

Caroline Downing 94-461

REV	REF	DESCRIPTION OF CHANGE	CHK BY	DATE
A		Original Initial Documentation (16 Pages)	D. Morgan	6-7-78
	A	As Per ECN 2642 (16 Pages)	D. Morgan	3-5-79
<div><div><i>Shirley Spence</i> Writer</div><div><i>Caroline Downing</i> Originator</div></div>				

155-0179-00

PART NUMBER

THIS DRAWING WHEN DISTRIBUTED OUTSIDE TEKTRONIX, INC. IS SUPPLIED FOR IDENTIFICATION; ENGINEERING EVALUATION AND/OR INSPECTION PURPOSES ONLY AND MAY NOT BE USED AS A BASIS FOR MANUFACTURE OR SALES OF PRODUCTS WITHOUT WRITTEN PERMISSION FROM TEKTRONIX, INC.

IF THIS DRAWING IS FURNISHED UNDER ANY U.S. GOVERNMENT CONTRACT, IT IS FURNISHED AS LIMITED RIGHTS DATA AND SHALL NOT, WITHOUT THE WRITTEN PERMISSION OF TEKTRONIX, INC., BE EITHER (A) USED, RELEASED OR DISCLOSED IN WHOLE OR IN PART OUTSIDE THE GOVERNMENT, (B) USED IN WHOLE OR IN PART BY THE GOVERNMENT FOR MANUFACTURE OR (C) USED BY A PARTY OTHER THAN THE GOVERNMENT, EXCEPT FOR: (I) EMERGENCY REPAIR OR OVERHAUL WORK ONLY, BY OR FOR THE GOVERNMENT, WHERE THE ITEM OR PROCESS CONCERNED IS NOT OTHERWISE REASONABLY AVAILABLE TO ENABLE TIMELY PERFORMANCE OF THE WORK, PROVIDED THAT THE RELEASE OR DISCLOSURE HEREOF OUTSIDE THE GOVERNMENT SHALL BE MADE SUBJECT TO A PROHIBITION AGAINST FURTHER USE, RELEASE, OR DISCLOSURE, OR (II) RELEASE TO A FOREIGN GOVERNMENT, AS THE INTEREST OF THE UNITED STATES MAY REQUIRE, ONLY FOR INFORMATION OR EVALUATION WITHIN SUCH GOVERNMENT OR FOR EMERGENCY REPAIR OR OVERHAUL WORK BY OR FOR SUCH GOVERNMENT UNDER THE CONDITIONS OF (I) ABOVE THIS LEGEND SHALL BE INCLUDED ON ANY REPRODUCTION HEREOF

THE DRAWING TYPE DESIGNATION AND APPROVED SOURCES OF SUPPLY FOR THIS ITEM ARE LISTED ON THE PURCHASED ITEM SOURCE LIST (PISL) FOR THIS PART NUMBER.



TEKTRONIX, INC.

P. O. BOX 500
BEAVERTON, OREGON U.S.A. 97077



DWN/
WR

COMP
ENGR

CHKR/
COORD

INSTR
DSGN

DIMENSIONS ARE IN INCHES / MM
TOLERANCES: UNLESS OTHERWISE SPECIFIED

DEC

ANLR

SCALE

FIRST USED ON

MATERIAL

FINISH

TITLE

HORIZONTAL CLAMP: H475

SH 1 OF 16

CODE IDENT NO
80009

SIZE
A

PART NUMBER

155-0179-00

REV
A

1.0

DESCRIPTION

The 155-0179-00 (H475) is a symmetrical soft clamp designed for use in a 50 Ω push-pull system. The point at which clamping occurs is externally controllable, and a transistor is included on the hybrid to allow temperature compensation of the clamp point.

The circuit is on a 1.22 cm square alumina substrate, and is mounted on the circuit board with a HYPCON connector.

When used in 50 Ω system, the 50 Ω environment is maintained except when clamping occurs. The hybrid has an insertion loss of approximately 3 dB.

The active devices are manufactured using the SHF III process.

