

catalog 1959

— RADAR INSTRUMENT LINE —

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INTRODUCTION

MAGNETIC AB, STOCKHOLM, SWEDEN, HAS SPECIALIZED IN DEVELOPMENT AND PRODUCTION OF TEST EQUIPMENT FOR RADAR AND OTHER MICROWAVE SYSTEMS - INTRODUCED ON THE MARKET UNDER THE DESIGNATION -RADAR INSTRUMENT LINE-.

THE FIRST INSTRUMENT IN THIS LINE WAS A TOTALLY NEW EQUIPMENT - AN AUTOMATIC NOISE FIGURE METER - INTRODUCED IN 1953. THIS INSTRUMENT HAS BECOME A SUCCESS AS IT MADE ALIGNMENT OF A COMPLEX RADAR RECEIVER A VERY SIMPLE PROCEDURE. FOLLOWING THE SAME IDEA - TO PRODUCE INSTRUMENTS THAT MAKE MEASURING SIMPLER - MAGNETIC AB CAN PRESENT THE FOLLOWING INSTRUMENTS, WHICH WILL ALL BE DESCRIBED IN THIS CATALOG.

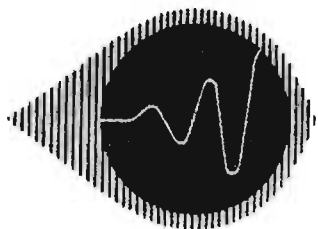
NOISE FIGURE METERS	TYPE BFM-
NOISE SOURCES	TYPE BK-
SPECTRUM ANALYZERS	TYPE SA-
POWER METERS	TYPE ER-
SIGNAL GENERATORS	TYPE SG-
HIGH POWER TERMINATIONS	TYPE HEA-

SUGGESTIONS FOR ORDERING

ALWAYS ORDER BY CATALOG MODEL NUMBER, NAME OF INSTRUMENT DESIRED AND FREQUENCY RANGE IF APPLICABLE. BE SURE TO MENTION SPECIAL FEATURES DESIRED. IF ANY.

ALL INSTRUMENTS FOR EXPORT ARE DELIVERED WITH ENGLISH TEXT ON THE PANELS. PANEL TEXT IN OTHER LANGUAGE UPON REQUEST.

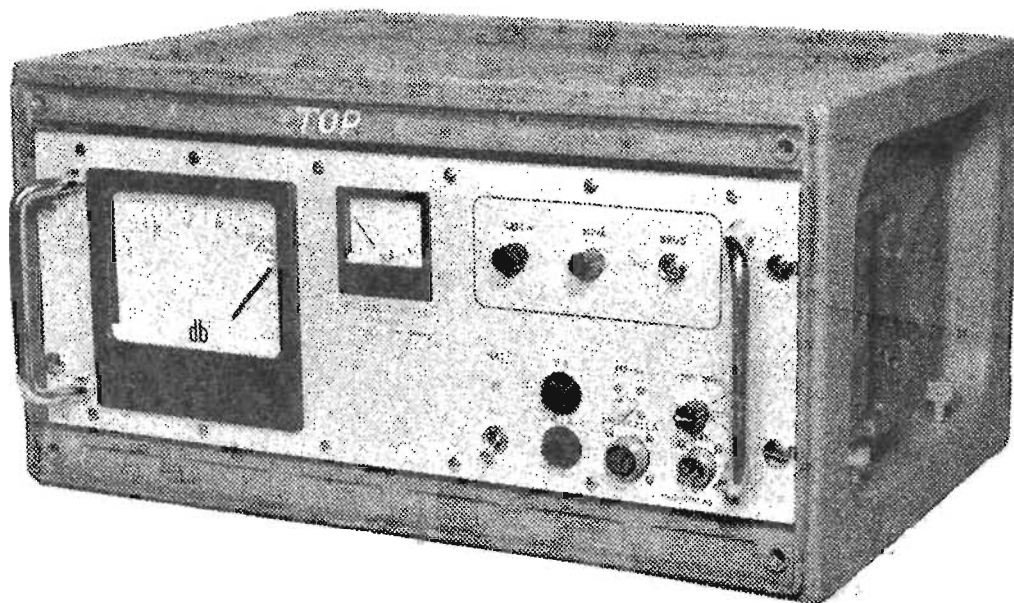
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AUTOMATIC NOISE FIGURE METER



MODEL BFM-CH-7
 MODEL BFM-CHM-7

Fig 1
 BFM-CH-7

WHERE USED:

THE MAGNETIC AUTOMATIC NOISE FIGURE METER IS SPECIALLY BUILT TO MAKE IT POSSIBLE FOR ANYONE TO ALIGN A RADAR RECEIVER TO BEST PERFORMANCE IN A VERY SHORT TIME. IN ADDITION TO ITS USE IN FIELD BFM IS VERY USEFUL IN RESEARCH LABORATORIES AND IN PRODUCTION FOR DESIGN AND CONTROL OF COMPLETE RADAR RECEIVERS, IF-AMPLIFIERS, CRYSTAL MIXERS AND SO ON.

A COMPLETE NOISE FIGURE METER INCLUDES A NOISE FIGURE INDICATOR -BFM- AND A NOISE SOURCE -BK- (SEE PAGE 3-5). TWO TYPES OF NOISE FIGURE INDICATORS ARE AVAILABLE.

BFM-CH-7 FOR NOISE SOURCES WITH GAS DISCHARGE TUBES
 BFM-CHM-7 FOR NOISE SOURCES WITH GAS DISCHARGE TUBES AND
 FOR NOISE SOURCES WITH TEMPERATURE-LIMITED DIODES

THE NOISE FIGURE METER IS BUILT TO STAND MILITARY TESTS ACCORDING TO SWEDISH MIL. TEST SPEC.

