HITACHI MAGNETRONS
FOR MICROWAVE

CTP

INTRODUCTION

Hitachi has about 100,000 (a hundred thousand) employees with a consolidated annual sales of more than 2,000 million dollars.

In the U.S. Fortune magazine, Hitachi is ranked 10 th in terms of sales among the industrial enterprises outside the United States.

Hitahi's main products range from power generating equipments, rolling stocks, computers, communications equipments, home-electronics and appliances like color TV., refrigerators, microwave ovens, magnetrons, to small semiconductors, and core memories.

Hitachi is delivering its products all over the word.

Hitachi magnetron production:

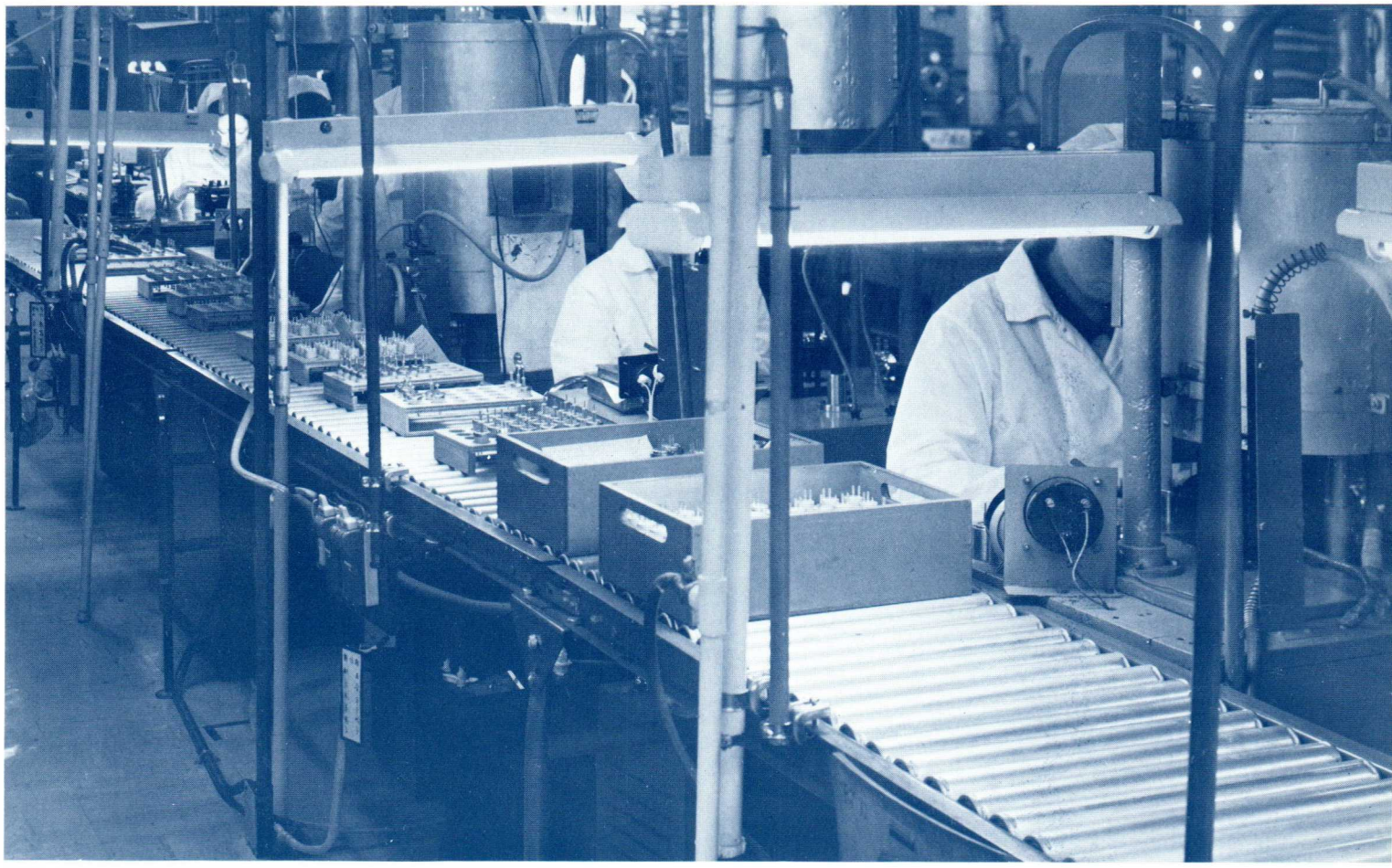
Hitachi started the development of the magnetron for microwave oven in 1967 and got into production in 1968 at Hitachi Mobara Works. Hitachi is supplying magnetrons not only to our own oven plant, but also to other domestic and foreign appliance manufacturers.

Hitachi has now developed high efficiency, high reliability magnetrons for domestic and commercial microwave ovens.

Mass production has been already started.

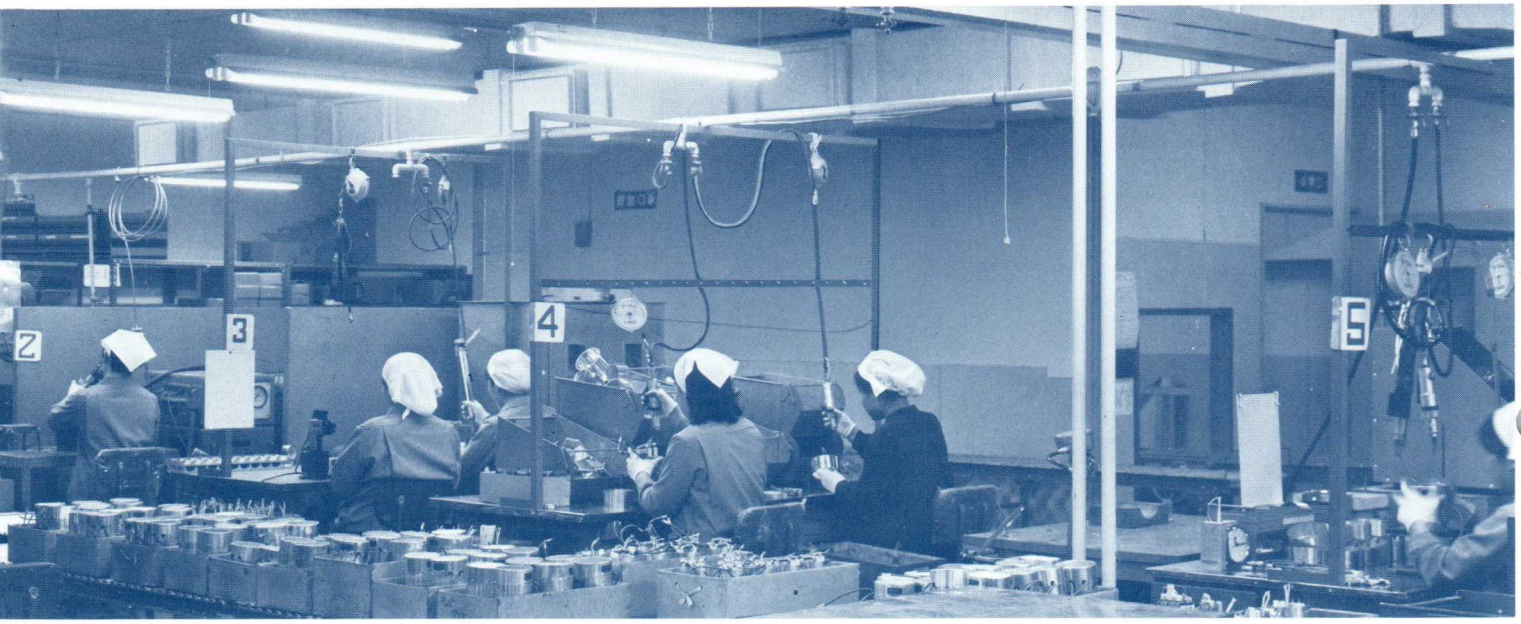
As Hitachi has its own oven manufacturing plant within the company, technological developments of magnetrons are always cooperatively made among the research and engineering teams of various fields.

HITACHI MOBARA WORKS



DISTINCTIVE FEATURES OF HITACHI MAGNETRONS

The Hitachi magnetrons are designed, manufactured and quality controlled on the basis of detailed analysis of various operating and environmental conditions that may occur in the use of microwave ovens. Outstanding reliability and wide range of adaptability are both particular features of Hitachi magnetrons. Most of important materials for tube parts are made by ourselves. High alumina ceramic and Fe-Ni-Co alloy for sealing, oxygen-free copper for anode, thoriated tungsten for filament, and even the magnets are all made with fully controlled quality at the factories in Hitachi-group.



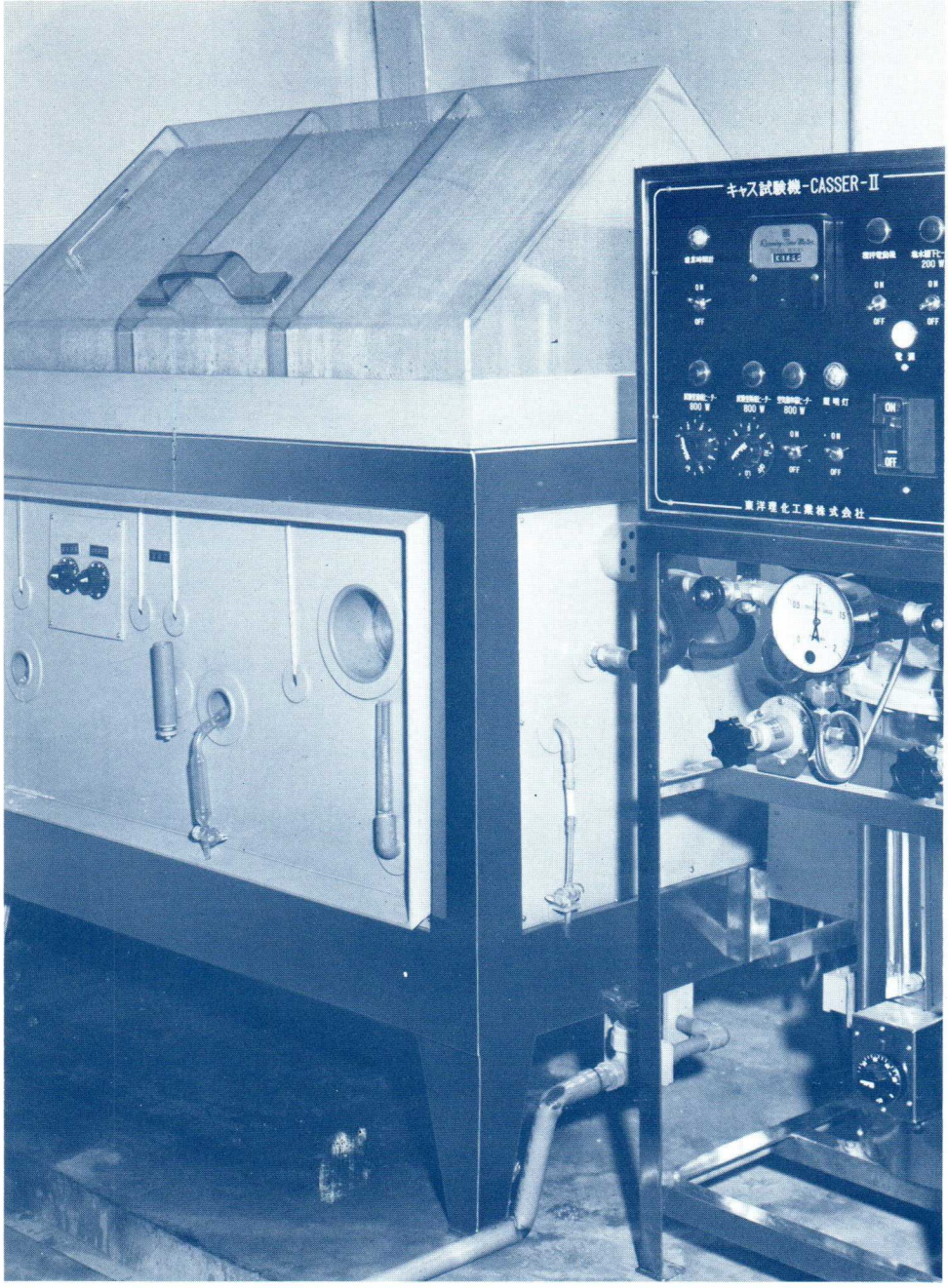
1. Entirely Ceramic and Metal Construction

Since the beginning of development program of magnetrons for MW-oven, we have consistently employed metal and ceramic design throughout for all tube types. This design philosophy is based on the fact that ceramics have many advantages over glass in being more endurable to severe operating conditions in a MW-oven.

