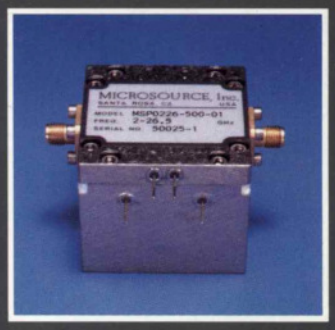
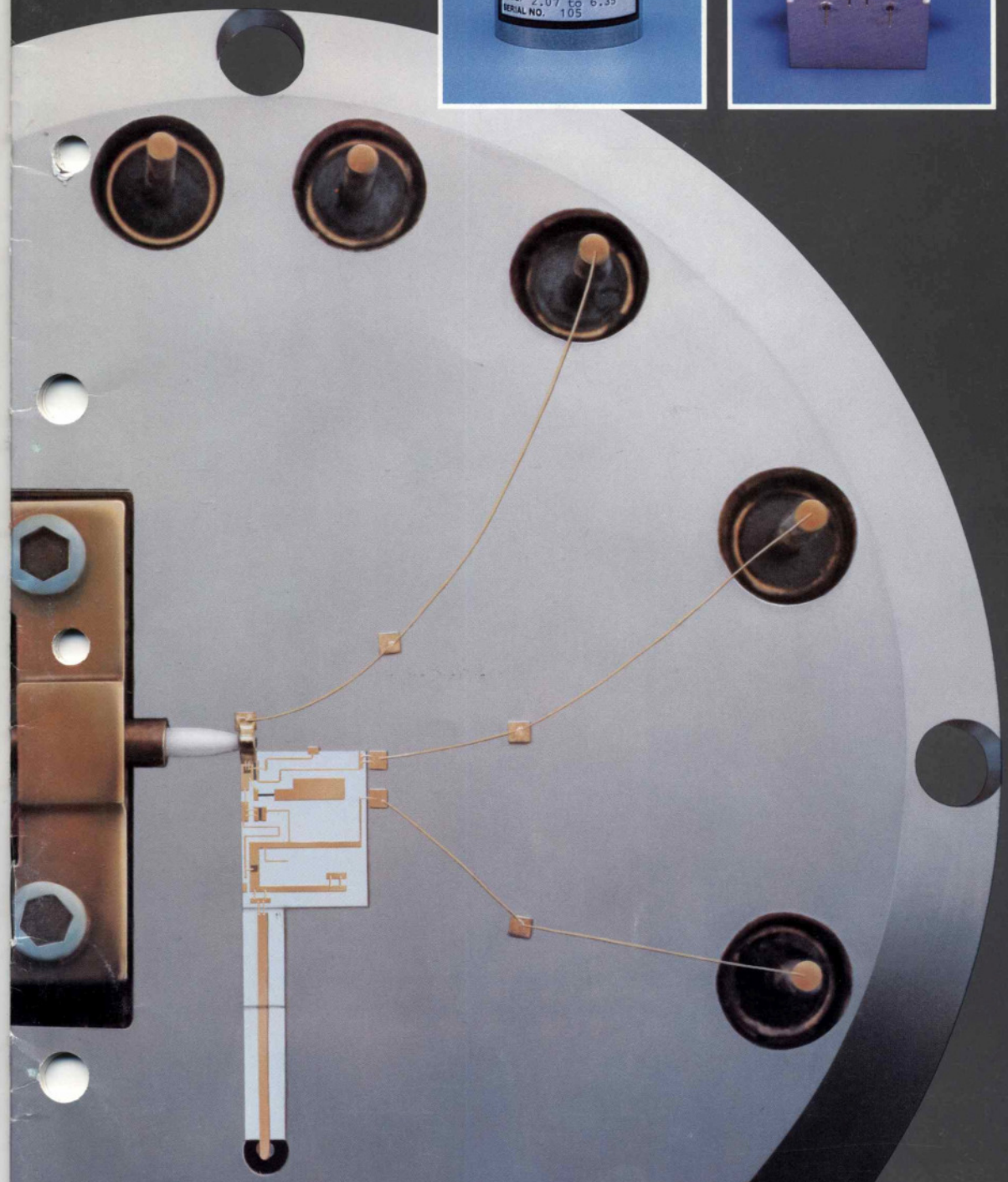
MICROSOURCE, Inc.

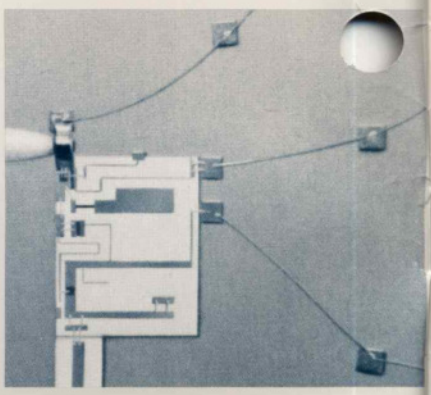
1986 PRODUCT CATALOG





Excellence By Design

MICROSOURCE, Inc.



Microsource, Inc., is a manufacturer of state-of-the-art quality microwave integrated circuit components and sub-systems, and a leader in YIG technology. Microsource manufactures and markets a comprehensive family of YIG oscillators, band-pass and band reject filters and YIG-tuned sub-systems. The Company continues to expand its product offering to include varactor-tuned oscillators and special purpose microwave synthesizers to address the military, telecommunications, ATE and instrumentation markets.

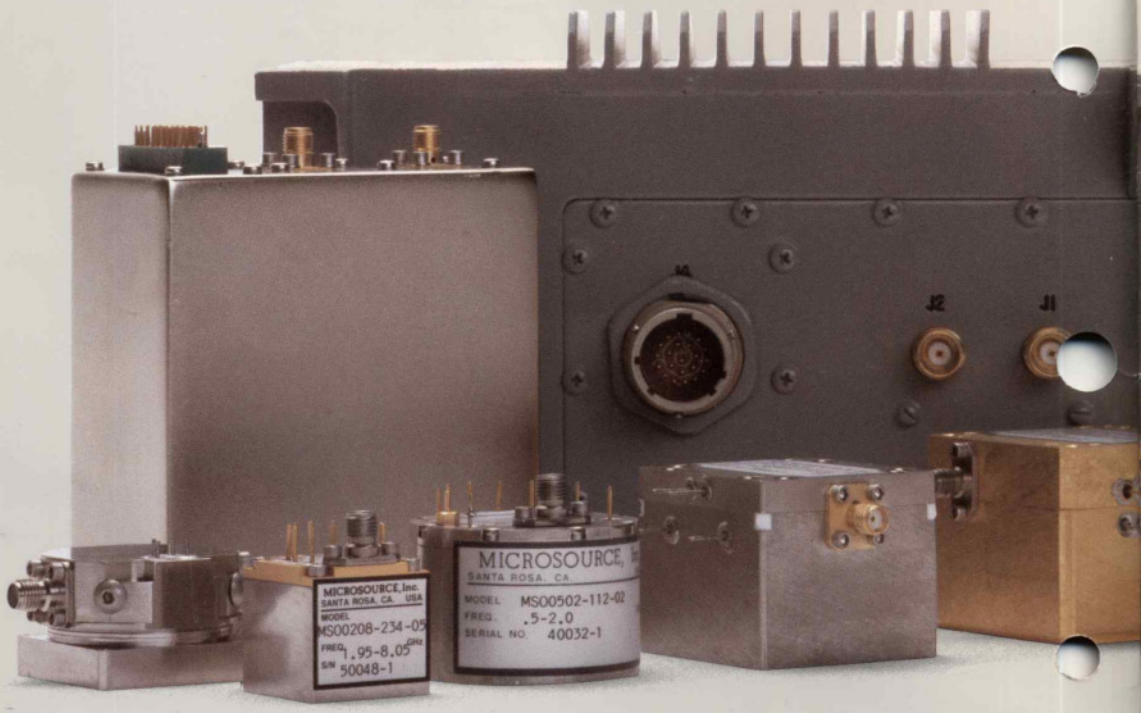
Since its beginning in 1981, Microsource's objectives have been to provide the highest quality in both products and customer service, and to be the leader in the products it manufactures through innovation and constant advancement in technology.

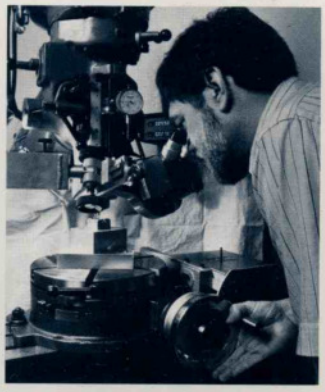
Microsource's modern 15,000 square foot facility in Santa Rosa, California, contains a vertically integrated manufacturing capability, a complete in-house product development engineering team, an advanced research and development engineering group, and the corporate staff. The organizational structure places the engineering, manufacturing, and quality assurance groups in one operational team. This facilitates the execution of the Company's commitment to total quality control from the start of the design cycle through the entire manufacturing process.

Microsource's operational philosophy dictates that products be designed and manufactured to the highest quality levels and for the best customer value. These goals are achieved through a carefully specified and managed product development and manufacturing plan. Each step of the development and production start-up process has a defined purpose, a milestone checklist, and a management commitment to meet performance, quality, and value goals.

The engineering group has complete RF and microwave product design capability. The group is supported by CAE/CAD systems that include circuit analysis, mechanical design analysis, and computer generated artwork and documentation. A precision machine shop allows for intricate part fabrication on a quick turnaround basis.

The manufacturing goal of total quality control is achieved through a just-in-time, integrated production system. The system emphasizes process control from thin-film and hybrid fabrication to product testing and environmental screening. Automated assembly and test equipment is used throughout the manufacturing process to enhance quality, productivity, and flexibility.





CUSTOMER SERVICE

Microsource prides itself on the quality and depth of customer service it provides. We are committed to providing the finest customer service in all aspects of our business from applications assistance and on-time delivery of products to quality products tailored to specific requirements.

The specifications in this catalog represent our standard products. We recognize that in our industry every application requires some degree of application specific performance. Our design and manufacturing philosophy is oriented toward the production of quality, special performance products. We welcome every opportunity to discuss and satisfy our customers' specific needs.