2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical

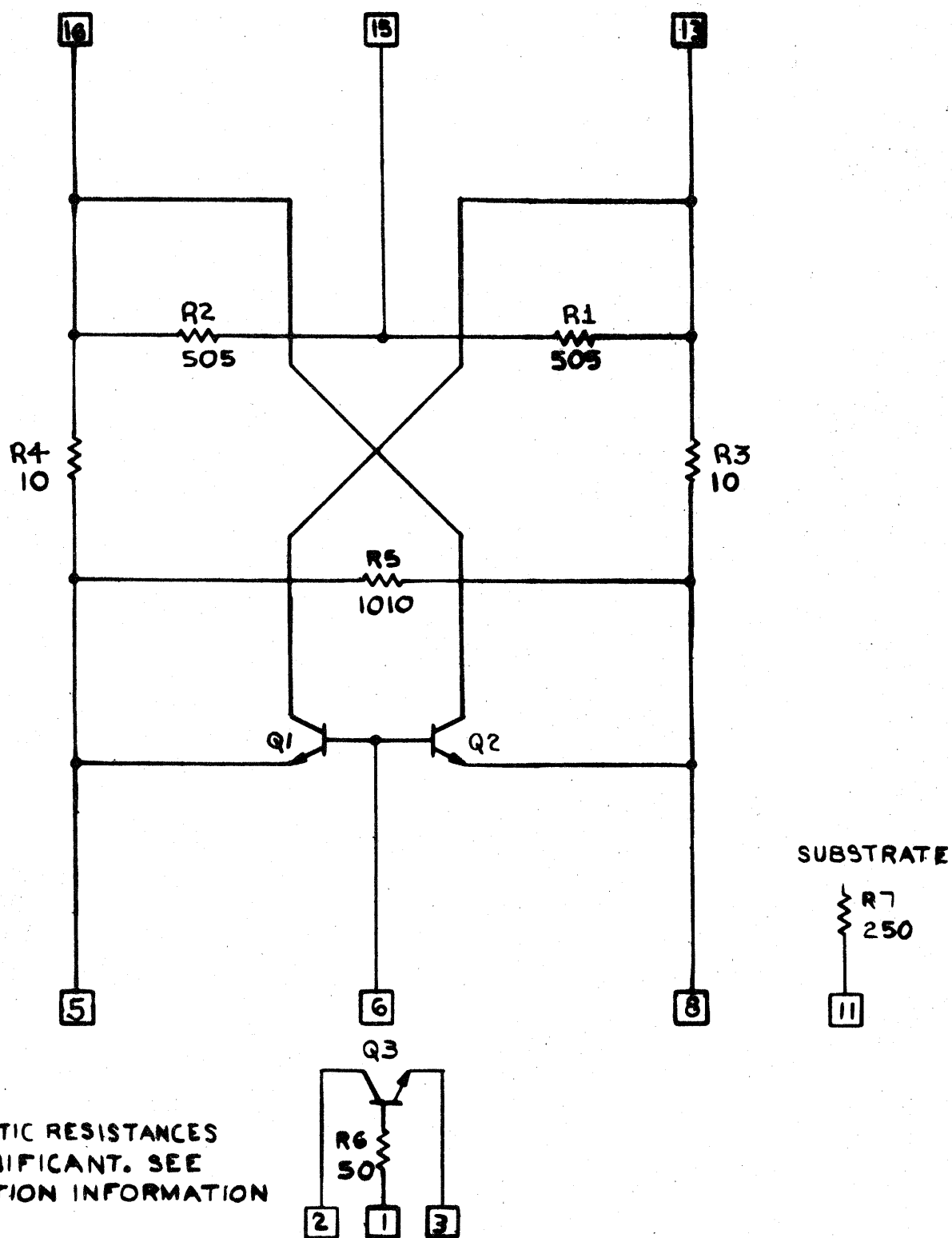
Voltage at Pin 5 Relative to Pin 6	+2 Volts
Voltage at Pin 8 Relative to Pin 6	+2 Volts
Voltage at Pin 13 Relative to Pin 6	3.2 Volts
Voltage at Pin 16 Relative to Pin 6	3.2 Volts
Voltage at Pin 3 Relative to Pin 1	4 Volts
Voltage at Pin 2 Relative to Pin 1	**
Collector Current in Q1	30 mA
Collector Current in Q2	30 mA
Collector Current in Q3	30 mA
Voltage at Pin 16 Relative to Pin 5	2.75 Volts
Voltage at Pin 13 Relative to Pin 8	2.75 Volts
Junction Temperature, Any Device	200°C
Voltage at Pin 11 Relative to All Other Pins	25 Volts

**See Section 8.0 (Applications Information) for
collector-base breakdown information on Q3.

2.2 Environmental

Storage Temperature	-55°C to 125°C
-------------------------------	----------------

