

HYPERTIJNSTRUCTUUR  
SPECTRUM  
VAN RUBIDIUM

(Langmuir, 1906)

Langmuir, C. J. Spectra  
of Rubidium, Potassium,  
and Caesium

Langmuir, C. J. Spectra  
of Rubidium, Potassium,  
and Caesium (1906)

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NO. 1178  
TOP



# OPERATING NOTES

HITACHI, LTD. 8, 2-CHOME, OTEMACHI, CHIYODA-KU, TOKYO, JAPAN

MODEL M 2101- 3

Serial# M4126

## BROADBAND DIRECTIONAL COUPLER



M 61747

1. The uni-directional characteristic of the Model 2101 Broadband Directional Coupler makes it an important device in waveguide systems. High directivity couplers such as the 2101 may be used in the measurement of reflection coefficients or VSWRs.

The relatively constant coupling across the waveguide band and the stability of the coupling with time make the 2101 useful also as a wide-band attenuator or for power-monitoring applications.

2. Each unit consists of two waveguide sections, the main arm and the auxiliary arm, joined together along their broad faces. The auxiliary arm is a length of waveguide with one end terminated in a matched load and the other end in a standard flange.

TABLE 1. TEST DATA

Frequency, GHz	Coupling, db
50	2.8
62	3.4
75	2.5

The directional characteristic is obtained by an array of graduated holes in the common wall of the two waveguides. The 2101 has an overall directivity of 35 db or greater over the full range of the waveguide.

PRECAUTION

Protect the face of the coupling flange from damage. Any scoring or burring of the mating surfaces causes discontinuity. The resulting increase in SWR degrades performance.

SPECIFICATIONS

Model	Frequency Range (GHz)	Coupling (db)	Max. VSWR Main Arm	Aux. Arm Max. Aver. Power (W)
K2101	18.0- 26.5	6, 10, 20	1.05	0.5
R2101	26.5- 40.0	6, 10, 20	1.05	0.5
Q2101	33.0- 50.0	6, 10, 20	1.1	0.5
F2101	40.0- 60.0	6, 10, 20	1.1	0.5
M2101	50.0- 75.0	6, 10, 20	1.1	0.3
E2101	60.0- 90.0	6, 10, 20	1.1	0.3
W2101	75.0-110.0	6, 10, 20	1.1	0.3

Directivity: Better than 35 db  
 Mean Coupling Accuracy:  $\pm 1$  db  
 Coupling Frequency Variation: 1.5 db

Model	Waveguide Type *		Flange Type **		Length Main Arm (mm)
	RG	WRJ	UG	BRJ	
K2101	RG-53/U	WRJ-220	UG-595/U	BRJ-24	250
R2101	RG-96/U	WRJ-320	UG-381/U	BRJ-34	200
Q2101	RG-97/U	WRJ-400	UG-383/U	BRJ-40	175
F2101	WR19	WRJ-500	UG-383/U	BRJ-50	150
M2101	RG-98/U	WRJ-620	UG-385/U	BRJ-60	150
E2101	RG-99/U	WRJ-740	UG-387/U	BRJ-75	125
W2101	WR10	WRJ-900	UG-387/U	BRJ-95	100

\* Dimensional specifications of both RG or WR-type and WRJ-type are identical. WRJ is designation of Japanese standard.

\*\* BRJ is designation of Japanese standard. Flanges specified at the time of order are attached.