TECHNOLOGY

By careful device characterization and design, Microsource has been able to realize predictable performance in state-of-the-art components on a consistent basis. Microsource's investment in manufacturing technology makes it possible for the Company to convert these designs into high performance products. These include low-noise, wide-band bipolar transistor oscillators and GaAs MESFET oscillators to 26.5 GHz, oscillators with integral tuning filters for high spectral purity to 18 GHz, bandpass filters with constant bandwidth over a wide tunable frequency range, and fast switching band reject YIG filters with notch depth and bandwidth specifications surpassing those previously available in the microwave industry.

Our technology philosophy uses sensible vertical integration to maintain control over critical processes ranging from thin-film fabrication, hybrid assembly, component alignment and test to system integration.

INNOVATION

Our commitment to providing innovative products is reflected in the size and quality of our research and development group. As a percent of revenue, Microsource invests nearly three times the industry average in its R&D efforts. This is how, in a short period of time, we have been able to achieve performance leadership in YIG oscillator, filter, and sub-system capability.

We have built up a library of designs ranging from low-noise oscillators and low-noise drivers, to buffer amplifiers, modulators, and closed-loop, high-performance filter systems. This library of designs allows the Company to integrate a variety of designs to fit our customers' unique component and sub-system needs.

QUALITY

At Microsource, quality is a management commitment which permeates the entire organization. Our products are designed to meet rigorous military standards including wide temperature ranges and harsh environments. All products are subjected to vigorous inspection, shock and burn-in at elevated temperatures to assure consistent and reliable performance.

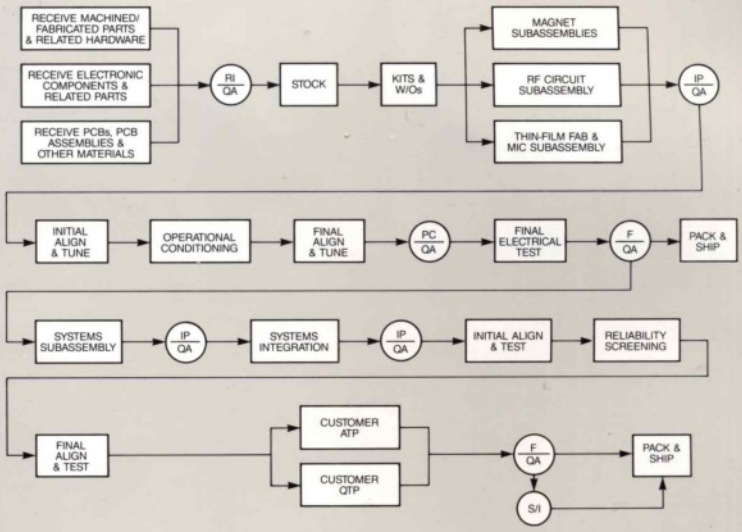
EXCELLENCE BY DESIGN

Customer service, innovative products, state-of-the-art technology, and high quality; in a word: Excellence. At Microsource, we achieve Excellence by Design.

Excellence By Design

QUALITY

•Product Assurance by Design



At Microsource, quality is a company-wide commitment. Focusing on the quality of organizational and operational processes, as well as the technical processes, results in a quality consciousness that is fundamental to the organizational culture. The quality of work life at Microsource promotes personal commitment and contribution to high quality results. This translates into high quality products and customer satisfaction through an emphasis on total quality control (TQC).

Quality is a team effort with the objective of designing and building quality and reliability into the product. Quality Engineering collaborates initially with Design Engineering to assure that appropriate reliability factors are incorporated into the design and to monitor or execute the achievement of Microsource or customer specified quality program requirements. This collaborative spirit continues throughout the product introduction and manufacturing stages, as Quality Engineering works with Process Engineering and Production to ensure that appropriate process controls are in place that assure conformance. Statistical quality control (SQC) techniques are incorporated in support of this activity and extend to quality control efforts to monitor the incoming quality levels of purchased parts and materials.

The Quality Assurance organization has the responsibility of managing the quality program at Microsource and functions independently from engineering and manufacturing. This responsibility includes the authority to exercise control of quality over any phase of the manufacturing process. Functional responsibilities include: Quality/Reliability Engineering, Quality Control, and Document Control. Quality and Reliability Engineering efforts are focused on design support and inputs, procurement specifications and supplier approvals, process control analysis and development, failure analysis and corrective action, and quality planning and support for Quality Control.

Quality Control efforts are primarily focused on monitoring, verifying and reporting results of receiving, in-process, and final inspection. Additionally, they perform the audit function with support from Quality Engineering. Document Control administers the configuration control function that includes initial product release, subsequent change, and effectivity control. The function formally controls product buildup from parts and materials, to sub-assemblies, to final assembly. Quality Assurance personnel monitor, audit, test, or inspect, as applicable, to verify and assure adherence and conformance to all applicable documentation.

Our quality system exceeds the requirements of MIL-I-45208 with the capability to upgrade to MIL-Q-9858 when made a specific program requirement. Customer requirements are thoroughly evaluated during the proposal and purchase order receipt stage to assure that all quality requirements are planned for and satisfied during the design, procurement, production, and delivery phases. Complete customer satisfaction is our objective.

YTTRIUM IRON GARNET

•An introduction to its use in microwave oscillators and filters

The term "YIG-tuned device" has come to denote a family of microwave components that use the ferrimagnetic resonance properties of certain materials when placed in a magnetic field. YIG stands for Yttrium Iron Garnet, but the term "YIG device" is also used to denote components that use Lithium ferrite, Nickel Zinc ferrite, or other ferrites in their resonator structure.

The application of an external D.C. field to ferrimagnetic materials causes the free electron spins to precess. The fundamental precession mode, called uniform precession, occurs at a frequency given by fo = 2.8xHi where fo is in MHz and Hi is the field internal to the material in gauss. If an R.F. field of frequency fo is applied orthogonal to the D.C. field as shown in Figure 1, this will couple to the precession and cause the precession angle to change. This results in the R.F. magnetic field having a component in the third orthogonal direction, allowing energy transfer to a second loop. If the applied field is at any frequency other than fo, there is no coupling to the precession. Coupling structures are designed using loop coupling or sphere-to-sphere coupling. It is possible to design oscillators, bandpass, and band reject filters with such structures having one or two loops.

The factors that make YIG devices extremely attractive for system applications are:

(a) High Q. Unloaded Q's of 1000 to 3000 can be routinely achieved with YIG over most of the microwave frequency range. In comparison, the best varactor Q achievable at 5 GHz is less than 150.

(b) Wide Bandwidth. The ferrimagnetic resonance property of YIG has no fundamental frequency limitations. It is possible, as evidenced elsewhere in this catalog, to produce a device that can tune from 2 GHz to 26.5 GHz with excellent performance.

(c) Linearity. The physical laws governing ferrimagnetic resonance make YIG devices very linear. Tuning nonlinearities are caused by the linearity of the electromagnet and frequency pulling by external circuits. These effects can be minimized by careful design.

(d) Excellent Thermal Drift Characteristics. The thermal drift characteristics of YIG resonators are a function of the thermal drift of the active devices, the thermal drift of the YIG sphere, and the variation over temperature of the applied D.C. field. The drift in the applied D.C. field is electronically correctable in the drive circuitry. The sphere drift itself is minimized by aligning the sphere on an axis of zero first order anisotropy, thermally isolating the sphere from the rest of the R.F. and D.C. circuitry, and heating it to a constant temperature (85°C in most Microsource devices). Heater power is used only to heat the sphere and holder and as a result, is much less than required in varactor-tuned circuits to achieve the same performance.

(e) Size and Weight. It is possible by proper magnetic and R.F. circuit design to obtain size and weight performance that rivals compact VCO designs and provides wider bandwidth coverage. The Microcube™ series of designs described in this catalog are a good example of the size/performance combination available.

(f) Tuning Speed. It is often mistakenly assumed that the tuning characteristics of YIG preclude its use in situations that require fast tuning. Such is not the case. There is no inherent speed limitation within the YIG material itself. The limitation arises only in the speed with which the D.C. field that determines the precession frequency can be varied. By proper design of the tuning magnetics, it is possible to achieve tuning rates faster than 10 GHz/millisecond.

APPLICATIONS

Given these desirable characteristics, system designers are finding more and more applications for YIG-tuned oscillators, filters, and subsystems. A few of these are highlighted below.

OSCILLATOR APPLICATIONS

The characteristics of YIG oscillators, in addition to those enumerated above, that make them attractive in system applications are: (a) low phase noise, (b) modulation at rates up to 10 MHz, (c) the ability to be phase-locked, and (d) the ability to add functions to produce Microwave Integrated Circuit (MIC) Super Components. Applications include:

(a) Sweep oscillators
(b) Signal generators
(c) Low-noise synthesizers
(d) Spectrum analyzer local oscillators
(e) Surveillance receiver local oscillators

BANDPASS FILTER APPLICATIONS

YIG-tuned bandpass filters are essential in any system that needs tunable preselection or harmonic suppression. Characteristics that are particularly attractive are: low passband insertion loss, low spurious modes, constant bandwidth, and the ability to incorporate multiple poles.

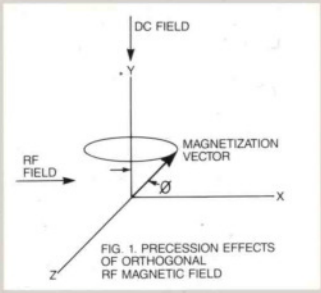


Figure 1

BAND REJECT FILTER APPLICATIONS

YIG-tuned band reject filters have applications in systems where it is desired to suppress a known signal in order to be able to receive other signals. The characteristics that are important are: prescribed stopband characteristics, low passband insertion loss, and multioctave tunability. Applications are in signal processing circuits and ECM jammers.

SYSTEM APPLICATIONS

By far, the most interesting aspects of YIG technology to system designers are the potential performance improvements and cost savings that occur when YIG devices are integrated with phase-locked loops and signal processing circuits to provide complex system functions in small, inexpensive packages.

Elsewhere in this catalog are described, for example:

(a) Fast switching phase-locked filters
(b) Wideband integrated front ends
(c) Special purpose frequency synthesizers

In addition, Microsource has the MIC capability to manufacture multifunction modules that provide modulation, multiple outputs, signal translation, and several other functions.

MEASUREMENT OF OSCILLATOR PARAMETERS

OSCILLATOR MEASUREMENTS

This section gives a brief description of the frequently specified characteristics of YIG-tuned oscillators and how they are measured.

