



# MICROWAVE CATALOG

TRAVELING WAVE TUBES

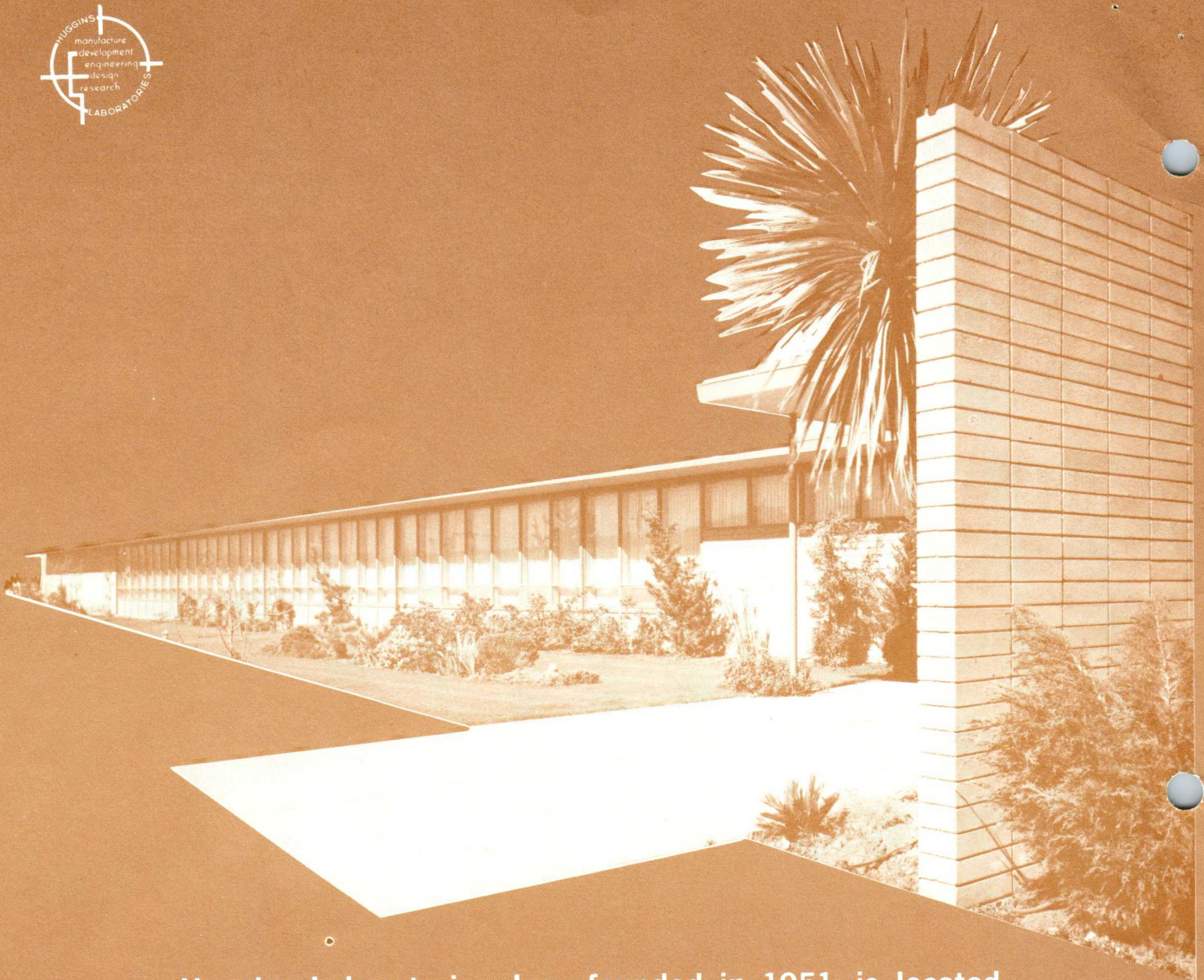
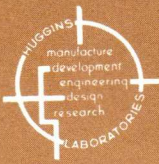
SOLENOIDS

TWT AMPLIFIERS

FERRITE DEVICES



HUGGINS LABORATORIES, INC.



Huggins Laboratories, Inc., founded in 1951, is located 40 miles south of San Francisco in the heart of the Peninsula's dynamic electronic industry complex. Situated on 14 acres of land in Sunnyvale's International Science Center, its 70,000 square feet of floor space includes a modern and complete manufacturing facility complemented by appropriate engineering model shops.

Widely recognized as the pioneer manufacturer of traveling wave tubes, Huggins Laboratories offers a broad engineering and production capability in the microwave and infrared fields, including components, instrumentation, and subsystems. Major product areas include Microwave and Special Electronic Instrumentation.

## **HUGGINS LABORATORIES, INC.**

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# HUGGINS LABORATORIES INC.

*results of imaginative  
and creative engineering*

## TRAVELING WAVE TUBES



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TOTAL CAPABILITIES	20
REPRESENTATIVES	20

## TRAVELING WAVE TUBES

- ... 250 to 16,000 Mc
- ... PPM focusing: Power output to 20 watts  
Noise Figures to 10 db  
MIL-E-5400 Class II availability
- ... long life: Greater than 30,000 hours documented

## SOLENOIDS

- ... 200 to 2000 gauss
- ... uniform parallel windings for minimum transverse fields
- ... liquid, forced air, or convection cooling
- ... for TWT, laser, and special applications.

## TRAVELING WAVE TUBE AMPLIFIERS

- ... 250 to 12,400 Mc
- ... Power Output to 20 watts
- ... Noise Figure to 5 db
- ... Rugged, modular power supplies
- ... Available with completely solid state power supplies

## FERRITE DEVICES

- ... 3 and 4 port circulators: octave bandwidths
- ... isolators
- ... phase shifters
- ... amplitude modulators



### ORDERING INFORMATION

ORDERING: Standard Tubes: Specify full tube nomenclature and primary performance specifications.

Custom Units: Many tubes whose characteristics fall outside those listed in this catalog are being made to individual customer specifications.

Contact Huggins Sales Department, or our representative in your area, to discuss your special needs.

TERMS: Net 30 days with approved credit.

DELIVERY: F.O.B. Sunnyvale, California. Consult Huggins Sales Department for latest quotations.

SHIPMENT: Via air freight unless requested otherwise.



# LOW NOISE TWTS

## WIDE DYNAMIC RANGE

This newest, state of the art, family of PPM focused TWTs offers the lowest available noise per watt. Engineered to include such features as:

- 500 to 12,000 Mc coverage
- 9 db noise figure
- Power output to 10 watts
- Gain - 50 to 60 db gain

Engineered and designed for use as Post amplifiers in reconnaissance systems Pre-amplifiers in ECM systems.

Available in integral, solid state, light weight power supplies. Specific information available upon request.

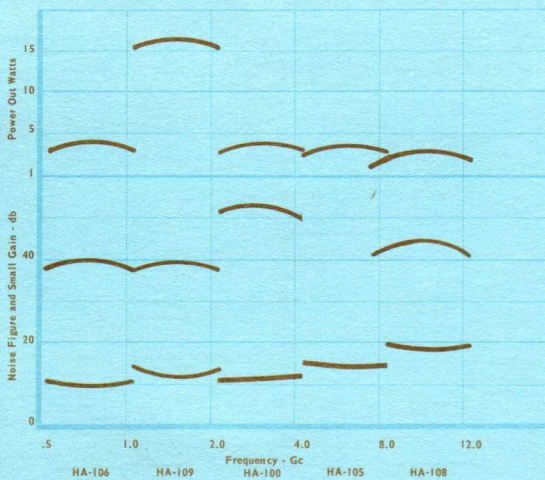


HA-100F

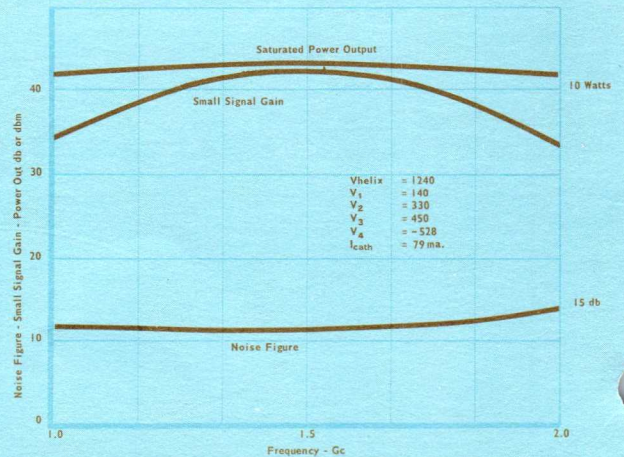
### LOW NOISE PPM FOCUSED

BAND	TYPE	FREQUENCY (GC)	MIN SS GAIN (db)	MIN SAT. Pout WATTS	MAX NOISE FIG (db)	MAX I <sub>k</sub> (MA)	HELIX	ELECTRODE VOLTAGES (Vdc)			REMARKS	
								GRID	A <sub>1</sub>	A <sub>2</sub>		A <sub>3</sub>
UHF	HA-106	0.5 - 1.0	30	1	13	60	400-600	-600 to 0	0-300	0-400	0-600	Huggins 142D
	HA-106A	0.5 - 1.0	30	1	13	60	400-600	-600 to 0	0-300	0-400	0-600	
L	HA-104	1.0 - 2.0	33	2	15	60	800-1100	-600 to 0	0-300	0-400	200-800	Huggins 144D
	HA-104B	1.0 - 2.0	33	2	15	60	800-1100	-600 to 0	0-300	0-400	200-800	
	HA-109	1.0 - 2.0	30	10	15	100	1000-1500	-600 to 0	0-500	0-600	200-800	Huggins 152D Huggins 152E
	HA-109A	1.0 - 2.0	30	10	15	100	1000-1500	-600 to 0	0-500	0-600	200-800	
	HA-109B	.790 - .815	40	10	15	100	750-1250	-600 to -100	50-550	100-600	200-700	
HA-109C	1.2 - 1.4	30	10	13	100	1100-1500	-700 to 0	0-500	0-600	200-800		
S	HA-100	2.0 - 4.0	35	1	11	25	800-1100	-600 to -200	0-300	200-600	50-400	11db Noise Figure 2-4 kmc
	HA-100A	2.0 - 3.0	35	1	10	25	800-1100	-600 to 0	0-300	100-600	40-500	
	HA-100B	2.0 - 4.0	35	1	13	25	800-1100	-600 to -200	0-300	200-600	50-400	Huggins 146D
	HA-100C	2.0 - 4.0	35	1	13	25	800-1100	-600 to -200	0-300	200-600	50-400	
	HA-100D	2.0 - 4.0	33	1	13	25	800-1000	-600	0-250	200-600	50-350	7 db max ssy Variation Light Weight Tube (1.8 lbs.)
	HA-100E	2.0 - 4.0	35	1	13	25	800-1000	-600 to -250	0-250	200-600	50-350	
	HA-100F	2.0 - 4.0	35	1	11	25	800-1100	-600 to -200	0-300	200-600	50-400	Huggins 153D
	HA-100H	2.8 - 3.2	50	2	10	25	800-1100	-100 to 0	250-700	200-600	50-400	
	HA-100J	2.0 - 4.0	35	5	15	50	1000-1400	-600 to 0	0-400	100-600	100-800	
	C	HA-105	4.0 - 8.0	33	1	18	30	1600-2200	-500 to 0	0-300	0-400	0-600
HA-105A		4.0 - 8.0	33	1	20	30	1600-2200	-500 to 0	0-300	0-400	0-600	
HA-105D		5.2 - 5.8	30	8	17	30	1600-2200	-500 to 0	0-300	0-400	0-600	Huggins 145E Huggins 154D
HA-105E		4.0 - 7.0	30	5	20	30	1600-2200	-500 to 0	0-300	0-400	0-600	
X	HA-108	7.0 - 11.0	30	1	20	20	2000-2500	-500 to 0	0-300	0-500	200-800	Huggins 148D
	HA-108A	7.0 - 11.0	30	1	20	20	2000-2500	-500 to 0	0-300	0-500	200-800	
	HA-108B	8.5 - 9.6	35	1	17	15	2000-2500	-500 to 0	0-300	0-500	200-800	

TYPICAL DATA 100 SERIES



TYPICAL DATA HA-109



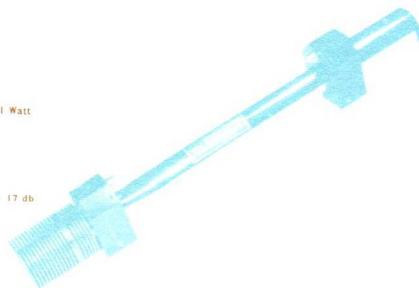
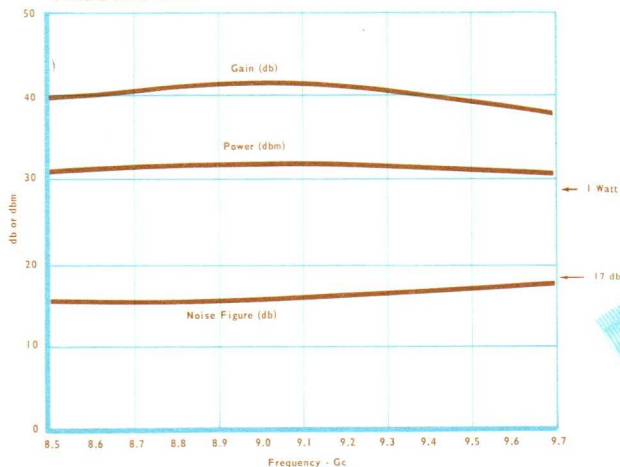
## PPM FOCUSED