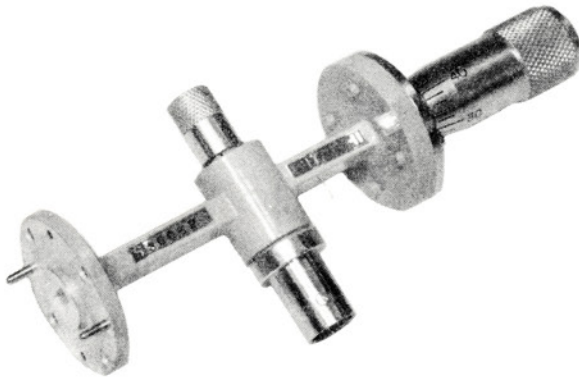
# OPERATING NOTES

HITACHI ELECTRONICS CO., LTD. 23-2, 1-CHOME, KANDA SUDA-CHO CHIYODA-KU, TOKYO 101, JAPAN

MODEL M 2608, 2622

Serial # M4127

## TUNABLE DETECTOR MOUNT



1. The Model 2608, 2622 Tunable Detector Mounts are used to detect CW, squarewave, pulse and frequency modulated millimeter wave signals.
2. Stray capacitance of the 2608, 2622 is about 5 pF, therefore, it may also be used, as a mixer, to mix two millimeter wave signals and to convert them down to IF signals.
3. A short plunger tunes for the maximum sensitivity and minimum VSWR. When used with the 1901 E-H Tuner, these mounts will

be easily matched. In addition, adjustment of diode-installing provides the most sensitive detection. The principal construction of 2622 Tunable Detector Mount is same as that of 2608 Tunable Detector Mount except the locking devices attached.

4. The detected output is available through a BNC-connector.

### PRECAUTION

Care should be taken to prevent damage to the face of the coupling flanges. Any scoring or burring of the mating surfaces causes a discontinuity. The resulting increase in SWR degrades performance.

SPECIFICATIONS

Model	Frequency Range (GHz)	Diode*	Approx. Length (mm)
K2608, K2622	18.0 - 26.5	IN26	139
R2608, R2622	26.5 - 40.0	IN53	134
Q2608, Q2622	33.0 - 50.0	IN53	109
F2608, F2622	40.0 - 60.0	IN53	101
M2608, M2622	50.0 - 75.0	IN53	99
E2608, E2622	60.0 - 90.0	IN53	99
* Not Supplied			

Model	Waveguide Type		Flange Type	
K2608, K2622	RG - 53/U	WR - 42	UG - 595/U*	
R2608, R2622	RG - 96/U	WR - 28	UG - 381/U*	
Q2608, Q2622	RG - 97/U	WR - 22	UG - 383/U*	
F2608, F2622		WR - 19	UG - 383/U* modified	
M2608, M2622	RG - 98/U	WR - 15	UG - 385/U*	
E2608, E2622	RG - 99/U	WR - 12	UG - 387/U*	
* Flanges supplied unless otherwise specified.				



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M2608, M2622	RG - 98/U	WR - 15	UG - 385/U*	
E2608, E2622	RG - 99/U	WR - 12	UG - 387/U*	
* Flanges supplied unless otherwise specified.				



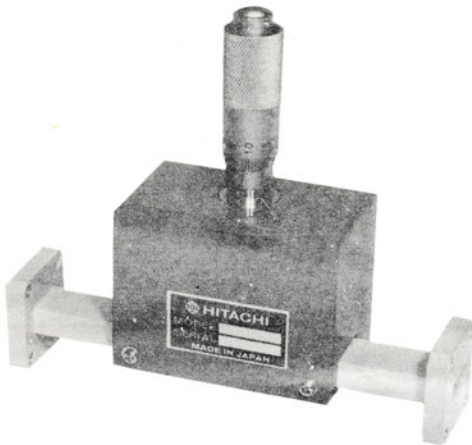
# OPERATING NOTES

HITACHI, LTD. 8, 2-CHOME, OTEMACHI, CHIYODA-KU, TOKYO, JAPAN

MODEL M 1525

Serial # 98296

## PRECISION ATTENUATOR



1. The Model 1525 Precision Attenuator is designed for use in waveguide systems. Typical applications are measuring power level, attenuation of transmission lines and setting power level or attenuation.
2. The 1525 consists of a section of slotted waveguide and a metalized mica vane precisely moved by a micrometer head. A metallic film on the mica absorbs millimeter wave energy according to its insertion depth into the waveguide, and provides calibrated attenuation of from 0 to 30 db.
3. The attenuation of the Model 1525 varies with frequency, and a calibration curve of attenuation vs. micrometer reading at the specified standard frequency is attached.
4. The calibration curves at another frequencies are easily obtained by the substitution with the rotary vane attenuator such as HITACHI Model 1514 or 1513 Direct Reading Attenuator. The approximate calibration is obtained, too, by utilizing the diode-property that the detection-law of the ordinary crystals is relatively constant with frequency.

### PRECAUTION

Protect the flanges from damage. Any scoring or burring of the mating surfaces causes a discontinuity. The resulting increase in SWR or leakage degrades performance.