Oscillator characteristic measurements can be separated into the following broad categories:

(a) Frequency Related
(b) Power Output
(c) Spectrally Related
(d) Tuning Characteristics
(e) Physical Dimensions

The typical oscillator test system used at Microsource is shown in block diagram form in Figure 2. All oscillators at Microsource undergo a minimum of two cycles of thermal shock and 48 hours of operating burn-in, at elevated temperature, prior to recording of final data. The data is typically taken by computer-controlled automatic systems.

FREQUENCY RELATED CHARACTERISTICS

These characteristics are measured using a frequency counter:

(a) FREQUENCY RANGE: The frequency range over which the oscillator produces its specified performance.
(b) FREQUENCY DRIFT OVER TEMPERATURE: The variation in frequency due to temperature change measured at a fixed tuning current. In oscillators with drivers, this is measured at a fixed tuning voltage or digital code.
(c) PULLING: The frequency variation due to load VSWR, typically specified at a 12dB return loss. Frequency pulling is measured by operating the oscillator into a short circuited 6dB attenuator at the end of a line stretcher and monitoring the frequency via a directional coupler. All Microsource oscillators are buffered to isolate the oscillator stage from the load and typically will oscillate into an infinite VSWR.
(d) PUSHING: A measure of the effects of power supply variations on the output frequency. This is measured by varying the power supply voltage a known incremental amount and recording the frequency change.

POWER OUTPUT

Typically, the minimum output power and the output power variation across the frequency and/or temperature range are specified. At Microsource, power output measurements are made on a scalar network analyzer with correction factors derived from power meter calibration taken into account.

SPECTRALLY RELATED

Spectrally related characteristics fall into four categories: Harmonics, Spurious, Phase Noise, and Incidental FM.

(a) HARMONICS: The power output at the harmonics of the desired output frequency. This is measured either with a spectrum analyzer, or on a swept basis by suppressing the fundamental, measuring the harmonic power, and comparing it to the fundamental power. This latter method adds the power outputs at all harmonic frequencies, and therefore tends to be more conservative.
(b) SPURIOUS: The non-harmonically related power output as measured on a spectrum analyzer. This is typically specified at greater than 60dB below the main signal.
(c) PHASE NOISE: The phase modulation of the signal due to internally generated noise. There are many methods of measuring phase noise in an oscillator with different limitations on accuracy, closeness to carrier, and measurement speed. At Microsource, several different methods are used depending upon the application. These include beating two similar oscillators together, the delay line discriminator technique, and stabilizing the oscillator and measuring the noise using a spectrum analyzer.
(d) INCIDENTAL FM: A measure of the inherent stability of the oscillator. It is measured on a spectrum analyzer by observing the variation of frequency over some period of time (typically one minute). It should be noted that all frequency and noise related measurements need to be made with a low-noise driver since driver and power supply noise will mask the true device characteristics.

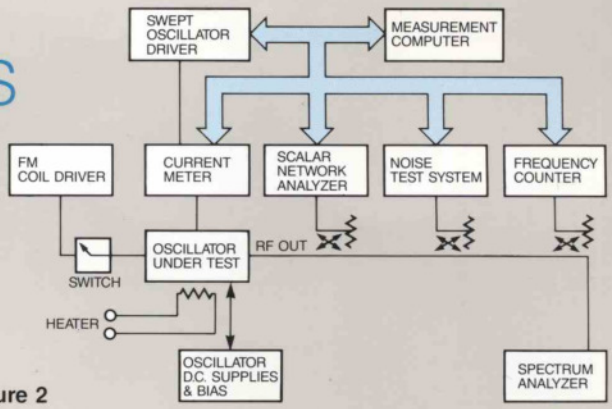


Figure 2

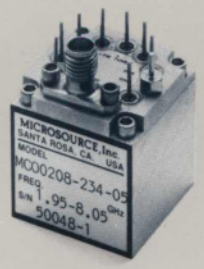
TUNING CHARACTERISTICS

Microsource YIG oscillators are frequency tuned by means of a main coil which drives the electromagnet. In addition, fine tuning, frequency modulation, and phase-lock can be achieved by means of an air core FM coil with wideband modulation capability. The tuning characteristics of prime interest in YIG oscillators are: Tuning Sensitivity and Linearity, Hysteresis, and FM Coil Sensitivity, Bandwidth, and Deviation.

(a) TUNING SENSITIVITY AND LINEARITY: These are both measured using a frequency counter and a digital voltmeter measuring the drop across a fixed resistor to obtain coil current. Linearity is the maximum deviation of the actual tuned frequency from a best-fit straight line of the frequency/coil current relationship expressed either in percentage or in megahertz.
(b) HYSTERESIS: This is measured by sweeping the oscillator between end points to clear the field and measuring the difference in frequency between up sweep and down sweep at a fixed tuning current at midband.
(c) FM SENSITIVITY AND BANDWIDTH: This is measured with a precision FM coil driver and frequency counter. Bandwidth and deviation are measured using a function generator, precision FM coil driver, and a spectrum analyzer.

COMMERCIAL YIG-TUNED OSCILLATORS

Standard (MSO) and Microcube™ (MCO) Series Oscillators
Guaranteed Specifications for 0 to 65°C Case Temperature



MSO and MCO Series Oscillators:	0501 -01	0502 -01	0102 -01	0104 -01	0204 -01	0204 -02	0206 -01	0208 -01
RF Characteristics:								
Frequency Range, min. (GHz)	.5-1	.5-2	1-2.3	1-4	2-4	2-4	2-6	2-8
Power Output								
Minimum (dBm)	10	10	17	13	13	20	13	15
Variation, max. (dB)	±3	±3	±1.5	±3	±1.5	±2	±3	±3
Harmonics, min. (dBc)	10	10	15[1]	12	12	12	12	12
Non-Harm. Spurious, min. (dBc)	60	60	60	60	60	60	60	60
Freq. Drift over Temp., max. (MHz)	10	15	10	15	10	10	15	20
Freq. Pulling (12dB Ret. Loss), typ. (MHz)	.5	.5	.5	.5	.5	.5	.5	.2
Power Supply Pushing								
+15V typ. (MHz/V)	.5	.5	.5	.5	.5	.5	.5	.2
– 5V typ. (MHz/V)	1	1	*	*	*	*	*	*
Main Coil:								
Sensitivity, typ. (MHz/mA)	20	20	20	20	20	20	20	20
3dB Bandwidth, typ. (kHz)	5	5	5	5	5	5	5	5
Linearity, max. (%)	±.2	±.3	±.1	±.25	±.05	±.05	±.05	±.1
Hysteresis, max. (MHz)	2	4	2	5	3	3	6	8
Impedance, typ. (Ω/mH)	10/90	10/90	10/90	10/90	10/95	10/95	10/95	10/95
FM Coil:								
Sensitivity, typ. (kHz/mA)	310	310	310	310	310	310	310	310
3dB Bandwidth, typ. (kHz)	400	400	400	400	400	400	400	400
Deviation at 400kHz rate, min. (MHz)	40	40	40	40	40	40	40	40
Impedance, typ. (Ω/μH)	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
D.C. Circuit Power:								
+15V typ. (mA)	150	150	150	150	120	200	120	120
– 5V typ. (mA)	40	40	*	*	*	*	*	*
Heater Power:								
Voltage, typ. (V)	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4
Current at 25°C								
steady, max. (mA)	25	25	25	25	25	25	25	25
surge, max. (mA)	300	300	300	300	300	300	300	300
Package Style(s)[2,3]	MSO1 MCO1	MSO1 MCO1	MSO1 MCO1	MSO1 MCO1	MSO1 MCO1	MSO1 MCO1	MSO1 MCO1	MSO1 MCO1

Notes:
- All Microsource oscillators will oscillate into better than 10:1 VSWR at all phases.
- Magnetic Susceptibility is 50kHz/Gauss. Reduced to 20kHz/Gauss with optional mu-metal shield.

Footnotes:
1. –20 dBc Harmonics available.
2. See pages 18 and 19 for outline drawings.
3. Main Coil Characteristics may be slightly different for Microcube™ (MCO) series.

* No –5 volt supply is required.

Microsource has available several package styles to address a variety of system requirements. For systems designed around the traditional 1-3/4" and 2" cylindrical packages, Microsource offers the MSO1 and MSO2 packages. These two packages offer the form and fit characteristics supplied by other manufacturers while producing superior functional performance.

For systems requiring high performance at high frequencies, Microsource offers the 2" square package (MSO3). This package, as a result of its even temperature distribution, provides better thermal performance over the cylindrical packages and greater mechanical mounting integrity.

For applications requiring the latest in technology, Microsource offers the Microcube™ package styles. These are denoted by the MCO prefix and are the best size/performance packages available today. The Microcube™ package shown above (MCO1), at a weight of only 4 ounces, is one-third the weight of the current industry standard package and yet outperforms it. This makes it ideal for airborne and missile applications and an excellent choice for the compact, portable instruments of the future.

Outline drawings for both the Microcube™ and MSO series package styles are shown on pages 18 and 19.