3.0

SCHEMATIC DIAGRAM

H475

TEKTRONIX, INC.
BEAVERTON, OREGON

SHT 4 OF 16

CODE IDENT NO
80009SIZE
A

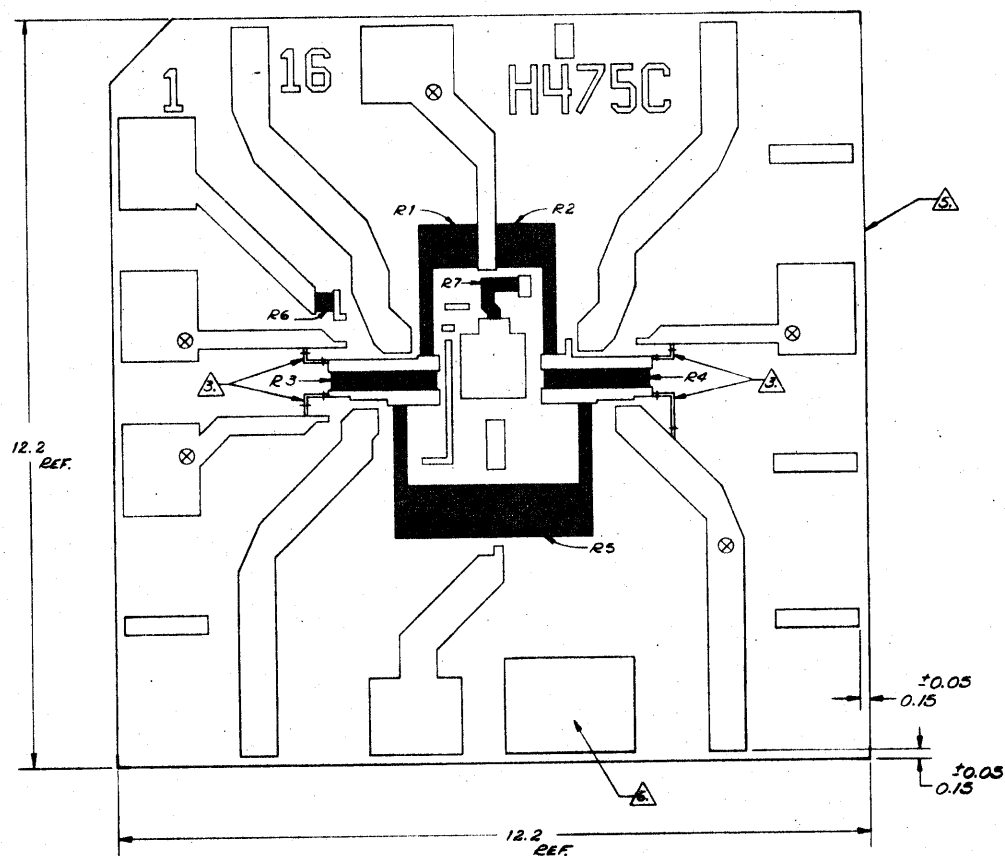
PART NUMBER

155-0179-00

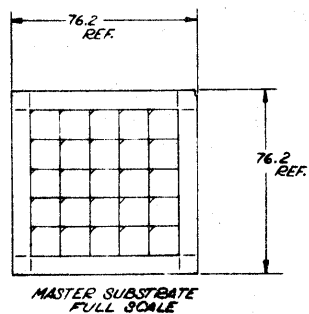
REV
A

3.1

Layout Drawing



R No.	AS PROCESSED		E.O.L.	
	VALUE	TOL.	VALUE	TOL.
1, 2	440 Ω	N/A	505 Ω	±1%
3, 4	8.8 Ω	N/A	10 Ω	±1%
5	880 Ω	±12%	1000 Ω	±1%
6	50 Ω	±20%	N/A	N/A
7	250 Ω	±20%	N/A	N/A



- 7 SCALE: 25.4:1 OR (1in=1cm).
 6 PAD FOR SERIALIZATION BY LASER IMPRINTED NUMBERS IF DESIRED.
 5 ONE OF 25 IDENTICAL PARTS ON MASTER SUBSTRATE.
 4 SCRIBE SPECIFICATIONS = ----
 3 SCRUB JUMBERS (4), IN AREA SHOWN, AFTER TRIM.
 2 ENCAPSULATION NOT SHOWN FOR CLARITY.
 1 ⊗ INDICATES PROBE POSITIONS.

NOTES:

TEKTRONIX, INC. BEAVERTON, OREGON U.S.A. DIV.		N/A-475C	
DESIGNED BY: R. DODSON		CHECKED BY: R. DODSON	
DATE: 11-28-77	BY: R. DODSON	DATE: 11-28-77	BY: R. DODSON
307-0581-00		307-0581-01	
TITLE: CLAMP SUBSTRATE PASSIVE LASER TRIMMED			
80009	D	307-0581-01	REV A

TEKTRONIX, INC.
BEAVERTON, OREGON

SHT 5 OF 16

CODE IDENT NO

80009

SIZE

A

PART NUMBER

155-0179-00

REV

A

3.2 Resistor Values

R_1$	. . . . .	505 \Omega \pm 2\%$
R_2$	. . . . .	505 \Omega \pm 2\%$
R_3$	. . . . .	10 \Omega \pm 1\%$
R_4$	. . . . .	10 \Omega \pm 1\%$
R_5$	. . . . .	1010 \Omega \pm 2\%$
R_6$	. . . . .	50 \Omega \pm 20\%$
R_7$	. . . . .	250 \Omega \pm 20\%$

4.0 PARAMETRIC DEFINITIONS

4.1 $V_{ON_{6-5}}$

The voltage at Pin 6 relative to Pin 5 necessary to cause 5 mA of current to flow through Q1.