THE 1525 ATTENUATOR HAS A MECHANICAL STOPPER AT THE END OF THE  
PENETRATION OF METALIZED VANES, AND HAS NO STOPPER OPPOSITE SIDE.  
THEREFORE, DO NOT UNSCREW THE MICROMETER HEAD OVER ACROSS THE  
ZERO POSITION.



## SPECIFICATIONS

	Frequency Range (GHz)	Maximum Insertion Loss (db)	Calibration Accuracy (db)	Standard Calibration Frequency (GHz)	Average Power (W)	Approx. Length (mm)
K1525	18.0- 26.5	0.3	±0.3	24.0	0.5	100
R1525	26.5- 40.0	0.3	±0.3	35.0	0.5	100
Q1525	33.0- 50.0	0.5	±0.3	40.0	0.5	100
F1525	40.0- 60.0	0.5	±0.3	48.0	0.5	80
M1525	50.0- 75.0	0.5	±0.5	60.0	0.3	80
E1525	60.0- 90.0	0.7	±0.5	68.0	0.3	80
W1525	75.0-110.0	0.7	±0.5	96.0	0.3	80

Attenuation Range: 0 to 30 db  
 Maximum VSWR: 1.1

Model	Waveguide Type*		Flange Type**	
K1525	RG-53/U	WRJ-220	UG-595/U	BRJ-24
R1525	RG-96/U	WRJ-320	UG-381/U	BRJ-34
Q1525	RG-97/U	WRJ-400	UG-383/U	BRJ-40
F1525	WR19	WRJ-500	UG-383/U	BRJ-50
M1525	RG-98/U	WRJ-620	UG-385/U	BRJ-60
E1525	RG-99/U	WRJ-740	UG-387/U	BRJ-75
W1525	WR10	WRJ-900	UG-387/U	BRJ-95

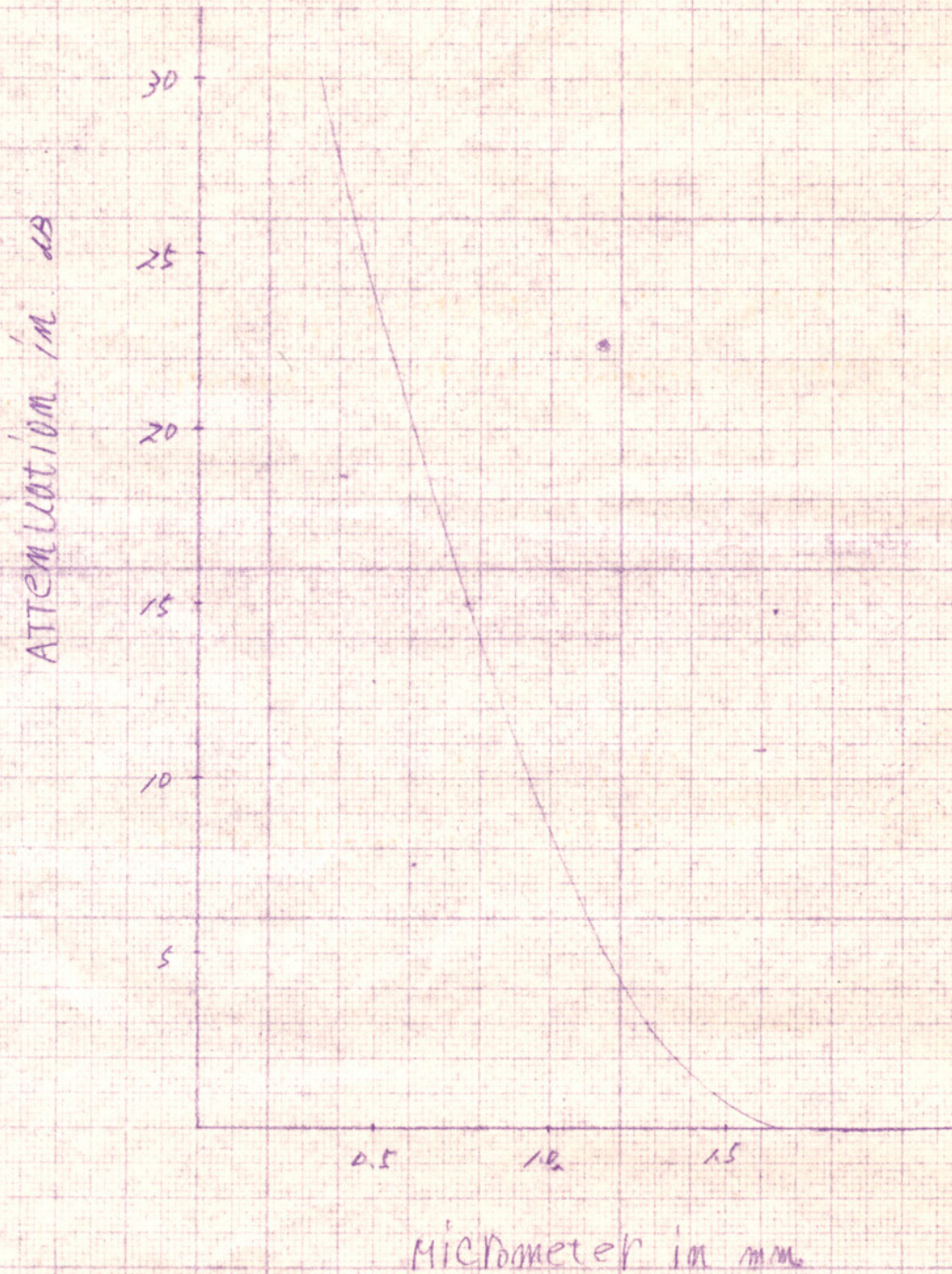
\* Dimensional specifications of both RG or WR-type and WRJ-type are identical. WRJ is designation of Japanese standard.