- ○ Larger thermal stability avoids cracking or spot-melting often seen with glass construction.
- ○ Higher steadiness to the thermal stresses increases safety margin for on-off operation of filament.
- ○ Mechanically more rugged, easier handling or mounting.
- ○ Higher temperature during exhausting in tube processing suppresses gas erolution from tube parts during magnetron operation at a high load VSWR.

Furthermore, higher dimensional preciseness of ceramic parts enables automatic assembling, and higher exhausting temperature permits short-cut of processing time. Thus, ceramic-metal construction is very advantageous also from the viewpoint of economical mass production of magnetrons.

Ceramic material used in the Hitachi magnetrons is a sort of high-alumina porcelain developed specially for electron tubes by ourselves. Hitachi has many experiences in economical mass production of ceramic power tubes since we completed a series of ceramic power tubes for UHF-TV broadcasting in 1959. This is the technical background that made Hitachi to be able to introduce the ceramic tube techniques into the production of magnetrons for MW-oven.



2. Environmental Durability

One of the important differences between the microwave communications equipment and the microwave oven is their working environments. In general, at the place where microwave oven is installed, we have to assume several bad conditions for a magnetron as a high voltage electronic part.
Hitachi magnetrons are designed to withstand every disadvantageous environments. Particularly, high voltage parts in the filament circuit are selected after strict evaluation tests and are disposed with proper distance between each other to secure insulation.
Some examples from test results of Hitachi magnetrons are as follows:

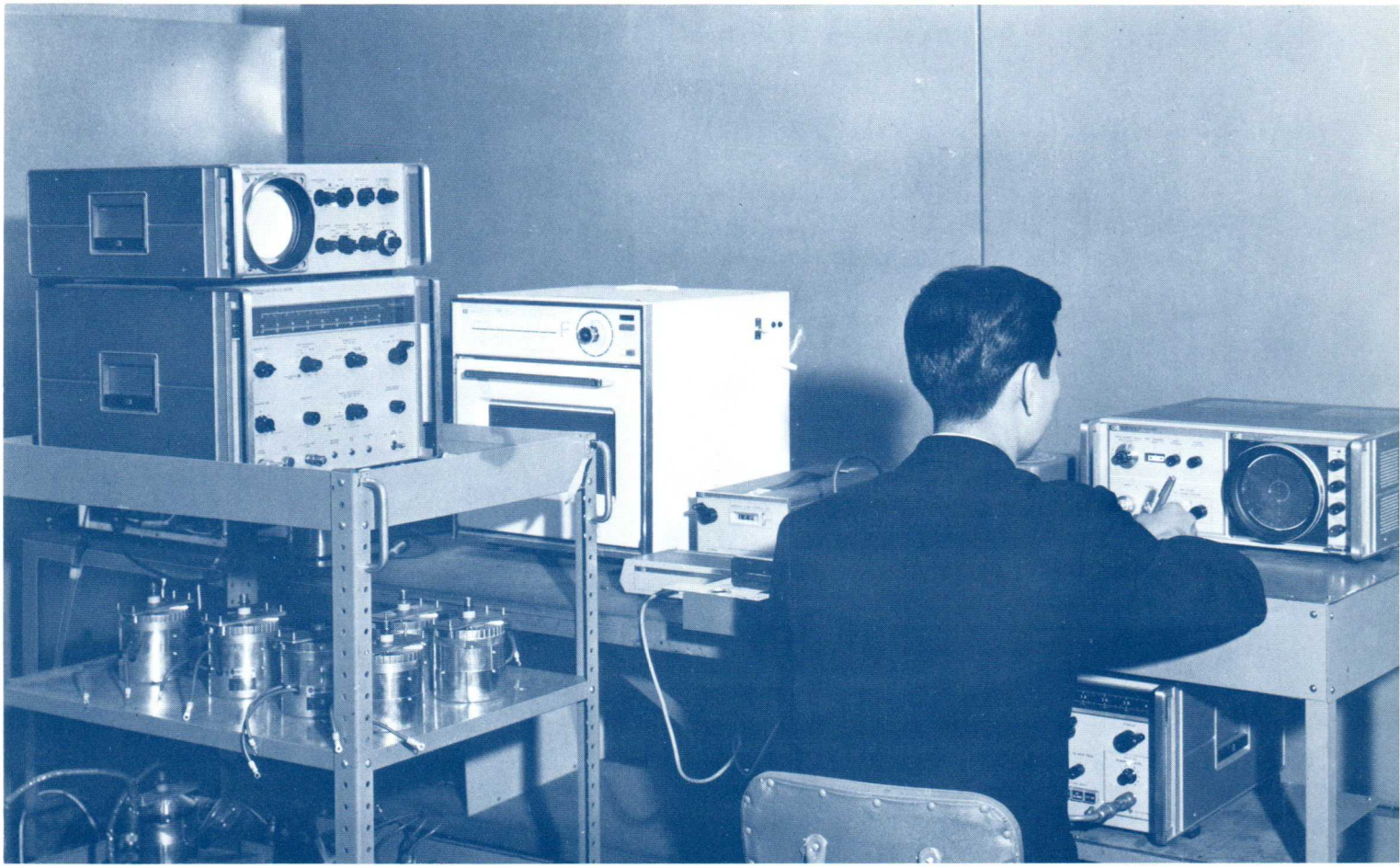
* 5% NaCl solution spray	1200 hrs	No degradation in performance.
* 10 PPM SO_2 gas atmosphere	100 hrs	Blackening of metal surface observed, but no degradation in performance.
* 10 PPM H_2S gas atmosphere	100 hrs	Same as above.
* Temperature cycling in a high humidity 10°C 100% ↔ 40°C 100% every 12 hrs	2000 hrs	No degradation.
* High temperature cycling 180°C 4hrs ↔ room temp.	5 cycles	same as above.

3. Quality Control System

Hitachi has for many years supplied high quality electron tubes, color or B & W picture tubes, numerical indicatior tubes and various electronic parts in a large quantity for OEMs in U.S., Japan and other countries. Through the production of these electron tubes or parts, a well-refined quality control system has been established. It is needless to say that this quality control system is applied for MW-oven-magnetrons.

Among many important points of quality control, we lay emphasis on suppression of failure rate at the assembly line in OEM. For instance, failure rate of magnetron in our own oven plant is as low as 0.1 percent level, and still decreasing.

On the other hand, guaranty of tube life is another point of importance. We have a sufficient amount of life test equipments including two hundred MW-ovens for checking every production lot according to a reasonable statistical rule.



4. Engineering Service

As you know, in order to realize a high degree of overall oven reliability, it is very important to determine properly the operating conditions of magnetron such as load impedance variation, power supply, cooling etc. Hitachi can offer technical informations not only about the magnetron itself, but also about its application, i.e. oven design. Skilled engineering staffs and modern measurement instruments are continuously working to obtain various useful data, which are periodically delivered to every customer as "Engineering Newsletters".

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HITACHI

CW MAGNETRON

2M141·2M161

The Hitachi 2M141 and 2M161 are continuous wave magnetrons that are capable of generating approximately 575 Watts (2M141)/830 Watts (2M161) of useful RF power output at 2450MHz (fixed).
The 2M141 and 2M161 are characterized by their high reliability with entirely ceramic-metal construction, light weight and low profile configuration.
These tubes can be used with any oven material, even magnetic, because of their concealed type magnetic circuit.
They are intended for use in domestic microwave ovens of the power output up to 450 Watts (2M141)/700 Watts (2M161). (Note.2)
The 2M141 and 2M161 are identical in outline dimensions. The 2M161 requires larger cooling air volume than the 2M141, depending on the anode dissipation.

GENERAL DATA

Electrical:

Filament; Thoriated tungsten coil

Filament voltage	3.15 ± 10% volts
Filament current	14 amperes
Heating time	2 seconds
Frequency (with a matched load)	2450 ± 10 MHz
Focusing	Built-in permanent magnet

Mechanical:

Dimensions				See outline drawing
	Width	Length	Height*	
	109 x	127 x	100	millimeters
	4.291x	5.000x	3.937	inches
Terminal connection				See outline drawing
Weight . . . . . approx.		2M141	2M161	
		1.4	1.6	kilograms
		3.2	3.6	pounds
Mounting position				any
Cooling				Forced air

* Antenna height excluded

ABSOLUTE MAXIMUM RATINGS

	Min.	Max.	
Filament voltage	2.85	3.45	volts
Heating time	0	—	seconds
Peak anode voltage 2M141		3.5	kilovolts
2M161		4.5	kilovolts
Average anode current		350	mAdc
Average anode input 2M141		1050	watts
2M161		1400	watts
	Min.	Max.	
Allowable load VSWR		4	
Load VSWR, instantaneous value at off-sink impedance		8	
Anode-cathode voltage 2M141	- 8	+ 8	kilovolts (D.C)
2M161	-10	+10	kilovolts (D.C)
Anode core temperature		180°C	
Antenna ceramic seal temperature		250°C	
Storage temperature	-30	+60°C	

TYPICAL OPERATION

With anode voltage from single-phase, full-wave rectifier without filter.

	2M141	2M161
Frequency	2450	2450 MHz
Filament voltage (in operation)	3.15	3.15 volts
Peak anode voltage	3.0	4.0 kilovolts
Average anode current	300	300 mAdc
Useful power output (standard oven)	500	720 W
Useful power output (matched load)	575	830 W
Air flow (forced air)	0.8	1.1 m^3/min.
	29	40 CFM
Static pressure drop (approx.)	4	8 mmH_2O
	0.16	0.32 $inchH_2O$

Notes:

(1) The information contained herein is tentative and may be changed without prior notice. It is therefore advisable to contact Hitachi before proceeding with the design of equipment incorporating this product.

(2) Values for 2M141 and 2M161 are described over and under the slant sign respectively.

(3) Information furnished by Hitachi is believed to be accurate and reliable. However, no license for its use is hereby conveyed under any patent and no responsibility is assumed by Hitachi for its use; nor for any infringements of patents or other rights of third parties which may result from its use.

OPERATING CONSIDERATIONS

Handling

Hitachi 2M141•2M161 are relatively robust compared with conventional glass-dome type because of its ceramic-metal construction. However, they contain a carburized thoriated tungsten filament which is essentially a very brittle material. Care must be taken to avoid giving it excessive mechanical shock.

Installation

Any mounting position is permissible. The RF connection between the magnetron and waveguide or oven is made by a built-in RF gasket. In order to secure proper contact, a circular ridge should be made around the antenna-insert-hole of the waveguide launcher or oven. A recommended waveguide launcher is shown in Fig. 5.

Cooling

Adequate air flow to limit the anode core temperature below 180°C should be delivered by a blower through the radiator during the application of filament and anode voltages. Typical cooling requirement curves are shown in Fig. 4.

Power Supply

The anode current of a permanent magnet type magnetron is very sensitive to the variation of anode voltage. Adequate constant-current circuit such as a high impedance, voltage-double rectifier is necessary.