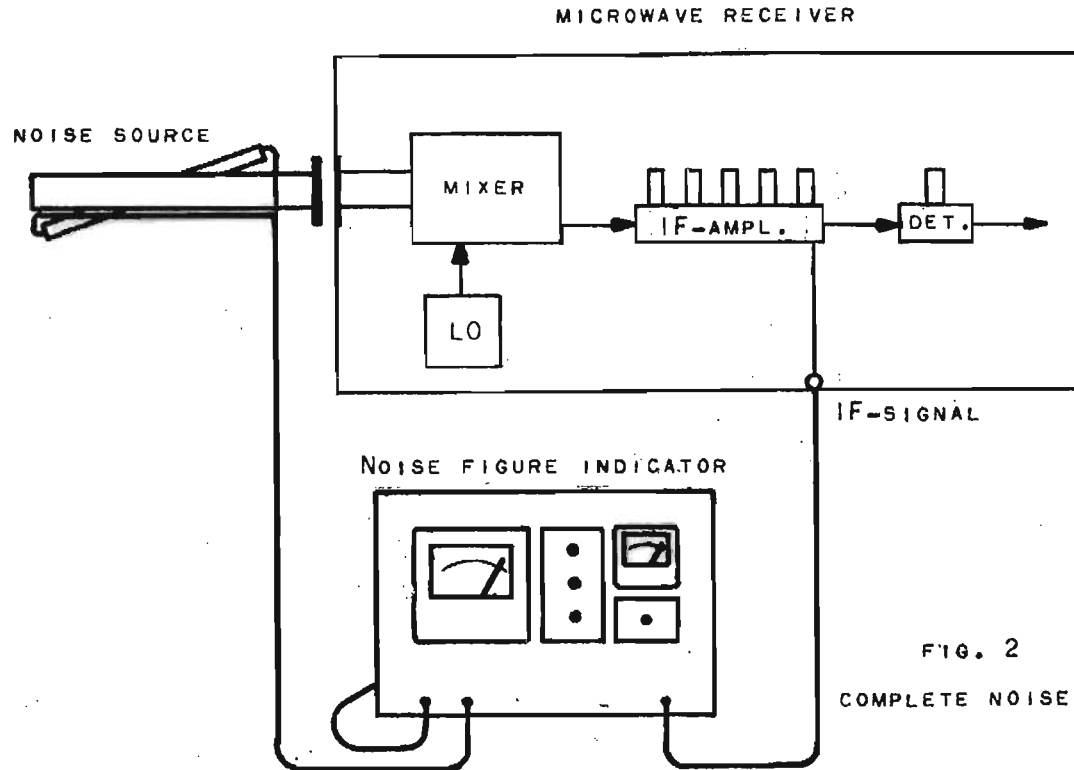


FIG. 2
COMPLETE NOISE FIGURE METER

DESCRIPTION:

THE NOISE FIGURE METER HAS A BUILT-IN, GATED AMPLIFIER THAT AMPLIFIES THE OUTPUT FROM THE RECEIVER UNDER TEST. DURING EVERY SECOND GATE-PULSE THE NOISE SOURCE IS ELECTRONICALLY SWITCHED ON. THE SIGNAL FROM THE GATED AMPLIFIER IS DEMODULATED AND WHEN THE NOISE SOURCE IS ON, THE OUTPUT FROM THE DEMODULATOR IS PROPORTIONAL TO THE NOISE FROM THE SOURCE AND THE RECEIVER UNDER TEST. WHEN THE SOURCE IS OFF THE OUTPUT IS PROPORTIONAL TO THE NOISE FROM THE RECEIVER ONLY. THE RATIO OF THESE PULSES IS MEASURED BY A RATIO METER THAT IS CALIBRATED DIRECTLY IN DB OF NOISE FIGURE.

SPECIFICATIONS

FREQUENCY RANGE	DEPENDS ON NOISE SOURCE USED	
NOISE FIGURE RANGE WITH NOISE DIODE	0-10 DB	TO INFINITY
NOISE FIGURE RANGE WITH GAS TUBE	5-25 DB	TO INFINITY
ACCURACY	±0.5 DB	
REQUIRED RECEIVER OR AMPLIFIER GAIN	APPROX 35 DB	
INPUT FREQUENCY ^{x/}	30, 45 OR 60 Mc/s SELECTED BY SWITCH	
POWER REQUIREMENTS ^{x/}	115/220/230 VOLTS, 50/60 CPS, 135 WATTS	
STANDARD INSTRUMENT CASE	4 UNIT 12" (SEE APP. 5)	
WEIGHT	26 KILOGRAMS	