\*\* BRJ is designation of Japanese standard. Flanges specified at the time of order are attached.

PRECISION ATTENUATOR  
CALIBRATION CHART

Model M1525  
Serial 98296

CALIBRATION FREQUENCY 60.0 GHz  
INSERTION LOSS 0.2 dB



DWN	J. Nagai	TITLE	Hitachi, Ltd. Tokyo Japan	KOGANEI BRANCH DWG. NO.
CHKD				MK-23700
APPD				

**TEST CERTIFICATE**

Instrument Title.....FREQUENCY METER..... Type No.....25/7.....

Serial No.....30.....

Date.....7th November 1972.....

Accuracy.....0.05%.....

Temperature.....18<sup>o</sup>c.....

Frequency GHz			Micrometer Setting		
50.0			2.341		
51.0			2.177		
54.0			1.704		
57.0			1.339		
60.0			1.049		
63.0			.811		
64.0			.740		
66.0			.610		
68.0			.492		
70.0			.385		
72.0			.287		
74.0			.198		
76.0			.117		

Approved Mechanical Inspection.....

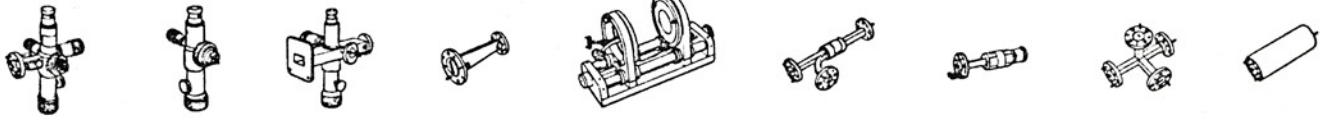
Approved Electrical Inspection .....

Calibrated by.....IC.....



Custom Microwave Components By

EMORY HORVATH  
7065 OVERBROOK DR.  
LONGMONT, COLO. 80501



### GENERAL INFORMATION FOR MULTIPLIERS AND DETECTORS

The units are furnished with one whisker and crystal installed and are ready to run in as received. The crystal will make contact with the whisker with approximately 1/2 turn of the run-in knob. CAUTION! TURN SLOWLY! A reasonable rate would be 1/2 turn per minute.

The run-in screw mechanism advances the crystal .0045 inch per revolution. After contact is made, compression of the whisker is normally limited to less than .004 inch or 1 turn of the run-in knob to prevent destruction of the delicate whisker.