Fig. 1 PERFORMANCE CHART

Filament voltage: 3.15 volts
Load VSWR; less than 1.1
Single-phase, full-wave rectifier without filter ibm ≒ 3 X Ib

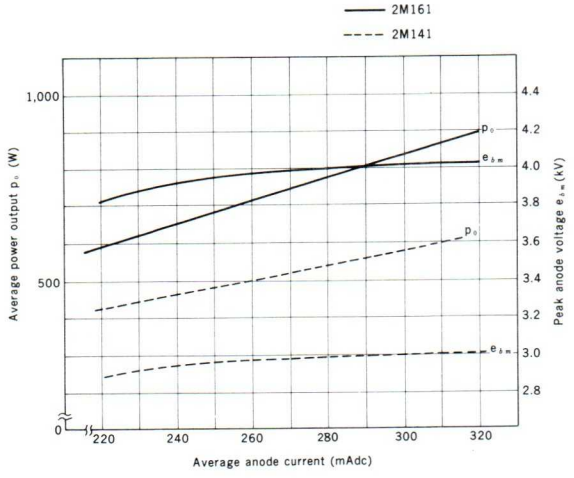


Fig. 2 TYPICAL RIEKE DIAGRAM OF 2M141

Operating conditions:
Power supply; single phase, full wave rectifier without filter
Average anode current; 300mAdc
Filament voltage; 3.15 volts

——— Power output (W)
---------- Frequency (MHz)

f_0 = 2450MHz

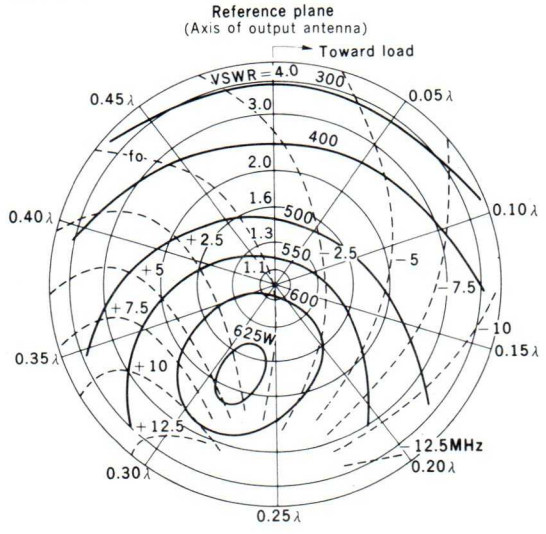


Fig. 3 TYPICAL RIEKE DIAGRAM OF 2M161

Operating conditions:
Power supply; single phase, full wave rectifier without filter
Average anode current; 300mAdc
Filament voltage; 3.15 volts

———— Power output (W)
---------- Frequency (MHz)
f_0 = 2450MHz

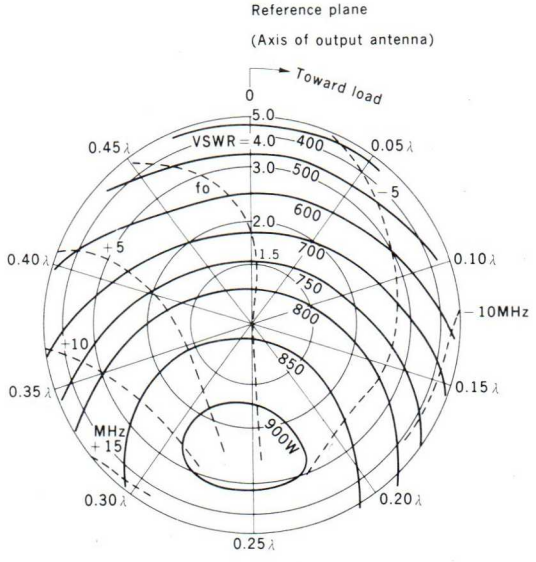
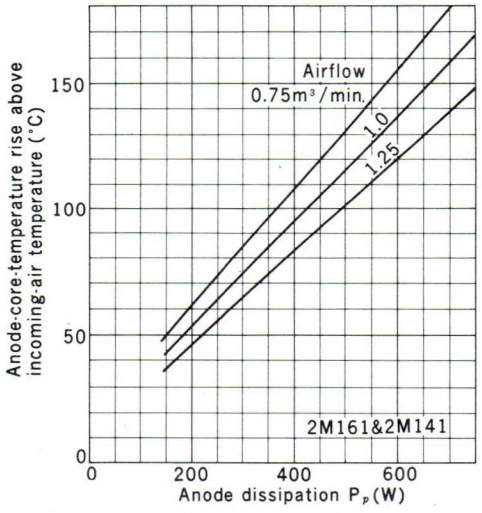


Fig. 4 COOLING REQUIREMENTS

a) Anode dissipation vs. anode core temperature rise



b) Air flow vs. static pressure drop

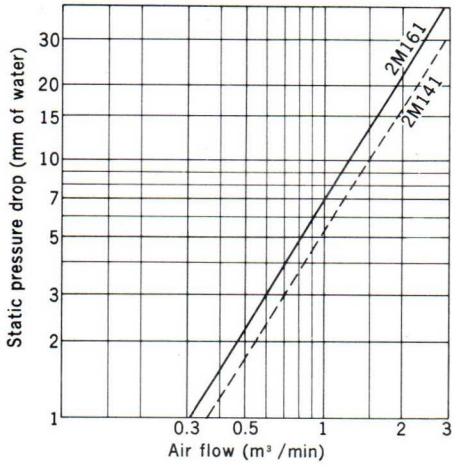
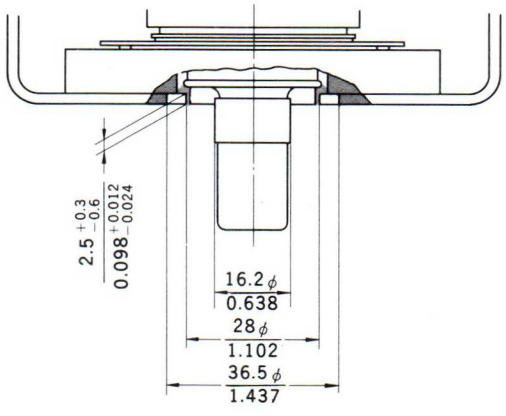
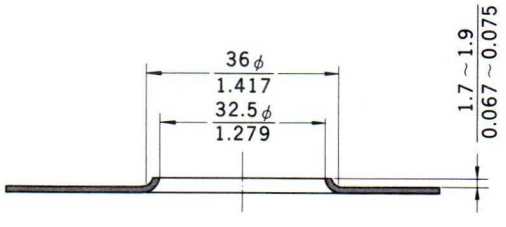


Fig. 5 RECOMMENDED WAVEGUIDE LAUNCHER

a) Details of RF connection Dimensions in millimeters / inches

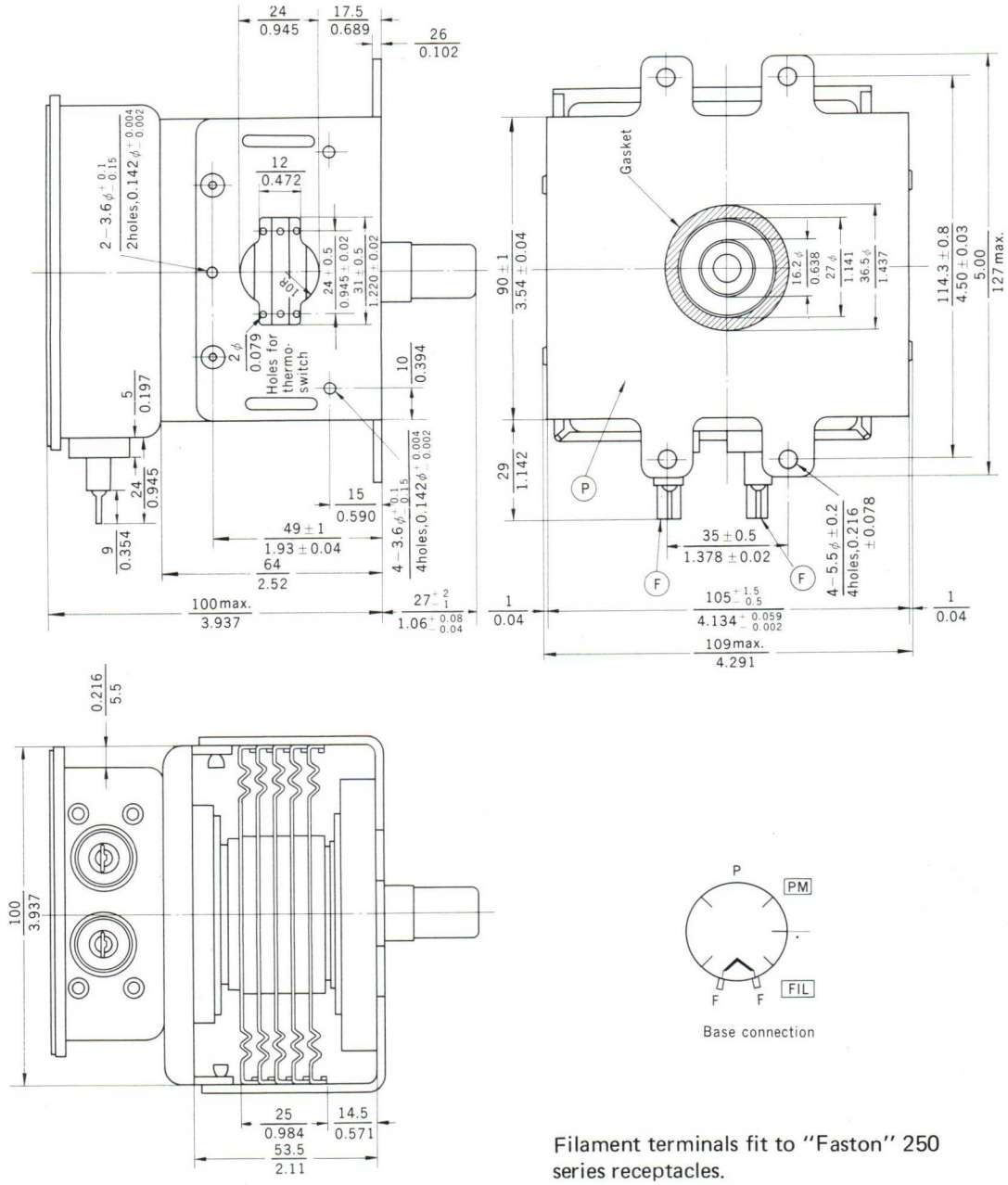


b) Details of waveguide contact



DIMENSIONAL OUTLINE OF 2M141 and 2M161

Dimensions in millimeters / inches



Base connection

Filament terminals fit to "Faston" 250 series receptacles.

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HITACHI

CW MAGNETRON

2M143·2M153·2M163

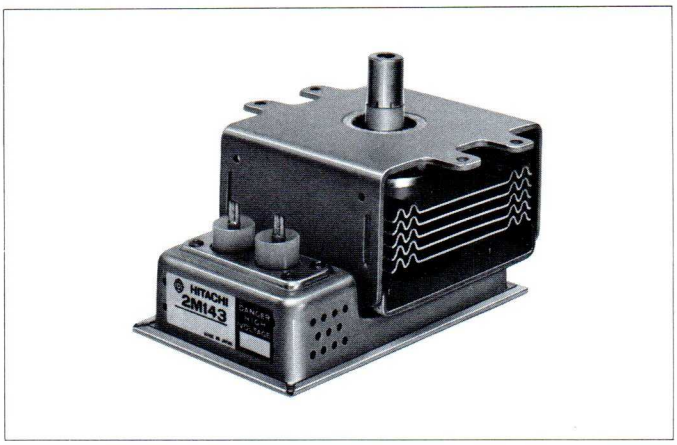
TENTATIVE DATA

The Hitachi 2M143, 2M153 and 2M163 are continuous wave magnetrons that are capable of generating approximately 575 watts (2M143) / 700 watts (2M153) / 840 watts (2M163) of useful RF power output at 2,450 MHz (fixed) into a matched load.

The Hitachi 2M143, 2M153 and 2M163 are characterized by their high reliability with entirely ceramic-metal construction, light weight and low profile configuration (76 mm max*).

These tubes can be used with any oven material even magnetic, because of their concealed type magnetic circuit.

They are intended for use in domestic microwave oven of the power output up to 480 watts (2M143) / 580 watts (2M153) / 700 watts (2M163).



GENERAL DATA

Electrical:

Filament: Thoriated tungsten

Filament voltage	2M143	3.3 ± 0.45	volts
	2M153	3.15 ± 10%	volts
	2M163	3.15 ± 10%	volts
Filament current	2M143	14.5	amperes
	2M153	14	amperes
	2M163	14	amperes
Heating time		3	seconds
Frequency (with a matched load)		2,450 $^{+20}_{-10}$	MHz
Focusing		Built in permanet magnet	

Mechanical:

Dimensions ..... See outline drawing

Width		Length		Height*	
100	x	80	x	75	millimeters
3.94	x	3.14	x	2.95	inches

*Antenna height excluded

Weight ..... approx.

2M143	2M153	2M163	
1.4	1.5	1.6	kilograms
3.1	3.3	3.5	pounds

Operating position ..... any

Cooling ..... forced air

ABSOLUTE MAXIMUM RATINGS

		Min.	Max.	
Filament voltage	2M143	2.85	3.75	volts
	2M153	2.85	3.45	volts
	2M163	2.85	3.45	volts
Heating time		0	—	seconds
Peak anode voltage	2M143	—	3.5	kilovolts
	2M153	—	3.8	kilovolts
	2M163	—	4.5	kilovolts
Average anode current		—	350	mAdc
Average anode input	2M143	—	1,050	watts
	2M153	—	1,200	watts
	2M163	—	1,400	watts
Load VSWR		—	4	
Load VSWR, instantaneous value at off-sink impedance		—	8	
Anode-cathode voltage (D.C)		−10	+10	kilovolts
Anode core temperature		—	180	°C
Antenna ceramic seal temperature		—	250	°C
Storage temperature		−30	+60	°C

Notes:

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〈June./1974〉

TYPICAL OPERATION

With anode voltage from single-phase, full-wave rectifier without filter.