4.2 $V_{ON_{6-8}}$

The voltage at Pin 6 relative to Pin 5 necessary to cause 5 mA of current to flow through Q2.

4.3 V_{OFFSET}

The difference between $V_{ON_{6-5}}$ and $V_{ON_{6-8}}$ above. This is an indicator of clamp point non-symmetry with respect to electrical center.

5.0 PARAMETRIC SUMMARY

NO	SYMBOL	PARAMETER	CONDITIONS	MIN	MAX	UNITS
1	$V_{ON_{6-5}}$	Voltage at Pin 6 relative to Pin 5 which makes the voltage at Pin 16 relative to Pin 13 be 0.412 volts	Pin 5 connected to current source of -85 mA Pin 8 connected to current source of -65 mA Pin 13 connected through 50 Ω to a positive supply Pin 16 connected through 50 Ω to same positive supply Pins 1, 2, 3, and 15 are not connected	0.78	0.88	V
2	$I_{6-5 \text{ Bias}}$	Bias current into Pin 6 which makes the voltage at Pin 16 relative to Pin 13 be 0.412 volts	Same as #1		125	μA
3	$V_{ON_{6-8}}$	Voltage at Pin 6 relative to Pin 8 which makes the voltage at Pin 13 relative to Pin 16 be 0.412 volts	Pin 5 connected to current source of -65 mA Pin 8 connected to current source of -85 mA Pin 13 connected through 50 Ω to a positive supply Pin 16 connected through 50 Ω to same positive supply Pins 1, 2, 3, and 15 are not connected	0.78	0.88	V
4	$I_{6-8 \text{ Bias}}$	Bias current into Pin 6 which makes the voltage at Pin 13 relative to Pin 16 be 0.412 volts	Same as #3		125	μA

5.0 PARAMETRIC SUMMARY (continued)

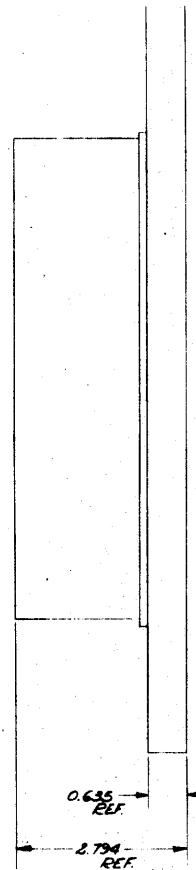
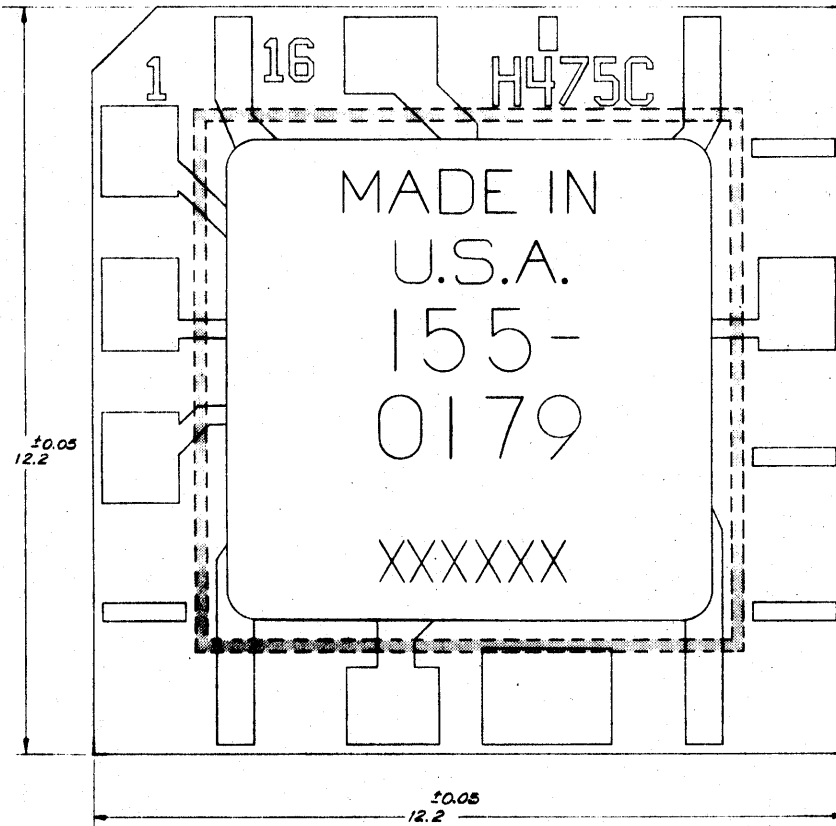
NO	SYMBOL	PARAMETER	CONDITIONS	MIN	MAX	UNITS
5	V_{OFFSET}	V_{OFFSET}	$V_{\text{OFFSET}} = V_{\text{ON}_{6-5}} - V_{\text{ON}_{6-8}}$	-30	+30	mV
6	$V_{\text{ON}_{1-3}}$	Voltage at Pin 1 relative to Pin 3	Pin 2 is 5 volts above Pin 1 Pin 3 is connected to a current source of -2 mA	0.75	0.85	V
7	$I_1 \text{ Bias}(10)$	Current into Pin 1	Pin 2 is 10 volts above Pin 1 Pin 3 is connected to a current source of -2 mA		50	μA
8	$I_1 \text{ Bias}(3)$	Current into Pin 1	Pin 2 is 3 volts above Pin 1 Pin 3 is connected to a current source of -2 mA		50	μA
9	R_{5-16}	Resistance measured between Pins 5 and 16	All other pins open	10.76	10.98	Ω
10	R_{8-13}	Resistance measured between Pins 8 and 13	All other pins open	10.58	10.79	Ω