BAND	TYPE	FREQUENCY (GC)	MIN SS GAIN (db)	MIN SAT. Pout (MW)	MAX NOISE FIG (db)	MAX I <sub>k</sub> (MA)	ELECTRODE VOLTAGES (Vdc)					REMARKS
							HELIX	GRID	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	
UHF	HA-67	0.5- 1.0	25	10	11	4.5	200 to 300	- 50 to 0	0 to 50	0 to 100	0 to 400	Huggins 136D
	HA-67A	0.5- 1.0	25	10	11	4.5	200 to 300	- 50 to 0	0 to 50	0 to 100	0 to 400	
L	HA-85	1.0- 2.0	25	10	11	3	150 to 250	-100 to 0	0 to 100	0 to 100	0 to 200	Huggins 110D & 111D
	HA-85A	1.0- 2.0	25	5	15	3	150 to 250	-100 to 0	0 to 100	0 to 100	0 to 125	
	HA-85E	1.0- 2.0	25	5	11	3	150 to 250	-100 to 0	0 to 100	0 to 100	0 to 200	
S	HA-54	2.0- 4.0	30	10	12	2	400 to 500	-200 to 0	0 to 75	0 to 50	0 to 200	
	HA-54C	2.0- 4.0	30	5	17	2.5	425 to 550	-150 to -50	0 to 50	20 to 100	75 to 125	
	HA-93A	2.0- 4.0	30	5	10	2	425 to 550	-100 to 0	0 to 75	0 to 100	0 to 200	
	HA-93B	2.3- 4.45	30	5	11	2	425 to 550	-100 to 0	0 to 75	0 to 100	0 to 200	
C	HA-84	4.0- 8.0		10	14	2	600 - 800	-150 to 0	0 to 150	0 to 300	100 to 600	
X	HA-60	7.0-11.0	25	10	14	1.5	1050 to 1300	-100 to 0	0 to 150	50 to 250	150 to 500	Huggins 127D & 123D MIL-E-1/1510A
	HA-60C	8.5- 9.5	30	10	15	1.5	1000 to 1250	-100 to 0	0 to 150	50 to 250	100 to 400	
	HA-60H	7.0-11.0	25	10	14	1.5	1100 to 1300	-100 to 0	0 to 150	100 to 300	300 to 800	
	HA-60S	7.0-11.0	37	10	15	1.5	1100 to 1300	- 50 to 0	0 to 150	100 to 300	300 to 800	
	HA-60K	7.0-11.0	30	5	13	1.5	1050 to 1300	-100 to 0	0 to 150	50 to 250	150 to 500	
	HA-60L	7.0-12.0	30	5	15	1.5	1050 to 1300	-100 to 0	0 to 150	50 to 250	150 to 500	

## SOLENOID FOCUSED

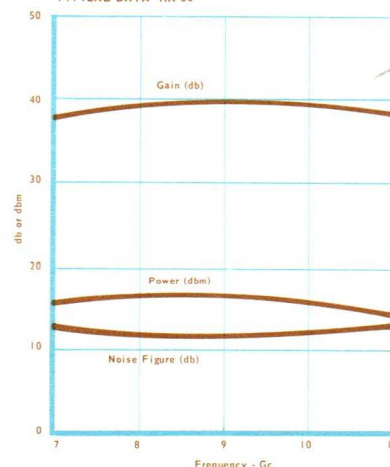
BAND	TYPE	FREQUENCY (GC)	MIN SS GAIN (db)	MIN SAT. Pout (MW)	MAX NOISE FIG (db)	MAX I <sub>k</sub> (MA)	ELECTRODE VOLTAGES (Vdc)					REMARKS
							HELIX	GRID	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	
UHF	HA-86	0.5 - 1.0	25	2	7	2	75 to 120	0 to 30	0 to 30	0 to 30	0 to 30	Huggins 101G
	HA-86A	0.8 - 1.2	25	1	7	2	75 to 120	0 to 30	0 to 30	0 to 30	0 to 30	
	HA-86B	0.45- 1.15	25	1	9	2	80 to 120	- 50 to 50	0 to 3	0 to 30	0 to 50	
	HA-86M	0.7 - 1.0	30	2	8	2	75 to 120	- 50 to 50	0 to 53	0 to 30	0 to 30	
	HA-72	0.5 - 1.0	25	2	8	2	70 to 120	0 to 30	0 to 30	0 to 30	0 to 30	
	HA-45	0.5 - 1.0	25	3	10	2	75 to 120	0 to 30	0 to 30	0 to 30	0 to 30	
	HA-45D	0.5 - 1.0	25	3	10	2	70 to 120	- 50 to 50	0 to 30	0 to 30	0 to 30	
HA-45E	0.5 - 1.0	25	1	10	1.5	78 to 100	- 50 to 50	0 to 30	0 to 30	0 to 30	Huggins 103D Alfred 5051	
L	HA-80	1.0 - 2.0	25	3	7	2	165 to 200	- 25 to 25	0 to 20	0 to 20	0 to 150	FSN 5906-963-6749
	HA-73	1.0 - 2.0	25	2	8	2	165 to 200	- 25 to 25	0 to 20	0 to 20	0 to 150	
	HA-73G	1.0 - 2.0	25	1	8	2	165 to 200	- 25 to 25	0 to 20	0 to 20	0 to 150	
	HA-14	1.0 - 2.0	25	2	10	2	165 to 200	- 25 to 25	0 to 20	0 to 20	0 to 120	
	HA-14N	1.1 - 2.4	30	1	10	2	165 to 200	- 25 to 25	0 to 20	0 to 20	0 to 150	
	HA-14S	1.0 - 2.6	27	1	8.5	2	165 to 200	- 20 to 20	0 to 20	0 to 20	0 to 150	
S	HA-89	2.0 - 4.0	25	1	8	2	375 to 450	- 75 to 0	0 to 75	0 to 100	0 to 150	
	HA-62	2.0 - 4.0	25	5	10	2	385 to 500	- 75 to 0	0 to 75	0 to 150	0 to 150	
	HA-62S	2.3 - 4.45	25	1	10	2	385 to 500	- 75 to 0	0 to 50	0 to 100	0 to 150	
	HA-11	2.0 - 4.0	25	3	15	2	375 to 475	- 50 to 0	0 to 50	0 to 80	0 to 150	
	HA-11D	2.0 - 4.0	25	5	15	2	400 to 500	- 23 to 0	0 to 43	0 to 190	0 to 405	
C	HA-47	4.0 - 8.0	25	2	10	2	500 to 700	-150 to 0	0 to 100	0 to 150	0 to 500	
	HA-47F	5.0 - 6.0	30	1	7	2	500 to 700	-150 to 0	0 to 100	0 to 150	0 to 500	
	HA-47S	4.3 - 7.3	27	1	9	2	500 to 700	-150 to 0	0 to 100	0 to 150	0 to 500	
X	HA-23	8.2 -12.4	25	3	10	2	1050 to 1250	- 50 to 0	0 to 100	0 to 150	0 to 500	
	HA-23S	7.0 -10.75	27	1	9	2	1050 to 1250	- 50 to 0	0 to 100	0 to 150	0 to 500	
	HA-23AA	8.5 - 9.5	25	1	8	2	1050 to 1250	- 50 to 0	0 to 100	0 to 150	0 to 500	

TYPICAL DATA HA-108

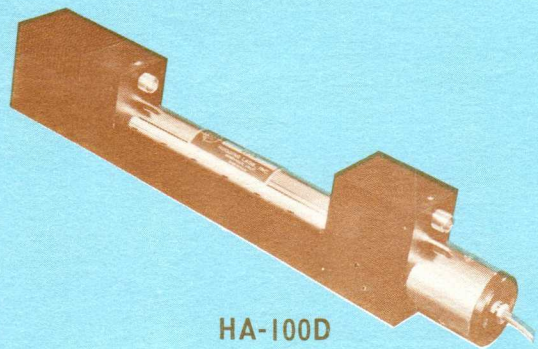


HA-109

TYPICAL DATA HA-60



# MEDIUM POWER TWTS



HA-100D

## LOW NOISE

### PPM FOCUSED

BAND	TYPE	FREQUENCY (Gc)	MIN. SS GAIN (db)	MIN. SAT. Pout WATTS	MAX. NOISE FIG. (db)	MAX. I <sub>k</sub> (MA)	ELECTRODE VOLTAGES (Vdc)			REMARKS
							HELIX	GRID	ANODE	
UHF	HA-79	0.25-0.5	30	2	20	60	300-600	-100 to 0	0 to 300	Huggins 342D Huggins 342E Huggins 345D
	HA-79A	0.2-0.4	25	3	20	70	300-600	-100 to 0	0 to 300	
	HA-50	0.5-1.0	30	1	20	65	400 to 500	-200 to 0	0 to 500	
	HA-50D	0.5-1.0	30	1	18	60	400 to 600	-200 to 0	0 to 350	
	HA-50E	0.4-1.0	30	1	20	60	400 to 600	-120 to 0	-350 to 350	
	HA-50K	0.5-1.0	30	2	20	60	400 to 600	-200 to 0	0 to 350	
L	HA-53	1.0-2.0	30	2	30	75	800 to 1100	0 to 100	300 to 600	Huggins 324D Huggins 324F Noise Generator
	HA-53D	1.715-1.735	40	5	30	50	800 to 1100	0 to 100	300 to 600	
	HA-53G	1.0-2.0	30	2	30	50	700 to 1000	0 to 100	300 to 600	
	HA-53H	1.0-2.0	30	2	25	50	800 to 1000	-50 to 0	200 to 600	
	HA-53T	1.0-2.0	30	2	30	50	800 to 1100	-50 to 0	200 to 600	
	HA-55	1.0-2.0	33	2	20	50	800 to 1100	-50 to 0	200 to 600	
	HA-78	1.0-2.0	30	5	30	50	750 to 1050	-50 to 0	300 to 700	
S	HA-30	2.0-4.0	30	1	25	25	800 to 1100	0	0 to 450	Huggins 304D 305D Conduction cooled Huggins 304M EIA 8280 FSN-5960-989-8575 Beam Pulsed EIA 8258 FSN-5960-989-2930
	HA-30A	2.0-4.0	30	1	25	25	800 to 1100	0	0 to 450	
	HA-30AA	2.0-4.0	35	1	20	25	800 to 1100	0	0 to 450	
	HA-30AL	2.565-2.835	35	1	-	25	800 to 1100	0	0 to 450	
	HA-30AM	2.4-4.3	30	1	-	25	800 to 1100	-50 to 0	150 to 450	
	HA-30E	2.1-2.5	45	1	25	25	800 to 1100	-	160 to 450	
	HA-59	2.0-4.0	35	2	20	25	800 to 1100	0	200 to 600	
	PA-6	2.0-4.0	30	1	-	50	800 to 1000	0 to 150	0 to 60	
PA-6D	2.3-2.7	30	2	-	40	800 to 1000	50 to 125	50 to 500		
C	HA-35	4.0-8.0	30	.5	30	20	1300 to 1600	0	0 to 700	Huggins 310B Huggins 320E EIA 8551 MIL-E-1/1539 Huggins 614A Huggins 310E Conduction cooled Huggins 309D, 310D Serrodyne Huggins 326D
	HA-35A	4.0-8.0	30	.5	-	20	1300 to 1500	0	0 to 700	
	HA-35AF	3.8-6.5	30	1	30	20	1300 to 1600	0	0 to 700	
	HA-35AM	5.6-6.0	40	1	-	20	1300 to 1500	0	200 to 700	
	HA-35N	4.4-5.0	35	1	-	20	1400 to 1600	-	300 to 700	
	HA-35Y	4.9-5.1	35	.5	-	20	1300 to 1500	0	0 to 700	
	HA-56	4.0-8.0	33	1	25	25	1800 to 2300	-50 to 0	1000 to 1800	
	HA-56C	5.4-6.0	40	2	27	25	1600 to 2100	-50 to 0	150 to 650	
	HA-56G	4.4-5.0	40	4	20	25	1600 to 2200	-50 to 0	150 to 650	
	HA-56H	4.0-8.0	33	1	25	25	1800 to 2300	-50 to 0	1000 to 1800	
	HA-56J	5.048-5.064	30	5	25	30	2300 to 2800	-50 to 0	100 to 500	
	HA-56M	4.0-8.0	30	2	30	30	1800 to 2300	-50 to 0	1000 to 1800	
	X	HA-21	8.0-11.0	33	.5	35	20	2000 to 2400	0	
HA-21AG		8.0-11.0	33	.5	35	20	2000 to 2400	-50 to 0	1000 to 1800	
HA-21AK		8.3-9.5	30	1	35	20	2000 to 2400	-30 to 0	1000 to 1800	
HA-71		8.0-12.4	25	.1	30	8	2000 to 2300	0	0 to 800	
HA-71E		8.0-11.0	33	.5	27	20	2000 to 2400	-50 to 0	400 to 800	
HA-71F		9.2-9.4	40	-	30	20	2000 to 2400	-50 to 0	1000 to 1800	
HA-57		7.0-12.4	30	2	35	25	2000 to 2400	-50 to 0	1200 to 2000	
HA-57A		8.3-9.5	30	2	35	20	2000 to 2400	-50 to 0	1200 to 2000	
HA-57C		7.0-12.4	30	1	30	25	2000 to 2400	-50 to 0	1200 to 1800	
HA-57E		8.0-12.4	30	1	-	25	2000 to 2400	-50 to 0	1200 to 1700	
HA-57J		8.0-11.0	33	2	30	25	2000 to 2400	-50 to 0	1000 to 1800	
HA-57-2		5.0-11.0	60	1	30	25	2000 to 2400	-50 to 0	1000 to 1800	
HA-115A		7.0-12.4	30	1	30	30	2000 to 2700	-30 to 0	1250 to 2500	



# MEDIUM POWER TWTS

WIDE DYNAMIC RANGE



HA-113A

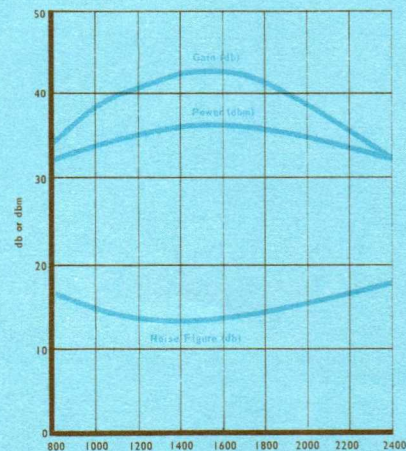


HA-114A

PPM FOCUSED

TEST EQUIPMENT

TYPICAL DATA HA-112  
(Band width 3:1)



1 watt minimum power 500 to 12,400 Mc. Simplicity of performance – lowest noise per watt – for general purpose test equipment. Available with stringent gain and phase characteristics.