	2M143	2M153	2M163	
Frequency	2,450	2,450	2,450	MHz
Filament voltage (in operation)	3.3	3.15	3.15	volts
Peak anode voltage	3.0	3.5	4.0	kilovolts
Average anode current	300	300	300	mAdc
Useful power output (matched load)	575	700	840	watts
Useful power output (standard oven)	500	580	720	watts
Air flow (Forced air)	0.8(28)	0.9(32)	1.1(39)	m^3/min. (CFM)
Static pressure drop (approx.)	5(.2")	6(.24")	7.5(.3")	mm H_2O (inch H_2O)

Fig. 1. PERFOMANCE CHART

Operating conditions:
Filament voltage: 3.15 volts
Load VSWR: less than 1.1
Single-phase, full-wave rectifier without filter $i_{bm} = 3 \times I_b$

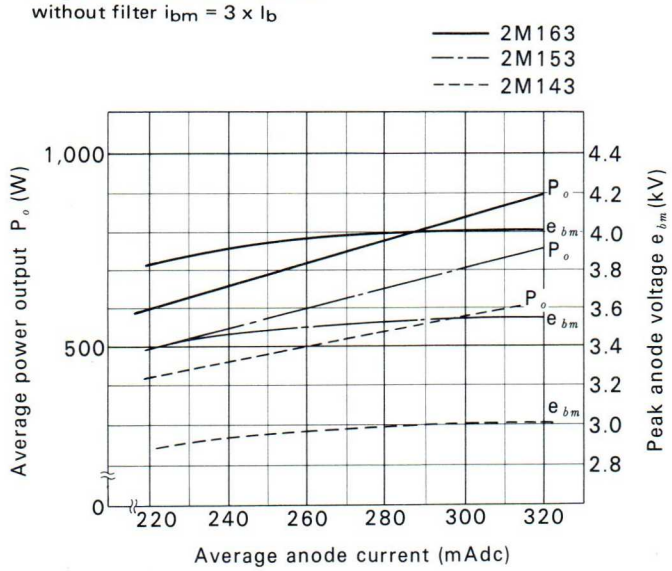
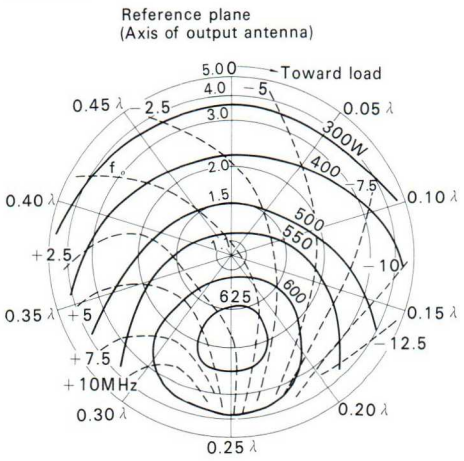


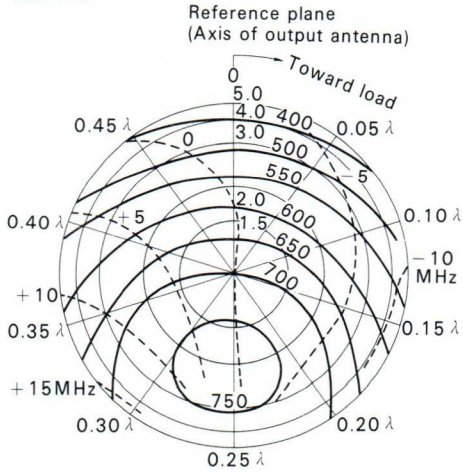
Fig. 2. TYPICAL RIEKE DIAGRAMS

Operating conditions:
Power supply: Single phase, full wave rectifier without filter
Average anode current: 300 mAdc
Filament voltage: 3.3 volts (2M143), 3.15 volts (2M153, 2M163)
———— Power output (W)
---------- Frequency (MHz)
f_0 = 2,450 MHz

2M143



2M153



2M163

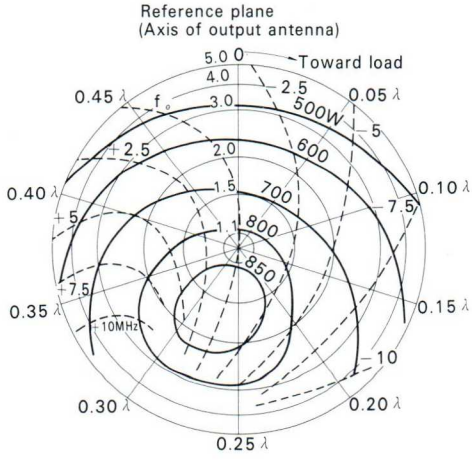
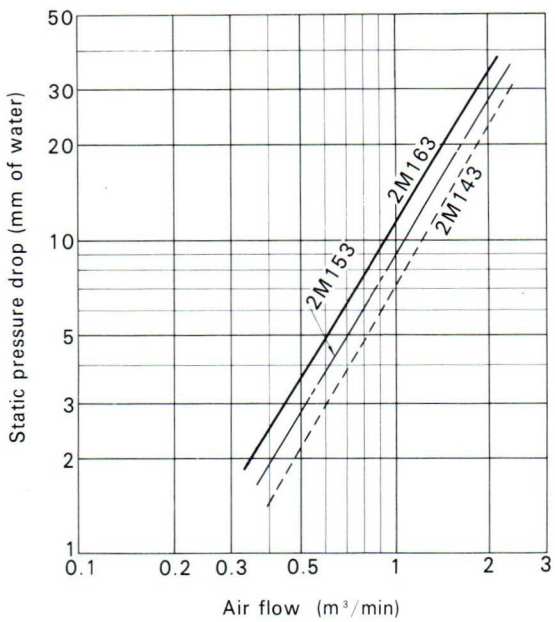
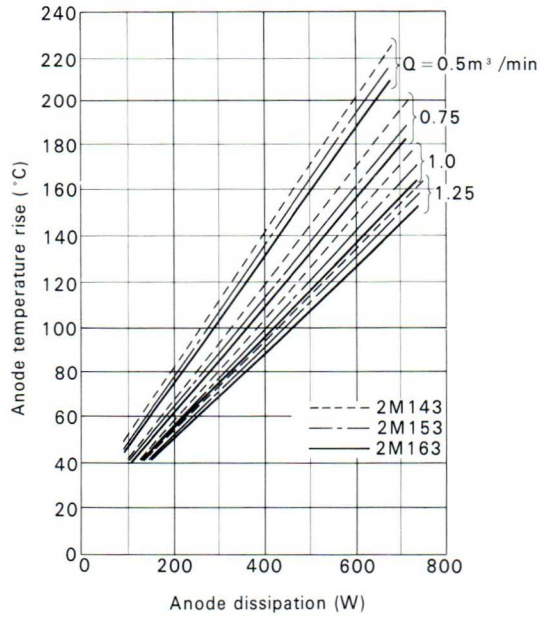


Fig. 3. COOLING REQUIREMENTS

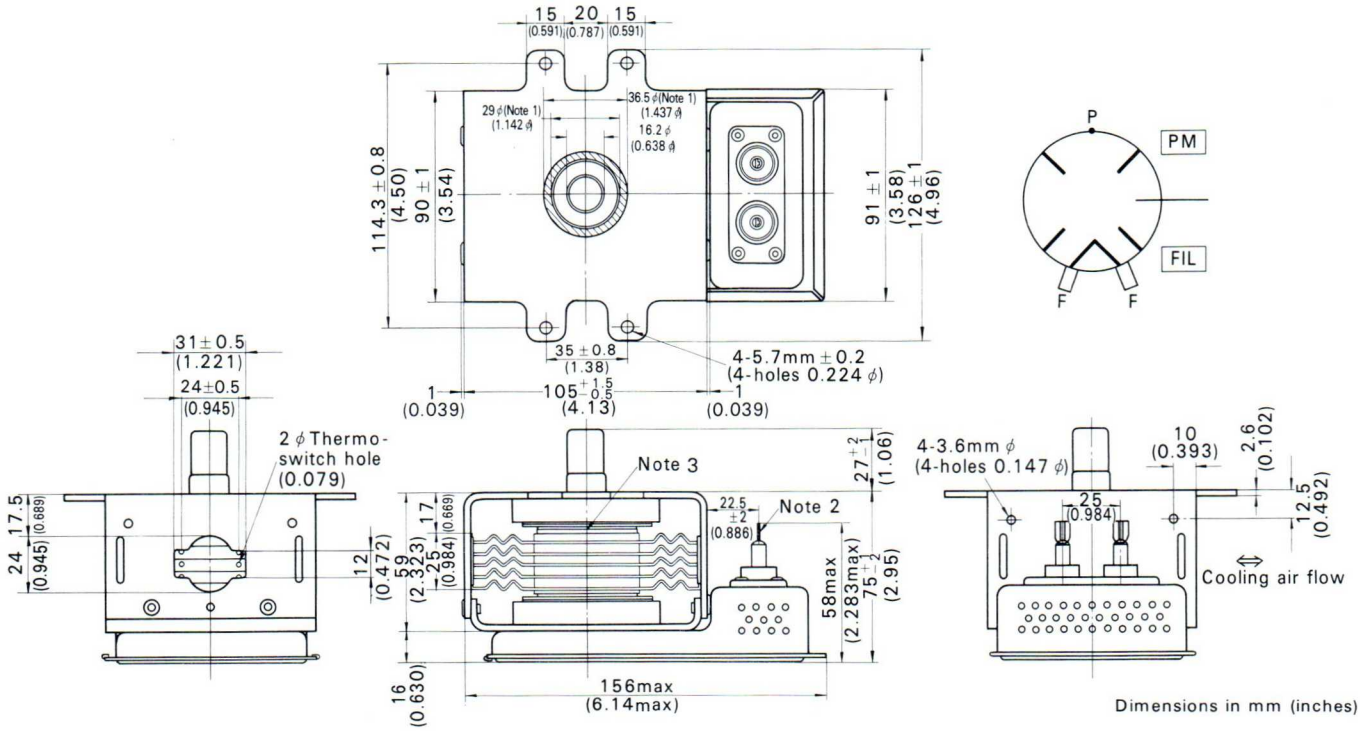


(a) Air flow vs. static pressure drop



(b) Anode dissipation vs. anode temperature rise

2M143, 2M153, 2M163 DIMENSIONAL OUTLINE



Note:

1. Outer and inner diameters of rf. gasket.
2. Adapted for A.M.P. INC. 250 series faston tabs.
3. Measurement point of anode core temperature.

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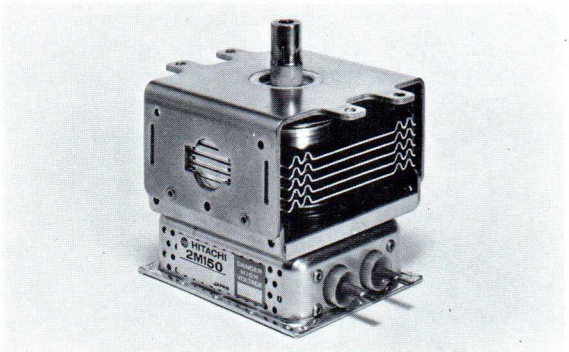
HITACHI

CW MAGNETRON

2M150

TENTATIVE DATA

The Hitachi 2M150 is continuous wave magnetron that is capable of generating approximately 700 Watts of useful RF power output at 2,450 MHz (fixed) into matched load. The 2M150 is characterized by their high reliability with entirely ceramic-metal construction, light weight and low profile configuration. This tube can be used with any oven material, even magnetic, because of their concealed type magnetic circuit. It is intended for use in domestic microwave oven of the power output up to 600 Watts.



GENERAL DATA

Electrical:

Filament; thoriated tungsten

Filament voltage	3.15 ± 10%	volts
Filament current	14	amperes
Heating time	2	seconds
Frequency (with a matched load)	2,450 ± 10	MHz
Focusing	Built-in permanent magnet	

Mechanical:

Dimensions ..... See outline drawing

Width	Length	Height*	
109	127	100	millimeters
4.291	5.000	3.937	inches

Terminal connection ..... See outline drawing
Weight (approx.) ..... 1.5 kilograms (3.4 pounds)
Mounting position ..... Any
Cooling ..... Forced air

*Antenna height excluded

ABSOLUTE MAXIMUM RATINGS

	Min.	Max.	
Filament voltage	2.85	3.45	volts
Heating time	0	—	seconds
Peak anode voltage	—	3.8	kilovolts
Average anode current	—	350	mAdc
Average anode input	—	1,200	watts
Allowable load VSWR	—	4	
Load VSWR, instantaneous value at off-sink impedance	—	8	
Anode-cathode voltage	−9	+9	kilovolts(D.C)
Anode core temperature	—	180	°C
Antenna ceramic seal temperature	—	250	°C
Storage temperature	−30	+60	°C

TYPICAL OPERATION

With anode voltage from single-phase, full-wave rectifier without filter.