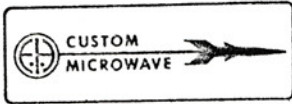
Occasionally it is found that the first contact does not produce a satisfactory diode, in which case the crystal should be retracted and run-in again. Once a satisfactory run-in is obtained, the unit should be handled with care and not dropped or bumped accidentally.

Usually, only several run-ins can be made with each whisker as the crystal eventually damages the point, so it is wise to handle the units with care during operation.

After normal use, when results start to fail, the whisker may need to be re-pointed. this is done in the following manner.

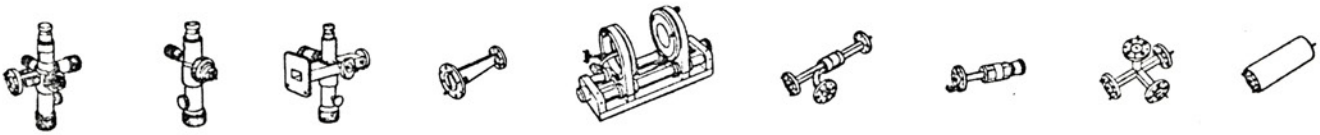
1. Remove the connector.
2. Remove the set screw holding in the whisker assembly, using the special 3/16" allen wrench supplied. (0-80 opposite end)
3. Using a sharp pair of tweezers, remove the whisker mount assembly, taking great care to lift it straight out. Do not create any side pressure on the holder as you are doing this or a damaged whisker may be the result.
4. The whisker may now be re-pointed using a whisker pointing apparatus. ( We can supply these if you do not care to fabricate one yourself. ) This is basically a device consisting of a small container of electrolyte with a stainless steel electrode, and a pin vise with a micrometer drive mechanism to lower the whisker in the electrolyte. Voltage for etching is supplied with a 6 volt filament transformer. The whisker mount is placed in the pin vise and lowered by means of the micrometer drive into the electrolyte (a 10-normal solution of potassium hydroxide) and withdrawn slowly until a maximum-height meniscus is formed. The voltage is then applied until etching is completed, which takes only about 2 seconds. By observing the bubbling action at the contact, one can determine when the pointing process is finished. It is advised to plug your whisker pointer into a small variable transformer so that the input voltage may be controlled in order to vary the shape of the point, as





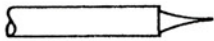
## Custom Microwave Components By

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7065 OVERBROOK DR.  
LONGMONT, COLO. 80501

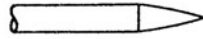


shown in the illustration below. This also allows the current to be turned on and off without touching the whisker pointer during the pointing process. This procedure assures you of no vibrations during the pointing process. After pointing, the whisker should be rinsed first in distilled water and finally in ethyl alcohol. NOTE: If this cleaning step is not done thoroughly, a minute bit of electrolyte could be transferred to the inside of the multiplier or detector and cause future corrosion.

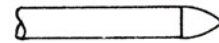
VOLTAGE TOO LOW |



IDEAL POINT |



VOLTAGE TOO HIGH |



5. After cleaning, return the whisker mount to the unit taking care not to bump the whisker. Replace the allen set screw, tighten firm but not over tight as you will deform the thin portion of waveguide on which it rests.

6. With the return of the connector, you are now ready to make a new run-in which consists of advancing the crystal the amount you have just etched off the whisker. When the whisker becomes too short for contact, a new mount must be used. NOTE: Back off the crystal as far as it will go before inserting a new mount.

Upon returning the exhausted whisker mounts to us, new whisker wires will be replaced in them for \$6.50 each. It is advised to have more than one box of whiskers for each unit as this enables you to always have some on hand while the others are being replaced, which could take several weeks.

If the crystal ever needs cleaning, it may be done in the following manner:

Etch in a solution of 24% HF acid for about 30 seconds, after which they should be cleaned with pure alcohol. This will remove all surface dirt and grease.