TWTs 500 to 12,400 Mc

BAND	TYPE	FREQUENCY Gc	MINIMUM SMALL SIGNAL GAIN db	MIN. SAT. POWER OUT (WATTS)	MAX. NOISE FIGURE	MIN. GAIN <sup>0</sup> 0 dbm Power INPUT	MAX GAIN VARIATION	FINE GAIN MAX.
UHF	HA-111A	0.5-1.0	30	1	18	30	10	5 db/100mc
L	HA-112A	1.0-2.0	33	2	18	30	10	5 db/100mc
S	HA-113A	2.0-4.0	35	1	18	30	10	5 db/200mc
C	HA-114A	4.0-8.0	33	1	25	30	12	5 db/400mc
X	HA-115A	7.0-12.4	30	1	30	30	10	5 db/300mc

## 10 WATT TWTs

BAND	TYPE	FREQUENCY Gc	MINIMUM SMALL SIG. GAIN db	MIN. SAT. POWER OUT (WATTS)	MAX. NOISE FIG. (db)	MAX. Ik ma	HELIX	GRID	ANODE	REMARKS
UHF	HA-124A	0.5-1.0	30	10	25	150	1000-1500	-100 to 0	400-1000	
L	HA-101	1.0-2.0	30	10	20	100	1000-1500	-100 to 0	400-1000	Huggins 401D Huggins 401E Huggins 401F Huggins 401G
	HA-101A	1.0-2.0	30	10	25	100	1000-1500	-100 to 0	500-1000	
	HA-101B	1.2-1.4	40	12	25	100	1000-1500	-100 to 0	500-1000	
	HA-101C	1.4-1.8	40	10	25	100	1000-1500	-100 to 0	500-1000	
	HA-101D	2.0-2.2	30	10	25	100	1000-1500	-100 to 0	400-1000	
S	HA-102	2.0-4.0	35	10	30	80	1000-1500	-100 to 0	400-1000	Huggins 403D
	HA-102A	2.9-3.1	40	5	30	50	1150-1250	-	900-1100	
	HA-102C	2.0-4.0	35	10	30	80	1000-1500	-100 to 0	400-1000	
	HA-102D	2.0-4.0	35	5	25	50	1000-1500	-100 to 0	500-1200	
	PA-10	2.0-4.0	30	5	60	900-1100	-	450-700		
PA-10A	2.7-2.9	33	8	60	1000-1200	-	600			
C	HA-103	4.0-8.0	30	5	30	40	2400-3000	-100 to 0	1000-2000	Huggins 406D
	HA-103B	4.0-8.0	30	5	30	40	2400-3000	-100 to 0	1000-2000	

## CONDUCTION COOLED TUBES

BAND	TUBE TYPE	FREQUENCY Gc	MIN. SS GAIN (db)	MIN. SAT. POWER (WATTS)	MAX. NOISE FIG. (db)	MAX. Ik (ma)	VOLTAGES		GRID	ANODE
							HELIX	COLLECTOR		
L	HA-53P	.950-1.25	20	2	20	40	800-1100	500	-100 to 0	300-700
	HA-55C	1.0-2.0	30	2	18	45	800-1000	500	-50 to 0	300-700
S	HA-30AN	2.0-4.0	35	1	18	25	800-1000	600	0	0-450
	HA-100D	2.0-4.0	30	1	13	25	800-1000	600	-600	200-600
	HA-102A	2.9-3.1	40	5	25	50	1050-1200	1200	50 to 350	0-250
C	HA-56N	4.0-8.0	35	1	25	25	1800-2300	1000	-50 to 0	1200-1800
	HA-56G	4.4-5.0	45	4	20	25	1800-2300	1000	-50 to 0	1200-1800
X	HA-57L	8.0-11.0	30	1	30	15	2000-2500	1500	-50 to 0	1000-1800



# MEDIUM POWER TWTS

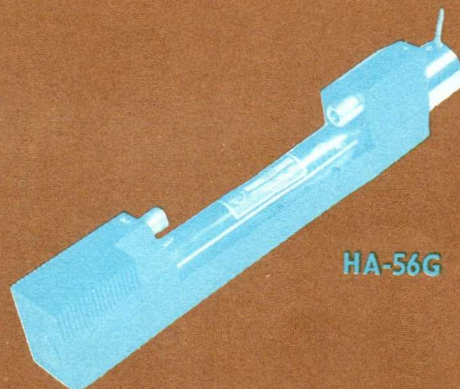


## SOLENOID FOCUSED

BAND	TYPE	FREQUENCY (Gc)	MIN. SS GAIN (db)	MIN. SAT. P <sub>out</sub> WATTS	MAX. NOISE FIG. (db)	MAX. I <sub>k</sub> MA	ELECTRODE VOLTAGES (Vdc)			REMARKS
							HELIX	GRID	ANODE	
UHF	HA-8	0.5-1.0	30	1	25	60	400 to 500	0 to 200	0 to 500	Alfred 508
	HA-8D	0.5-1.0	30	1	30	50	400 to 525	0 to 175	0 to 550	
	HA-8J	0.3-0.5	30	1	30	65	400 to 600	0 to 200	0 to 500	
	HA-8N	0.5-1.0	30	1	25	50	400 to 500	0 to 175	100 to 400	
L	HA-18	1.0-2.0	33	2	30	75	650 to 850	0 to 100	200 to 550	Huggins 325D
	HA-18E	1.0-2.0	30	2	30	75	650 to 850	0 to 100	100 to 500	
	HA-18L	1.0-2.0	30	1	30	50	650 to 850	0	200 to 600	
	HA-39	1.6-2.6	30	1	25	25	850 to 1250	0	0 to 450	
	HA-39B	1.6-2.6	30	1	30	25	800 to 1250	0	0 to 550	
S	HA-2	2.0-4.0	30	1	25	25	800 to 1100	0	0 to 450	Alfred 502
	HA-2D	2.0-4.0	30	1	25	20	800 to 1100	0	225 to 435	
	HA-2E	2.0-4.0	30	1	25	20	800 to 1100	—	225 to 435	Alfred 502A
	HA-2F	2.0-4.0	30	1	25	25	800 to 1100	0	0 to 450	
	HA-2HP	2.0-4.0	30	.5	30	25	800 to 1100	—	0 to 450	Huggins 303E
	HA-2HPA	2.0-4.0	30	.5	30	25	800 to 1100	—	200 to 450	
	HA-2P	2.0-4.0	30	1	25	25	800 to 1100	0	100 to 500	Huggins 303D
	PA-4	2.0-4.0	33	1	—	50	800 to 950	0 to 150	200 to 700	
PA-4A	2.0-4.0	30	1	—	45	800 to 1000	0 to 150	0 to 435	Alfred 512	
C	HA-6	4.0-8.0	30	.5	30	20	1200 to 1500	0	0 to 700	Alfred 506
	HA-6AB	7.0-8.0	30	.5	—	20	1200 to 1500	0	0 to 700	
	HA-6AC	4.0-8.0	30	.5	30	20	1200 to 1600	—	352 to 650	Huggins 308D & 308F
	HA-6AG	4.0 to 8.0	30	1	30	20	1200 to 1500	0	200 to 700	
	HA-6B	5.2-6.1	32	1	30	20	1200 to 1600	—	352 to 650	Alfred 506
	HA-6E	4.0-8.0	30	.5	30	20	1200 to 1600	—	352 to 650	Alfred 506 S/n 11 to 89
	HA-6Y	4.0-8.0	30	.5	30	20	1200 to 1600	—	352 to 650	
	PA-7	4.0-8.0	30	1	—	60	1200 to 1600	0 to 150	0 to 600	Beampulsed 0.1 DF
PA-7D	4.0-8.0	30	1	—	60	1200 to 1600	0 to 150	0 to 600	Beampulsed 0.1 DF	
X	HA-9	8.0-11.0	33	.5	35	20	2000 to 2400	0	1000 to 1800	Alfred 509
	HA-9AE	8.0-11.0	30	.5	35	20	1900 to 2400	0	0 to 2350	
	HA-9E	8.0-11.0	30	.5	35	20	2000 to 2400	0	0 to 1800	Alfred 509
	HA-9G	8.0-11.0	30	.5	35	20	1900 to 2400	0	0 to 2350	
	HA-9R	8.0-11.0	30	.5	35	20	2000 to 2400	0	1000 to 2400	Huggins 314D
	HA-10	8.0-12.4	25	.1	30	8	2000 to 2300	0	0 to 800	Alfred 510
	HA-10E	8.0-12.4	24	.1	30	8	1900 to 2300	—	350 to 580	
	HA-10J	8.0-12.4	25	.1	30	8	1900 to 2300	—	0 to 580	Alfred 510
	HA-10K	8.4-9.6	25	.5	30	8	1900 to 2300	—	350 to 580	Alfred 510
	HA-10M	7.0-12.4	20	.1	30	8	1900 to 2400	0	0 to 700	Alfred 510
HA-10N	8.0-12.4	25	.1	—	8	1900 to 2300	0	0 to 580		



HA 102A



HA-56G





# GENERAL PURPOSE TWTS

## HUGGINS LABORATORIES INC.

### 10 M. W. TYPICAL POWER OUTPUT

#### PPM FOCUSED

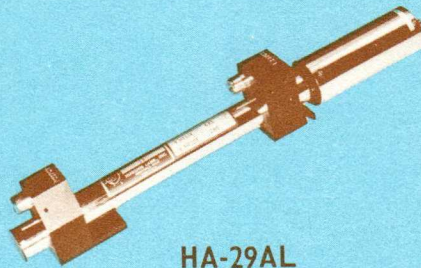
BAND	TYPE	FREQUENCY (Gc)	MIN. SS GAIN (db)	MIN. SAT. P <sub>out</sub> mw	MAX. NOISE FIG. (db)	MAX. I <sub>k</sub> (MA)	ELECTRODE VOLTAGES (Vdc)			REMARKS
							HELIX	GRID	ANODE	
UHF	HA-51	0.25-0.5	20	50	25	10	150 to 250	-50 to 0	0 to 300	Huggins 201D & 200D  Slope gain Huggins 203D & 204D
	HA-51B	0.25-0.5	25	50	20	10	150 to 250	-50 to 0	0 to 300	
	HA-51G	0.25-0.5	20	50	20	10	150 to 250	-50 to 0	100 to 300	
	HA-36	0.5-1.0	25	20	25	8	180 to 300	0	0 to 175	
	HA-36A	0.370-0.670	20	10	25	12	150 to 300	-20 to 0	100 to 250	
	HA-36K	0.5-1.0	30	10	17	10	90 to 250	-75 to 0	75 to 300	
	HA-36R	0.5-1.0	—	10	17	10	90 to 250	-75 to 0	75 to 300	
	HA-36T	0.5-1.0	25	10	25	8	180 to 300	-75 to 0	50 to 125	
HA-69	0.5-1.0	30	5	17	10	150 to 250	-75 to 0	75 to 300		
L	HA-31	1.0-2.0	30	10	25	6	180 to 220	0	0 to 180	Huggins 205D & 206D Huggins 205E Noise Generator Huggins 205F Noise Generator
	HA-31C	1.0-2.0	30	10	25	6	180 to 220	0	0 to 180	
	HA-31T	1.0-2.0	30	3	25	6	180 to 220	0	0 to 175	
	HA-31U	1.0-2.0	30	10	25	6	180 to 220	0	0 to 175	
S	HA-29	2.0-4.0	35	20	25	4	400 to 525	0	0 to 350	FSN-5960-850-3943 Huggins 210D, 210H, 211D, 211E  EIA8279 FSN-5960-984-9925  Noise Generator Noise Generator
	4012	2.0-4.0	35	10	35	5	550 to 700	0	135 to 235	
	HA-29AJ	2.0-4.0	35	20	25	4	400 to 525	0	150 to 350	
	HA-29AL	2.5-2.9	35	100	25	6	575 to 675	0	150 to 350	
	HA-29C	2.3-2.7	25	13	20	4	400 to 525	0	110 to 350	
	HA-29GA-9	2.2-4.3	25	5	25	4	400 to 525	0	0 to 350	
	HA-29S	3.0-5.0	30	10	30	4	550 to 700	0	0 to 350	
	HA-29U	2.0-4.0	30	3	—	5	400 to 525	0	0 to 350	
	HA-29U	2.0-4.0	33	10	—	5	400 to 525	0	0 to 350	
C	HA-28	4.0-8.0	30	10	30	2.5	650 to 800	0	0 to 450	Huggins 212D & 213D Huggins 212E
	HA-28K	5.0-6.0	46	40	25	2.5	650 to 800	0	0 to 450	
	HA-28S	4.0-8.0	30	10	30	2.5	650 to 800	0	100 to 450	
	HA-28U	4.0-8.0	30	10	27	2.5	650 to 800	0	100 to 450	
X	HA-20	8.0-12.4	30	10	30	2.5	1100 to 1300	0	0 to 450	Huggins 217D & 218D Huggins 217E & 217F Huggins 217G (Serrodyne) Huggins 217H (Serrodyne) Huggins 217L Serrodyne FSN-5960-883-7960
	HA-20BT	8.0-12.4	30	10	30	2.5	1100 to 1300	0	150 to 450	
	HA-20BU	8.0-12.4	30	10	25	2.5	1100 to 1300	0	150 to 450	
	HA-20CA	7.8-8.5	20	10	30	2.5	1100 to 1300	-25 to 0	150 to 450	
	HA-20CD	9.2-9.45	20	3	30	2.5	1100 to 1300	0	75 to 450	
	HA-20CF	8.0-12.4	30	10	25	2.5	1100 to 1300	0	150 to 450	
	HA-20G	10.25-10.50	—	10	25	3.0	900 to 1400	-25 to 0	0 to 500	
	HA-20ST	8.0-11.0	30	10	—	2.0	1100 to 1300	—	0 to 450	
	HA-20T	7.5-8.5	25	10	25	2.0	1100 to 1300	0	0 to 450	