Frequency	2,450	MHz
Filament voltage (in operation)	3.15	volts
Peak anode voltage	3.5	kilovolts
Average anode current	300	mAdc
Useful power output (standard oven)	600	W
Useful power output (matched load)	700	W
Air flow (forced air)	0.9 (32	m^3/min. CFM)
Static pressure drop (approx.)	5 (0.20	mm H_2O inch H_2O)

Notes:

(1) The information contained herein is tentative and may be changed without prior notice. It is therefore advisable to contact Hitachi before proceeding with the design of equipment incorporating this product.

(2) Information furnished by Hitachi is believed to be accurate and reliable. However, no license for its use is hereby conveyed under any patent and no responsibility is assumed by Hitachi for its use; nor for any infringements of patents or other rights of third parties which may result from its use.

June/1974

OPERATING CONSIDERATIONS

Handling

Hitachi 2M150 is relatively robust compared with conventional glass-dome type because of its ceramic-metal construction. However, it contains a carburized thoriated tungsten filament which is essentially a very brittle material. Care must be taken to avoid giving it excessive mechanical shock.

Installation

The RF connection between the magnetron and waveguide or oven is made by a built-in RF gasket. In order to secure proper contact, a circular ridge should be made around the antenna-insert-hole of the waveguide launcher or oven. A recommended waveguide launcher is shown in Fig. 4.

Cooling

Adequate air flow to limit the anode core temperature below 180°C should be delivered by a blower through the radiator during the application of filament and anode voltages. Typical cooling requirement curves are shown in Fig. 3.

Power Supply

The anode current of a permanent magnet type magnetron is very sensitive to the variation of anode voltage. Adequate constant-current such as a high impedance, voltage-double rectifier is necessary.

Fig. 1 PERFORMANCE CHART

Filament voltge: 3.15 volts
Load VSWR; less than 1.1
Single-phase, full-wave rectifier
without filter ibm ≒ 3 x Ib

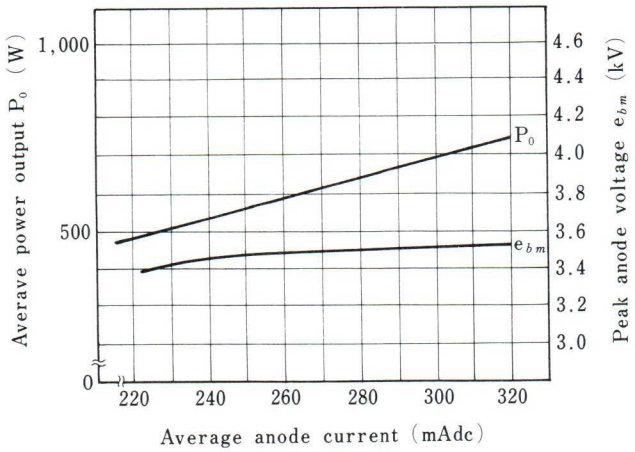


Fig. 2 TYPICAL RIEKE DIAGRAM

Operating conditions:
Power supply; single phase, full wave
rectifier without filter
Average anode current: 300 mAdc
Filament voltage: 3.15 volts

—— Power output (W)
- - - - - Frequency (MHz)
f_O = 2,450 MHz

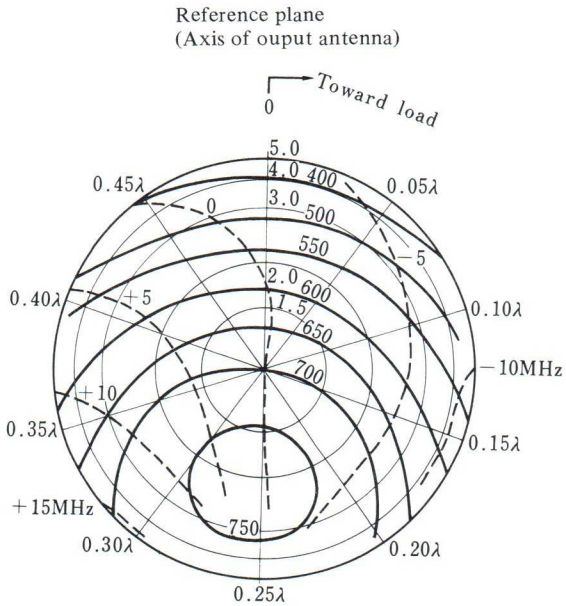
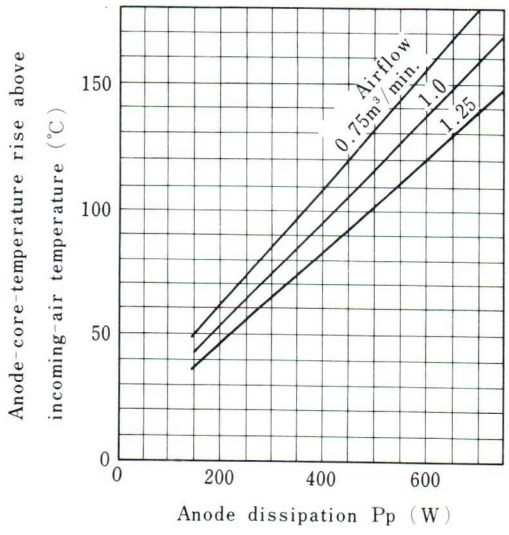


Fig. 3 COOLING REQUIREMENTS

a) Anode dissipation vs. anode core temperature rise



b) Air flow vs. static pressure drop

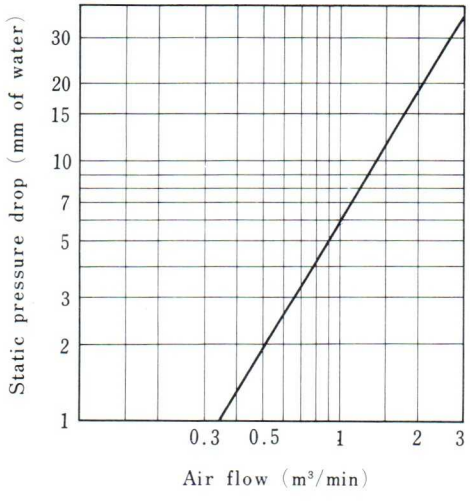
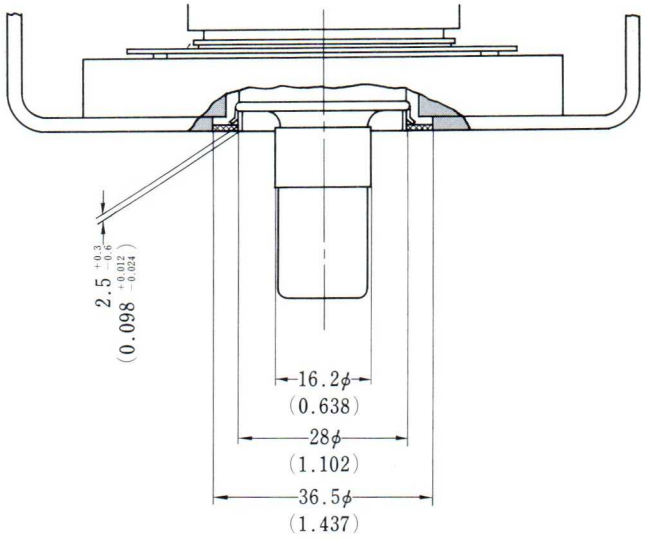


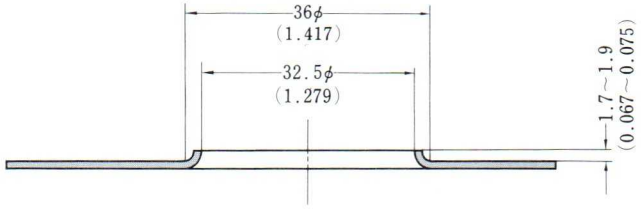
Fig. 4 RECOMMENDED WAVEGUIDE LAUNCHER

Dimensions in millimeters
(inches)

a) Details of RF connection

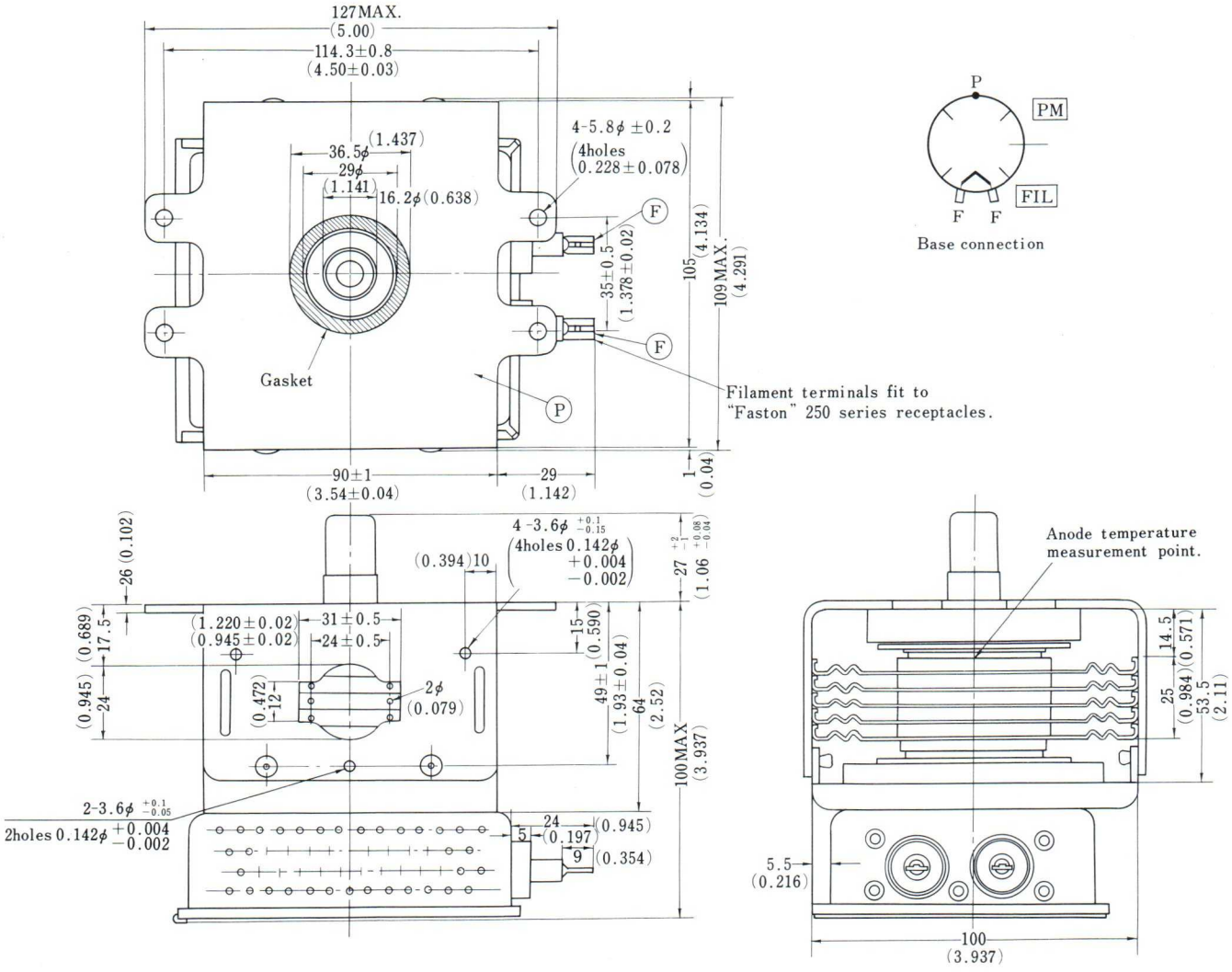


b) Details of waveguide contact



DIMENSIONAL OUTLINE

Dimensions in millimeters
(inches)



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Catalog No. CE-E353 Printed in Japan NS-N(H)

HITACHI ELECTRON TUBE

H3032A

CW MAGNETRON

HITACHI H3032A is a fixed tuned, permanent-magnet focused, ceramic-metal magnetron that is capable of generating useful continuous RF power output of 885 watts at high efficiency. It is useful as a 2450 MHz RF power source in a domestic microwave oven.