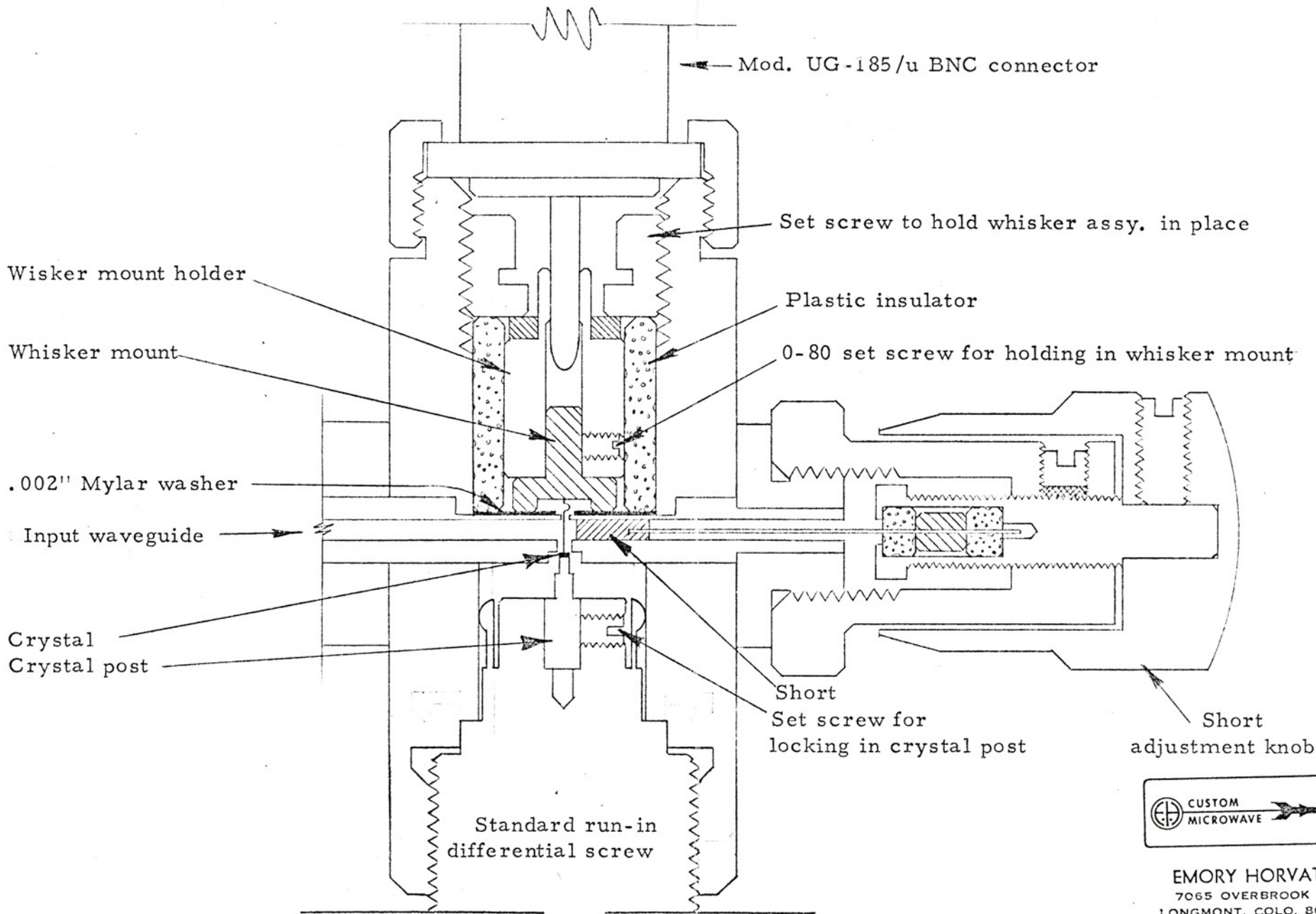
When removing the run-in screw assembly from the unit, be very careful not to bump the crystal post as it is brass and very easily bent.

The special run-in screw assembly elevates the crystal .0045 inch per revolution of the run-in knob. There is a total of approximately 6 turns available. This is sufficient travel for at least 5 to 6 new points on each whisker mount. On the opposite end of the special 3/16" allen wrench supplied, there is a small 0-80 allen wrench for changing crystal posts.

The units are equipped with a silicon crystal and the whiskers are of .001" tungsten wire. Please write if you have any further questions on these units.