#### SOLENOID FOCUSED

BAND	TYPE	FREQUENCY (Gc)	MIN. SS GAIN (db)	MIN. SAT. P <sub>out</sub> mw	MAX. NOISE FIG. (db)	MAX. I <sub>k</sub> (MA)	ELECTRODE VOLTAGES (Vdc)			REMARKS
							HELIX	GRID	ANODE	
UHF	HA-7	0.5-1.0	30	10	20	3.5	90 to 120	0 to 5	0 to 100	Alfred 507
	HA-7E	0.5-1.0	30	10	25	3.5	90 to 160	0 to 5	50 to 100	
L	HA-5	1.0-2.0	30	10	25	3.5	180 to 220	0	0 to 150	Alfred 505
	HA-5D	1.0-2.0	30	10	24	3.5	170 to 230	0	45 to 175	
	HA-5MP	1.0-2.0	30	10	25	3.5	180 to 220	0	0 to 150	
S	HA-1	2.0-4.0	30	10	25	3.5	400 to 525	0	0 to 350	Alfred 501 EIA 8225 FSN5960-984-9926
	HA-1D	2.0-4.0	30	10	25	3.5	400 to 500	0	170 to 390	
	HA-1F	2.0-4.0	30	10	25	3.5	400 to 500	—	0 to 350	
	HA-1HP	2.0-4.0	30	10	25	4	400 to 525	0	150 to 350	
C	HA-26	4.0-8.0	30	10	25	2.5	650 to 800	0	0 to 450	Alfred 503 S/n 26 & up  Noise Generator Serrodyne
	HA-26D	4.0-8.0	30	10	24	3.2	600 to 800	0	150 to 435	
	HA-26HP	4.0-8.0	30	20	25	2.75	650 to 800	0	0 to 450	
	HA-26L	5.85-6.0	50	1	25	3	650 to 800	0	0 to 450	
	HA-26M	4.5-5.5	20	10	25	2.5	600 to 800	0	150 to 435	
X	HA-4	7.0-12.4	30	10	25	2.5	1100 to 1300	0	0 to 450	Huggins 216A Huggins 216D Alfred 504 S/n 76 & up FSN-5960-813-4315
	HA-4AD	7.0-12.4	30	20	30	3	1100 to 1300	0	150 to 452	
	HA-4AG	7.0-12.4	30	20	30	3.0	1100 to 1300	0	150 to 450	
	HA-4D	8.0-12.4	30	10	25	2.5	1100 to 1300	0	180 to 435	
	HA-4HPA	7.0-12.4	30	20	25	2	1100 to 1250	0	0 to 450	
	HA-4P	8.2-12.4	30	10	—	2.5	1100 to 1250	0	0 to 500	
	HA-24	12.4-16.0	25	5	30	2.5	1100 to 1300	0	0 to 450	



# SPECIAL PURPOSE TWTS



HA-29AL

## SERRODYNE TUBES

TUBE TYPE	FREQ. (Gc)	MAX 55 GAIN (db)	MIN. SAT. POWER OUT (dbm)	MIN. SIDEBAND SUPP. 150 Kc (db)	MAX CATHODE CURRENT (ma)	HELIX VOLTAGE	ANODE VOLTAGE	GRID VOLTAGE	FOCUS
HA-26-1	5.0-6.0	25	10	33	2.5	600-800	0-450	0	SOL
HA-28-2	5.0-6.0	30	10	33	2.5	600-800	0-450	0	PPM
HA-4E	9.0-10.2	15	7	33	2.0	900-1400	0-450	-50 to 0	SOL
HA-4F	7.5-8.5	18	9	33	3.0	1050-1275	0-370	0	SOL
HA-4G	10.0-10.5	18	3	33	2.0	900-1400	0-450	-50 to 0	SOL
HA-4Y	9.0-10.0	30	10	20	3.0	1050-1275	0-450	0	SOL
HA-20BN	7.0-12.4	25	10	30	3.0	1100-1300	0-450	0	PPM
HA-20CA	7.5-8.5	30	10	30	2.5	1100-1300	150-450	-25 to 0	PPM
HA-20CE	10.0-11.0	30	10	33	3.0	1100-1300	150-450	-25 to 0	PPM
HA-20CG	7.0-11.0	60	13	25	3.0	1100-1300	0-450	0	PPM
HA-20CH X-Band		20	10	60	3.0	1100-1300	0-450	0	PPM
HA-20G	10.25-10.5	20	10	33	3.0	900-1400	0-500	-25 to 0	PPM

## NOISE GENERATORS

TUBE TYPE	FREQ. (Gc)	MINIMUM NOISE POWER OUTPUT	CATHODE CURRENT (ma)	HELIX VOLTAGE	ANODE VOLTAGE	GRID VOLTAGE	COMMENTS
HA-31T HA-31U	1.0-2.0	1 milliwatts	10	180-250	0-180	0	Tubes in Cascade
HA-53T	1.0-2.0	1 watt	60	700-1000	300-600	-100 to 0	Cascaded with HA-31T & U
HA-29U HA-29Y	2.0-4.0	10 milliwatts	5	400-525	0-350	0	Tubes in Cascade
HA-29T HA-30S	2.2-3.6	1 watt	4 25	400-525 800-1100	0-350 0-450	0	Tubes in Cascade
HA-26L	5.8-6.0	1 milliwatts	3	650-800	0-450	0	Input Terminated
HA-71F HA-71F	9.2-9.4	200 milliwatts	10	2000-2400	1000-1800	-50 to 0	Tubes in Cascade

## FREQUENCY MULTIPLIERS

TUBE TYPE	FREQ. INPUT (Gc)	FREQ. OUTPUT (Gc)	POWER INPUT (dbm)	POWER OUTPUT (dbm)	CATHODE CURRENT (ma)	HELIX VOLTAGE	ANODE VOLTAGE	GRID VOLTAGE	FOCUS
HA-34	0.4 - 1.0	2.0 - 4.0	13	3	6	400-550	0-200	170-250	SOL
HA-16	1.76 - 10%	8.8 - 10%	13	3	25	850-1200	0-550	---	SOL
HA-16B	1.7 - 1.92	8.5 - 9.6	10	0	25	800-1100	0-550	---	SOL
HA-30L	2.275	4.55	5	24	25	800-1100	0-450	---	PPM
HA-6AH	4.75	9.50	5	30 - 4.75 23 - 9.5	20	1200-1500	0-705	0	SOL
HA-56-1	4.75	9.50	5	30 - 4.75 23 - 9.5	30	1800-2300	1300-2000	-50 to 0	PPM

## PPM LIMITERS & LEVELED SYSTEMS

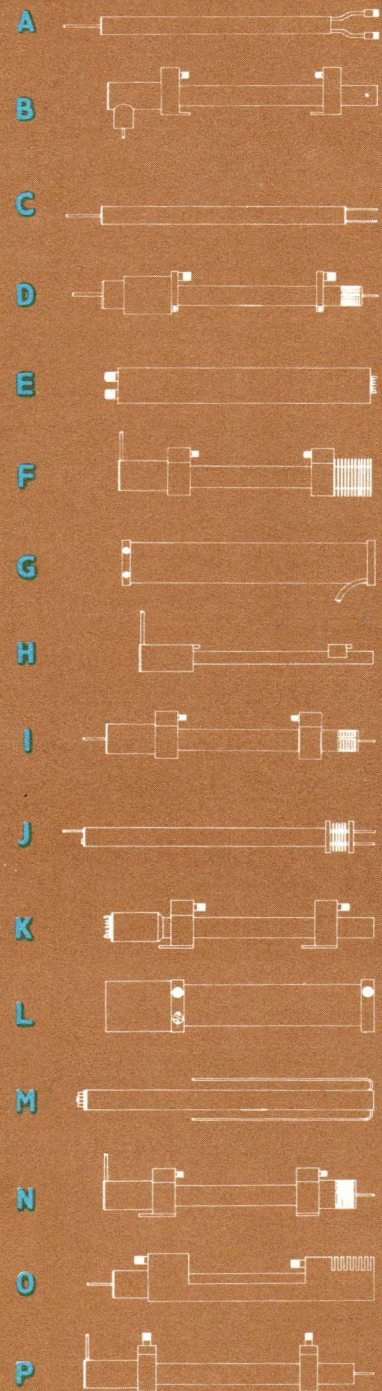
TUBE TYPE	FREQ. VAR. Gc	POWER INPUT VAR. (dbm)	MIN. POWER OUTPUT (dbm)	OUTPUT VAR. (db)	Ik (ma)	HELIX VOLTAGE	ANODE VOLTAGE
HA-29AL	2.5-2.9	-15 to -7	20	-1	6	575-675	150-300
HA-102A	2.9-3.2	-3 to -7	36	-1	50	1050-1200	900-1000
HA-105D*	5.2-5.8	-9 to -13	37	-0.3	30	2300-2800	4 anode
---	7.0-11.0	-60 to 0	10	-1.5	---	---	---

\*Leveled System

## PPM MATCHED GAIN TUBES

TUBE TYPE	FREQ. (Gc)	MIN 55G (db)	NOISE FIGURE (db)	POWER OUTPUT (dbm)	GAIN MATCHING (db)	CATHODE CURRENT (ma)	HELIX VOLTAGE
HA-67-1	0.5-1.0	25	11	10	-2	4.5	200-300
HA-85-1	1-2	25	11	7	-2	3.0	150-250
HA-54-1	2-4	30	11	10	-1	2.0	400-550
HA-84-1	4-8	25	14	10	-2	2.0	600-800
HA-60-1	7-11	30	14	10	-1	1.5	1050-1300

## TYPICAL TUBE OUTLINE



DESIGNED FOR YOUR REQUIREMENTS

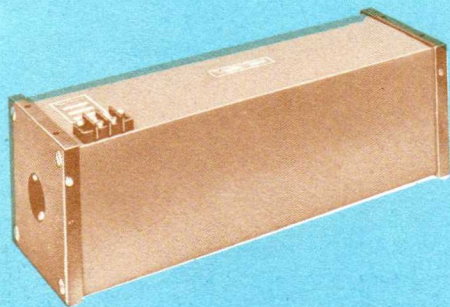
## TUBE WARRANTY

All Huggins' TWTs are tested and inspected prior to shipment. Huggins' customers enjoy the most liberal warranty in the industry.

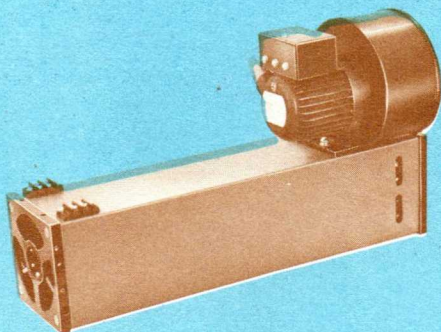
1 to 10 mw Amplifiers: 500 hours full guarantee, 2000 hours prorated. 100 mw and above: 250 hours full guarantee, 1000 hours prorated. Low noise Amplifiers: 500 hours full guarantee, 1500 hours prorated. All Tubes: 12-month shelf life.



## AIR & CONVECTION COOLED



AS-21



BS-27C

### TWT, BWO, LASER AND PLASMA PHYSICS APPLICATIONS

Huggins Laboratories solenoids are engineered to meet the exacting magnetic field requirements encountered in focusing traveling wave tubes and backward wave oscillators. Such solenoids are also particularly well suited for other specific applications requiring exceptionally uniform magnetic fields over considerable lengths. Constriction of laser plasmas and other media involving electrical charges are examples of the possible use of these devices.

The primary objectives of the design of these units are uniformity of field strength and minimum transverse field components. Other features included double magnetic shielding, thermal overload switches and integral focusing adjustment. These solenoids are available in all standard configurations compatible with current traveling wave tubes and backward wave oscillators. Depending upon power and magnetic field requirements, they can be furnished in convection cooled, forced air cooled, and water cooled configurations. Integrally-mounted blower assemblies can be supplied where required.

We especially invite inquiries regarding specific requirements for sources of magnetic fields involving rigidly-controlled characteristics.

### TYPICAL SOLENOID CATALOG DATA

MOD. NO.	TYPE COOLING	FIELD (GAUSS)	VOLTAGE	CURRENT (AMPS)	WINDING LENGTH (INCHES)	WEIGHT (POUNDS)	TYPICAL APPLICATION
AS - 3	CONVECTION	300	90 - 100	0.64	14	23	HUGGINS TWT, HA-1
AS - 22	"	400	90 - 100	0.77	13	21	HUGGINS TWT, HA-5
AS - 21	"	500	90 - 100	1.10	14	45	HUGGINS TWT, HA-34
AS - 28	"	SHAPED	80 - 110	3.00	12-1/8	35	RCA TWT, 4036
AS - 68	"	610	103 - 112	1.55	12-1/2	39	RCA TWT, 6861
BS - 3C	FORCED AIR	1000	90 - 100	4.10	8-1/2	26	HUGGINS BWO, HO-2, HO-4
BS - 9C	"	600	90 - 100	2.60	12-1/2	25	HUGGINS TWT, HA-2
BS - 27C	"	1000	90 - 100	6.50	14	36	HUGGINS TWT, HA-14, HA-25, HA-47
BS - 39C	"	1000	90 - 105	7.00	13-3/8	48	WJ TWT, 211, 212
BA - 45	"	1000	90 - 100	3.70	6-5/8	30	ITT TWT, F-6868
LS - 102	WATER	1500	80 - 100	7.50	14.0	125	LASER PLASMA CONSTRICTION
LS - 103	"	1000	65 - 85	7.50	18.5	90	LASER PLASMA CONSTRICTION



# TWT AMPLIFIERS

## LATEST COMPONENT DESIGN

The Huggins product line of traveling wave tube amplifiers utilizes the most modern concepts in design and assembly technology.

Features include:

- ... PPM-focused TWTs
- ... Complete 250 to 12,400 Mc band coverage
- ... Power output to 10 watts (20 to 30 watts available in certain models)
- ... Helix modulation jack (for phase modulation, including serrodyne)
- ... Grid modulation jack (for amplitude modulation)
- ... Running time meter
- ... Modular power supply construction

For applications as

- ... Pre-amplifiers (wide dynamic range)
- ... Line amplifiers
- ... Wide-band IF amplifiers
- ... Serrodyne amplifiers (sideband suppression to 60 db)

Instruments providing identical RF performance are also available in light weight, high efficiency solid state power supply configurations. For example, the HL-701 provides identical RF performance to the Model 146D. Operation from 28 V.d.c. or 115 V.a.c. 48 to 420 cps power buses can be supplied. Complete quotations available upon submission of detailed requirements.

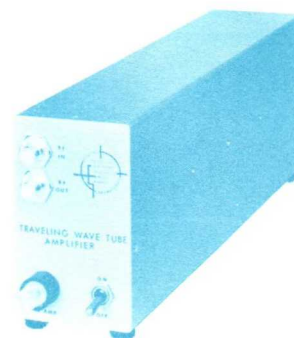
## WARRANTY

All Huggins' instruments and components are thoroughly tested and inspected prior to shipment. Instruments and solenoids are warranted for one year to be free from defects in material and workmanship. Microwave tubes are covered by the tube manufacturer's warranty.