GENERAL DATA

Electrical:

Filament; Thoriated tungsten coil

Filament voltage	3.15	volts
Filament current	13	amperes
Heating time	5	seconds
Frequency	2450±10	MHz
Focusing	Built-in permanent magnet	

Mechanical:

Operating position	Vertical, either end up
Maximum Overall Length	170 millimeters max. (6.69 inches max.)
Maximum Width	112 × 130 millimeters max. (4.41 × 5.12 inches max.)
Terminal Connection	See Dimensional Outline
Weight (approx.)	1.65 kilograms (3.64 pounds)

Thermal:

Ceramic Insulator Temperature	250°C max.
Metal Surface Temperature	150°C max.
Cooling	Forced Air

ABSOLUTE MAXIMUM RATINGS

	Min.	Max.	
Filament Voltage	3.0	3.3	volts
Heating time	3	—	seconds
Peak Anode Voltage		4.5	kV peak
DC Anode Current		350	mAdc
Average Anode Input		1,400	Watts
Allowable Load VSWR		4	
Anode Core Temperature		150	°C

TYPICAL OPERATION

With anode voltage from single-phase, full-wave rectifier without filter.

At 2450 MHz

Filament Voltage	3.15	Volts
Peak Anode Voltage	4.2	kV peak
DC Anode Current	300	mAdc
Useful Power Output (Matched Load)	885	watts
Air Flow	1.2	m^3/min (42.4 CFM)
Static Pressure Drop	10	millimeters of water (0.4 inches of water)

*Information furnished by Hitachi Ltd. is believed to be accurate and reliable. However, no responsibility is assumed by Hitachi for its use; nor for any infringements of patents or other rights of third parties which may result from its use.

OPERATING CONSIDERATIONS

Handling

Hitachi H3032A is relatively robust compared with conventional glass-dome type because of its ceramic-metal construction. However, it contains a carburized thoriated tungsten filament which is essentially a very brittle material. Care must be taken to avoid giving it excessive mechanical shock.

Installation

The mounting position should be with axis vertical, either end up or down. The RF connection between the magnetron and waveguide or oven is made by a built-in RF gasket. In order to secure proper contact, a circular ridge should be made around the antenna-insert-hole of the waveguide launcher or oven. A recommended waveguide launcher is shown in Fig. 5.

Cooling

Adequate air flow to limit the anode core temperature below 150°C should be delivered by a blower through the radiator during the application of filament and anode voltages. Typical cooling requirement curves are shown in Fig. 3.

Power Supply

The anode current of a permanent magnet type magnetron is very sensitive to the variation of anode voltage. Adequate constant-current circuit such as a high impedance, voltage-doubler rectifier is necessary.

Fig. 1 PERFORMANCE CHART

Operating Conditions:
Filament Voltage: 3.15 V
Anode Power Source: Single-phase. Full-wave Rectifier without Filter, ibm=3×Ib
Load VSWR: less than 1.1

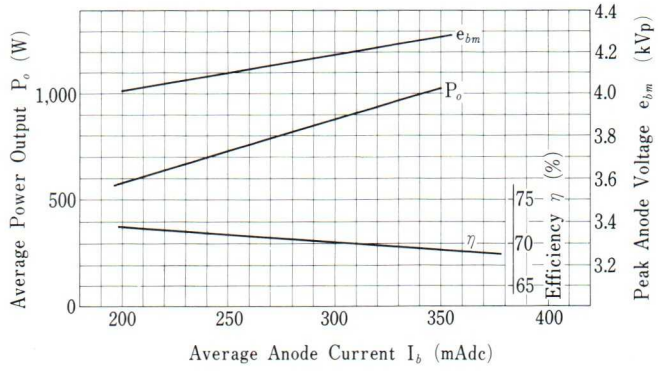


Fig. 2 RIEKE DIAGRAM

Operating Conditions:
Ef=3.15V
Ib=300 mA
Single-Phase, Full-wave Rectifier without Filter
——Power Output
——Frequency
Oscillating Frequency with Matched Load: 2450 MHz

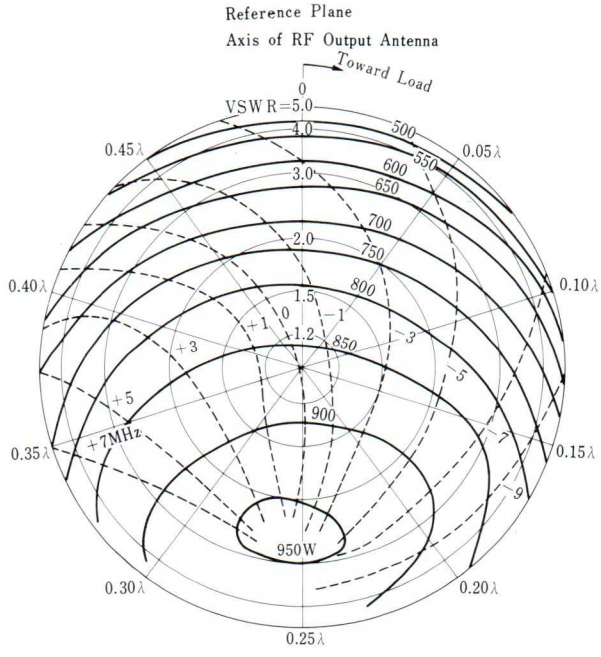
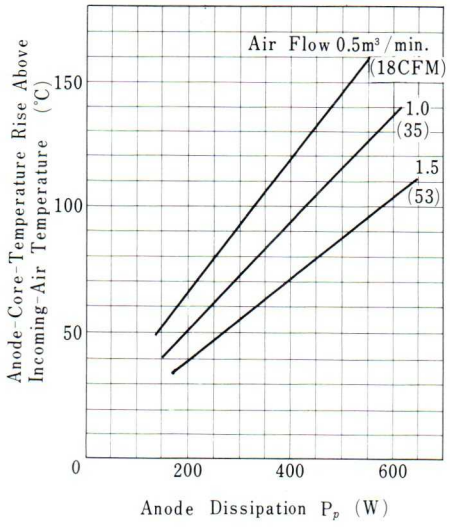
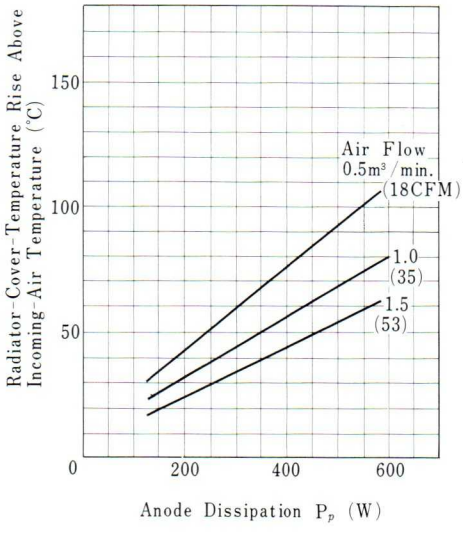


Fig. 3 COOLING REQUIREMENTS





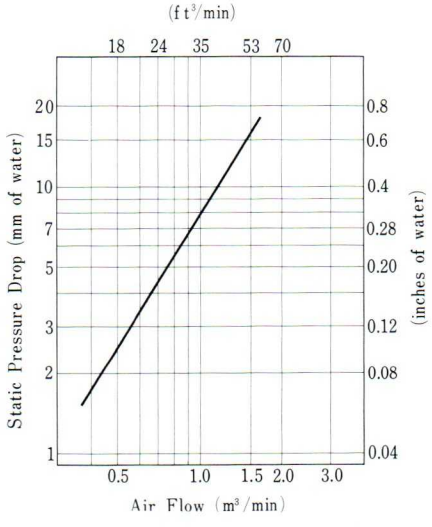


Fig. 4 BACK PLUNGER CHARACTERISTICS

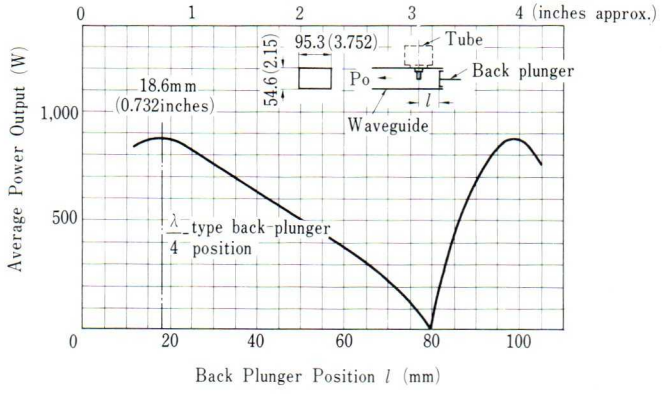
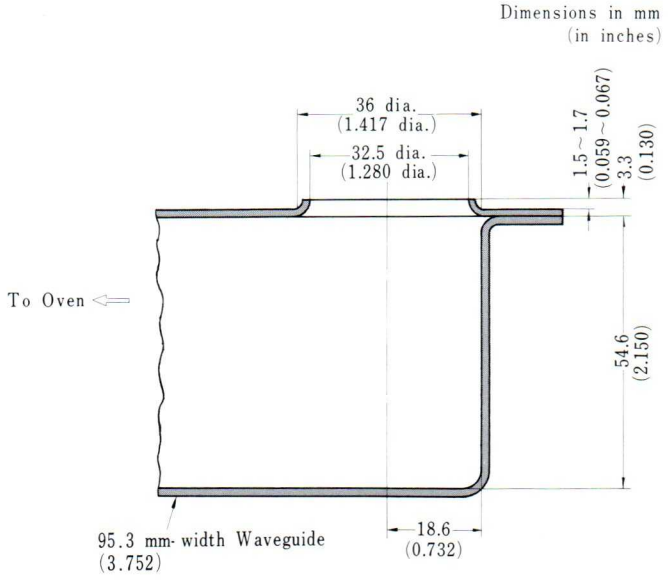
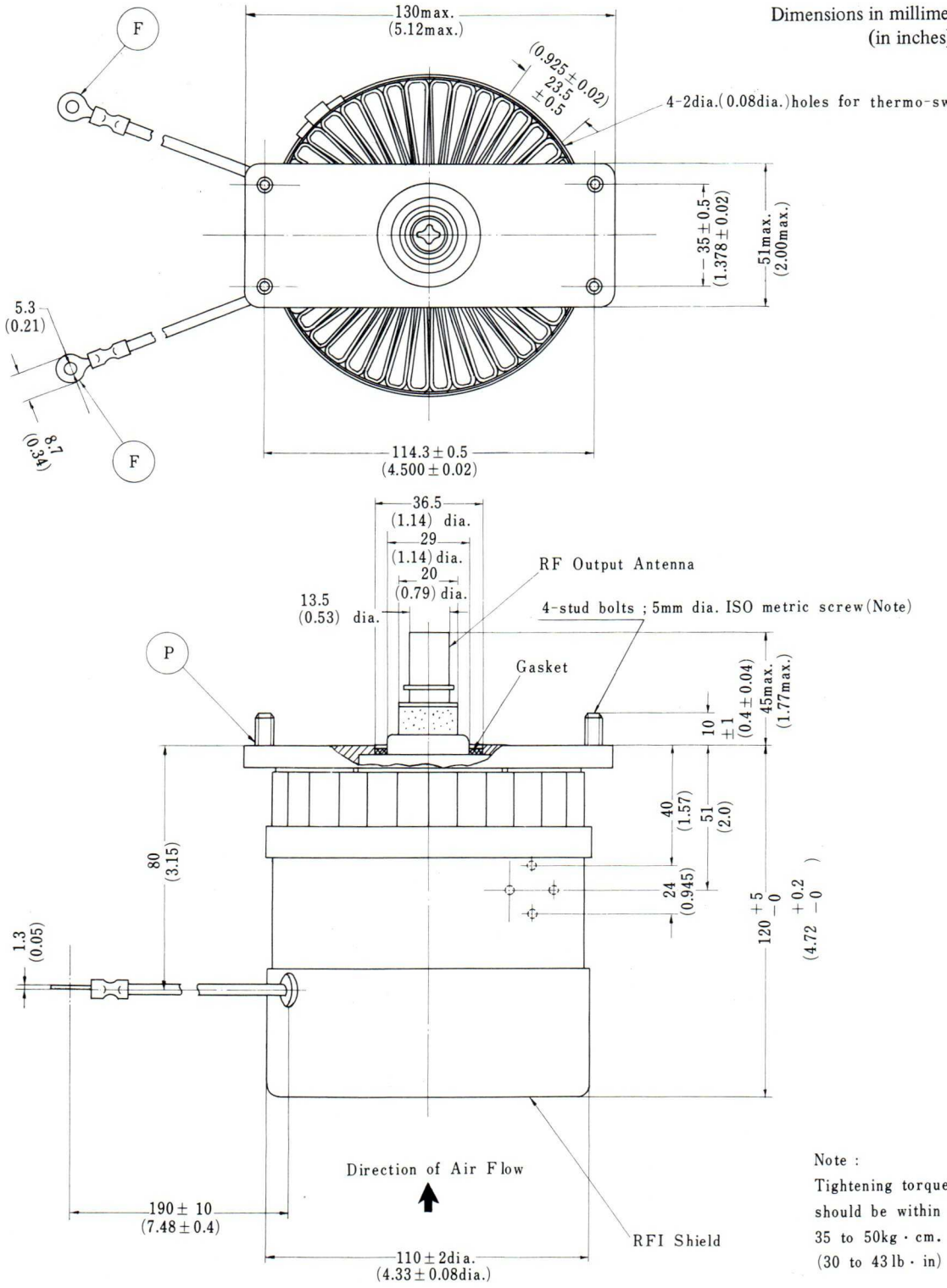


Fig. 5 RECOMMENDED WAVEGUIDE LAUNCHER



DIMENSIONAL OUTLINE H3032A

Dimensions in millimeters
(in inches)



Note :
Tightening torque
should be within
35 to 50kg · cm.
(30 to 43lb · in)

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Catalog No. CE-E180 Printed in Japan NT-G(H)

HITACHI

CW MAGNETRON

2M53(H)

The HITACHI 2M53(H) is a fixed-tuned, permanent-magnet-focused, ceramic-metal magnetron that is capable of generating, useful continuous RF power output of 830 watts at high efficiency. It is useful as a 2450 MHz RF power source in a domestic microwave oven.