^{x/} OTHER UPON REQUEST

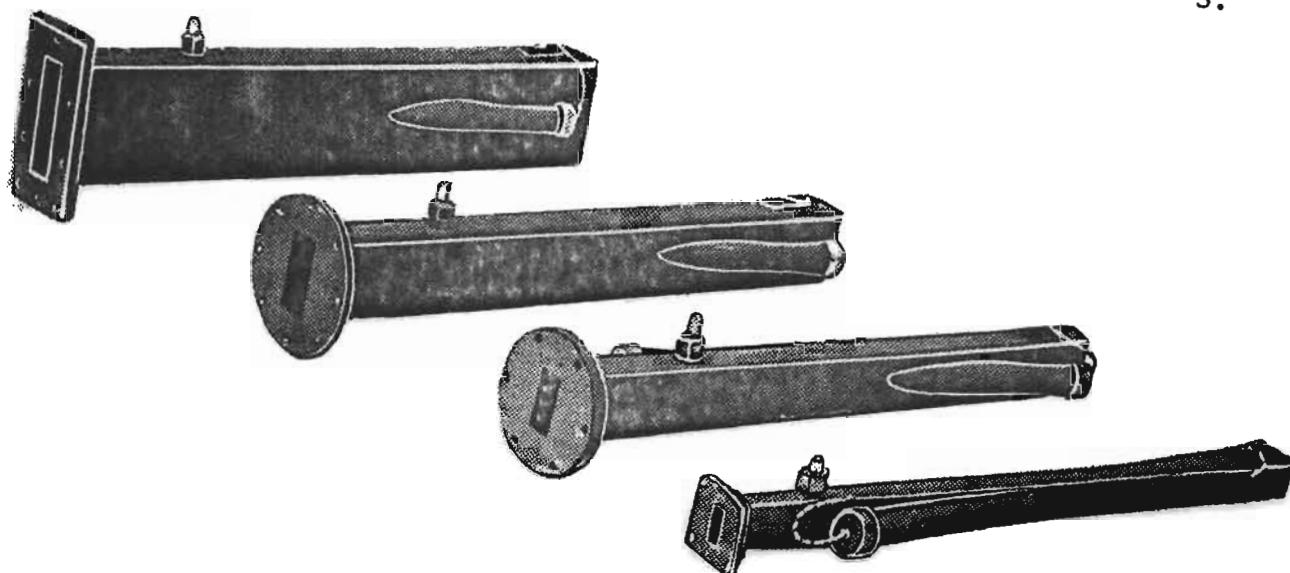


FIG. 3. WAVEGUIDE NOISE SOURCES

WAVEGUIDE NOISE SOURCES: (FOR NOISE FIGURE INDICATOR TYPE BFM-CH-7 OR BFM-CHM-7)

<u>TYPE</u>	<u>FREQ. BAND</u> kMc/s	<u>WAVEGUIDE</u>	<u>FLANGE^{x/}</u>
BK-S-E	2.45-3.75	ENGLISH 3"x1"	W9076
BK-S-53	2.60-3.95	RG-48/U	UG-53/U
BK-WR229	3.30-4.90	WR-229	CTR-229
BK-G-149A	3.95-5.85	RG-49/U	UG-149A/U
BK-J-344	5.85-8.20	RG-50/U	UG-344/U
BK-H-51	7.05-10.0	RG-51/U	UG-51/U
BK-X-39	8.2-12.4	RG-52/U	UG-39/U
BK-X-BTH	8.2-12.4	RG-52/U	BTH COVER

^{x/} OTHER UPON REQUEST

INPUT CABLES:

1.5 METERS, TERMINATED IN AN AMPHENOL CONNECTOR AN3106-145-5P

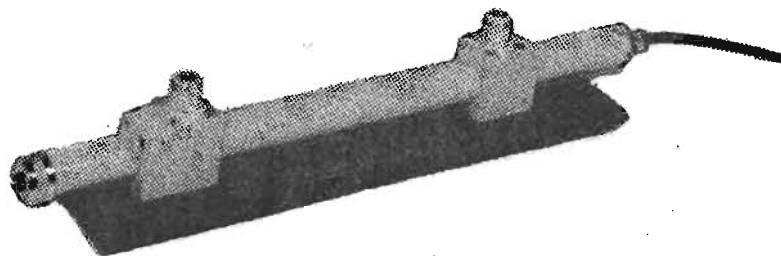


FIG. 4. BK-HEL-N

HELIX NOISE SOURCE:

TENTATIVE SPECIFICATIONS

TYPE	BK-HEL-N
FREQUENCY RANGE	200-2300 Mc/s
EXCESS NOISE	15.8 \pm 0.5 db
VSWR ^{x/} ON:	1.3 MAX, 1.2 AVE
OFF:	1.5 " , 1.25 " }
	200 - 2000 Mc/s
ON:	1.35 " , 1.2 " }
OFF:	1.7 " , 1.3 " }
	200 - 2300 Mc/s
OUTPUT CONNECTORS	TYPE N, FEMALE
CURRENT SUPPLY	65 - 100 MA DC
	CURRENT IS SUPPLIED BY THE
	NOISE FIGURE INDICATOR
LENGTH	35 CENTIMETERS
INPUT CABLE	1.5 M LONG, TERMINATED IN AN
	AMPHENOL CONNECTOR TYPE AN 3106-145-5P

A 6.6 DB ATTENUATOR MODEL LED-N-6.6 SHOULD BE CONNECTED BETWEEN THIS NOISE SOURCE AND THE UNIT UNDER TEST WHEN USED WITH THE MODEL BFM-CH-7 NOISE FIGURE METER. WITH THIS ATTENUATOR THE NOISE FIGURE METER WILL BE DIRECT READING. WITH MODEL LED-N-11.6 ATTENUATOR THE NOISE FIGURE RANGE FOR BFM-CH-7 WILL BE 0 - 20 DB WITH INDICATION TO INFINITY.

WHEN THE ATTENUATOR IS USED WITH THE NOISE SOURCE, THE VSWR WILL BE MAINLY DUE TO THE ATTENUATOR VSWR.

^{x/} SOURCE TERMINATED IN A WELL MATCHED LOAD SUCH AS THE MODEL LEA-N

NOTE: SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE



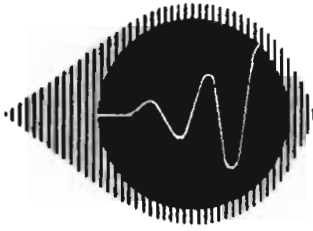
FIG. 5. BK-MF-3

TEMPERATURE-LIMITED DIODE NOISE SOURCE FOR IF-AMPLIFIER NOISE MEASUREMENT.