COMMERCIAL YIG-TUNED OSCILLATORS

Standard (MSO) and Microcube™ (MCO) Series Oscillators
Guaranteed Specifications for 0 to 65°C Case Temperature

MSO and MCO Series Oscillators:	0408 -01	0408 -02	0210 -01	0812 -01	0812 -02	0618 -01	0818 -01	0818 -02	1218 -01	1218 -02	0820 -01	1020 -01	1826 -01	1826 -02
RF Characteristics:														
Frequency Range, min. (GHz)	4-8	4-8	2-10	8-12.4	8-12.4	6-18.6	8-18.6	8-18.6	12-18.6	12-18.6	8-20	10-20	18-26.5	18-26.5
Power Output														
Minimum (dBm)	13	20	16	13	20	15	13	17	13	17	13	13	10	13
Variation, max. (dB)	±2	±2	±3	±3	±3	±3	±3	±3	±3	±3	±3	±3	±3	±3
Harmonics, min. (dBc)	12[1]	12	10	12[1]	12[1]	10	12	12	12	12	12[1]	12	12	12
Non-Harm. Spurious, min. (dBc)	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Freq. Drift over Temp., max. (MHz)	20	20	35	25	25	40	40	40	40	40	50	50	60	60
Freq. Pulling (12dB Ret. Loss), typ. (MHz)	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
Power Supply Pushing														
+15V typ. (MHz/V)	.5	.5	.5	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
– 5V typ. (MHz/V)	*	*	1	*	*	*	*	*	*	*	*	*	*	*
Main Coil:														
Sensitivity, typ. (MHz/mA)	20	20	20	20	20	18	18	18	18	18	18	18	29.5	29.5
3dB Bandwidth, typ. (kHz)	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Linearity, max. (%)	±.1	±.1	±.15	±.1	±.1	±.2	±.1	±.1	±.1	±.1	±.2	±.15	±.1	±.1
Hysteresis, max. (MHz)	6	6	10	6	6	15	12	12	9	9	15	15	12	12
Impedance, typ. (Ω/mH)	10/95	10/95	10/90	10/90	10/90	6/70	6/70	6/70	6/70	6/70	6/70	6/70	12/150	12/150
FM Coil:														
Sensitivity, typ. (kHz/mA)	310	310	310	310	310	450	450	450	450	450	450	450	450	450
3dB Bandwidth, typ. (kHz)	400	400	400	400	400	400	400	400	400	400	400	400	400	400
Deviation at 400kHz rate, min. (MHz)	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Impedance, typ. (Ω/μH)	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
D.C. Circuit Power:														
+15V typ. (mA)	120	200	225	250	250	250	250	300	250	250	250	250	250	300
– 5V typ. (mA)	*	*	40	*	*	*	*	*	*	*	*	*	*	*
Heater Power:														
Voltage, typ. (V)	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4
Current at 25°C														
steady, max. (mA)	25	25	25	25	25	25	25	25	25	25	25	25	25	25
surge, max. (mA)	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Package Style(s)[2,3]	MSO1 MCO1	MSO1 MCO1	MSO1	MSO1 MCO2	MSO1 MCO2	MSO2 MSO3 MCO2	MSO2 MSO3 MCO2	MSO2 MSO3 MCO2	MSO2 MSO3 MCO2	MSO2 MSO3 MCO2	MSO2 MSO3 MCO2	MSO2 MSO3 MCO2	MSO2	MSO2

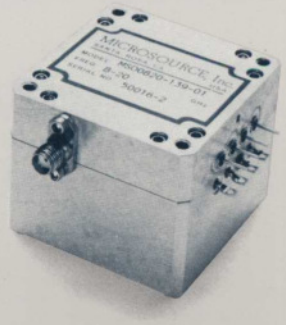
Notes:
- All Microsource oscillators will oscillate into better than 10:1 VSWR at all phases.
- Magnetic Susceptibility is 50kHz/Gauss. Reduced to 20kHz/Gauss with optional mu-metal shield.

Footnotes:
1. –20 dBc Harmonics available.
2. See pages 18 and 19 for outline drawings.
3. Main Coil Characteristics may be slightly different for Microcube™ (MCO) series.

* No –5 volt supply is required.

MILITARY YIG-TUNED OSCILLATORS

Standard (MSO) and Microcube™ (MCO) Series Oscillators
Guaranteed Specifications for −55 to +75°C Case Temperature



MSO and MCO Series Oscillators:	0502 -02	0104 -02	0208 -02	0210 -02	0812 -03	0618 -02	0818 -03	1826 -03
RF Characteristics:								
Frequency Range, min. (GHz)	.5-2	1-4	2-8	2-10	8-12.4	6-18.6	8-18.6	18-26.5
Power Output								
Minimum (dBm)	7	10	10	13	15	13	13	7
Variation, max. (dB)	±4	±4	±4	±4	±3	±4	±3	±3
Harmonics, min. (dBc)	10	10	10	10	12	10	10	12
Non-Harm. Spurious, min. (dBc)	60	60	60	60	60	60	60	60
Freq. Drift over Temp., max. (MHz)	40	40	40	60	50	80	70	100
Freq. Pulling (12dB Ret. Loss), typ. (MHz)	.5	.5	.5	.5	.5	.5	.5	.5
Power Supply Pushing								
+15V typ. (MHz/V)	.5	.5	.2	.5	.1	.1	.1	.1
− 5V typ. (MHz/V)	1	*	*	1	*	*	*	*
Main Coil:								
Sensitivity, typ. (MHz/mA)	20	20	20	20	20	18	18	29.5
3dB Bandwidth, typ. (kHz)	5	5	5	5	5	5	5	5
Linearity, max. (%)	±.3	±.3	±.1	±.15	±.1	±.2	±.15	±.1
Hysteresis, max. (MHz)	4	6	8	10	6	15	12	12
Impedance, typ. (Ω/mH)	10/90	10/90	10/95	10/90	10/90	6/70	6/70	12/150
FM Coil:								
Sensitivity, typ. (kHz/mA)	310	310	310	310	450	450	450	450
3dB Bandwidth, typ. (kHz)	400	400	400	400	400	400	400	400
Deviation at 400kHz rate, min.(MHz)	40	40	40	40	40	40	40	40
Impedance, typ. (Ω/μH)	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
D.C. Circuit Power:								
+15V typ. (mA)	150	150	120	225	250	250	250	250
− 5V typ. (mA)	40	*	*	40	*	*	*	*
Heater Power:								
Voltage, typ. (V)	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4
Current at 25°C								
steady, max. (mA)	25	25	25	25	25	25	25	25
surge, max. (mA)	300	300	300	300	300	300	300	300
Package Style(s)[1,2]	MSO1 MCO1	MSO1 MCO1	MSO1 MCO1	MSO1	MSO1 MCO2	MSO2 MSO3 MCO2	MSO2 MSO3 MCO2	MSO2

Notes:
- All Microsource oscillators will oscillate into better than 10:1 VSWR at all phases.
- Magnetic Susceptibility is 50kHz/Gauss. Reduced to 20kHz/Gauss with optional mu-metal shield.

Footnotes:
1. See pages 18 and 19 for outline drawings.
2. Main Coil Characteristics may be slightly different for Microcube™ (MCO) series.

* No −5 volt supply required.

Microsource offers a complete family of militarized YIG-tuned oscillators covering 500 MHz to 26.5 GHz. The construction techniques utilized in manufacturing these oscillators guarantees performance and allows meeting the stringent requirements of any one of the following general specifications:

Mil-E-5400
Electronics Equipment
Airborne
Mil-E-16400
Electronics Equipment
Naval Ship and Shore
Mil-E-4158
Electronics Equipment
Ground Based

Mil-STD-810 is the most commonly used guideline for screening and qualification. The oscillators described on this page are designed and manufactured with the ability to meet the following Mil-STD-810 environmental conditions:

Shock:
Method 516.2,
Procedure 1,
Basic design.
Humidity:
Method 507.1,
Procedure 1,
A/B electronic equipment.
Vibration:
Method 514.2,
Procedure 1.
High Temp.:
Method 501.1,
Procedure 1,
Storage.
Low Temp.:
Method 502.1,
Procedure 1,
Storage.
Salt Fog:
Method 509.1,
Procedure 1.
Temp./Altitude:
Method 504.1,
Equipment category 3.

COMMERCIAL AND MILITARY YIG-FILTERED OSCILLATORS

	Commercial 0 to 65°C Case Temp.			Military −55 to +75°C Case Temp.		
MSF Series Filtered Oscillators:	**0102 -01**	**0208 -01**	**0818 -01**	**0102 -02**	**0208 -02**	**0818 -02**
RF Characteristics:						
Frequency Range, min. (GHz)	1-2	2-8	8-18	1-2	2-8	8-18
Power Output						
Minimum (dBm)	12	15	12	10	10	10
Variation, max. (dB)	±2	±3	±3	±3	±4	±4
Harmonics, min. (dBc)	40	40	40	35	35	35
Non-Harm. Spurious, min. (dBc)	60	60	60	60	60	60
Freq. Drift over Temp., max. (MHz)	20	20	50	40	60	70
Freq. Pulling (12dB Ret. Loss), typ. (MHz)	.5	.5	.5	.5	.5	.5
Power Supply Pushing						
+15V typ. (MHz/V)	.5	.5	.1	.5	.5	.1
− 5V typ. (MHz/V)	1	1	*	1	1	*
Main Coil:						
Sensitivity, typ. (MHz/mA)	20	20	18	20	20	18
3dB Bandwidth, typ. (kHz)	5	5	5	5	5	5
Linearity, max. (%)	±.2	±.1	±.15	±.2	±.1	±.15
Hysteresis, max. (MHz)	2	8	12	2	8	12
Impedance, typ. (Ω/mH)	10/160	10/160	8/125	10/160	10/160	8/125
FM Coil:						
Sensitivity, typ. (kHz/mA)	310	310	450	310	310	450
3dB Bandwidth, typ. (kHz)	400	400	400	400	400	400
Deviation at 400kHz rate, min.(MHz)	40	40	40	40	40	40
Impedance, typ. (Ω/μH)	1/1	1/1	1/1	1/1	1/1	1/1
D.C. Circuit Power:						
+15V typ. (mA)	150	225	250	150	225	250
− 5V typ. (mA)	35	35	*	35	35	*
Heater Power:						
Voltage, typ. (V)	28±4	28±4	28±4	28±4	28±4	28±4
Current at 25°C						
steady, max. (mA)	60	60	60	60	60	60
surge, max. (mA)	500	500	500	500	500	500
Package Style[1]	MSO1	MSO1	MSO3	MSO1	MSO1	MSO3

Notes:
- All Microsource oscillators will oscillate into better than 10:1 VSWR at all phases.
- Magnetic susceptibility is 50kHz/Gauss. Reduced to 20kHz/Gauss with optional mu-metal shield.

Footnotes:
1. See page 19 for outline drawings.

* No −5 volt supply required.

In many systems a tracking filter is placed at the output of an oscillator to improve its spectral purity. An efficient method of doing this is to place the filter and oscillator within the same magnetic structure. This inherently provides excellent tracking between the oscillator and filter. Generally, such structures are larger due to the need for an increased magnet-pole area.

Microsource's 1-2 and 2-8 GHz YIG-filtered oscillators are available in the same industry standard cylindrical package in which many oscillators without tracking filters are provided. Thus, they provide plug-in and pin-for-pin compatability yet deliver 25 dB better harmonic performance.

The 8-18 GHz YFO is available in the 2″ square (MSO3) package and also provides −40 dBc harmonics as well as improved thermal performance and greater mechanical mounting integrity.