HUGGINS LABORATORIES INC.  
SUNNYVALE, CALIFORNIA



MODEL 218D PORTABLE



MODEL HL 701



MODEL 304D RACK MOUNT

Modulation: BNC front panel connector for grid modulation, AM passband DC to 100 Kc; BNC front panel connector for helix modulation.

Input, Output Connectors: Type N, female.

Input, Output Impedance: 50 ohms.

Spurious Modulation: 45 db minimum below signal.

Controls: Power On-Off; High Voltage On-Off; Helix and Grid Voltage Adjusts.

Metering: Helix Voltage; Helix Current; Collector Current.

Input Power: 115 or 220  $\pm$  10% 50 to 60 cps (400 cps available on special order basis).

Accessories Furnished: Power Cord, 5 feet long, NEMA plug. Hardware for converting cabinet to EIA-conforming rack mount.



# AMPLIFIERS

## GENERAL PURPOSE

## TRAVELING WAVE TUBE AMPLIFIERS

### LOW LEVEL AMPLIFIERS

MODEL NO.		FREQUENCY Gc	NOISE FIGURE db	SAT. PWR. OUTPUT mw	GAIN - db		MIN. GRID ON/OFF RATIO	MAX. V <sub>2</sub> $\pi$ (HELIX VOLTAGE)
RACK MOUNTABLE ①	PORTABLE ②				@ RATED PWR. OUT.	SSG		
200D	201D	0.25-0.5	25	50	15	20	20 db / -100V	50
203D	203D	0.5-1.0	20	20	20	25	30 db / -50V	30
205D	205D	1.0-2.0	25	10	25	30	30 db / -50V	25
210D	210D	2.0-4.0	25	20	30	35	35 db / -50V	30
212D	213D	4.0-8.0	30	10	25	30	45 db / -50V	40
217D	218D	8.0-12.4	30	20	25	30	50 db / -50V	40

### 1 WATT AMPLIFIERS

MODEL NO.		FREQUENCY Gc	NOISE FIGURE db	SAT. PWR. OUTPUT Watts	GAIN - db		MIN. GRID ON/OFF RATIO	MAX. V <sub>2</sub> $\pi$ (HELIX VOLTAGE)
RACK MOUNTABLE ①	PORTABLE ②				@ RATED PWR. OUT.	SSG		
342D ③	---	0.5-1.0	18	1	30	30	30 db / -30V	100
324D	---	1.0-2.0	18	1	30	33	30 db / -30V	150
304D	305D	2.0-4.0	18	1	30	35	30 db / -30V	100
309D	310D	4.0-8.0	25	1	30	33	30 db / -30V	120
328D	313D	7.0-12.4	30	1	30	30	30 db / -30V	120
315D	323D	8.0-11.0	30	1	30	33	30 db / -30V	100

### MEDIUM POWER AMPLIFIERS: 2 watt min. output (for 1 watt leveling systems)

MODEL NO.		FREQUENCY Gc	NOISE FIGURE db	SAT. PWR. OUTPUT Watts	GAIN - db		MIN. GRID ON/OFF RATIO	MAX. V <sub>2</sub> $\pi$ (HELIX VOLTAGE)
RACK MOUNTABLE ①	PORTABLE ②				@ RATED PWR. OUT.	SSG		
345D ③	---	0.5-1.0	20	2	25	30	/ -30V	100
324D	---	1.0-2.0	20	2	25	30	30 db / -30V	150
346D	351D	2.0-4.0	20	2	25	30	30 db / -30V	100
326D	352D	4.0-8.0	25	2	25	30	30 db / -30V	120
347D	353D	8.0-11.0	30	2	25	30	30 db / -30V	120

### 10 WATT AMPLIFIERS

MODEL NO. ③	FREQUENCY Gc	NOISE FIGURE db	SAT. PWR. OUTPUT Watts	GAIN - db	
				@ RATED PWR. OUT.	SSG
401D	1.0-2.0	20	10	30	33
403D	2.0-4.0	25	10	30	35
406D	4.0-8.0	30	5	30	33
405D	4.0-8.0	—	10	30	30
409D	7.0-12.4	—	10	35	25

### LOW NOISE

#### LOW NOISE AMPLIFIERS (10 mw min. power output)

MODEL NO.		FREQUENCY Gc	NOISE FIGURE db	SAT. PWR. OUTPUT mw	GAIN - db	
RACK MOUNT. ①	PORTABLE ②				@ RATED PWR. OUT.	SSG
136D	---	0.5-1.0	11	10	25	30
110D	111D	1.0-2.0	11	10	25	30
140D	116D	2.0-4.0	11	10	25	30
150D	122D	4.0-8.0	14	10	25	30
123D	127D	7.0-11.0	14	10	25	30

#### LOW NOISE MEDIUM POWER AMPLIFIERS (lowest noise/watt available)

MODEL NO. ①	FREQUENCY Gc	NOISE FIGURE db	SAT. PWR. OUTPUT Watts	GAIN - db	
				@ RATED PWR. OUT.	SSG
142D ③	0.5-1.0	13	1	25	30
144D	1.0-2.0	15	2	28	33
152D	1.0-2.0	15	10	28	33
146D	2.0-4.0	13	1	30	35
153D	2.0-4.0	20	5	30	35
145D	4.0-8.0	20	1	28	33
154D	4.0-8.0	20	2.5	28	33
148D	7.0-11.0	20	1	25	30

Note 1 5 3/16" H x 16 3/8" W x 20 3/4" D. Weight, 37 lbs.  
 Note 2 6 7/32" H x 8 1/2" W x 20 3/4" D. Weight, 27 lbs.  
 Note 3 6 15/16" H x 16 3/8" W x 20 3/4" D. Weight, 45 lbs.

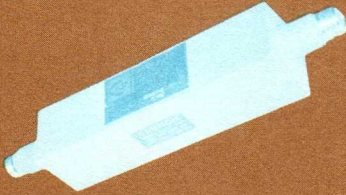


# FERRITE ISOLATORS

HUGGINS

## COAXIAL UNILINE<sup>®</sup> ISOLATORS

Huggins Laboratories, Cascade Research, is the original source of Microwave Ferrite Components. In addition to the items listed in the catalog, a comprehensive line of components is manufactured to custom specifications. Your inquiries on special items are invited. A competent engineering staff is available to design components compatible with your particular system requirements.

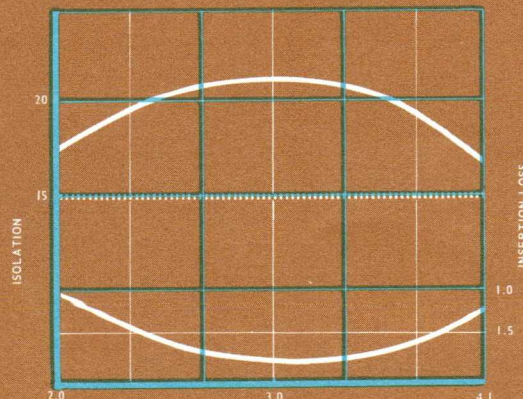


HF-7024

### COAXIAL UNILINE ISOLATORS

BAND	MODEL NO.	FREQUENCY Gc	ISOLATION db MIN.	INSERTION LOSS db MAX.	VSWR. MAX.	RF POWER		LENGTH INCHES (approx.)	WEIGHT LBS. (approx.)	CASCADE MODEL
						PEAK-kw	AVG.-w			
UHF	HF-7000	0.75-1.0	10	1.0	1.30	10	10	10	3	CN-12-74
	HF-7007	0.75-1.0	10	1.0	1.30	10	250	10	3	CN-14-4
L	HF-7001	1.0-2.0	10	1.0	1.25	10	10	10	3	CN-12-62
	HF-7008	1.0-2.0	10	1.0	1.25	10	250	10	3	CN-14-5
	HC-7066	1.0-2.0	17	0.5	1.25	2	10	3 1/2	2	-----
	HC-7067	1.3-1.7	20	0.3	1.25	2	10	3	1 1/2	-----
	HC-7068	1.7-2.0	20	0.3	1.25	2	10	2 1/2	1	-----
S	HF-7024	2.0-4.0	15	1.0	1.25	10	10	6 1/8	1 3/4	-----
	HC-7069	2.0-4.0	15	1.0	1.25	10	250	6 1/8	1 3/4	-----
	HC-7070	2.0-4.0	17	0.4	1.25	2	10	2 1/2	1	-----
	HC-7071	2.0-3.0	20	0.3	1.25	2	10	2 1/2	1	-----
	HC-7072	2.7-3.4	20	0.3	1.25	2	10	2 1/2	1	-----
	HC-7073	3.0-4.0	20	0.3	1.25	2	10	2 1/2	1	-----
C	HF-7005	4.0-8.0	10	1.0	1.25	10	10	6 5/8	1 3/4	CN-12-77
	HF-7012	4.0-8.0	10	1.0	1.25	10	10	6 5/8	1 3/4	CN-14-9
	HC-7074	4.0-6.0	17	0.4	1.25	2	10	1 1/4	3/4	-----
	HC-7075	4.0-5.0	20	0.3	1.25	2	10	1 1/4	3/4	-----
	HC-7076	5.0-6.0	20	0.3	1.25	2	10	1 1/4	3/4	-----
X	HF-7006	7.0-10.7	10	1.0	1.30	10	10	6 5/8	1 3/4	CN-12-68
	HF-7034	7.0-10.7	10	1.0	1.30	10	10	6 5/8	1 3/4	CN-14-10
	HF-7077	8.2-12.4	40	1.0	1.40	10	10	8 1/2	4 1/2	-----

Notes 1. Connectors: Type N provided unless otherwise specified (Asterisk after length indicates TNC Connectors utilized on standard models.)



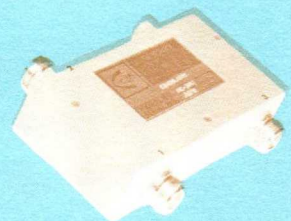
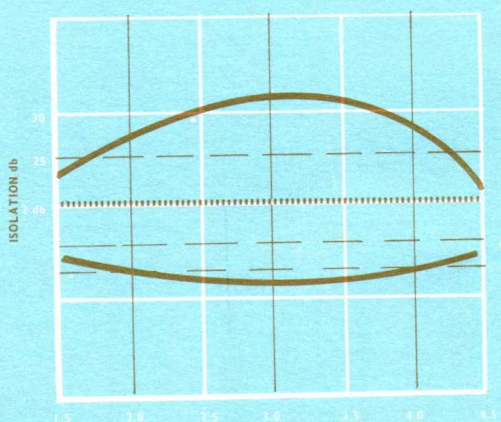
## COAX. CIRCULATOR

Huggins Laboratories Coaxial Isolators and Circulators feature broad bandwidth, high performance, light weight, small size and stable characteristics. Octave bandwidth units are available from 1 to 12 Gc in either resonance isolators(HF7024) or stripline junction circulators (HC7081).

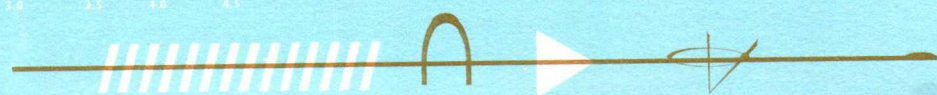


### COAXIAL CIRCULATORS

BAND	MODEL No.	FREQUENCY Gc	ISOLATION db min.	INSERTION LOSS db Max.	VSWR MAX.	SIZE INCHES (approx.)	WEIGHT LBS. (approx.)	CONFIGURATION	CASCADE MODEL	
UHF	HC-7094	0.5-0.6	20	0.4	1.25	4 1/2D x 1 1/2H	1 1/4	3-Y	-----	
	HC-7095	0.6-0.7	20	0.4	1.25	4 1/2D x 1 1/2H	1 1/4	3-Y	-----	
	HC-7096	0.7-0.8	20	0.4	1.25	4 1/2D x 1 1/2H	1 1/4	3-Y	-----	
	HC-7097	0.8-1.0	20	0.4	1.25	4 1/2D x 1 1/2H	1 1/4	3-Y	-----	
L	HC-7078	1.0-2.0	17	0.5	1.25	4 1/2D x 1 1/2H	1 1/4	3-Y	-----	
	HC-7108	1.0-2.0	17/30	0.5/0.8	1.25	7 1/2L x 4W x 1 1/4H	2	4-H	-----	
	HC-7035	0.9-1.3	20	0.4	1.25	4 1/2D x 1 1/2H	1 1/4	3-Y	CN-42-3	
	HC-7015	1.3-1.7	20	0.3	1.25	2 1/2D x 1 3/8H	3/4	3-Y	CN-42-6	
	HC-7080	1.3-1.7	20/35	0.3/0.6	1.25	5L x 2 1/2W x 1 3/8H	1 1/4	4-H	CN-42-29	
	HC-7016	1.7-2.3	20	0.3	1.25	2 1/4L x 2 1/8W x 1 1/16H	3/4	3-T	CN-42-12	
	HC-7081	1.7-2.3	20/35	0.3/0.6	1.25	4 1/2L x 2 1/8W x 1 1/16H	1 1/4	4-H	CN-42-30	
S	HC-7082	2.0-4.0	17	0.4	1.25	3 1/8D x 1 1/4H	1	3-Y	-----	
	HC-7107	2.0-4.0	17/30	0.4/0.7	1.25	5L x 2 3/8W x 1H	2	4-H	-----	
	HC-7083	2.0-4.0	20	0.3	1.25	3 1/8D x 1 1/4H	1	3-Y	-----	
	HC-7017	2.0-2.5	20	0.3	1.25	2 1/4L x 2 1/8W x 1 1/16H	3/4	3-T	CN-42-13	
	HC-7036	2.0-2.5	20/35	0.3/0.6	1.25	4 1/2L x 2 1/8W x 1 1/16H	1 1/4	4-H	CN-42-31	
	HC-7018	2.7-3.4	20	0.3	1.25	2 1/4L x 2 1/8W x 1 1/16H	3/4	3-T	CN-42-14	
	HC-7037	2.7-3.4	20/35	0.3/0.6	1.25	4 1/2L x 2 1/2W x 1 1/16H	1 1/4	4-H	CN-42-32	
	HC-7019	3.3-4.0	20	0.3	1.25	2 1/4L x 2 1/8W x 1 1/16H	3/4	3-T	CN-42-15	
	HC-7038	3.3-4.0	20/35	0.3/0.6	1.25	4-1/2L x 2 1/8W x 1 1/16H	1 1/4	4-H	CN-43-33	
C	HC-7084	4.0-8.0	17	0.4	1.25	2 1/4D x 1H	3/4	3-Y	-----	
	HC-7110	4.0-8.0	17/30	0.4/0.7	1.25	2 5/8L x 1 1/8W x 1H	1	4-H	-----	
	HC-7020	4.0-5.0	20	0.3	1.25	1 5/8L x 1 1/2W x 1H	1/4	3-T	CN-42-16	
	HC-7039	4.0-5.0	20/35	0.3/0.6	1.25	3 1/2W x 1 1/2W x 1 1/16H	1	4-H	CN-42-34	
	HC-7021	5.0-6.0	20	0.3	1.25	1 1/2L x 1 1/2W x 1H	1/2	3-T	CN-42-4	
	HC-7040	5.0-6.0	20/35	0.3/0.6	1.25	3 1/8L x 1 1/2W x 1 1/16H	1	4-H	CN-42-35	
	HC-7022	5.4-6.5	20	0.3	1.25	1 3/8L x 1 3/8W x 1H	3/8	3-T	CN-42-17	
	HC-7041	5.4-6.5	20/35	0.3/0.6	1.25	3L x 1 3/8W x 1 1/16H	3/4	4-H	CN-42-36	
HC-7085	6.0-8.0	20	0.3	1.25	1 1/2D x 1H	*	3/8	3-Y	-----	
X	HC-7086	7.0-9.0	20	0.3	1.25	1 1/2D x 1H	*	3/8	3-Y	-----
	HC-7087	8.5-9.6	20	0.3	1.25	1 1/2D x 1H	*	3/8	3-Y	-----
	HC-7111	8.0-12.0	17	0.4	1.25	1 1/2D x 1H	*	3/8	3-Y	-----