SPECIFICATIONS

MODEL No.	BK-MF-3
FREQUENCY RANGE	5 - 150 Mc/s
IMPEDANCE	50 Ω ^{x/}
OUTPUT CONNECTOR	BNC
INPUT CABLE LENGTH	1.5 METERS
INPUT CONNECTOR	AN 3106-145-5P

^{x/} ANY IMPEDANCE 50-400 Ω CAN BE OBTAINED BY USING SERIES RESISTANCES. NOISE LEVEL DEPENDS ON CATHODE CURRENT, SUPPLIED FROM AND METERED BY THE NOISE FIGURE INDICATOR TYPE BFM-CHM- . THE CURRENT METER IS CALIBRATED IN OHMS IMPEDANCE.



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SPECTRUM ANALYZER

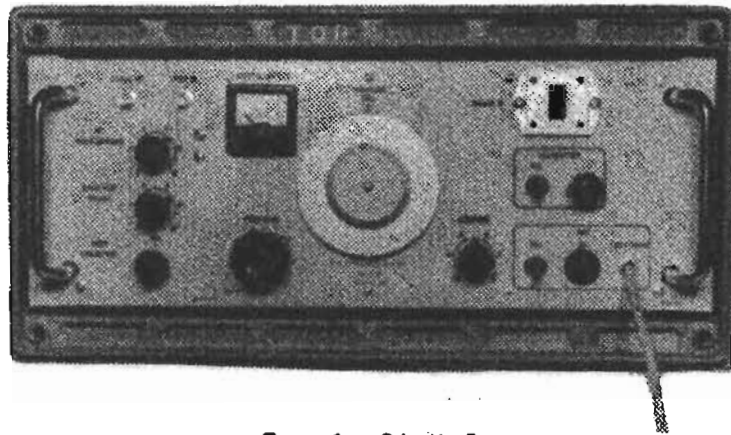


Fig 1. SA-X-2

MODEL SA-X-2

MODEL SA-S-2

WHERE USED:

MAGNETIC MODEL SA SPECTRUM ANALYZER IS AN EXCELLENT INSTRUMENT IN THE RADAR STATION FOR OBSERVATION OF THE CHARACTER AND QUALITY OF PULSES OF MICRO-WAVE POWER FROM THE RADAR TRANSMITTER.

THE INSTRUMENT SHOWS EFFECTS OF INTERMITTENT NATURE SUCH AS

- AFC - OPERATION
- ARCING
- MISSING PULSES
- PARABITIC OSCILLATIONS
- MAGNETRON PULLING

UNDER OPERATION CONDITIONS

DESCRIPTION

THE MODEL SA-2 SPECTRUM ANALYZER CONTAINS ALL THE NECESSARY CIRCUITRY EXCEPT THAT FOR THE DISPLAY.

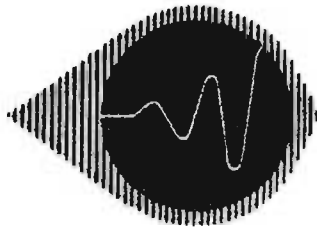
THE INCOMING SIGNALS ARE FED THROUGH AN ATTENUATOR TO A CRYSTAL MIXER, WHERE THEY ARE MIXED WITH THE FREQUENCY SWEEP OUTPUT OF THE LOCAL OSCILLATOR. THE RESULTANT HETERODYNE SIGNALS ARE AMPLIFIED IN THE 1ST IF, CONVERTED TO A LOWER FREQUENCY AND AMPLIFIED BY A NARROW BAND AMPLIFIER. AFTER THIS THE SIGNALS ARE DETECTED BY A SQUARE LAW DETECTOR FOR FREQUENCY-DIFFERENCE MEASUREMENTS THE SA-2 ANALYZER HAS A SERIES OF MARKER PIPS ON THE SCREEN OF THE DISPLAY UNIT. THE SIGNALS ARE DISPLAYED ON A SEPARATE DISPLAY UNIT (ANY SUITABLE OSCILLOSCOPE) THAT ALSO SUPPLIES THE SAWTOOTH SWEEP VOLTAGE. THE LOCAL OSCILLATOR IS A KLYSTRON WITH A TRACKED REPELLER VOLTAGE.

A SPECIAL MODEL WITH BUILT-IN DISPLAY UNIT IS UNDER DEVELOPMENT. THE MODEL NUMBER WILL BE SA-3.

SPECIFICATIONS

MODEL	SA-S-2	SA-X-2
FREQUENCY RANGE	2.9 - 3.5 kmc/s	8.5 - 9.6 kmc/s
RESOLUTION	50 kc/s	50 kc/s
SWEEP FREQUENCY RATE (WITH IN-2)	10-50 cps	10-50 cps
FREQUENCY DISPERSION (MAX)	15 mc/s	30 mc/s
SENSITIVITY	-80 DBM	-60 DBM
MARKER PIP SEPARATION	1 mc/s	5 mc/s
1 ST IF FREQUENCY (CHOISE)	15, 30 OR 45 Mc/s	
POWER REQUIREMENTS	115/220/230 VOLTS, 50/60 CPS 150 WATTS, 150 VA	
STANDARD INSTRUMENT CASE	4 UNIT 12" (SEE APP. 5)	
WEIGHT	(APPROX.) 19 KILOGRAMS	

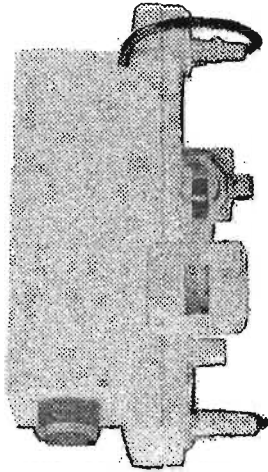
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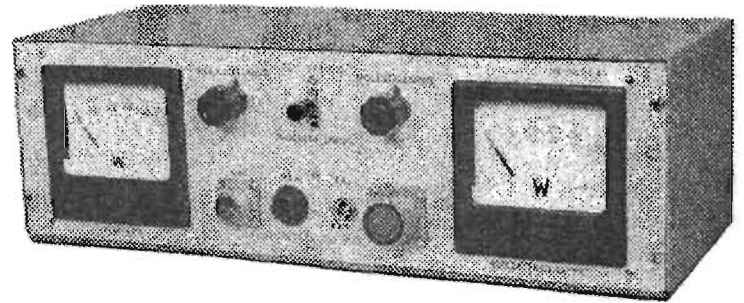
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POWER METER