Microsource's YIG-filtered oscillators require the same bias supply voltages that are used on standard oscillators. Their unique internal filtering design enables the filter to internally track the oscillator needing no additional filter fine tuning.

Contact your local Microsource representative or the factory for a YIG-filtered oscillator tailored to meet your specific requirements.

SPECIAL PURPOSE SYNTHESIZERS

SPECIAL PURPOSE SYNTHESIZERS

There often exists a need for a stable signal source whose frequency can be digitally commanded over a wide frequency range, and where the frequency accuracy will allow sensitive system parameters to be optimized. It is also necessary that such sources be in small enough packages to fit into applications where space and weight are critical. Two such applications are: (a) ATE systems for field testing of wideband systems and (b) sensitive receivers. To address these needs, Microsource has developed a compact synthesizer that is designed to meet military environmental requirements. Presently, an 8-18 GHz synthesizer with the following specifications is available. This design is also convertible to cover the 2-8 GHz range. Microsource is developing designs that will cover the 2-18 GHz frequency range.

Summary of Pertinent Specifications

Frequency Range	8 to 18 GHz
Power Output	10 dBm
Frequency Resolution	100 kHz
Reference	100 MHz crystal osc. at 0 dBm
Tuning Command	TTL
Phase Noise	−70 dBc/Hz at 10 kHz offset
Harmonics	−12 dBc
Tuning Speed	6 GHz step in 10 ms
Power Requirement	12 watts max.
Size	7″ × 4.5″ × 3″

OSCILLATORS WITH DRIVERS

In many system applications, the system engineer is required to pay particular attention to the ability of the YIG oscillator to tune quickly to the desired frequency and remain stable and noise-free once there.

The characteristics of greatest concern consist of the following:

(a) system tuning linearity,
(b) ability to respond accurately to a digital tuning command,
(c) tuning speed,
(d) minimum incidental FM and phase noise due to the driver,
(e) operation over mil spec temperature ranges of −55 to +95°C, and
(f) size and weight.

As a result of designing some of the most advanced YIG-tuned source subsystems including phase-locked and fast-switching synthesized subsystems for military applications, Microsource has developed analog and digital driver designs with a wide range of state-of-the-art performance capabilities which have been proven in military applications. These designs are the industry leaders in size, weight, and performance, and are the most cost-effective solutions to the requirements in military airborne or ATE systems.

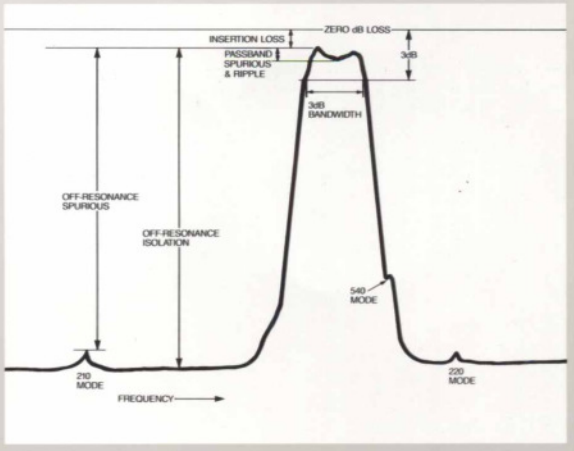
Microsource has the capability to produce hybrid drivers which are a fraction of the size of standard driver dimensions. Please contact the factory or your local Microsource representative for more information.

TYPICAL SPECIFICATIONS OF OSCILLATORS WITH DRIVERS

Parameter	Digitally Tuned Oscillator	Voltage Tuned Oscillator
RF Characteristics	See appropriate MSO or MCO series specifications.	
Operating Temperature	Commercial version: 0 to 65°C Military version: −55 to +75°C	
Tuning Characteristics[1] Start Frequency Stop Frequency	 All zeros All ones	 0.1000 volts 9.8000 volts
Frequency Accuracy	0.1% of desired frequency, typical	
Resolution	12 bit[2]	NA
Tuning Port Impedance	One standard TTL load[3]	≥ 10kΩ
Driver contribution to frequency pushing	0.01% of oscillator start frequency	
Driver related current requirement +15 and −15 volts	40 mA each supply	20 mA each supply

Footnotes:
1. Other digital codes or voltage ranges available.
2. Other resolutions available.
3. Other input loads available.

MEASUREMENT OF FILTER PARAMETERS



FILTER MEASUREMENTS

Microsource has pioneered the transition of YIG-tuned filters from "cut and try" to consistent circuit design and repeatable performance. Our filters are designed and operate as synchronously-tuned, multiple-resonant structures. Through attention to the coupling structures and the magnetics design, Microsource filters also offer spurious-free passband performance unsurpassed in the industry.

The following gives a brief description of frequently specified characteristics of YIG-tuned filters and how they are measured.

Filter characteristic measurements can be separated into the following broad categories:

(a) Frequency Range
(b) Passband Characteristics
(c) Off-Resonance Characteristics
(d) Tuning Characteristics
(e) Physical Dimensions

FREQUENCY RANGE

This is the minimum frequency range over which the passband center can be tuned while maintaining specified performance. It is measured using a network analyzer and frequency counter.

PASSBAND CHARACTERISTICS

(a) 3dB BANDWIDTH: The width of the passband in megahertz at the upper and lower 3dB points (minimum insertion loss plus 3dB) as measured using a network analyzer and frequency counter.

(b) INSERTION LOSS: The power loss in dB at the minimum loss point within the passband. This is usually measured with a network analyzer.

(c) PASSBAND SPURIOUS AND RIPPLE: The combination of passband shape perturbations caused by coupling ripple and magnetostatic modes. It is measured using a network analyzer.

(d) PASSBAND VSWR: The maximum VSWR at the best insertion loss point in the passband. This is measured using a network analyzer.

(e) NUMBER OF STAGES: This refers to the number of spheres used in a filter circuit. Each sphere accounts for approximately 6dB of attenuation per octave of the filter skirt.

OFF-RESONANCE CHARACTERISTICS

(a) OFF-RESONANCE ISOLATION: The signal rejection in dB, relative to the insertion loss, outside the passband skirts. Depending on the specification, this is measured using a spectrum or network analyzer.

(b) OFF-RESONANCE SPURIOUS: The rejection in dB of magnetostatic modes outside the passband skirts, which tune at the same rate as the passband, measured relative to the insertion loss. Typically, for filters with a start frequency greater than 4 GHz, the 210 mode is approximately 650 MHz below the passband center frequency and the 220 mode is approximately 330 MHz above the passband center frequency. It should also be noted that the 540 mode is approximately 150 MHz above the passband center frequency. For filters with start frequencies less than 4 GHz, all modes are closer to the passband center frequency and vary depending on the actual start frequency.

Microsource has the ability to modify the position of a mode with some trade-offs in performance in other areas.

TUNING CHARACTERISTICS

(a) SENSITIVITY AND LINEARITY: These are both measured using a frequency counter and a digital voltmeter measuring the drop across a fixed resistor to obtain the coil current. Sensitivity is the tuning slope defined in megahertz per milliamp and is a function of the number of turns in the tuning coil and the pole gap. Linearity is the maximum deviation of the actual tuned frequency from a best-fit straight line of the frequency/coil current relationship expressed either in percentage or in megahertz.

(b) HYSTERESIS: This is measured by sweeping the filter between end points to clear the field and measuring the difference in frequency between up sweep and down sweep at a fixed tuning current at midband. It should be noted that hysteresis effects can be minimized in system operation and filter performance characterization by tuning to the extremes of the filter frequency range and approaching a given frequency from the same direction each time.

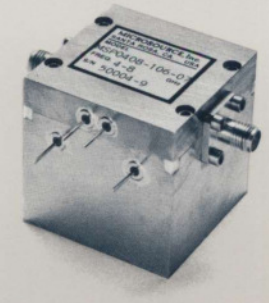
(c) FREQUENCY DRIFT OVER TEMPERATURE: The maximum change in center frequency at a fixed tuning current due to a change in temperature. This is measured using a precision current source, network analyzer, frequency counter, and a temperature chamber.

A NOTE ON QUALITY

All filters at Microsource undergo a minimum of two cycles of thermal shock and 48 hours of operating burn-in, at elevated temperature, prior to recording of final data. The data is typically taken by computer-controlled automatic systems.

COMMERCIAL YIG-TUNED BANDPASS FILTERS, OCTAVE BAND

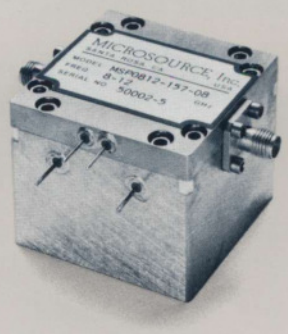
Standard (MSP) and Microcube™ (MCP) Bandpass Filters
Guaranteed Specifications for 0 to 65°C Case Temperature



MSP and MCP Series Bandpass Filters:	0501 -01	0501 -02	0501 -03	0501 -04	0102 -01	0102 -02	0102 -03	0102 -04	0204 -01	0204 -02	0204 -03	0204 -04	0408 -01	0408 -02
RF Characteristics:														
Frequency Range, min. (GHz)	.5-1	.5-1	.5-1	.5-1	1-2	1-2	1-2	1-2	2-4	2-4	2-4	2-4	4-8	4-8
Number of Stages	2	3	4	Dual 2	2	3	4	Dual 2	2	3	4	Dual 2	2	3
Bandwidth at 3dB, min. (MHz)	15	15	10	10	20	18	20	20	25	20	20	20	30	25
Freq. Drift over Temp., typ. (MHz)	4	4	4	4	5	5	5	5	6	6	6	6	8	8
Insertion Loss, max. (dB)	5	6	8	8	3	4	5	6	3	4	5	6	3	3
Off-Res. Isolation, min. (dB)	40	70	80	80	40	70	80	80	50	70	80	80	50	70
Off-Res. Spurious, min. (dB)	25	40	50	50	25	40	50	50	25	40	50	50	25	40
Passband VSWR, typ.	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1
Combined Passband Ripple and Spurious, max. (dB)	2	2	2.5	2.5	2	2	2.5	2.5	2	2	2	2	2	2
Limiting Level, min. (dBm)	−23[1]	−23[1]	−23[1]	−23[1]	−23[1]	−23[1]	−23[1]	−23[1]	+10	+10	+10	+10	+10	+10
Tuning Coil Characteristics:														
Sensitivity, typ. (MHz/mA)	17	17	17	17	17	17	17	17	20	20	20	20	20	20
Linearity, max. (MHz)	±2	±2	±2	±2	±2	±2	±2	±2	±3	±3	±3	±3	±5	±5
Hysteresis, max. (MHz)	4	4	4	4	4	4	4	4	6	6	6	6	8	8
Impedance, typ. (Ω/mH)	14/180	14/180	14/180	14/180	14/180	14/180	14/180	14/180	9/95	9/95	9/95	9/95	9/95	9/95
Heater Power:														
Voltage, typ. (V)	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4
Current at 25°C														
steady, max. (mA)	60	90	120	120	60	90	120	120	60	90	120	120	60	90
surge, max. (mA)	500	750	1000	1000	500	750	1000	1000	500	750	1000	1000	500	750
Package Style(s)[2,3]	MSP1 MCP1	MSP1 MCP1	MSP1 MCP1	MSP3	MSP1 MCP1	MSP1 MCP1	MSP1 MCP1	MSP3	MSP1 MCP1	MSP1 MCP1	MSP1 MCP1	MSP3	MSP1 MCP2	MSP1 MCP2

Footnotes:
1. +10 dBm Limiting Level available.
2. See pages 18 and 19 for outline drawings.
3. Main Coil Characteristics may be slightly different for Microcube™ (MCO) series.