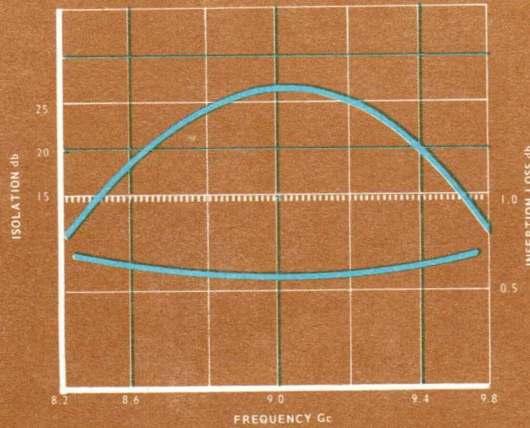
HC-7081



# WAVEGUIDE ISOLATORS

# HUGGINS

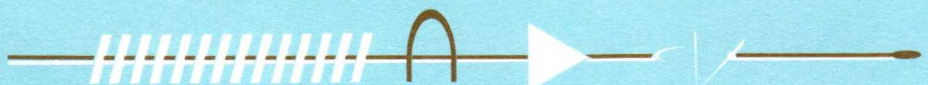
Huggins Laboratories Uniline Load Isolators provide isolation between RF signal source and load with slight loss in transmitted power. By absorbing energy reflected from antennas or other mismatches in transmission lines, the Uniline Isolator improves signal source stability, reduces long line effects and protects critical parts, such as high power klystrons and magnetrons.



HF-8028

BAND RG-(x)/u	MODEL NO.	FREQUENCY Gc	ISOLATION db Min.	INSERTION LOSS db Max.	VSWR. MAX.	RF POWER		LENGTH INCHES (approx.)	WEIGHT LBS. (approx.)	FLANGES UG-(x)/u	CASCADE MODEL
						PEAK-kw	AVG.-w				
104	HF-8022	2.4-2.5	10	0.8	1.20	1000	5000	13 3/4	17	435A	SL-17-2
48	HF-8023	2.7-2.9	10	0.8	1.15	750	205	8	13	53	S-15-1
	HF-8140	2.8-3.2	22	1.0	1.15	50	50	8	13	53	-----
49	HF-8001	3.95-5.85	20	1.0	1.15	10	10	8	5	149A	G-12-4
	HF-8137	3.95-5.85	40	1.0	1.10	10	10	8	4	149A	-----
	HF-8109	4.4-5.0	20	0.5	1.15	10	20	3 1/4	2 1/2	149A	-----
	HF-8025	5.4-5.9	15	0.7	1.15	300	300	5	3 3/4	149A	G-15-3
	HF-8024	5.4-5.9	8	0.5	1.25	3300	5000	11	14	149A	G-19-1
50	HF-8110	5.4-5.9	22	1.7	1.35	100	250	5 1/4	2	344	RS-54-59
	HF-8003	5.85-8.2	30	1.0	1.15	10	10	8	4 1/2	344	J-12-70
	HF-8002	5.85-8.2	40	1.0	1.15	10	10	8	4 1/2	344	J-12-65
	HF-8138	5.85-8.2	40	1.0	1.10	10	10	6	3 1/2	344	-----
	HF-8111	5.925-6.425	20	0.5	1.08	10	20	3	1	344	-----
	HF-8014	5.925-6.425	40	0.8	1.15	10	20	5	1 3/4	344	J-12-50A
	HF-8112	6.575-6.875	20	0.5	1.15	10	20	3	1	344	-----
	HF-8015	6.575-6.875	40	0.8	1.15	10	20	5	1 3/4	344	J-12-51A
	HF-8113	6.825-7.125	20	0.5	1.15	10	20	3	1	344	-----
	HF-8016	6.825-7.125	40	0.8	1.15	10	20	5	1 3/4	344	J-12-52A
	HF-8114	7.125-7.65	20	0.5	1.15	10	20	3	1	344	-----
	HF-8017	7.125-7.65	40	0.8	1.15	10	20	5	1 3/4	344	J-12-53A
51	HF-8005	7.05-10.0	30	1.0	1.15	10	10	7	4 1/2	51	XL-12-10
	HF-8004	7.05-10.0	40	1.0	1.15	10	10	7	4 1/2	51	XL-12-7
	HF-8018	7.125-7.8	20	0.5	1.15	10	20	5	2	51	XL-12-34
	HF-8094	7.125-7.8	60	1.0	1.15	10	20	5	2	51	XL-12-32
	HF-8019	7.5-8.5	20	0.5	1.15	10	20	5	2	51	XL-12-33
	HF-8095	7.5-8.5	60	1.0	1.15	10	20	5	2	51	XL-12-35
	HF-8027	8.5-9.6	15	0.5	1.15	300	300	2 1/2	2	51	XL-15-7
	HF-8028	8.6-9.4	13	0.6	1.15	300	300	1 3/4	2	51	XL-15-10

Notes: Flanges indicated above are standard, however flanges of your choice may be utilized on request at no additional charge.





Huggins Laboratories isolators have exceptional isolation to insertion loss characteristics and can be designed to either commercial or military specifications. Isolators are available covering the entire frequency range from 2.4 through 36.0 Gc.

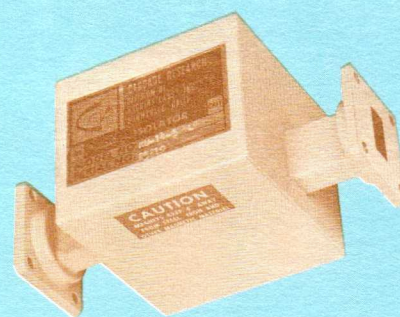
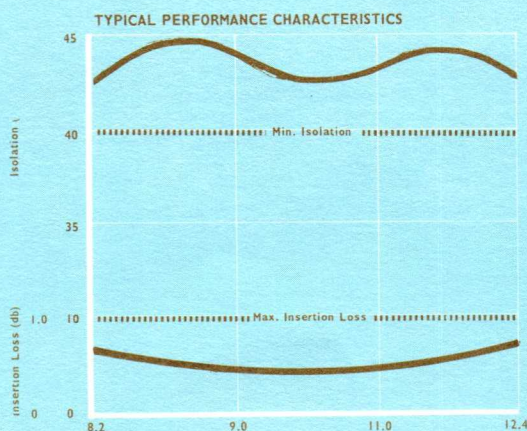


## WAVEGUIDE UNILINE® ISOLATORS

BAND RG - (x)/u	MODEL NO.	FREQUENCY Gc	ISOLATION db Min.	INSERTION LOSS db Max.	VSWR Max	POWER		LENGTH INCHES (approx)	WEIGHT LBS (approx)	FLANGES UG - (x)/u	CASCADE MODEL
						Peak Kw	Avg w				
52	HF-8030	8.2-12.4	10	0.7	1.15	200	400	4-1/4	1-1/2	39	X-12-0
	HF-8029	8.2-12.4	20	1.4	1.15	200	400	8-1/2	2-1/2	39	X-12-1
	HF-8007	8.2-12.4	30	1.0	1.15	10	10	9	4-3/4	39	X-12-29
	HF-8006	8.2-12.4	40	1.0	1.15	10	10	9	4-3/4	39	---
	HF-8141	8.2-12.4	30	1.0	1.15	10	20	5-3/4	3-1/4	39	---
	HF-8089	8.2-12.4	40	1.0	1.10	10	20	5-3/4	3-1/4	39	---
	HF-8033	8.5-10.2	15	0.5	1.10	200	200	3	1-1/2	39	X-14-6
	HF-8008	8.5-9.6	30	0.7	1.25	5	10	3	1-9/10	39	X-12-34
	HF-8031	8.5-9.6	25	1.0	1.20	5	10	3-1/2	1-1/2	39	X-12-6
	HF-8032	8.5-9.6	10	1.0	1.10	100	100	1	1/2	39	X-12-5
	HF-8090	8.8-9.6	13	1.0	1.30	1	10	3	6/10	39	R-88-96
	HF-8027	8.9-9.3	10	0.5	1.10	100	100	1	7/10	39	X-12-7
HF-8115	9.6-10.4	13	1.0	1.30	1	10	3-1/2	1/2	39	R-96-104	
WR-75	HF-8116	10.0-15.0	15	1.0	1.15	10	10	5	2	WR-75	---
	HF-8117	10.5-11.7	20	0.5	1.15	10	20	3	1-1/4	WR-75	---
	HF-8020	10.5-11.7	40	1.0	1.15	10	20	5	2	WR-75	M-12-1
	HF-8118	11.7-13.2	20	0.5	1.15	10	20	3	1-1/4	WR-75	---
	HF-8021	11.7-13.2	40	1.0	1.15	10	20	5	2	WR-75	M-12-2
91	HF-8009	12.4-18.0	13	0.8	1.20	100	100	4-1/2	2-1/10	419	Kv-14-3
	HF-8119	12.4-18.0	30	1.0	1.15	10	10	5-1/4	3-1/2	419	---
	HC-8120	13.0-15.0	20	0.4	1.20	5	5	1-1/4	1/2	419	---
	HC-8121	15.5-17.5	20	0.4	1.20	5	5	1-1/4	1/2	419	---
53	HF-8010	18.0-26.5	20	1.0	1.15	10	10	4-1/2	2-1/4	595	K-12-4
	HF-8142	18.0-26.5	20	1.0	1.15	10	10	4-1/2	2-1/4	425	---
	HF-8011	23.0-25.0	17	1.0	1.30	50*	25	1-3/4	3/4	595	K-13-5
	HF-8012	23.0-25.0	10	1.0	1.30	50*	25	1-1/2	1/2	595	K-13-1
96	HF-8013	34.0-36.0	17	1.0	1.25	25*	50	2	1-1/4	599	KA-13-1

\*Pressurized

Notes: (1) Flanges indicated above are standard, however flanges of your choice may be utilized on request.  
 (2) Asterisk after power rating indicates pressurization is necessary.



HF-8089



# WAVEGUIDE CIRCULATORS

Huggins Laboratories Waveguide Junction Circulators maintain specified performance over extreme temperature range and typical insertion loss is 0.1 db. Special units can be provided with 1.05:1 VSWR over 10% bandwidth.