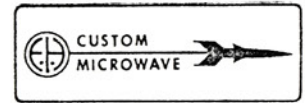
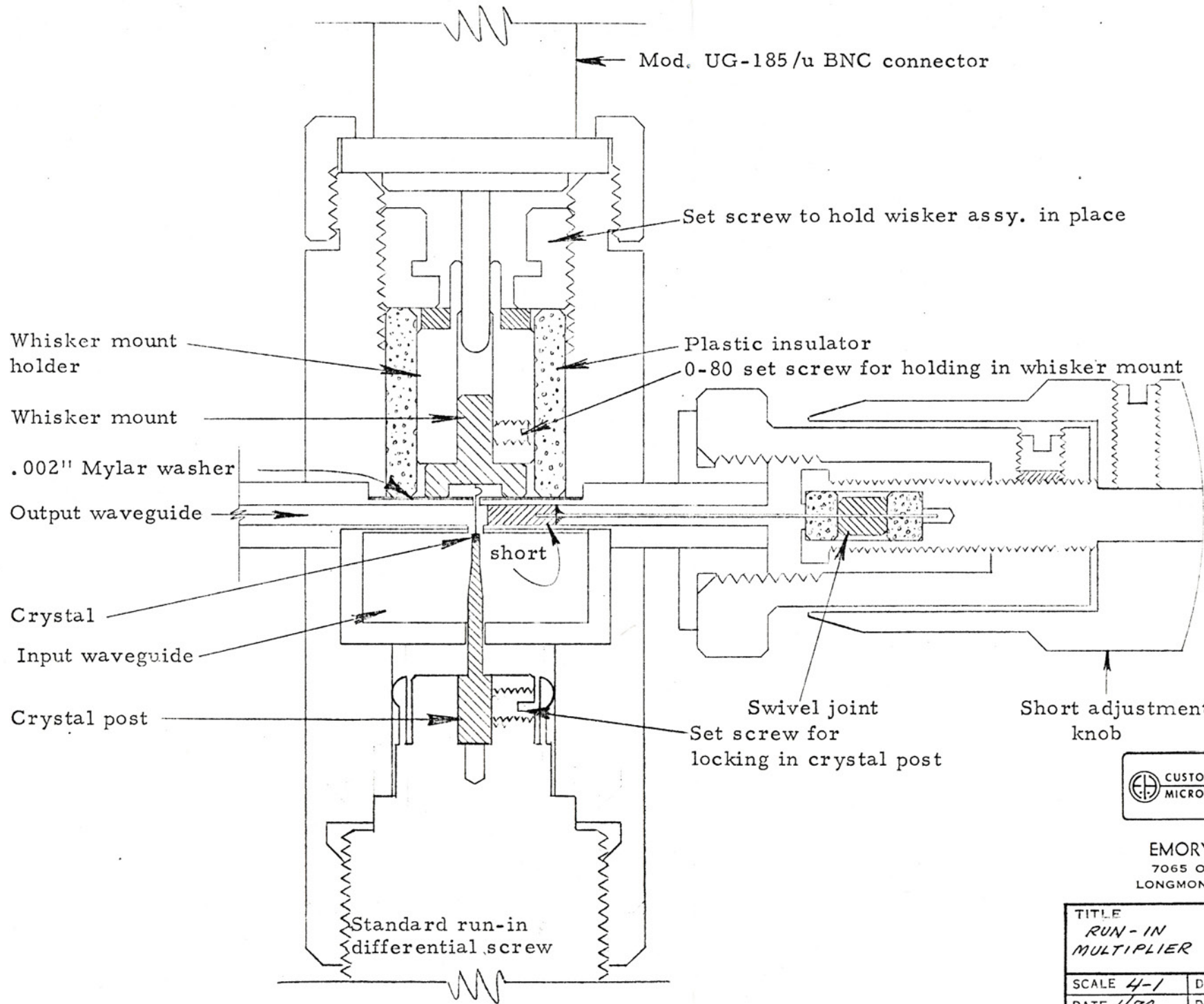