6.0 PACKAGING

6.1 Terminal Identification

PIN	NAME	INPUT/OUTPUT
1	Emitter Follower	Input
2	Emitter Follower	V _{CC}
3	Emitter Follower	Output
5	+Input	
6	Clamp Level Input	
8	-Input	
11	Substrate Bias	
13	-Output	
15	Output Common Mode Sense	
16	+Output	

6.2 Outline Drawing



SCALE: 25.4:1 OR (1" = 1mm).

1. CONNECTION TO DEVICE TO BE MADE BY HYCON INTERCONNECTION SYSTEM.

NOTES:

TEKTRONIX, INC. BEAVERTON, OREGON U.S.A. 97005		P. O. BOX 800	
DRAWN BY: D. J. DOOLEY		CHECKED BY: J. L. GALT	
DATE: 12/27/77		DATE: 1/10/78	
BY: D. J. DOOLEY		BY: J. L. GALT	
PART: 155-0179-47		REV: 1/10/78	
TITLE: CLAMP (TESTED)		REV: 1/10/78	
PART: 80009		REV: 155-0179-00	

METRIC

TEKTRONIX, INC.
BEAVERTON, OREGON

SMT 10 OF 16

CODE IDENT NO
80009

SIZE
A

PART NUMBER

155-0179-00

REV
A

6.3 Thermal Characteristics

Not Applicable

7.0 RELIABILITY STATEMENT

λ , Failure Rate; $\leq .1\%/1K$ hours at $75^{\circ}C T_j$

MTTF $\geq 10^6$ hours at $75^{\circ}C T_j$

Expected instrument life; 10K hours

Life Test Results (90% Lower Confidence Limits)

λ , $.078\%/1K$ hours at $75^{\circ}C T_j$

Life Test Report #RA-28

8.0 APPLICATIONS INFORMATION

The H475 would typically be used in a CRT Deflection Amplifier to limit the dynamic range of the signal applied to the amplifier's output stages.

Approximately 75 mA of standing current per side is required for proper operation. This current would typically be obtained by using this hybrid at the output of an H442 Channel Switch, and routing the channel switch standing current through the H475.

Q3 is autoprobed to meet or exceed the following parameters:

$BV_{CBO} = 12$ Volts

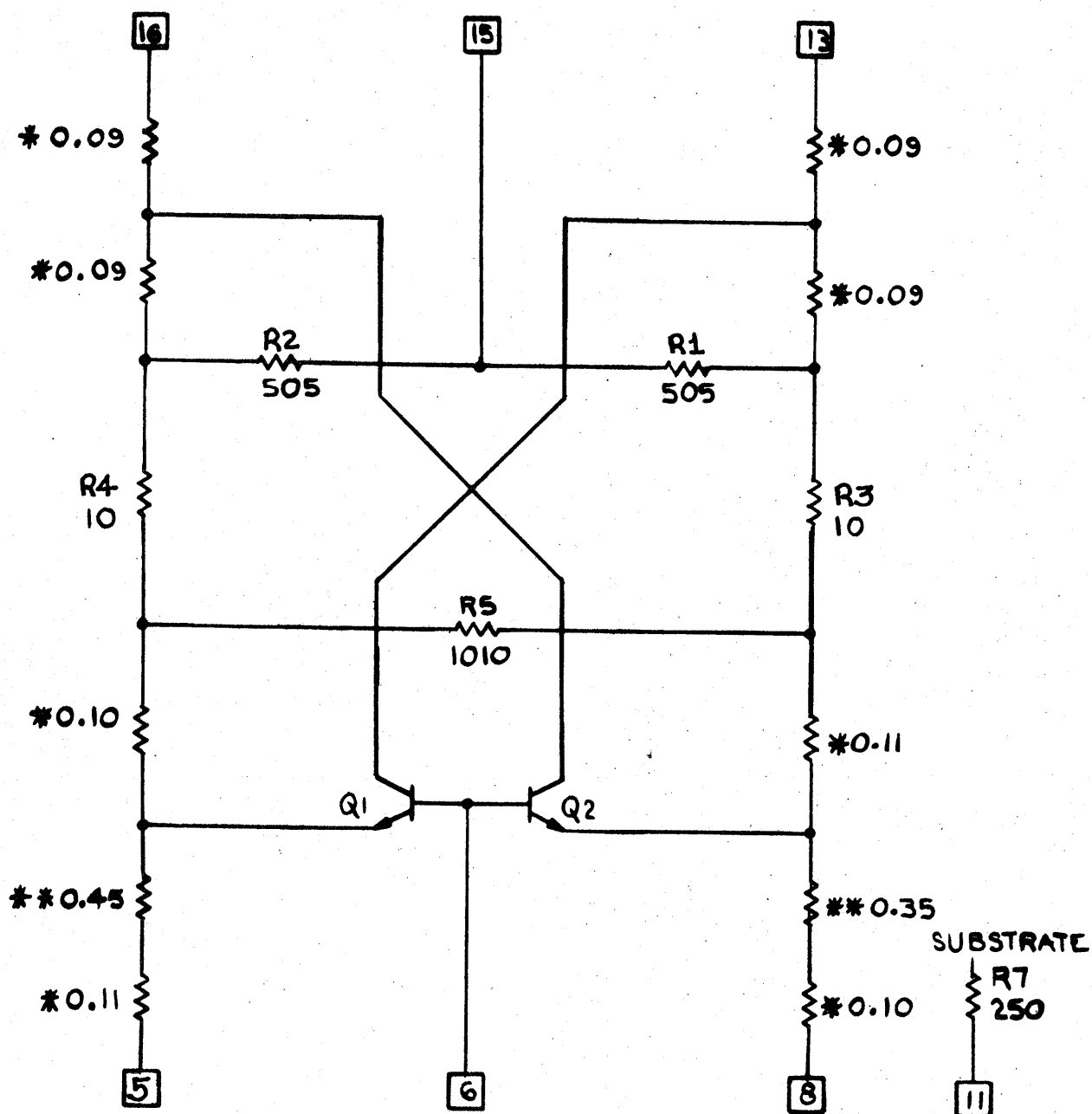
$BV_{CES} = 8$ Volts

$LV_{CEO} = 5.5$ Volts

The following page shows a schematic diagram of the part with parasitic resistances added, and indicates the source of the resistance.

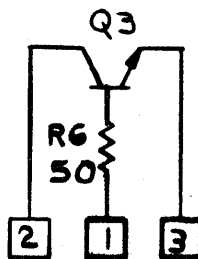
8.1

FIGURE 8.1



* DENOTES RESISTANCE DUE
TO BOND WIRES

** DENOTES RESISTANCE DUE
TO METAL RUNS ON THE
M198 DIE



H475

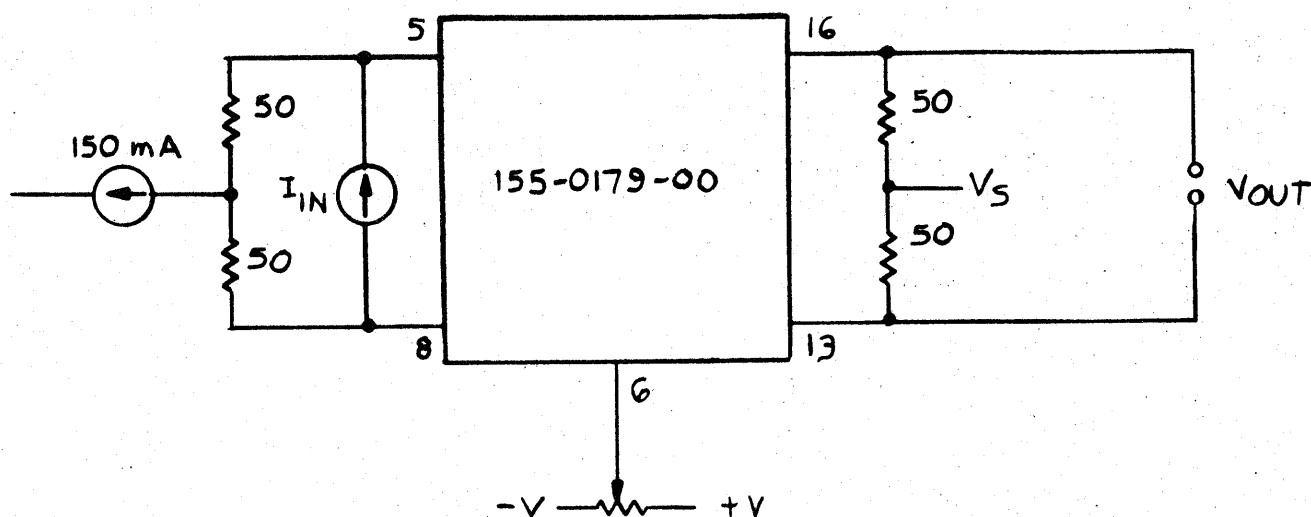
8.0 APPLICATIONS INFORMATION (continued)

8.2 Clamping Characteristics of the 155-0179-00 (H475)

The following graphs (on Pages 15 and 16) show the clamping characteristics of the 155-0179-00 as it is used in the Horizontal Amplifier of the 7104 Oscilloscope.