COMMERCIAL YIG-TUNED BANDPASS FILTERS, OCTAVE BAND

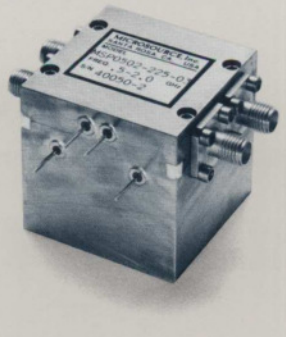


Standard (MSP) and Microcube™ (MCP) Bandpass Filters
Guaranteed Specifications for 0 to 65°C Case Temperature

MSP and MCP Series Bandpass Filters:	0408 −03	0408 −04	0812 −01	0812 −02	0812 −03	0812 −04	1218 -01	1218 -02	1218 -03	1218 -04	1826 -01	1826 -02	1826 -03	1826 -04
RF Characteristics:														
Frequency Range, min. (GHz)	4-8	4-8	8-12.4	8-12.4	8-12.4	8-12.4	12-18.6	12-18.6	12-18.6	12-18.6	18-26.5	18-26.5	18-26.5	18-26.5
Number of Stages	4	Dual 2	2	3	4	Dual 2	2	3	4	Dual 2	2	3	4	Dual 2
Bandwidth at 3dB, min. (MHz)	25	20	30	30	30	30	40	40	40	40	40	40	40	40
Freq. Drift over Temp., typ. (MHz)	8	8	8	8	8	8	10	10	10	10	20	20	20	20
Insertion Loss, max. (dB)	4	5	3	3	4	5	3	4	4	5	4	5	6	7
Off-Res. Isolation, min. (dB)	80	80	50	70	80	80	50	70	80	80	40	60	70	70
Off-Res. Spurious, min. (dB)	50	50	25	40	50	50	25	40	50	50	20	30	50	50
Passband VSWR, typ.	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1
Combined Passband Ripple and Spurious, max. (dB)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Limiting Level, min. (dBm)	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10
Tuning Coil Characteristics:														
Sensitivity, typ. (MHz/mA)	20	20	20	20	20	20	20	20	20	20	30	30	30	30
Linearity, max. (MHz)	±5	±5	±4	±4	±4	±4	±6	±6	±6	±6	±15	±15	±15	±15
Hysteresis, max. (MHz)	8	8	6	6	6	6	9	9	9	9	25	25	25	25
Impedance, typ. (Ω/mH)	9/95	9/95	5/75	5/75	5/75	5/75	5/75	5/75	5/75	5/75	8/70	8/70	8/70	8/70
Heater Power:														
Voltage, typ. (V)	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4
Current at 25°C														
steady, max. (mA)	120	120	60	90	120	120	60	90	120	120	60	90	120	120
surge, max. (mA)	1000	1000	500	750	1000	1000	500	750	1000	1000	500	750	1000	1000
Package Style(s)[1,2]	MSP1 MCP2	MSP3	MSP2 MSP1 MCP2	MSP2 MSP1 MCP2	MSP2 MSP1 MCP2	MSP4	MSP2 MCP2	MSP2 MCP2	MSP2 MCP2	MSP4	MSP2	MSP2	MSP2	MSP4

Footnotes:
1. See pages 18 and 19 for outline drawings.
2. Main Coil Characteristics may be slightly different for Microcube™ (MCO) series.

COMMERCIAL YIG-TUNED BANDPASS FILTERS, MULTI-OCTAVE BAND

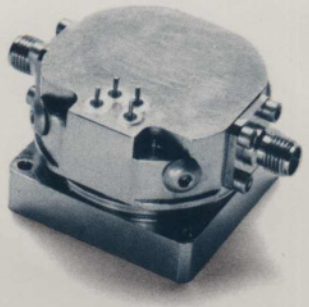


Standard (MSP) and Microcube™ (MCP) Bandpass Filters
Guaranteed Specifications for 0 to 65°C Case Temperature

MSP and MCP Series Bandpass Filters:	0502 -01	0502 -02	0502 -03	0208 -01	0208 -02	0208 -03	0818 -01	0818 -02	0818 -03	0118 -01	0118 -02	0222 -01	0222 -02	0222 -03	0226 -01
RF Characteristics:															
Frequency Range, min. (GHz)	.5-2	.5-2	.5-2	2-8	2-8	2-8	8-18.6	8-18.6	8-18.6	1-18	1-18	2-22	2-22	2-22	2-26.5
Number of Stages	2	3	4	2	3	4	2	3	4	2	3	2	3	4	1
Bandwidth at 3dB, min. (MHz)	15	15	15	25	25	25	30	40	40	20	20	25	25	25	20
Freq. Drift over Temp., typ. (MHz)	6	6	6	7	7	7	8	8	8	20	20	15	15	15	20
Insertion Loss, max. (dB)	5	6	7	3	5	5	3	4	5	7	7	5	6	7	4[5]
Off-Res. Isolation, min. (dB)	45	70	70	50	70	80	50	70	80	45	70	50	70	80	40
Off-Res. Spurious, min. (dB)	20	40	50	20	40	50	20	40	50	20	40	20	40	50	10
Passband VSWR, typ.	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1	2:1
Combined Passband Ripple and Spurious, max. (dB)	2	2	2	2	2	2	2	2	2	2	2.5	2	2	2	.5
Limiting Level, min. (dBm)	−23[1]	−23[1]	−23[1]	+10	+10	+10	+10	+10	+10	+10[4]	+10[4]	+10	+10	+10	+10[6]
Tuning Coil Characteristics:															
Sensitivity, typ. (MHz/mA)	17	17	17	20	20	20	20	20	20	20	20	20	20	20	30
Linearity, max. (MHz)	±2	±2	±2	±5	±5	±5	±6	±6	±6	±15	±15	±10	±10	±10	±20
Hysteresis, max. (MHz)	4	4	4	9	9	9	15	15	15	25	25	20	20	20	30
Impedance, typ. (Ω/mH)	14/180	14/180	14/180	9/95	9/95	9/95	5/75	5/75	5/75	5/75	5/75	5/75	5/75	5/75	8/70
Heater Power:															
Voltage, typ. (V)	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4	28±4
Current at 25°C															
steady, max. (mA)	60	90	120	60	90	120	60	90	120	60	90	60	90	120	30
surge, max. (mA)	500	750	1000	500	750	1000	500	750	1000	500	750	500	750	1000	250
Package Style(s)[2,3]	MSP1 MCP1	MSP1 MCP1	MSP1 MCP1	MSP1 MCP1	MSP1 MCP1	MSP1 MCP1	MSP2 MCP2	MSP2 MCP2	MSP2 MCP2	MSP2 MCP2	MSP2 MCP2	MSP2	MSP2	MSP2	MSP2

Footnotes:
1. +10 dBm Limiting Level available.
2. See pages 18 and 19 for outline drawings.
3. Main Coil Characteristics may be slightly different for Microcube™ (MCO) series.
4. −23 dBm Limiting Level below 2 GHz.
5. 3 dB Insertion Loss below 12 GHz.
6. −20 dBm Limiting Level from 2.0 to 2.4 GHz.

MILITARY YIG-TUNED BANDPASS AND BAND REJECT FILTERS



MILITARY FILTERS

Microsource manufactures bandpass filters for a variety of different military applications including ECM, ECCM, and surveillence receivers.

The filters shown on the previous three pages are also offered in a militarized version operating over the -55 to +75°C temperature range. Most specifications will remain the same, however the most notably affected parameter will be frequency drift which will increase by approximately 50% over the figures for the commercial temperature range of 0 to 65°C. Frequency drift is predictable in direction and linear with temperature and, therefore, can be easily compensated for in the drive circuitry. Microsource has built multi-octave filters with drivers that exhibit less than 15 MHz of total drift over the −55 to +75°C temperature range.

Microsource offers several standard package styles (see page 19) which provide form and fit replaceability while providing superior functional performance. For applications requiring the latest in technology, we offer the Microcube™ series package styles (see page 18). For applications where size and weight are a major concern, the light weight and small size of the Microcube™ filters make them an ideal choice.

Many applications require special packaging requirements. Our filter designs allow for flexibility to enable us to meet your specific packaging requirements.

BAND REJECT FILTERS

Microsource has done extensive work in band reject filter technology. Our high frequency band reject filter subsystems have been used in airborne ECM and other military applications, all of which are of a classified nature. Microsource's reputation for excellence in this area is unsurpassed.

Our band reject filter subsystems are multistage, have extremely deep notches and wide notch bandwidths, and far exceed the performance available from any other manufacturer today. Please contact Microsource for more information.

YIG-TUNED HARMONIC GENERATORS

Microsource's harmonic generators use step recovery diodes to accept fundamental signals at specified frequencies between 500 MHz and 6 GHz and produce harmonics up to 26.5 GHz. The integration of the impulse generator into the filter structure assures the highest efficiency multiplication with an exceptionally clean passband and a wide input dynamic range.