X-BAND RF-HEAD



INDICATING UNIT

MODEL ER-S-3
 MODEL ER-X-3

WHERE USED:

THE POWER METER ER-3 IS BUILT FOR FIELD USE AND PRIMARILY INTENDED FOR PERMANENT INSTALLATIONS IN RADAR STATIONS.

THE METER GIVES A CONTINUOUS INDICATION OF THE OUTPUT POWER AND OF TRANSMISSION SYSTEM REFLECTIONS. THE UNIQUE DESIGN OF THE HIGH FREQUENCY PARTS MAKES THE INSTRUMENT AS ACCURATE AS ANY HIGH QUALITY LABORATORY POWER METER.

DESCRIPTION

THE INSTRUMENT CONSISTS OF TWO UNITS: THE RF-HEAD AND THE INDICATING UNIT. THE RF-HEAD CONTAINS TWO DIRECTIONAL COUPLERS. ONE OF THESE PICKS UP THE OUTPUT POWER AND THE OTHER THE REFLECTED POWER IN THE TRANSMITTER-ANTENNA WAVEGUIDE. THE RF-HEAD ALSO CONTAINS THE POWER MEASURING THERMISTORS AND SOME AUXILIARY EQUIPMENT WHICH WILL BE DESCRIBED BELOW. THE DIRECTIONAL COUPLERS, THERMISTOR MOMENTS AND OTHER PARTS IN THE RF-SYSTEM ARE ALL BUILT OF BROAD BAND STRIP TYPE CIRCUITS WHICH ELIMINATE ALL REACTIVE ELEMENTS.

THE INDICATING UNIT CONTAINS TWO TEMPERATURE COMPENSATED BRIDGES WITH SEPARATE INDICATING INSTRUMENTS ON THE PANEL. THE BRIDGES ARE COMPENSATED FOR ZERO DRIFT AS WELL AS FOR SENSITIVITY VARIATIONS DUE TO TEMPERATURE. THE COMPENSATING THERMISTORS ARE MOUNTED IN THE RF-HEAD CLOSE TO THE POWER MEASURING THERMISTORS. BOTH BRIDGES HAVE NORMALLY THE SAME SENSITIVITY. SINCE THE REFLECTED POWER GENERALLY IS MUCH SMALLER THAN THE OUTPUT POWER THE SENSITIVITY IN THE REFLECTED-POWER BRANCH CAN BE INCREASED 10 DB BY OPERATING A SWITCH ON THE PANEL OF THE INDICATING UNIT. CHECKING THE BALANCE OF THE BRIDGE DURING OPERATION OF THE RADAR STATION CAN ALSO BE ACCOMPLISHED BY OPERATING THE SAME SWITCH ON THE PANEL WHICH EFFECTIVELY SHUTS OFF THE RF-POWER FROM THE THERMISTORS.

INSTALLATION

BECAUSE THE ER-3 IS PRIMARILY INTENDED FOR PERMANENT INSTALLATIONS IN RADAR STATIONS, IT HAS BEEN DESIGNED TO BE EASILY ADAPTABLE TO ANY STATION.

THE RF-HEAD IS DELIVERED WITH WAVEGUIDE WHICH CAN BE EXCHANGED WITH SOME PART OF THE EARLIER WAVEGUIDE SYSTEM. IT CAN ALSO BE MOUNTED DIRECT ON THE EXISTING WAVEGUIDE IN THE RADAR SET. IN THIS LATTER CASE THE TWO HOLES HAVE TO BE DRILLED ON THE BROAD SIDE OF THE WAVEGUIDE BEFORE THE RF-HEAD IS MOUNTED ON IT. EQUIPMENT FOR PREASURIZING THESE HOLES CAN BE DELIVERED.

THE INDICATING UNIT CAN BE PLACED ANYWHERE WITHIN CONVENIENT DISTANCE FOR THE OBSERVER.

SPECIFICATIONS:

MODEL	ER-S-3	ER-X-3
FREQUENCY RANGE	2.9-3.5 kMc/s	8.5-9.6 kMc/s
POWER RANGES	50, 100, 250 OR 500 WATTS AVE.	

ACCURACY:

THE INSTRUMENT IS CALIBRATED AT 20°C, MIDBAND FREQUENCY AND 80 % OF FULL SCALE READING AGAINST A CALORIMETRIC WATT-METER WITH AN ACCURACY OF 5 %

FOR FREQUENCY VARIATIONS WITHIN THE SPECIFIED BAND (CONSTANT POWER, CONSTANT TEMPERATURE)

5 % 8 %

FOR TEMPERATURE VARIATION -10° TO +40°C (CONSTANT FREQ., CONSTANT POWER)

5 % 5 %

MAX NONLINEARITY

5 % 5 %

DIRECTIVITY

AT A VSWR OF 1.5 THE INSTRUMENT INDICATES A REFLECTED POWER CORRESPONDING TO A VSWR BETWEEN 1.3 AND 1.7 DEPENDING UPON THE PHASE OF THE REFLEXIONS