The HITACHI 2M53(H) is interchangeable with the 2M53.

GENERAL DATA

Electrical:

Filament; thoriated tungsten coil
- Filament voltage ..... 3.15 volts
- Filament current ..... 13 amperes
- Heating time ..... 5 seconds

Frequency ..... 2450±10MHZ
Focusing ..... Built-in permanent magnet

Mechanical:

Operating position ..... any
Maximum overall length ..... 170 millimeters (6.69 inches)
Maximum width ..... 112 x 130 millimeters (4.41 x 5.12 inches)
Terminal connection ..... See dimensional outline
Weight (approx.) ..... 1.65 kilograms (3.64 pounds)

Thermal:

Ceramic insulator temperature ..... 250°C max.
Anode core temperature ..... 150°C max.
Cooling ..... Forced air

ABSOLUTE MAXIMUM RATINGS

	Min.	Max.	
Filament voltage	3.0	3.3	volts
Heating time	3	—	seconds
Peak anode voltage	—	4.5	kVp
DC anode current	—	350	mA
Average anode input	—	1,400	W
Allowable load VSWR	—	4	
Anode core temperature	—	150	°C

TYPICAL OPERATION

With anode voltage from single-phase, full-wave rectifier without filter.

At 2450 MHz:

Filament voltage	3.15	volts
Peak anode voltage	4.0	kVp
DC anode current	300	mAdc
Useful power output (matched load)	830	watts
Air flow	1.2	m^3/min
	(42.4	CFM)
Static pressure drop	3.0	mm H_2O
	(0.2	inches H_2O)

Feb./1974

OPERATING CONSIDERATIONS

Handling

The Hitachi 2M53(H) is relatively robust compared with conventional glass-dome types because of its ceramic-metal construction. However, it contains a carburized thoriated tungsten filament which is essentially a very brittle material. Care must be taken to avoid giving it excessive mechanical shock. The 2M53(H) should be handled by its yoke or by the enclosure near its clamping band.

Installation

The RF connection between the magnetron and waveguide or oven is made by a built-in RF gasket. To secure proper contact, a circular ridge should be made around the antenna-insert-hole of the waveguide launcher or oven. A recommended waveguide launcher is shown in Fig. 5.

Cooling

Adequate air flow to limit the anode core temperature below 150°C should be delivered by a blower through the radiator during the application of filament and anode voltages. Typical cooling requirement curves are shown in Fig. 3.

Power Supply

The anode current of a permanent magnet type magnetron is very sensitive to variations of the anode voltage. An adequate constant-current circuit such as a high impedance, voltage-doubler rectifier is necessary.

Fig. 1 PERFORMANCE CHART

Operating Conditions:
Filament Voltage: 3.15V
Anode Power Source: Single-phase. Full-wave Rectifier without Filter, ibm=3×Ib
Load VSWR: less than 1.1

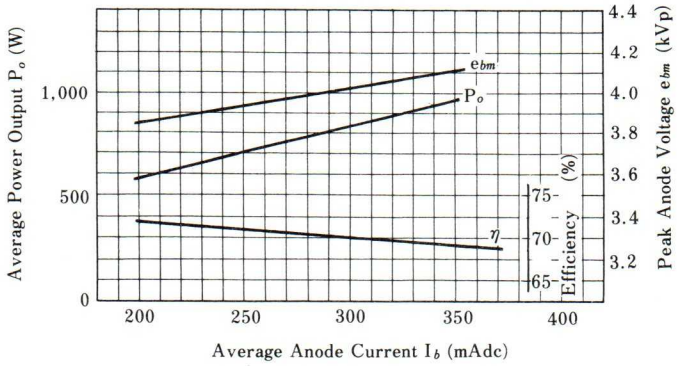


Fig. 2 TYPICAL RIEKE DIAGRAM OF 2M53(H)

Operating conditions:
Power supply; single-phase, full-wave rectifier without filter
Average anode current; 300mAdc
Filament voltage; 3.15 volts
——— Power output (W)
- - - - - - - Frequency (MHz)
f_0 = 2450MHz

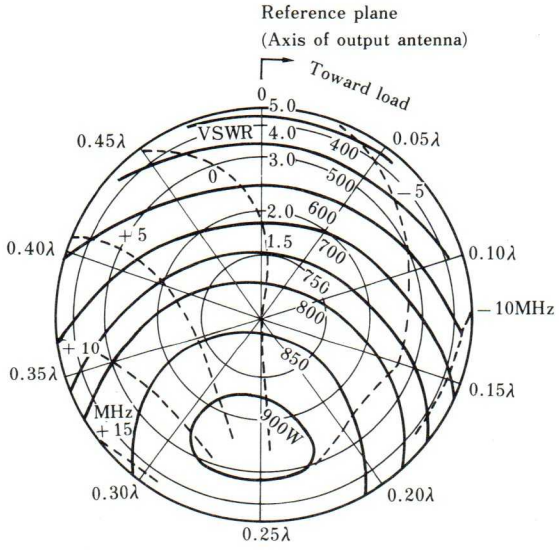
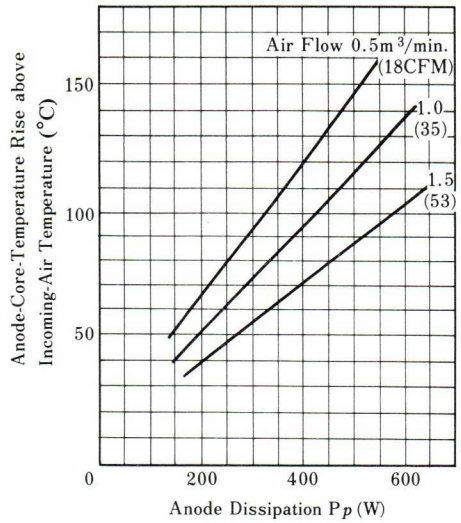
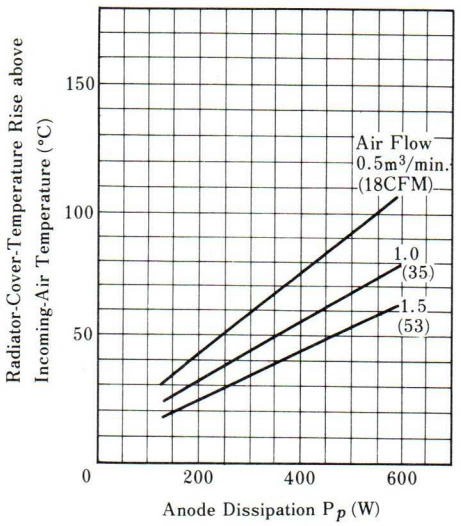


Fig. 3 COOLING REQUIREMENTS





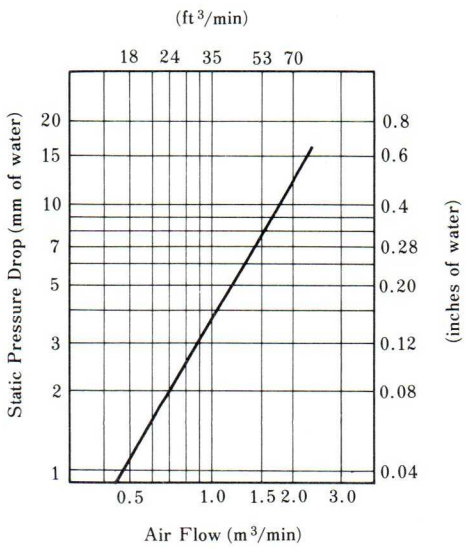


Fig. 4 BACK PLUNGER CHARACTERISTICS

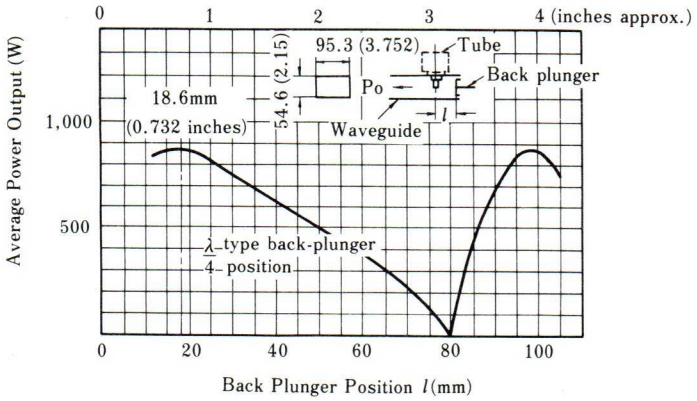
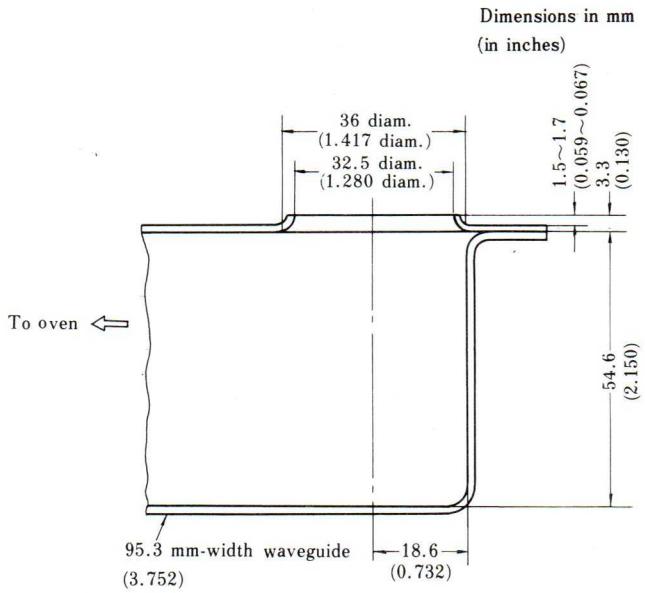
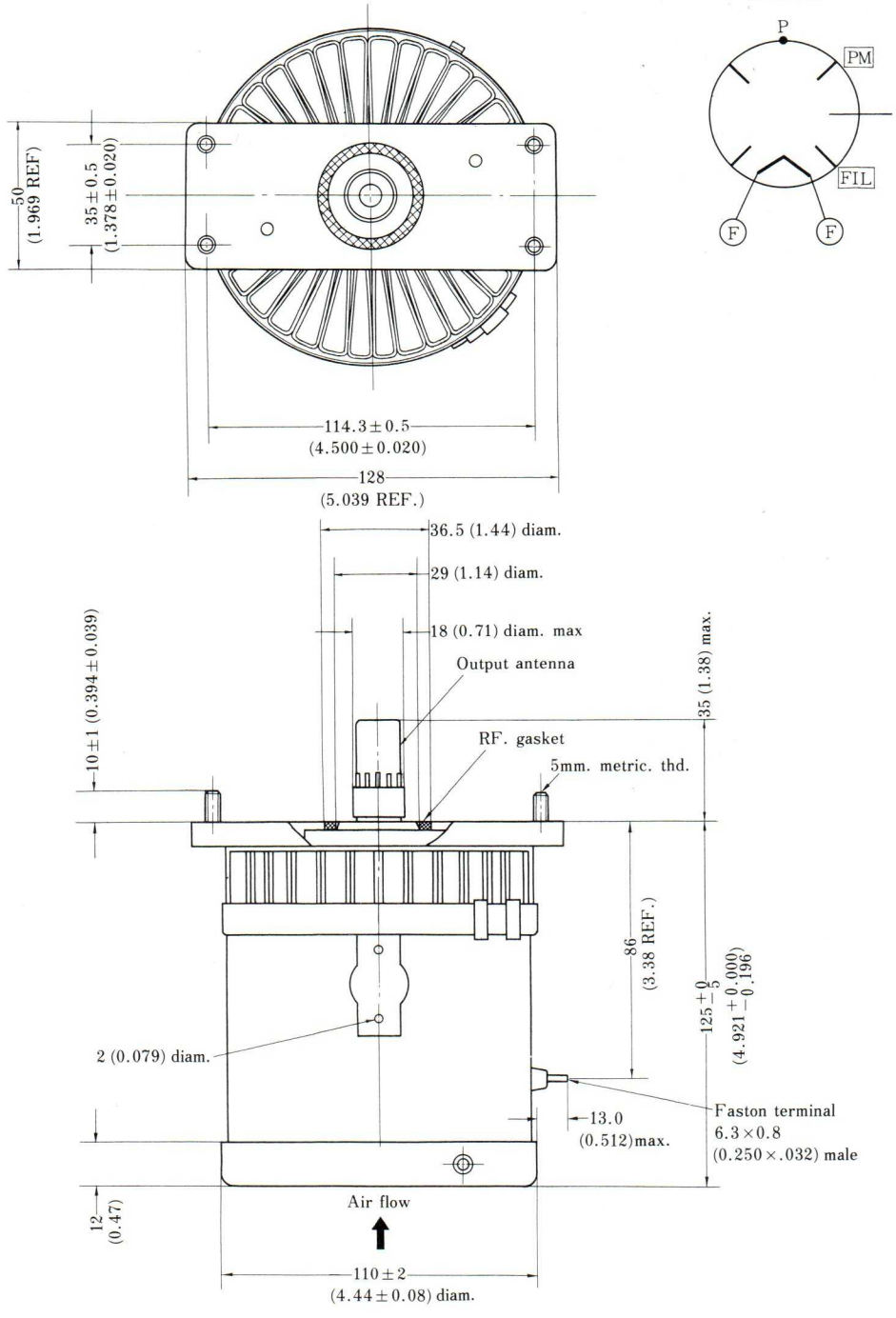