In this application, the hybrid is used to limit an input of ± 15 divisions to an output of ± 10 divisions. The graphs show clamping in divisions from electrical center.

The following is a simplified schematic to show the bias conditions of the hybrid under which the data was taken.

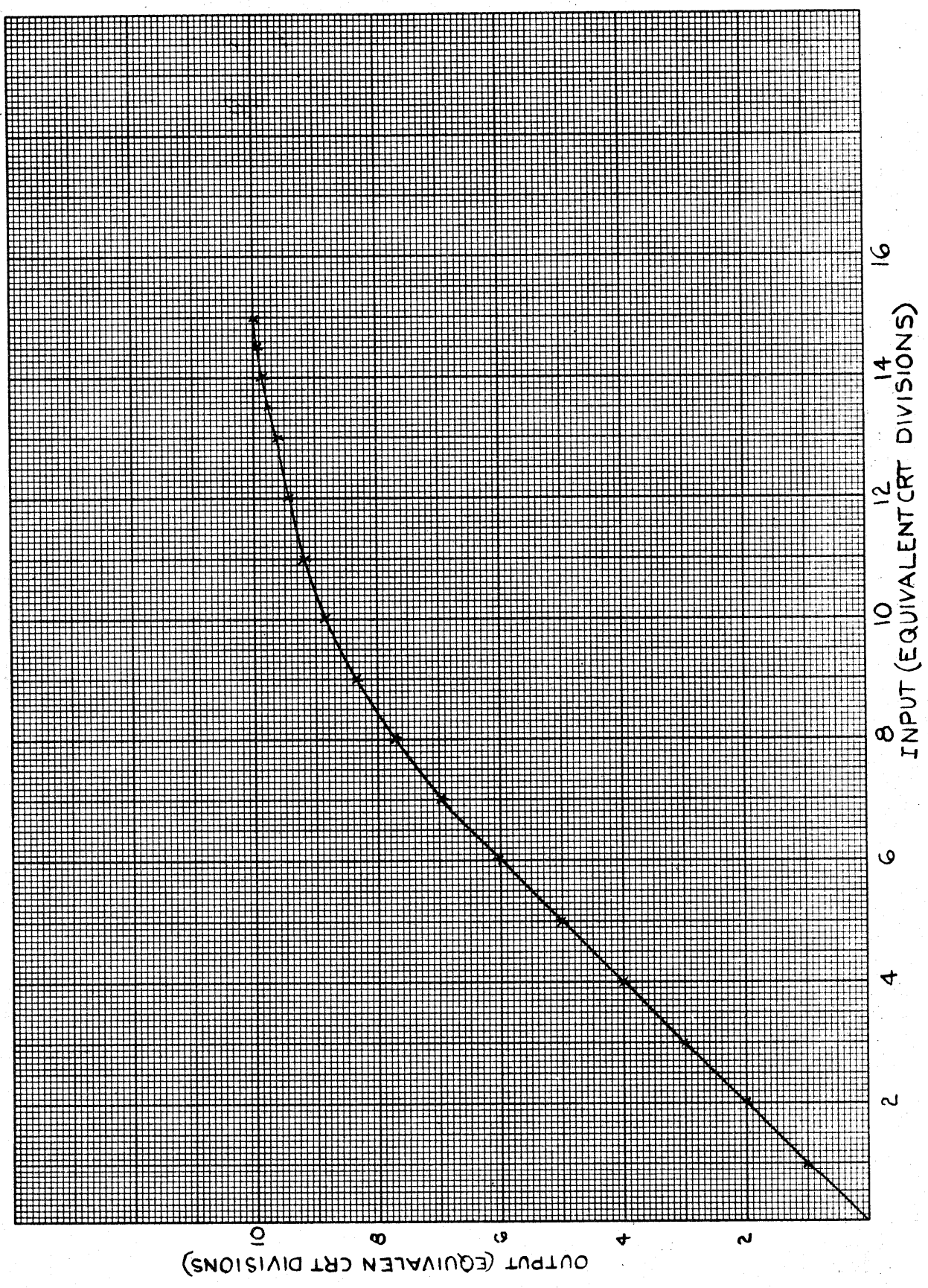


The signal levels are such that, on the graphs and the schematic, 1 division = 66 mV at the output.