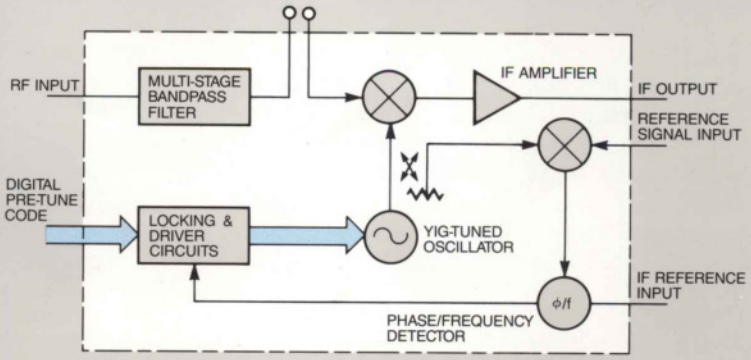
Microsource's standard harmonic generator has an integral three-sphere filter. The structure has been carefully designed to be thermally compensated and to have consistent unit-to-unit performance. The impulse generator design is flexible and, depending upon the customer requirements, can be changed to accept any input frequency.

These harmonic generators are also available with a wide variety of drivers in a variety of package styles. Please contact your local Microsource representative or the factory for additional information.

TYPICAL YIG-TUNED HARMONIC GENERATOR SPECIFICATION:

Input Frequency	500 MHz (Specifiable: 500-6000MHz)
Input Power	800 mW
Input VSWR (max)	2.0:1
Output Frequency	1.4 - 19 GHz (Specifiable to 26.5GHz)
Output Power	−33 dBm at 19 GHZ
Adjacent Harmonic Rejection	−30 dBc
Tuning Sensitivity	22 to 27 MHz/mA
Linearity	±35 MHz max
Hysteresis	±13 MHz max
Coil Resistance	8 to 12 ohms
3 dB Bandwidth	20 MHz min at 1.4 GHz 40 MHz min at 19 GHz

INTEGRATED RECEIVER FRONT ENDS



INTEGRATED FRONT ENDS

Microsource now offers the system designer, who is interested in high performance in a miniature package, the ability to achieve preselection and down-conversion to a fixed IF frequency in a digitally-tuned package with phase-locked accuracy.

Microsource's integrated front end, IFE, is available in a phase-locked version and a synthesized local oscillator version using Microsource's compact synthesizer technology (see page 11). The microwave portion of the front end incorporates a YIG-tuned multiple-resonator bandpass filter and a wideband tracking YIG oscillator within the same magnetic structure. The oscillator tracks the filter at a frequency separation determined by the desired IF frequency. The ability to achieve ultra-linear performance in oscillators, plus the high frequency YIG-filtered oscillator technology pioneered by Microsource, make this kind of performance possible.

The advantages to the system designer are many:

- Small size and weight.
- Only one magnet structure to drive resulting in lower power dissipation.
- Lower component count, higher reliability.
- Cost effectiveness.
- Phase-locked or synthesized accuracy.
- Excellent tracking over wide temperature ranges.
- No need for continuous reference signal.
- Operation with a wide range of pulsed reference signals.

A block diagram of a typical phase-locked version system is shown above. Microsource has the capability to build such IFE's from 2-20 GHz. Please contact the factory or your local Microsource representative for more information.

FILTERS WITH DRIVERS

FILTER DRIVERS

Microsource has developed a line of state-of-the-art drivers for use with its YIG filters. These standard drivers have been designed to be easily used in a variety of customer requirements. Our goal is to provide low cost, high performance drivers.

To achieve thermal stability, Microsource uses components with low temperature drift and designs each driver to sense temperature fluctuations and actively compensate for variations.

To guarantee reliable driver performance, all our integrated circuit components are carefully chosen. Also, all components are tested before installation to minimize driver failure. The approach taken minimizes package size and component count and maximizes reliability and performance over environmental conditions.

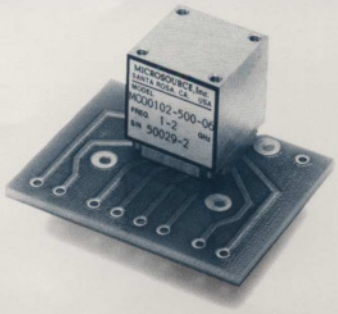
Microsource also supplies drivers that incorporate active thermal compensation to reduce frequency drift over the operating temperature range.

Custom products are also available to satisfy the more unique needs of our customers. Microsource has provided units incorporating integral digital-to-analog converters with up to eighteen bits of data. Other custom products include high-reliability products for demanding military applications and extremely low-noise drivers for those customers whose applications demand the utmost in performance.

TYPICAL SPECIFICATIONS OF FILTERS WITH DRIVERS

Parameter	Digitally Tuned Filter	Voltage Tuned Filter
RF Characteristics	See appropriate MSP or MCP series specifications.	
Operating Temperature	Commercial version: 0 to 65°C Military version: −55 to +75°C	
Tuning Characteristics[1] Start Frequency Stop Frequency	 All zeros All ones	 0.1000 volts 9.8000 volts
Frequency Accuracy	0.1% of desired frequency, typical	
Resolution	12 bit[2]	NA
Tuning Port Impedance	One standard TTL load[3]	≥ 10kΩ
Driver contribution to frequency pushing	0.01% of filter start frequency	
Driver related current requirement +15 and −15 volts	40 mA each supply	20 mA each supply

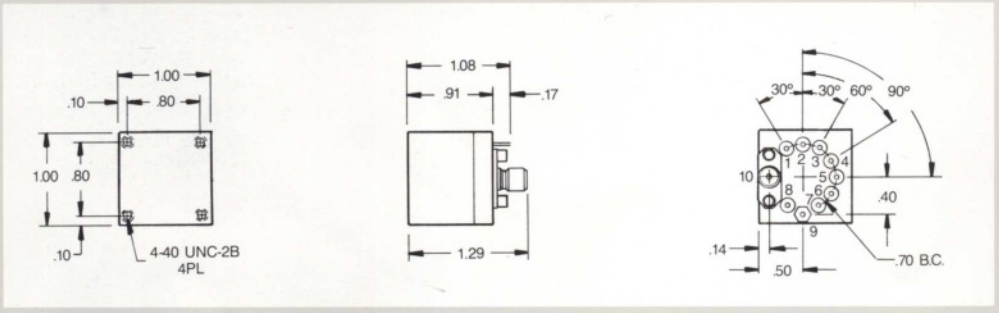
MICROCUBE OUTLINE DRAWINGS



Where size and weight are a concern, the Microcube™ is the best size/performance package available today. The Microcube™ family of YIG oscillators and YIG filters, shown on this page, represent the next generation of YIG component technology. They were designed to make the YIG device an integral part of a system design. The light weight and small size of the Microcube™ provides improved mechanical shock and vibration performance and yet provides the same RF performance as Microsource's larger cylindrical packages. Its small size also provides for faster tuning characteristics.

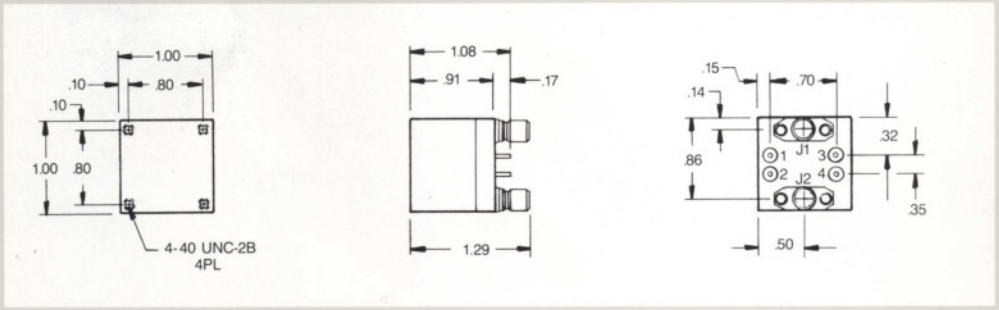
The Microcube™ has excellent thermal characteristics and mechanical mounting integrity due to the location and depth of its mounting holes. It can be mounted in a similar fashion to other coventional YIG oscillators.

An added advantage is that, by removing the SMA connector, it is possible to use the Microcube™ as a hermetic PC board mounted oscillator. This mounting scheme affords many space, performance, and system design advantages.



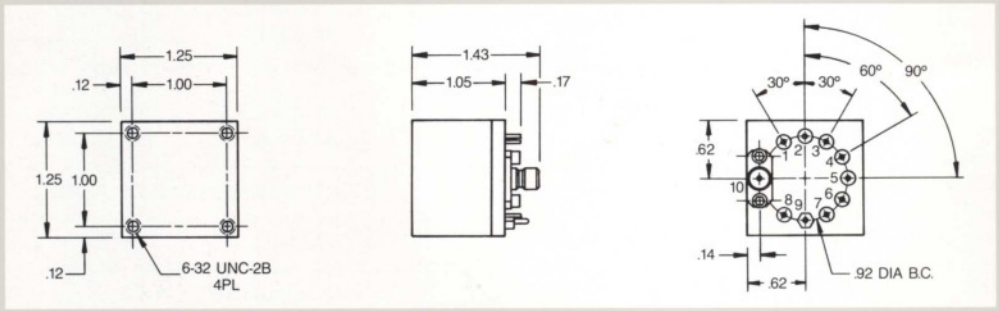
MCO1

CONN	TYPE	FUNCTION
1	FEEDTHRU	+15V
2	FEEDTHRU	– 5V
3	FEEDTHRU	+FM
4	FEEDTHRU	–FM
5	FEEDTHRU	+TUNE
6	FEEDTHRU	–TUNE
7	FEEDTHRU	HEATER
8	FEEDTHRU	HEATER
9	LUG	GROUND
10	SMA	RF OUT