CABLE LENGTH RF-HEAD TO INDICATOR^{x/}

1.5 METERS

POWER REQUIREMENTS

115/220/230 V 50/60 CPS 50 WATTS

DIMENSIONS

45 CM WIDE BY 13 CM HIGH BY 21 CM DEEP

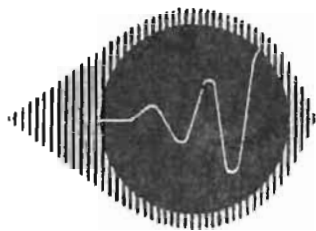
WEIGHT OF INDICATOR UNIT

7 KILOGRAMS

† THE INDICATOR UNIT CAN BE DELIVERED MOUNTED IN A 4 UNIT 12" STANDARD CASE (SEE APP. 5)

^{x/} LONGER UPON SPECIAL REQUEST

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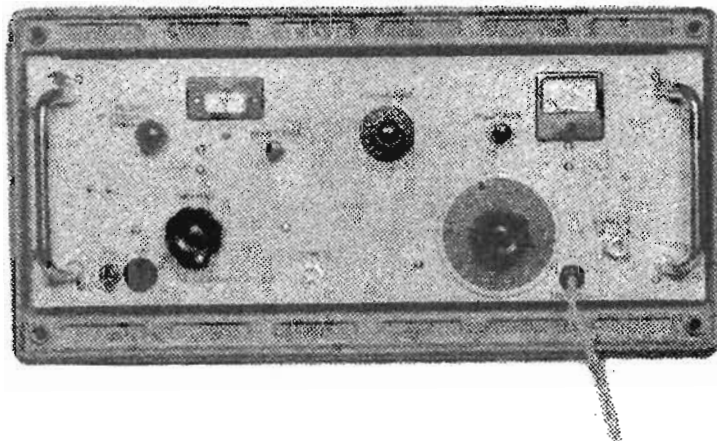


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SIGNAL GENERATOR
FOR
FIELD USE

PRELIMINARY SPECIFICATIONS



MODEL SG-X-2

WHERE USED:

MAGNETIC MODEL SG- SIGNAL GENERATOR IS USED TO PRODUCE AN ARTIFICIAL ECHO IN A RADARSTATION AND TESTS THE OVERALL PERFORMANCE OF THE RECEIVER FROM ANTENNA TO INDICATOR. SG- IS ALSO USED AS A STANDARD CW-SIGNAL GENERATOR FOR MEASUREMENT OF ATTENUATION, BANDWIDTH, IMAGE REJECTION, POWER GAIN, SWR AND SO ON.

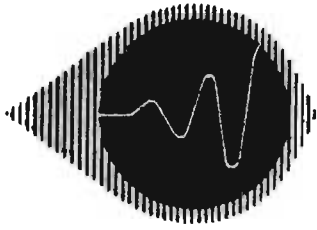
FEATURES:

ONE DIAL TUNING CONTROL
DIRECT READING FREQUENCY DIAL
ACCURATE, CALIBRATED POWER OUTPUT
HIGH STABILITY
STURDY, COMPACT, BUILT FOR FIELD USE
VARIABLE PULSE SIGNAL DELAY

SPECIFICATIONS:

MODEL	SG-X-2
FREQUENCY RANGE	8.5 - 9.6 kMc/s
POWER OUTPUT (CW OR PULSE)	0 DBM TO -90 DBM
OUTPUT ATTENUATOR ACCURACY	± 2 DB
INTERNAL PULSE MODULATION	
WIDTH	1 μ s
REPETITION RATE	100 - 2000 CPS
SYNC	EXTERNAL +5 VOLTS 10 μ s
DELAY	VARIABLE 1 - 100 μ s
POWER REQUIREMENTS	115/220/230 VOLTS 50/60 CPS 135 WATTS
STANDARD INSTRUMENT CASE	4 UNIT 12" (SEE APP. 5)
WEIGHT	29 KILOGRAMS

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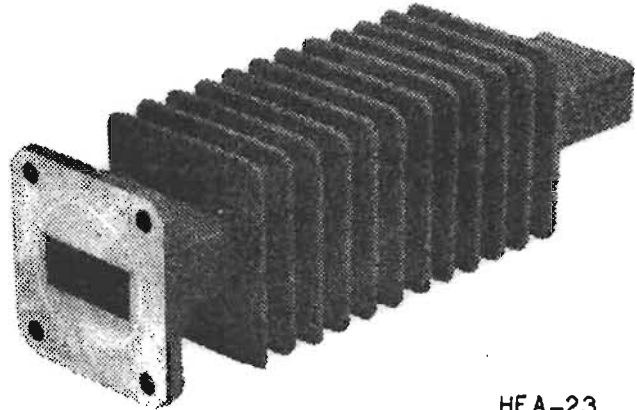
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**HIGH POWER TERMINATIONS
FOR
WAVEGUIDES**