OUTPUT VS INPUT

CLAMPING CHARACTERISTICS

155-0179-00



TEKTRONIX, INC.
BEAVERTON, OREGON

SHT 14 OF 16

CODE IDENT NO
80009

SIZE
A

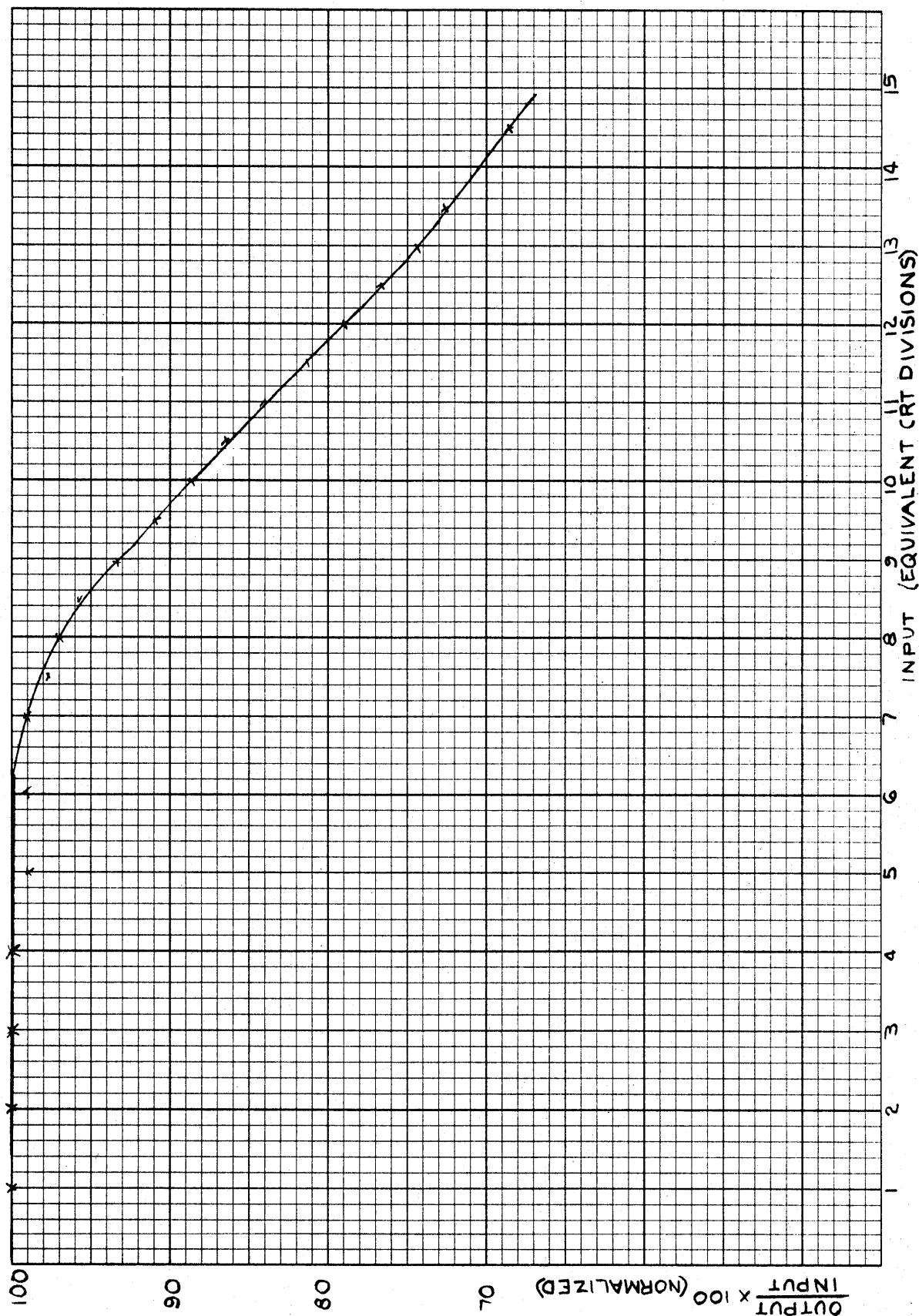
PART NUMBER
155-0179-00

REV
A

DO NOT SCALE DRAWING

OUTPUT AS A PERCENTAGE OF
INPUT VS INPUT (NORMALIZED)

155-0179-00 CLAMPING CHARACTERISTICS



TEKTRONIX, INC.
BEAVERTON, OREGON

SHT 15 OF 16

CODE IDENT NO
80009

SIZE
A

PART NUMBER

155-0179-00

REV
A

9.0

REFERENCE LIST

SPEC NO

TITLE

SOURCE

TEKTRONIX, INC.
BEAVERTON, OREGON

SHT 16 of 16

CODE IDENT NO

80009

SIZE

A

PART NUMBER

155-0179-00

REV

A