Fig. 5 RECOMMENDED WAVEGUIDE LAUNCHER



DIMENSIONAL OUTLINE

Dimensions in millimeters
(in inches)



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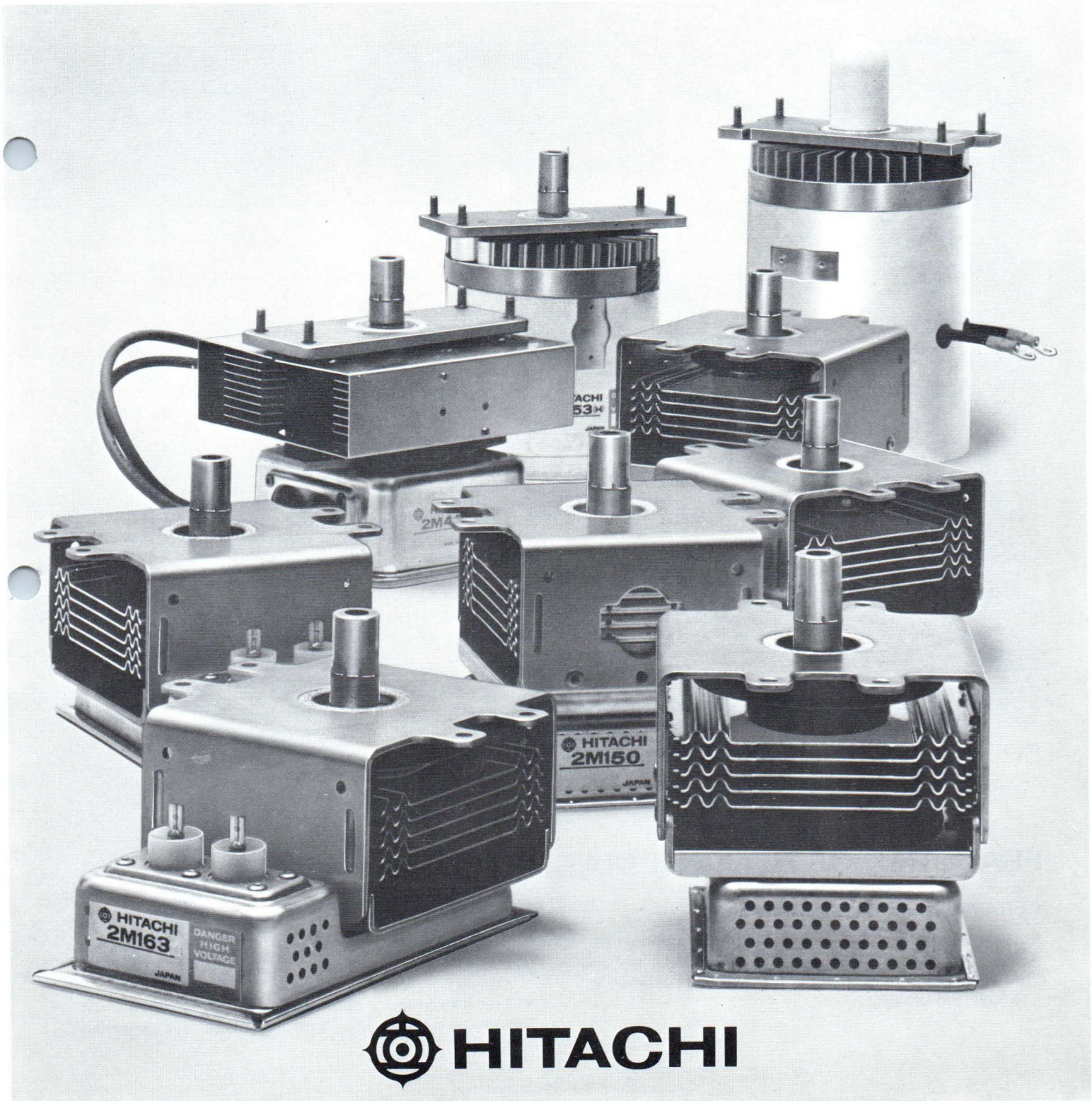
Catalog, No. CE-E028 Printed in Japan NS-H(H)

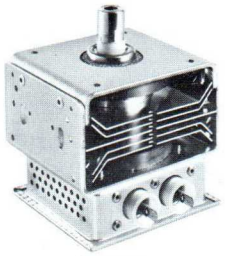
HITACHI MAGNETRONS FOR MICROWAVE OVEN USE

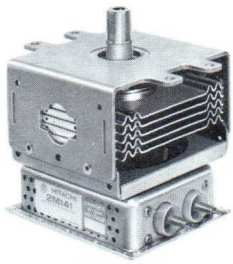
(Sept., 1975)



HITACHI

HITACHI MAGNETRONS FOR MICROWAVE OVEN USE


2M140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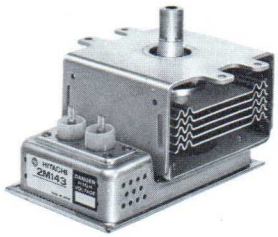
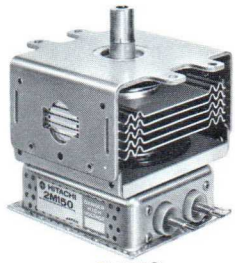

2M143


2M45


2M150

Hitachi type	Similar type	Oven output power range (W)	Filament		Typical Operation		
			Voltage (V)	Current (A)	Matched load power output (W)	Peak anode voltage (kV)	
2M140	–	300 ~ 500	3.40	10	560	4.0	
2M141	2M151	350 ~ 500	3.30	14	575	3.0	
2M143	–	350 ~ 500	3.30	14	575	3.0	
2M45	–	450 ~ 550	3.15	14	650	3.3	
2M150	2M151	450 ~ 600	3.15	14	700	3.5	
2M153	–	450 ~ 600	3.15	14	700	3.5	
2M161	2M57 · 2M59	550 ~ 750	3.15	14	830	4.0	
2M163	–	550 ~ 750	3.15	14	830	4.0	
2M71 (Note 2)	–	550 ~ 750	3.15	14	860	4.1	
2M53(H)	2M53 · DX453	550 ~ 750	3.15	14	830	4.0	
2M53(A)	–	550 ~ 750	3.15	14	830	4.0	
2M121	–	800 ~ 1,000	4.6	14	1,200	4.0	
2M123	–	800 ~ 1,000	4.6	14	1,200	4.0	
2M131	2M90 · L5001	800 ~ 1,300	4.6	19	1,600	3.6	

Note 1. Antenna height excluded. Note 2. For existing equipment only.

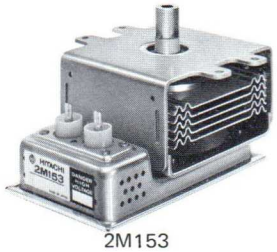
FEATURES OF HITACHI MAGNETRONS

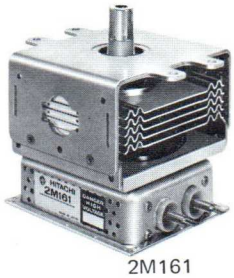
CERAMIC-METAL CONSTRUCTION

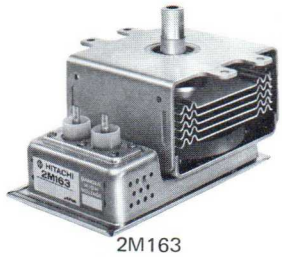
- Higher thermal stability avoids cracking or spot-melting.
- Higher temperature during exhausting suppresses gas evolution from tube parts during magnetron operation at a high load VSWR.

HIGHER RELIABILITY

- Special thoriated tungsten wire processed exclusively for magnetrons at Hitachi own factory eliminates filament sagging.
- Life tests at many different operating or environmental conditions assure quality of every parts and completed magnetrons.


2M153


2M161


2M163


2M53(H)


2M121

Average anode current (mA)	Frequency (MHz)	Cooling forced air	Magnetic field	Weight (kg/lb)	(Note 1) Height (mm/inch max.)	Hitachi type
200	2,450	Horizontal	Ferrite	1.2/2.66	85/3.346	2M140
300	2,450	Horizontal	Ferrite	1.4/3.1	100/3.937	2M141
300	2,450	Horizontal	Ferrite	1.4/3.1	76/2.992	2M143
300	2,450	Horizontal	Alnico	1.5/3.3	106/4.173	2M45
300	2,450	Horizontal	Ferrite	1.5/3.3	100/3.937	2M150
300	2,450	Horizontal	Ferrite	1.5/3.3	76/2.992	2M153
300	2,450	Horizontal	Ferrite	1.6/3.5	100/3.937	2M161
300	2,450	Horizontal	Ferrite	1.6/3.5	76/2.992	2M163
300	2,450	Horizontal	Ferrite	2/4.4	102/4.016	2M71
300	2,450	Vertical	Alnico	1.65/3.64	125/4.921	2M53(H)
300	2,450	Vertical	Ferrite	1.76/3.88	125/4.921	2M53(A)
450	2,450	Horizontal	Ferrite	2.1/4.63	100/3.937	2M121
450	2,450	Vertical	Alnico	1.9/4.19	125/4.921	2M123
700	2,450	Vertical	Alnico	1.9/4.2	160/6.299	2M131

HOBBING ANODE

- Precise cold hobbing anode improves cavity resonant characteristics.

LOW SPURIOUS RADIATION

- Choke structure in output antenna suppresses the 2nd harmonics radiation into the oven.
- Carefully designed shield box covers the cathode terminal to minimize the spurious radiation of any frequency range.


2M123


2M131

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December 2, 1975

Mr. P.G. Durham
Head of Technology
English Electrical Valve Company, Ltd.
Waterhouse Ln
Chelmsford Essex England

RE: Advertisement in Microwave Journal Magazine for Hitachi Magnetrons

Dear Mr. Durham:

Thank you for your inquiry regarding Hitachi Magnetrons. We appreciate your interest in our products.

I am enclosing catalogs describing Hitachi Magnetrons. If you have any questions regarding this material, please feel free to contact me.

Very truly yours,

HITACHI AMERICA, LTD.
Chicago Office

T. Koga
Senior Engineer

TK/lp

Enclosures