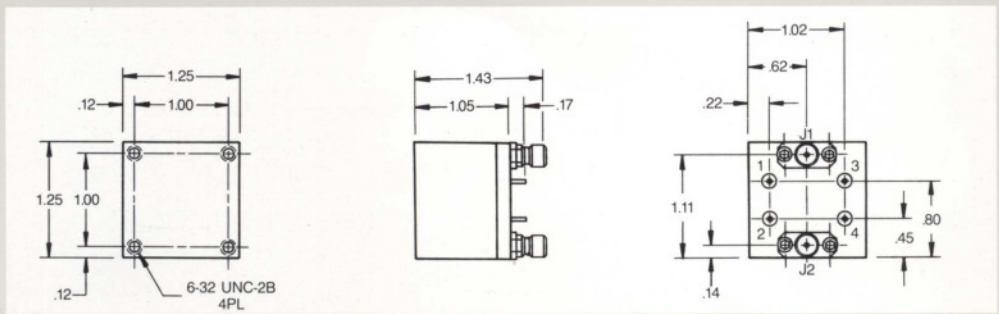
MCP1

CONN	TYPE	FUNCTION
J1	SMA	RF IN
J2	SMA	RF OUT
1	FEEDTHRU	COIL
2	FEEDTHRU	COIL
3	FEEDTHRU	HEATER
4	FEEDTHRU	HEATER



MCO2

CONN	TYPE	FUNCTION
1	FEEDTHRU	+15V
2	FEEDTHRU	– 5V
3	FEEDTHRU	+FM
4	FEEDTHRU	–FM
5	FEEDTHRU	+TUNE
6	FEEDTHRU	–TUNE
7	FEEDTHRU	HEATER
8	FEEDTHRU	HEATER
9	LUG	GROUND
10	SMA	RF OUT

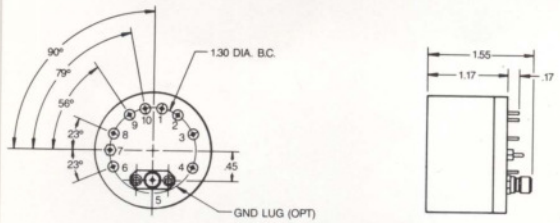


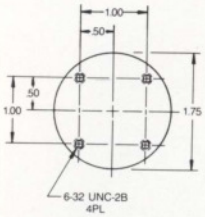
MCP2

CONN	TYPE	FUNCTION
J1	SMA	RF IN
J2	SMA	RF OUT
1	FEEDTHRU	COIL
2	FEEDTHRU	COIL
3	FEEDTHRU	HEATER
4	FEEDTHRU	HEATER

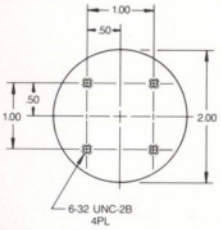
STANDARD OUTLINE DRAWINGS

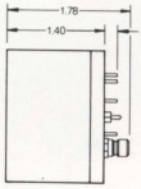
MSO1

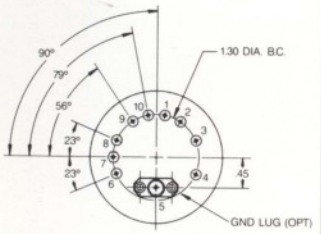




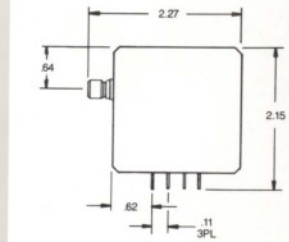
MSO2

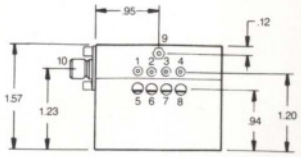


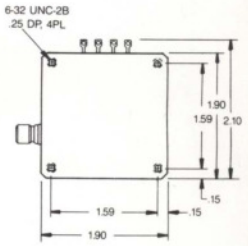




MSO3







MSO1 and MSO2

CONN	TYPE	FUNCTION
1	FEEDTHRU	+TUNE
2	FEEDTHRU	-TUNE
3	FEEDTHRU	HEATER
4	FEEDTHRU	HEATER
5	SMA	RF OUT
6	FEEDTHRU	+15 VOLTS
7	LUG	GROUND
8	FEEDTHRU	-5 VOLTS
9	FEEDTHRU	+FM
10	FEEDTHRU	-FM

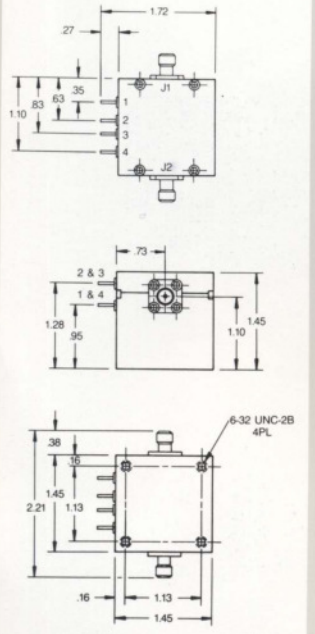
MSO3

CONN	TYPE	FUNCTION
1	FEEDTHRU	+15V
2	FEEDTHRU	- 5V
3	FEEDTHRU	HEATER
4	FEEDTHRU	HEATER
5	FEEDTHRU	-FM
6	FEEDTHRU	+FM
7	FEEDTHRU	+TUNE
8	FEEDTHRU	-TUNE
9	LUG	GROUND
10	SMA	RF OUT

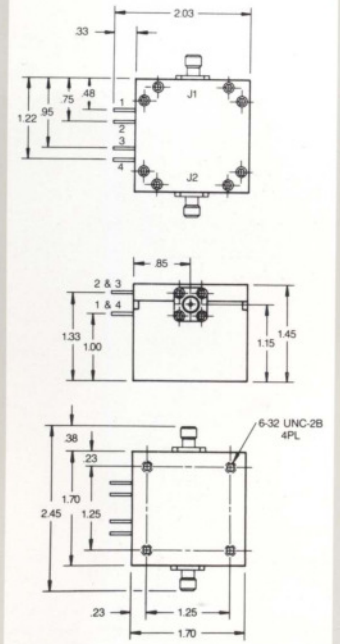
MSP SERIES

CONN	TYPE	FUNCTION
J1	SMA	RF IN
J2	SMA	RF OUT
J3	SMA	RF IN
J4	SMA	RF OUT
1	FEEDTHRU	COIL
2	FEEDTHRU	HEATER
3	FEEDTHRU	HEATER
4	FEEDTHRU	COIL

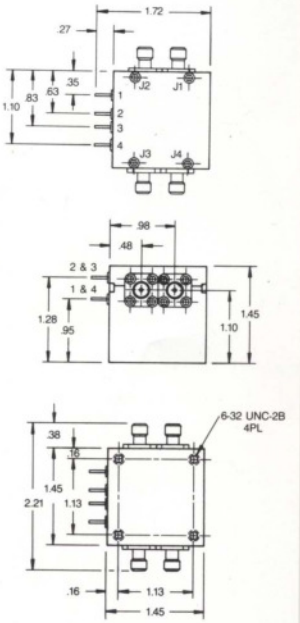
MSP1



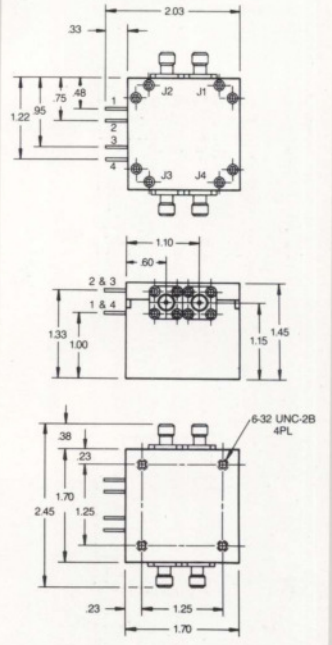
MSP2



MSP3



MSP4



ORDERING INFORMATION

Orders for Microsource, Inc., products may be placed with our engineering sales representatives or directly with Microsource's sales department. Please specify model number, description, quantity, price, and purchase order number. Also, please include shipping and billing information. All prices and specifications are subject to change without notice.

Unless specific instructions accompany the order, shipments will be made via UPS or Parcel Post. All shipments are FOB Santa Rosa, CA.

Prices for all products are available from our engineering sales representatives or directly from Microsource. Terms are net 30 days with appropriate credit information.

WARRANTY

Microsource, Inc., warrants each of its products to be free from defects in materials and workmanship for a period of 12 months from date of shipment. Our liability under this warranty is solely limited to the repair or replacement of the defective device. This warranty is void in the event the device fails as a result of negligence, misuse, tampering, or improper installation by the user. Microsource's standard warranty applies to the original purchaser only.

SERVICE ON RETURNS

Units returned for repair or evaluation must be returned freight prepaid, FOB factory. All units returned will be inspected and tested at Microsource to determine the cause of failure. If warranty repair is applicable, the unit will be repaired and returned freight prepaid, FOB destination; and the cost of the evaluation (inspection and testing) will be borne by Microsource, Inc. For out-of-warranty units, there is a charge for evaluation. A price for repair will be quoted, and if the customer subsequently approves the repair, the evaluation charge will be considered as part of the repair cost. If the customer declines to have the unit repaired, they will be billed for the evaluation charge. Non-warranty repairs will be returned FOB Santa Rosa, CA.

SPECIFICATIONS

Microsource, Inc., reserves the right to discontinue or modify any product or specification without notice.

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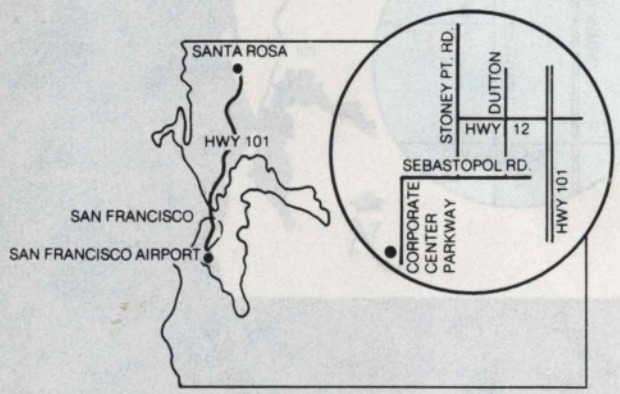

From the airport, drive north on Highway 101 through San Francisco to the Golden Gate Bridge. Continue on 101 north 55 miles to Santa Rosa. Once in Santa Rosa take the Highway 12 West exit then turn left on Stoney Point Rd. Turn right on Sebastopol Road and turn left on Corporate Center Parkway.

Driving time from San Francisco Airport to Santa Rosa is about 1½ hours. The distance is 75 miles.

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