONTAL CIRCUIT BOARD
TO B OF VERTICAL CIRCUIT BOARD
+1400V
+110V
CRT 5ABP31
FOCUS
ASTIG
INTENSITY
R1 3.3M 1W
R2 2M
R3 1M
R4 250K
R5 1M
R6 250K
R7 68K
C1 .22
C2 .1
NE-2H PL1
6.3VAC
-1400V
TO A ON POWER SUPPLY CIRCUIT BOARD
-1400V
+1400V
R402 1M
T1
BRN
6.3 VAC
BRN
+1400
R403 470K 1W
+1750
D404 57-52
C403
H
GRN
GRN-RED
CRT BIAS
R401 1M
ZD402 56-79
C402 .1
D405 57-52
ZD403 56-79
C404 .1
D406 57-52
-1400
R404 220K
-1650
D407 57-52
C405 .1
TO E ON VERTICAL CIRCUIT BOARD
TO LL ON HORIZONTAL CIRCUIT BOARD
TO MM ON HORIZONTAL CIRCUIT BOARD
TO F ON VERTICAL CIRCUIT BOARD
TO KK ON HORIZONTAL CIRCUIT BOARD
K
L
M
N
P
R405 90 5W
R406 140 5W
R407 120 5W
R408 140 5W
R409 150 1W
Q401 417-175
+18
+30
R411 1000
ZD408 56-55 36V
C406 100 µF
D411
D412
57-27
D413
D414
C407 500 µF
-18
R412 150 10W
R
YEL
S
YEL-GRN
TO 1 VOLT P-P 60Hz ON FRONT PANEL
BB
AA
WHT
WHT
68
R413 1000
Q402 417-284
G
R415 47K
ZD409 56-68 68V
R418 10K 10W
C411 180
+1.0
R414 1000
Q404 417-173
TO MM ON HORIZONTAL CIRCUIT BOARD
Z
Q403 417-173
464
+1.0
R416 2200
C412 .001
R417 100K
ZD401 56-79
C401 .005
TO CRT PIN 3
A
TO EE ON HORIZONTAL CIRCUIT BOARD
180 VOLT SOURCE
TO LUG 1 OF ASTIG CONTROL
+110 VOLT SOURCE
V
TO C ON VERTICAL CIRCUIT BOARD
+110 VOLT SOURCE
W
TO D ON VERTICAL CIRCUIT BOARD
-36 VOLT SOURCE
AND GG ON HORIZONTAL CIRCUIT BOARD
C408 100 µF
R421 1000 10W
R419 10K 10W
R422 140 5W
U 2
Y 1
100µF
100µF
100µF
C409
D415
D416
57-27
D417
D418
J
RED
X
RED-YEL
T
ZD419 56-55 36V
POWER SUPPLY CIRCUIT BOARD
6.3 VAC SOURCE
SCALE ILLUMINATION
R423 200
BLU
BLU
PL2
PL3
S1
RED-BLK
GRN-BLK
YEL-BLK
BLK
1 AMP SLO-BLO
F1
RIBBED
120 VAC 50/60 Hz
240 VAC 50/60 Hz

SCHEMATIC OF THE HEATHKIT®

15 MHz TRIGGERED-SWEEP OSCILLOSCOPE MODEL IO-104

NOTES:

1. REFER TO THE CHASSIS PHOTOGRAPHS AND CIRCUIT BOARD X-RAY VIEWS FOR THE PHYSICAL LOCATION OF PARTS.

2. ALL RESISTORS ARE 1/2 WATT 10% UNLESS OTHERWISE SPECIFIED.

3. ALL CAPACITOR VALUES LARGER THAN 1.0 ARE IN pF UNLESS OTHERWISE SPECIFIED. CAPACITOR VALUES LESS THAN 1.0 ARE IN µF.

4. THE ARROW INDICATES CLOCKWISE ROTATION OF A CONTROL OR SWITCH, AS VIEWED FROM THE KNOB END OR AS SHOWN FOR CIRCUIT BOARD CONTROLS. THE FOLLOWING CIRCUIT BOARD CONTROL LUG NUMBERS CORRESPOND TO THOSE SHOWN ON THE SCHEMATIC AND X-RAY VIEWS.

5. ALL VOLTAGES MEASURED WITH AN 11 MEGOHM INPUT VTVM FROM THE POINT INDICATED TO GROUND.

6. ⬭ INDICATES A DC VOLTAGE MEASURED FROM THE POINT INDICATED TO GROUND WITH THE TIME/CM SWITCH AT THE EXT HORIZ X 1 POSITION, THE CALIBRATOR SWITCH ON (PRESSED IN), AND BOTH THE VERTICAL AND THE HORIZONTAL AMPLIFIERS BALANCED (DOT CENTERED).

7. ⬭* INDICATES A SWEEP CIRCUIT VOLTAGE TAKEN WITH THE TIME/CM SWITCH IN THE 1 mSEC POSITION AND THE STABILITY CONTROL AT THE CENTER OF ITS ROTATION.

8. □ INDICATES A LETTERED WIRE CONNECTION TO A CIRCUIT BOARD.

9. ▽ INDICATES CIRCUIT GROUND.

10. ⟵ INDICATES A POWER SUPPLY CONNECTION.

11. ⊖ INDICATES A PART MOUNTED ON THE CHASSIS ALTHOUGH ITS LOCATION IN THE SCHEMATIC SUGGESTS ANOTHER LOCATION.

12. COMPONENTS ARE NUMBERED IN THE FOLLOWING GROUPS:

0-99	PARTS IN THE CRT CIRCUIT.
100-199	PARTS IN THE VERTICAL AMPLIFIER CIRCUIT.
300-399	PARTS IN THE HORIZONTAL AMPLIFIER CIRCUIT.
400-499	PARTS IN THE POWER SUPPLY CIRCUIT.
500-599	PARTS IN THE CALIBRATOR CIRCUIT.