HIGH POWER TERMINATIONS

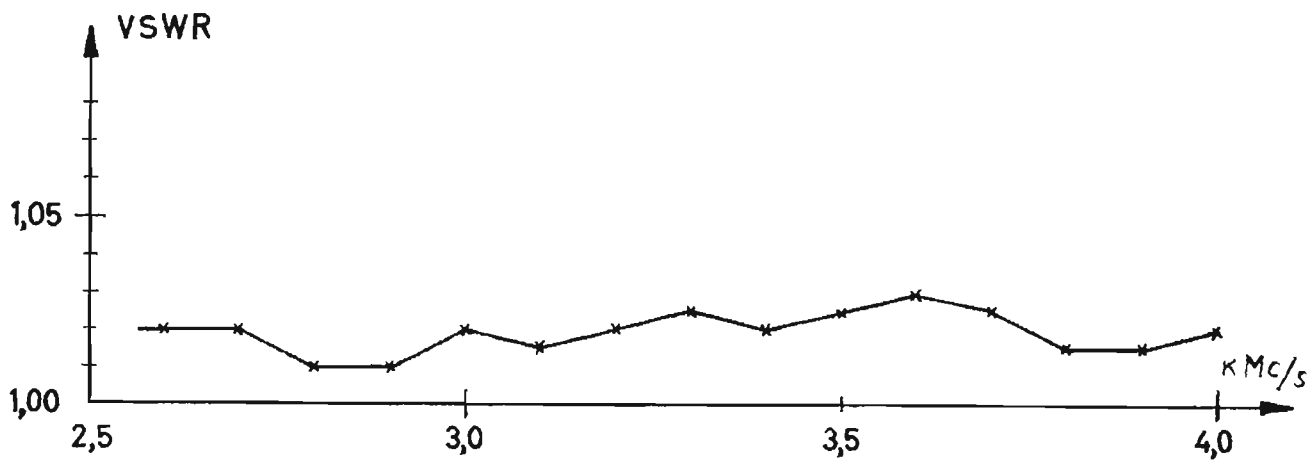
HEA



HEA-23

SPECIAL FEATURES

- HIGH AVERAGE POWER RATING
- LOW VSWR
- HIGH PEAK POWER RATING
- SMALL DIMENSIONS
- LOW PRICE



TYPICAL VSWR VS FREQUENCY FOR HEA-E

SPECIFICATIONS:

TYPE	FREQUENCY	WAVEGUIDE	FLANGE	DIMENSION (MM)			AVERAGE POWER (w)
				L	B	H	
HEA-72	2.60-3.95	RG-48/U	UG-53/U	540	134	134	1500
HEA-58	3.30-4.90	WR229(RMA)	CTR-229	440	97	62	1000
HEA-48	3.95-5.85	RG-49/U	UG-149A/U	300	92	92	500
HEA-35	5.85-8.20	RG-50/U	UG-344/U	230	57	57	375
HEA-28	7.05-10.00	RG-51/U	UG-51/U	160	48	48	250
HEA-23	8.20-12.40	RG-52/U	UG-39/U	140	41	41	200
HEA-23s	8.20-12.40	RG-52/U	UG-39/U	200	90	60	500
HEA-23W	8.20-12.40	RG-52/U	UG-39/U	200	30	45	2000 ^{x/}
HEA-E	2.45-3.75	ENGLISH 3"x1"	W-9076	540	119	69	1000

^{x/} WATERCOOLED

MAX. VSWR:

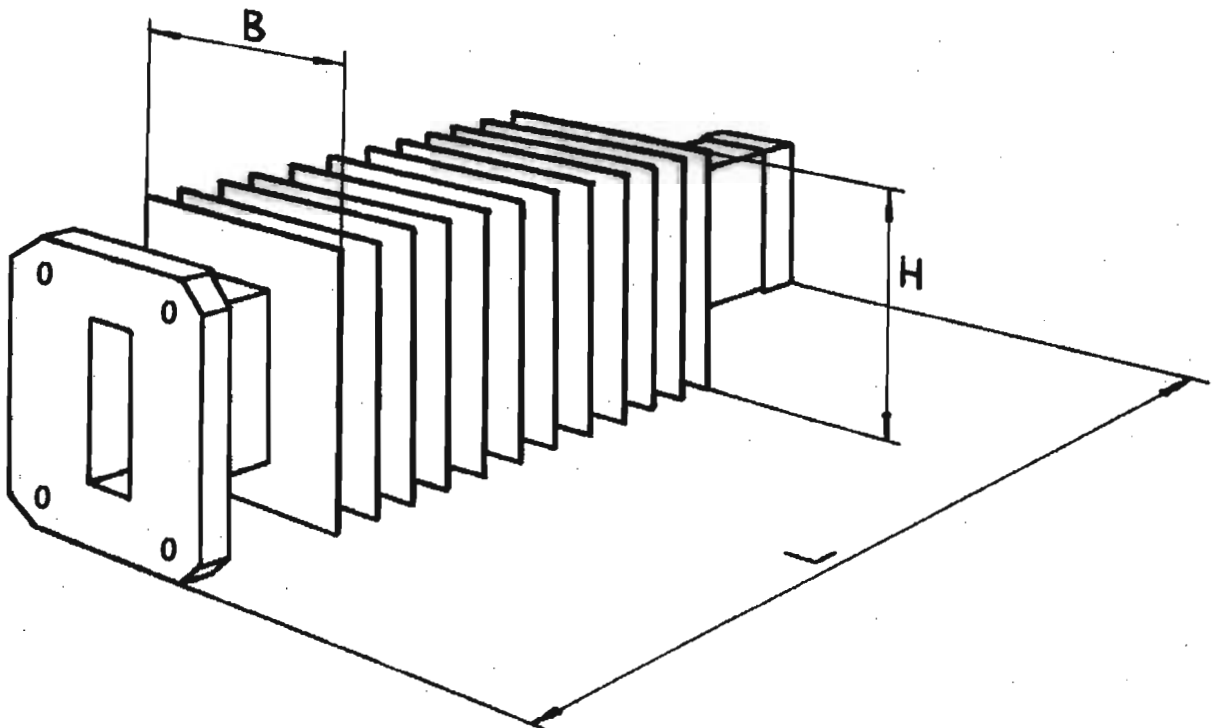
OVER THE FREQUENCY RANGE SPECIFIED IS 1,05

PEAK POWER:

THE PEAK POWER OF THE TERMINATION IS EQUAL TO
PEAK POWER OF THE WAVEGUIDE

MAX. POWER RATING:

THE MAX. POWER RATING IS DOUBLED BY FORCED
AIR COOLING



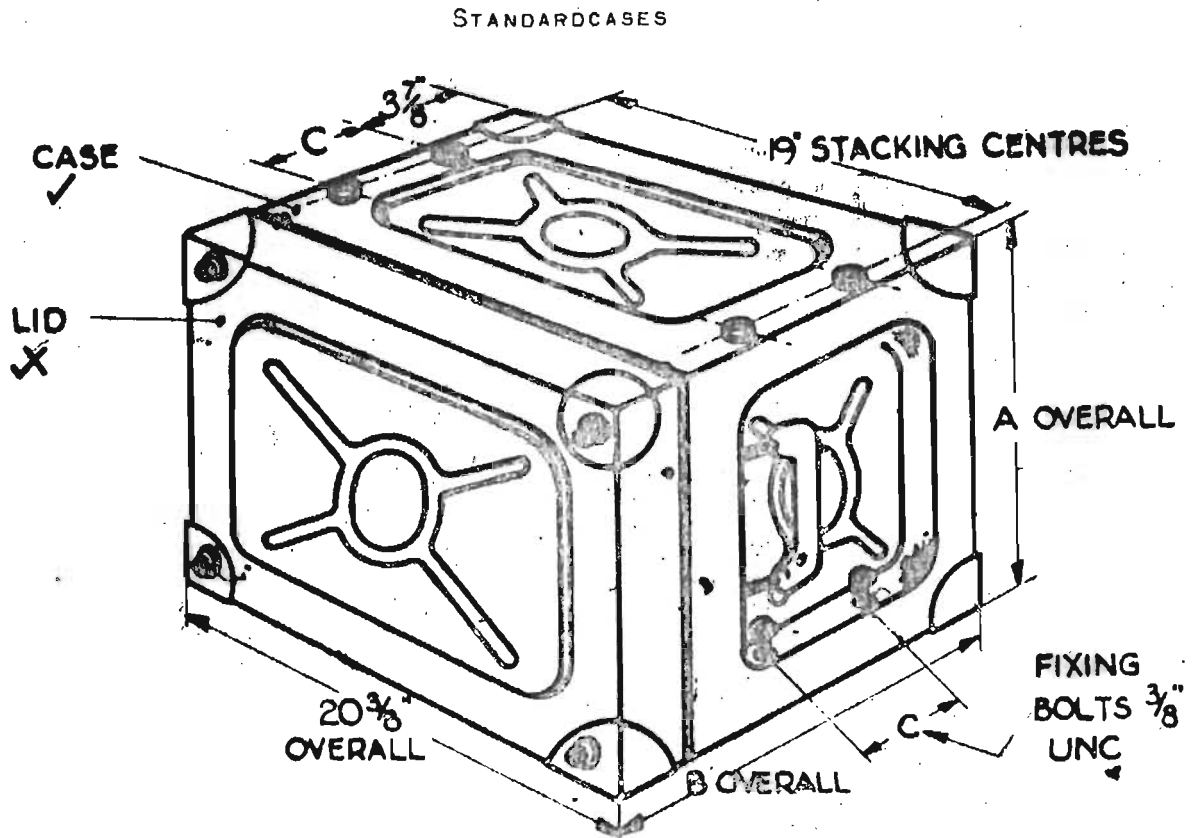
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APPENDIX 4

STANDARD WAVEGUIDES

WAVEGUIDE			RECOMMENDED FREQUENCY RANGE FOR TE ₁₀ MODE (kMc/s)	INNER DIMENSIONS	
SWEDISH DESIGNATION	RMA RETMA DESIGN.	JAN TYPE		A	B
				MM	MM
VL 165 L	WR 650	RG-69/U	1.12 - 1.70	165.10	85.55
VL 72 S	WR 284	RG-48/U	2.60 - 3.95	72.14	34.04
VL 58 BELL	WR 229	-	3.30 - 4.90	58.16	29.08
VL 48 G	WR 187	RG-49/U	3.95 - 5.85	47.54	22.14
VL 40 C	WR 159	-	4.90 - 7.05	40.38	20.19
VL 35 J	WR 137	RG-50/U	5.85 - 8.20	34.84	15.75
VL 28 H	WR 112	RG-51/U	7.05 - 10.00	28.49	12.64
VL 23 X	WR 90	RG-52/U	8.20 - 12.40	22.86	10.16
3"x1" Eng.	-	-	2.45 - 3.75	76.20	25.40

APPENDIX 5



TYPE	DIMENSIONS			WEIGHT INCL LID
	A	B	C	
4 UNIT 9"	10 3/8"	13 1/2"	3"	11.4 KG
4 UNIT 12"	10 3/8"	16 1/2"	6"	12.3 KG
4 UNIT 15"	10 3/8"	19 1/2"	6"	13.2 KG
6 UNIT 9"	13 7/8"	13 1/2"	3"	13.2 KG
6 UNIT 12"	13 7/8"	16 1/2"	6"	14.5 KG
6 UNIT 15"	13 7/8"	19 1/2"	6"	15.9 KG
8 UNIT 9"	17 3/8"	13 1/2"	3"	14.5 KG
8 UNIT 12"	17 3/8"	16 1/2"	6"	15.9 KG
8 UNIT 15"	17 3/8"	19 1/2"	6"	17.3 KG
8 UNIT 18"	17 3/8"	22 1/2"	6"	18.6 KG

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BRUSSELS, BELGIUM
CABLE "BELRAMEL"
TEL. 38 12 40

WARRANTY

Magnetic AB warrants each instrument of its manufacture to be free from defects in material and workmanship. Our obligation under this Warranty is limited to servicing or adjusting any instrument returned to our factory for that purpose, and to making good at our factory any part or parts thereof except tubes, fuses or batteries, which shall, 12 months after making delivery to the original purchaser, be returned to us with transportation charges prepaid, and which on our examination shall disclose to our satisfaction to have been thus defective.