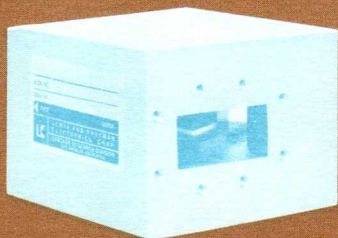
## WAVEGUIDE CIRCULATORS

BAND RG-(x)/u	MODEL No.	FREQUENCY Gc	ISOLATION db Max.	INSERTION LOSS db Min.	VSWR MAX.	SIZE INCHES (approx.)	WEIGHT LBS. (approx.)	FLANGES UG-(x)/u	CONFIGU- RATION	CASCADE MODEL
75	HC-8035	2.6-3.0	20	0.3	1.20	5 1/2 L x 7 1/2 W x 3 H	4 1/2	53	3-T	S-43-2
	HC-8122	2.6-3.0	20/35	0.3/0.6	1.20	11 L x 7 1/2 W x 3 H	9	53	4-H	S-43-8
	HC-8036	2.8-3.4	20	0.3	1.20	5 1/2 L x 7 1/2 W x 3 H	4 1/2	53	3-T	S-43-3
	HC-8123	2.8-3.4	20/35	0.3/0.6	1.20	11 L x 7 1/2 W x 3 H	9	53	4-H	S-43-9
	HC-8037	3.4-4.0	20	0.3	1.20	5 1/2 L x 7 1/2 W x 3 H	4 1/2	53	3-T	S-43-12
	HC-8124	3.4-4.0	20/35	0.3/0.6	1.20	11 L x 7 1/2 W x 3 H	9	53	4-H	S-43-13
49	HC-8038	3.9-5.0	20	0.3	1.20	4 1/2 L x 4 1/4 W x 3 H	3	419A	3-T	G-43-1
	HC-8039	3.9-5.0	20/35	0.3/0.6	1.20	9 L x 4 1/4 W x 3 H	6	419A	4-H	G-43-4
	HC-8040	5.0-5.9	20	0.3	1.20	4 1/2 L x 4 1/4 W x 3 H	3	419A	3-T	G-43-2
	HC-8041	5.0-5.9	20/35	0.3/0.6	1.20	9 L x 4 1/4 W x 3 H	6	419A	4-H	G-43-5
	HC-8125	5.4-5.9	20	0.5	1.20	2 1/2 L x 4 5/16 W x 5 1/16 H	8	419A	4-D	G-44-3
	50	HC-8042	5.2-6.5	20	0.3	1.15	3 1/2 L x 3 1/4 W x 2 1/4 H	2 1/4	344	3-T
HC-8043		5.2-6.5	20/35	0.3/0.6	1.15	7 L x 3 1/4 W x 1 1/2 H	4 1/2	344	4-H	J-43-33
HC-8044		5.9-6.5	20	0.3	1.15	3 1/2 L x 3 1/4 W x 2 1/4 H	2 1/4	344	3-T	J-43-14
HC-8045		5.9-6.5	20/35	0.3/0.6	1.15	7 L x 3 1/4 W x 2 1/4 H	4 1/2	344	4-H	J-43-34
HC-8046		6.5-7.1	20	0.3	1.15	3 1/2 L x 3 1/4 W x 2 1/4 H	2 1/4	344	3-T	J-43-15
HC-8126		6.5-7.1	20/35	0.3/0.6	1.15	7 L x 3 1/4 W x 2 1/4 H	4 1/2	344	4-H	J-43-35
HC-8047		7.0-8.0	20	0.3	1.15	3 1/2 L x 3 1/4 W x 2 1/4 H	2 1/4	344	3-T	J-43-17
HC-8127		7.0-8.0	20/35	0.3/0.6	1.15	7 L x 3 1/4 W x 2 1/4 H	4 1/2	344	4-H	J-43-37
51		HC-8048	7.1-8.4	20	0.3	1.15	2 1/2 L x 2 1/4 W x 2 H	1 1/4	51	3-T
	HC-8049	7.1-8.4	20/35	0.3/0.6	1.15	5 L x 2 1/4 W x 3 1/4 H	2 1/2	51	3-H	XL-43-4
	HC-8128	7.5-8.5	20	0.5	1.20	1 1/2 L x 3 1/8 W x 3 1/4 H	4 1/4	51	4-D	XL-44-9
	HC-8050	8.4-10.0	20	0.3	1.20	2 1/2 L x 2 1/4 W x 2 H	1 1/4	51	3-T	XL-43-2
	HC-8051	8.4-10.0	20/35	0.3/0.6	1.20	5 L x 2 1/4 W x 2 H	2 1/2	51	4-H	XL-43-5
	HC-8129	8.5-9.6	20	0.5	1.20	1 1/2 L x 3 1/8 W x 3 1/4 H	4 1/4	51	4-D	XL-44-2
52	HC-8052	8.2-10.0	20	0.3	1.20	2 1/4 L x 2 1/4 W x 1 1/16 H	3/4	39	3-T	X-43-10
	HC-8053	8.2-10.0	20/35	0.3/0.6	1.20	4 1/2 L x 2 1/4 W x 1 1/16 H	1 1/2	39	4-H	X-43-19
	HC-8056	10.0-12.4	20	0.3	1.20	2 1/4 L x 2 1/4 W x 1 1/16 H	3/4	39	3-T	X-43-17
	HC-8057	10.0-12.4	20/35	0.3/0.6	1.20	5 L x 2 1/4 W x 1 1/16 H	1 1/2	39	4-H	X-43-21
WR-45	HC-8054	10.5-11.7	20.0	0.3	1.15	2 L x 2 W x 1 1/2 H	1 1/2	WR-75	3-T	M-43-1
	HC-8130	10.5-11.7	20/35	0.3/0.6	1.15	4 L x 2 W x 1 1/2 H	3	WR-75	4-H	M-43-3
	HC-8058	11.7-13.2	20.0	0.3	1.15	2 L x 2 W x 1 1/2 H	1 1/2	WR-75	3-T	M-43-2
	HC-8059	11.7-13.2	20/35	0.3/0.6	1.15	4 L x 2 W x 1 1/2 H	3	WR-75	4-H	M-43-4
91	HC-8060	13.0-15.0	20.0	0.3	1.20	1 1/2 L x 1 1/2 W x 1 7/16 H	1/2	419	3-T	KU-43-11
	HC-8061	13.0-15.0	20/35	0.3/0.6	1.20	3 L x 1 1/2 W x 1 7/16 H	1	419	4-H	KU-43-15
	HC-8062	14.0-16.0	20.0	0.3	1.20	1 1/2 L x 1 1/2 W x 1 7/16 H	1/2	419	3-T	KU-43-13
	HC-8063	14.0-16.0	20/35	0.3/0.6	1.20	3 L x 1 1/2 W x 1 7/16 H	1	419	4-H	KU-43-17
	HC-8064	15.0-17.0	20.0	0.3	1.15	1 1/2 L x 1 1/2 W x 1 7/16 H	1/2	419	3-T	KU-43-12
	HC-8065	15.0-17.0	20/35	0.3/0.6	1.15	3 L x 1 1/2 W x 1 7/16 H	1	419	4-H	KU-43-16
	HC-8131	16.0-17.0	20.0	0.5	1.20	7/3 L x 2 1/2 W x 2 8/10 H	2 1/2	419	4-D	KU-43-4
	HC-8066	16.0-18.0	20.0	0.3	1.20	1 1/2 L x 1 1/2 W x 1 7/16 H	1/2	419	3-T	KU-43-18
	HC-8132	16.0-18.0	20/35	0.3/0.6	1.20	3 L x 1 1/2 W x 1 7/16 H	1	419	4-H	KU-43-19
53	HC-8133	23.0-25.0	20	0.5	1.20	1 1/4 L x 1 1/4 W x 1 H	1/3	595	3-T	-----
	HC-8134	23.0-25.0	20/35	0.5/0.8	1.20	2 1/2 L x 1 1/4 W x 1 H	2/3	595	4-H	-----
96	HC-8135	34.5-35.5	20	0.5	1.20	1 L x 1 W x 1 H	1/3	599	3-T	-----
	HC-8136	34.5-35.5	20/35	0.5/0.8	1.20	2 L x 1 W x 1 H	2/3	599	4-H	-----

Notes: (1) RF Power Input 10 kw peak, 10 watts Average unless otherwise specified.

(2) Configuration 3-, 4-, Ports Y, or Pi, configuration available on special request.

4-D-Differential Phase Shift. Handles up to 300 Kw peak and 300 W average power.



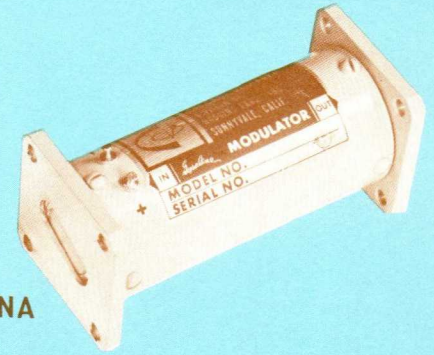
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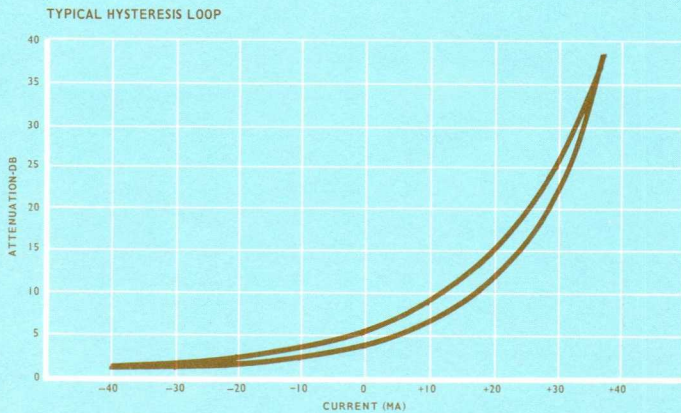
# AMPLITUDE MODULATORS

## GYRALINE

Huggins Laboratories Gyralline Ferrite Modulators are electrically controlled variable attenuators. They can be used as amplitude modulators, automatic gain controls and as off-on switches.



920-NA

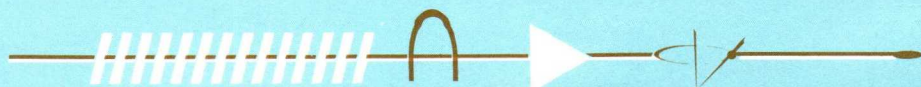


### GYRALINE<sup>®</sup> AMPLITUDE MODULATORS

BAND	MODEL NO.	FREQUENCY	INSERTION LOSS	ATTENUATION RANGE	VSWR	MODULATION FREQUENCY	NOMINAL MIDBAND CURRENT	LENGTH INCHES	WEIGHT LBS	FLANGES	CASCADE MODEL
RG - (x)/u		Gc	db Max	db Min	Max	(Kc)	(ma)	(approx)	(approx)	UG - (x)/u	
S	HS-7092	2.5-3.8	1.0	10	1.30	0.1	225	6-2/3	7-1/2	Coax-N	CN-22-2
C	HS-7093	4.0-7.0	1.0	10	1.25	0.1	250	6-1/2	7-1/2	Coax-N	CN-22-4
50	HS-8070	5.4-5.9	1.4	18	1.35	3.0	350	5-1/2	2-1/8	344	RS-570
	HS-8071	5.4-5.9	1.4	18	1.35	70.0	350	5-1/2	2-1/8	344	RS-570(Hf)
	HS-8072	5.9-6.4	1.2	25	1.35	3.0	90	5-6/10	2-1/8	344	R-620
	HS-8073	5.9-6.4	1.2	25	1.35	70.0	90	5-6/10	2-1/8	344	R-620(Hf)
	HS-8074	6.4-6.9	1.0	25	1.30	3.0	90	5-1/10	2-1/8	344	R-670
	HS-8075	6.4-6.9	1.0	25	1.30	70.0	90	5-1/10	2-1/8	344	R-670(Hf)
	HS-8076	6.9-7.4	1.0	25	1.30	3.0	90	4-1/10	2-1/8	344	R-720
HS-8077	6.9-7.4	1.0	25	1.30	70.0	90	4-1/10	2-1/8	344	R-720(Hf)	
52	HS-8078	8.2-10.6	1.0	25	1.45	0.2	10	3-1/2	3/4	39	920-NA
	HS-8079	8.2-10.6	1.0	25	1.45	3.0	45	3-1/2	3/4	39	R-920
	HS-8080	8.2-10.6	1.0	25	1.45	70.0	85	3-1/2	3/4	39	R-920(Hf)
91	HS-8081	13.5-15.0	1.0	25	1.30	3.0	30	2-6/10	1/2	419	R-1350
	HS-8082	13.5-15.0	1.0	25	1.30	70.0	30	2-6/10	1/2	419	R-1350(Hf)
	HS-8083	15.0-17.0	1.0	25	1.30	3.0	30	2-6/10	1/2	419	R-1650
	HS-8084	15.0-17.0	1.0	25	1.30	70.0	30	2-6/10	1/2	419	R-1650(Hf)
53	HS-8085	23.0-25.0	1.0	25	1.40	70.0	50	2-6/10	3/8	595	K-21-1
96	HS-8086	34.0-35.5	1.0	25	1.50	70.0	75	1-1/4	3/8	599	Ka-21-1

### WARRANTY

All components manufactured by Huggins Laboratory Inc. are thoroughly tested and inspected prior to shipment. Products are protected by the most liberal warranty available. All Huggins' Ferrite Components are warranted for one full year to be free from defects in materials and workmanship.



# OTHER CAPABILITIES

## INFRARED

RADIOMETERS  
BOLOMETERS  
RADIATION THERMOMETER  
TARGET IDENTIFICATION SYSTEMS

## INSTRUMENTATION

TRANSIENT DETECTOR  
LINE VOLTAGE MONITORS  
NANOSECOND PULSE GENERATORS

## CUSTOM INSTRUMENTS & SYSTEMS

INTEGRATED MICROWAVE & INFRARED SYSTEMS.

### HUGGINS TECHNICAL REPRESENTATIVES

TERRITORIES	NAME	OFFICES			
Washington - Oregon	J. K. DOOLEY CO., INC.	4110 Stone Way No. Seattle, Wash. 98103 206-637-1618			
California - Nevada - Arizona	RF ASSOCIATES	1621 Pontius Ave. Los Angeles, Calif. 90025 213-478-1586 TWX: 213-490-3952	800 San Antonio Rd. Palo Alto, Calif. 94303 415-327-5531 TWX: 415-492-9446		
Montana - Idaho - Wyoming - Utah - N. Mexico - Colorado - El Paso, Texas	KELLEY ENTERPRISES	336 East Fourth Street Loveland, Colorado 80537 303-667-1376			
Arkansas - Oklahoma - Texas (except El Paso) - Louisiana - South Texas	AIREP ENGINEERING COMPANY	P. O. Box 9555 Dallas, Texas 75214 214-824-3800	P. O. Box 36211 Houston, Texas 77036 713-494-7260		
Kansas - Nebraska - Indiana - Iowa - Missouri - Wisconsin - Minnesota - Illinois	COZZENS & CUDAHY	175 Old Orchard Arcade Skokie, Illinois 60079 312-675-6700 TWX: 312-677-6735			
Kentucky - Michigan - Ohio Western Pennsylvania - West Virginia	MICRO SALES CORPORATION	T-17 Executive Building 1750 W. Dorothy Lane Dayton, Ohio 45409 513-298-3033 TWX: 513-944-0450	1925 Lee Road Cleveland, Ohio 44118 216-371-0527	19341 Trinity Detroit, Michigan 48219 313-537-6460	
Tennessee - Virginia - N. Carolina - S. Carolina - Georgia - Florida - Alabama - Mississippi	E. G. HOLMES & ASSOCIATES	4969 Roswell Road, NE Atlanta, Georgia 30305 404-255-6660 TWX: 404-731-3417	430 W. Gaston Street Greensboro, N. Carolina 27401 919-272-0855	316-1/2 Bumby Street Orlando, Florida 32803 305-241-2128 TWX: 305-275-1599	915-F Franklin Huntsville, Alabama 35801 205-539-1114
Delaware - Maryland - Northern Virginia - Washington, D. C.	E-A, INCORPORATED	1406 Shoemaker Road Baltimore, Maryland 21209 301-825-2385 TWX: 301-828-7039	Washington, D. C. 202-783-7319 (Ans. Service)		
New Jersey - Metropolitan New York - Long Island - E. Pennsylvania	cdh ENTERPRISES	675 W. Jericho Turnpike Huntington, L. I., New York 11743 516-692-5200 TWX: 516-421-4699	10 E. Schoolhouse Lane Philadelphia, Pennsylvania 19144 215-844-9100		
Upstate New York	KLM ASSOCIATES	9 Hollywood Drive Whitesboro, New York 13492 315-736-2450 TWX: 315-797-1763			
New Hampshire - Maine - Rhode Island - Vermont - Connecticut - Massachusetts	TRITEK, INCORPORATED	1764 Massachusetts Avenue Lexington, Massachusetts 02175 617-862-4631			
All Canada	BRH ASSOCIATES, LTD.	6338 Victoria Ave. Montreal 26, Quebec 514-733-5331	P. O. Box 214, Station G Toronto 7, Ontario 416-489-9191		
Export	HUGGINS INTERNATIONAL	750 Third Avenue, Suite 67 New York, New York 10017 212-986-2244 Cable: ARTROCKE, N. Y. Telex: 1-25534			