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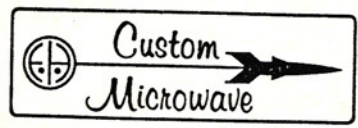
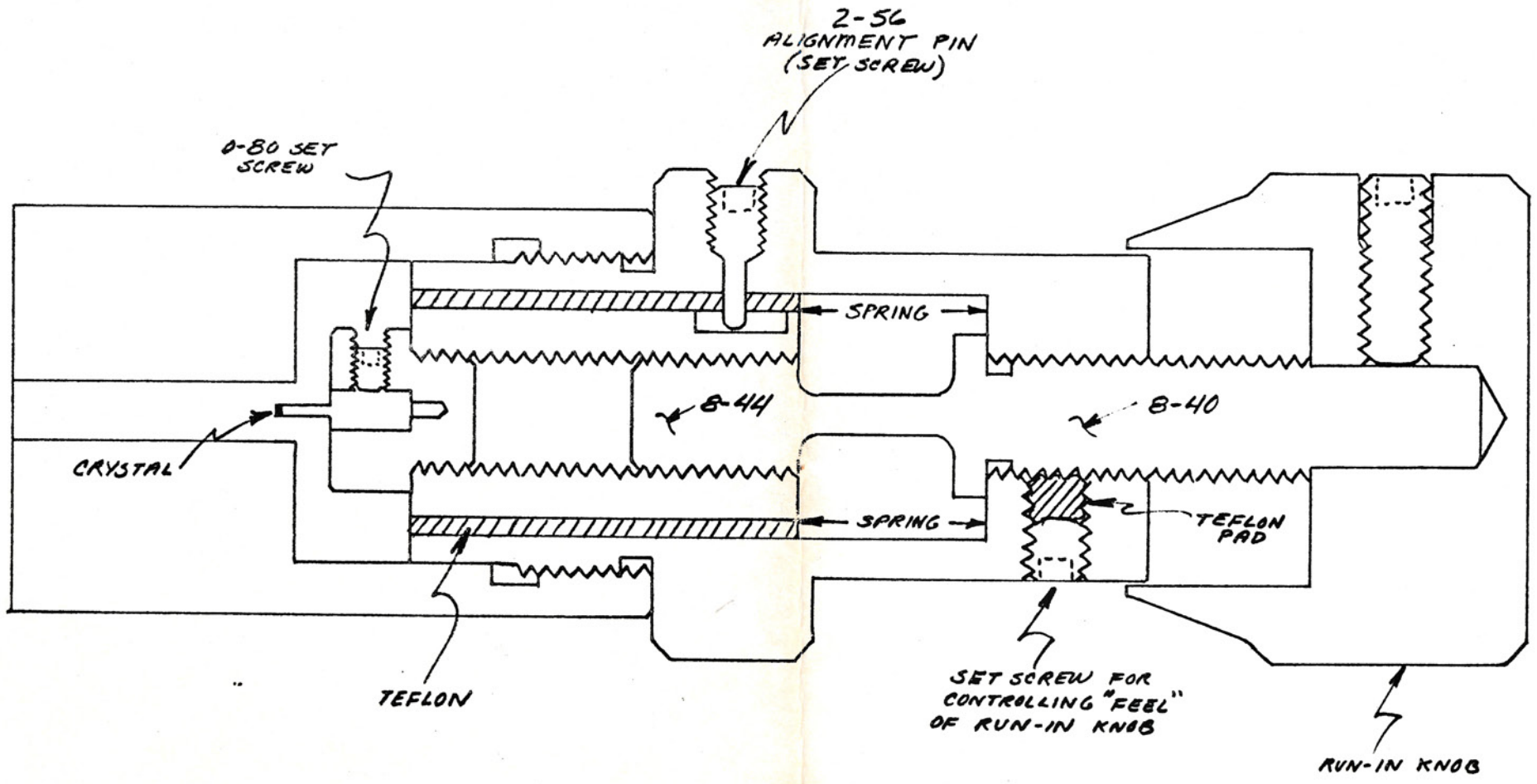
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SCALE <i>4-1</i>	DRAWN <i>E. HORVATH</i>
DATE <i>1/70</i>	DRAWING NO. <i>0122</i>



EMORY HORVATH  
7065 OVERBROOK DR.  
LONGMONT, COLO. 80501

TITLE <i>RUN-IN MULTIPLIER</i>	
SCALE <i>4-1</i>	DRAWN <i>E. HORVATH</i>
DATE <i>1/70</i>	DRAWING NO. <i>0121</i>





7065 OVERBROOK DRIVE  
 LONGMONT, COLORADO  
 80501

DIFFERENTIAL SCREW  
ASSEMBLY