## HUGGINS LABORATORIES, INC.

999 EAST ARQUES AVENUE  
TWX: 408-737-9992

SUNNYVALE, CALIFORNIA 94086  
TELEPHONE (408) 736-9330



Effective Feb. 15, 1960

CTP1

# TRAVELING WAVE TUBES

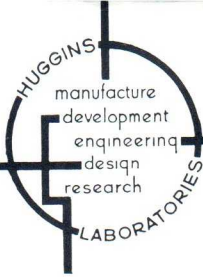
BACKWARD WAVE AMPLIFIERS  
FORWARD WAVE AMPLIFIERS  
BACKWARD WAVE OSCILLATORS  
SPECIAL PURPOSE TUBES

SALES & SERVICE IN THE UNITED KINGDOM:-  
**B. & K. LABORATORIES LTD.**  
4 TILNEY ST., PARK LANE, LONDON, W.1., ENGLAND.  
TELEPHONE: GROSVENOR 4567



**HUGGINS LABORATORIES, INC.**

999 EAST ARQUES AVENUE • SUNNYVALE, CALIFORNIA



# TRAVELING WAVE TUBES

VHF-BAND

UHF-BAND

L-BAND

## BROADBAND FORWARD WAVE AMPLIFIERS

10 MW Standard 30 db min. small-signal gain		<b>HA-7 ▲</b> 0.5 TO 1.0 KMC \$850.00 6 - 8 WKS. DEL.	<b>HA-5 ▲</b> 1.0 TO 2.0 KMC \$750.00 4 - 6 WKS. DEL.
1 W Standard 30 db min. small-signal gain		<b>HA-8 ▲</b> 0.5 TO 1.0 KMC \$1,500.00 6 - 8 WKS. DEL.	<b>HA-18 ▲</b> 1.0 TO 2.0 KMC \$1,000.00 8 - 12 WKS. DEL.
Medium Noise 25 db min. small-signal gain 15 db noise figure		<b>HA-40 ▲</b> 0.5 TO 1.0 KMC \$1,500.00 6 - 8 WKS. DEL.	<b>HA-17 ▲</b> 1.0 TO 2.0 KMC \$1,500.00 6 - 8 WKS. DEL.
Low Noise 25 db small-signal gain 10 db max. noise figure		<b>HA-45 ▲</b> 0.5 TO 1.0 KMC \$2,000.00 6 - 8 WKS. DEL.	<b>HA-14 ▲</b> 1.0 TO 2.0 KMC \$2,000.00 6 - 8 WKS. DEL.
<b>Pulsed</b> 1 W Min. 30 db min. sat. gain 0.1 max. duty cycle			

## PERMANENT MAGNET FOCUSED AMPLIFIERS

10 MW Standard 30 db small-signal gain	<b>HA-51 ▲</b> 250 TO 500 MC \$1,575.00 6 - 8 WKS. DEL.	<b>HA-36 ▲</b> 0.5 TO 1.0 KMC \$1,575.00 6 - 8 WKS. DEL.	<b>HA-31 ▲</b> 1.0 TO 2.0 KMC \$1,350.00 6 - 8 WKS. DEL.
1 W Standard (Pulsed Tubes have PA designation) 30 db small-signal gain			

## ELECTROSTATICALLY FOCUSED AMPLIFIERS

5 MW 30 db small-signal gain		<b>HA-52<sup>D</sup> ▲</b> 0.5 TO 1.0 KMC	<b>HA-27 ▲</b> 1.0 TO 2.0 KMC \$2000.00 3 - 4 MONTHS DEL.
1 W 30 db small-signal gain		<b>HA-58 ▲ †</b> 0.5 TO 1.0 KMC \$3250.00 3 - 4 MONTHS DEL.	

## BACKWARD WAVE AMPLIFIERS

Voltage Tuned 0.1 to 1.0% bandwidth 15 db gain			
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## BACKWARD WAVE OSCILLATORS (Voltage Tuned)

1 MW min. power output			
10 MW min. power output			<b>HO-9</b> 1.0 TO 2.0 KMC \$1,500.00 6 - 8 WKS. DEL.

## PM FOCUSED BWO (Voltage Tuned)

10 MW min. power output			
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## SPECIAL PURPOSE TUBES

Frequency multiplier tubes		<b>HA-34 ▲</b> UHF-BAND TO S-BAND \$1,250.00 6 - 8 WKS. DEL.	
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**MANY MODIFICATIONS** of these tubes have been made to customers' specifications. A technical staff is available for your problem as well as for special research and development. Feel free to address us with your inquiry.

**PRICE NOTE:** Above prices apply to small quantities only and are subject to change without notice. A 10% credit will be allowed upon return of the used encapsulated tube when reordering. Shipment made from F.O.B. Sunnyvale, California, via air freight. Terms: Net 30 days.

**DELIVERY QUOTATIONS** given above represent the average situation. Consult us directly for latest quotations.

# THE INDUSTRY'S **broadest line**

S-BAND

C-BAND

X-BAND

Ku-BAND

► **BROADBAND FORWARD WAVE AMPLIFIERS**

<b>HA-1▲</b> 2.0 TO 4.0 KMC \$650.00 4 - 6 WKS. DEL.	<b>HA-26▲ (HA-3)</b> 4.0 TO 8.0 KMC \$750.00 4 - 6 WKS. DEL.	<b>HA-4▲</b> 8.2 TO 12.4 KMC \$850.00 4 - 6 WKS. DEL.	<b>HA-24▲</b> <b>HA-25▲</b> 12.4 - 15.0 KMC 12.0 - 18.0 KMC \$950.00 \$2,000.00 4 - 6 WKS. DEL. 10 - 12 WKS. DEL.
<b>HA-2▲</b> 2.0 TO 4.0 KMC \$750.00 4 - 6 WKS. DEL.	<b>HA-6▲†</b> 4.0 TO 8.0 KMC \$1,000.00 4 - 6 WKS. DEL.	<b>HA-9▲†</b> <b>HA-10‡</b> 8.2 TO 11.0 KMC 8.2 TO 12.4 KMC \$1,500.00 \$850.00 6 - 8 WKS. DEL. 4 - 6 WKS. DEL.	
<b>HA-11▲</b> 2.0 TO 4.0 KMC \$1,500.00 4 - 6 WKS. DEL.	<b>HA-23▲</b> 8.2 TO 11.0 KMC \$2,000.00 6 - 8 WKS. DEL.	<b>HA-44▲</b> 8.2 TO 12.4 KMC \$1,500.00 6 - 8 WKS. DEL.	<b>HA-43▲</b> 12.0 TO 18.0 KMC \$3,000.00 10 - 12 WKS. DEL.
<b>HA-37▲</b> 2.0 TO 4.0 KMC* \$2,000.00 6 - 8 WKS. DEL.	<b>HA-47▲<sup>D</sup></b> 4.0 TO 8.0 KMC	<b>HA-23▲</b> 8.2 TO 11.0 KMC \$2,000.00 6 - 8 WKS. DEL.	<b>HA-46▲‡</b> <b>HA-48▲†</b> 12.0 - 18.0 KMC 12.0 - 16.0 KMC \$3,500.00 \$3,250.00 10 - 12 WKS. DEL. 6 - 8 WKS. DEL.
<b>PA-4▲ (HA-12)</b> 2.0 TO 4.0 KMC \$850.00 4 - 6 WKS. DEL.	<b>PA-7▲</b> 4.0 TO 8.0 KMC \$1,250.00 4 - 6 WKS. DEL.	<b>PA-1▲</b> 8.2 TO 11.0 KMC \$1,750.00 6 - 8 WKS. DEL.	

► **PERMANENT MAGNET FOCUSED AMPLIFIERS**

<b>HA-29▲</b> 2.0 TO 4.0 KMC \$1,000.00 6 - 8 WKS. DEL.	<b>HA-28▲</b> 4.0 TO 8.0 KMC \$1,125.00 6 - 8 WKS. DEL.	<b>HA-20▲</b> 8.2 TO 11.0 KMC \$1,350.00 6 - 8 WKS. DEL.	<b>HA-49▲††</b> 10.5 TO 16.0 KMC \$2,250.00 6 - 8 WKS. DEL.
<b>HA-30▲</b> <b>PA-6▲</b> 2.0 - 4.0 KMC 2.0 - 4.0 KMC \$1,350.00 \$1,575.00 8 - 12 WEEKS DELIVERY	<b>HA-35▲†</b> <b>PA-8</b> 4.0 - 8.0 KMC 4.0 - 8.0 KMC \$2,250.00 \$2,475.00 10 - 12 WEEKS DELIVERY	<b>HA-21▲†</b> <b>PA-9▲</b> 8.2 - 11.0 KMC 8.2 TO 11 KMC \$2,700.00 \$3,500.00 10-12 WKS. DEL. 6-8 WKS. DEL.	

► **ELECTROSTATICALLY FOCUSED AMPLIFIERS**


► **BACKWARD WAVE AMPLIFIERS**

<b>BA-1</b> 2.4 TO 3.6 KMC \$1,500.00 2 - 3 MONTHS DEL.		<b>BA-2</b> 8.2 TO 12.4 KMC \$1,500.00 2 - 3 MONTHS DEL.	
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► **BACKWARD WAVE OSCILLATORS (Voltage Tuned)**

<b>HO-18</b> 2.0 TO 4.0 KMC \$750.00 4 - 6 WKS. DEL.	<b>HO-3</b> <b>HO-13</b> 3.75 - 7.0 KMC 4.0 - 8.0 KMC \$750.00 \$750.00 4 - 6 WEEKS DELIVERY	<b>HO-14</b> <b>HO-17</b> 8.2 - 12.4 KMC 7.0 - 11.0 KMC \$750.00 \$750.00 4 - 6 WEEKS DELIVERY	<b>HO-19</b> 12.0 TO 18.0 KMC \$1,250.00 4 - 6 WKS. DEL.
<b>HO-1</b> 2.0 TO 4.0 KMC \$1,000.00 4 - 6 WKS. DEL.	<b>HO-20</b> <b>HO-21</b> 3.75 - 7.0 KMC 4.0 - 8.0 KMC \$1,000.00 \$1,000.00 6 - 8 WEEKS DELIVERY	<b>HO-2</b> 8.2 TO 12.4 KMC \$1,000.00 6 - 6 WKS. DEL.	<b>HO-4</b> 12.4 TO 18.0 KMC \$1,500.00 4 - 6 WKS. DEL.

► **PM FOCUSED BWO (Voltage Tuned)**

		<b>HO-22§</b> 8.5 TO 12.0 KMC \$2000.00 10 - 12 WEEKS DELIVERY	
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► **SPECIAL PURPOSE TUBES**

<b>HA-16</b> S-BAND TO X-BAND \$850.00 6 - 8 WKS. DEL.		
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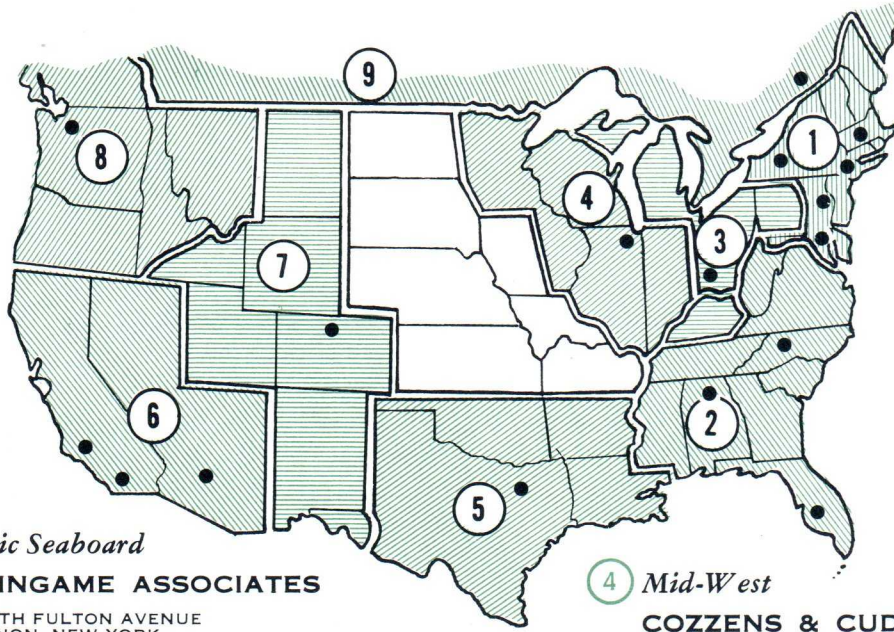
▲gridded  
 ◻ under development  
 \*11 db max. noise figure  
 †0.5 watt over specified band  
 ††this tube will provide 20 db min.  
 small-signal gain over the 12.0  
 to 18.00 Kmc band.  
 ‡12 db max. noise figure  
 §5 dbm min. 8.2 - 12.4 Kmc  
 ¶ 13 db maximum noise figure  
 †† 100 MW

Changes or Additions to the November  
Short Form Catalog

A CATALOG and Engineering Handbook are available for you.  
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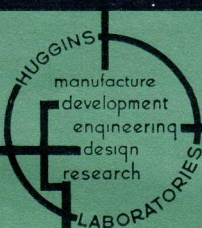
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