



## FEATURES

- 0.5 to 18 GHz, Standard  
0.5 to 20 GHz, Optional
- Wide IF Bandwidths (Up to 500 MHz)
- Small Size
- Low Phase Noise:  $< 1^\circ$  rms
- Built-in Test Functions
- Synthesized and Sweeplable
- Expanded Coverage Available to 40 GHz
- Stand-alone (Remote) or SMR-1600 System Application

## DESCRIPTION

The SMR-1660 is a new member of the SMR-1600 Microwave Receiving System. The SMR-1660 is a miniaturized, synthesized microwave tuner produced by the Micro-Tel Division of Adams-Russell, INC. The SMR-1660's small size and high performance is made possible by the combined efforts of several Adams-Russell divisions including Micro-Tel, Anzac, RHG, and the Adams-Russell Semiconductor Center.

The SMR-1660 Tuner is a wide-band, multi-octave tuner that covers the 0.5 to 18 GHz frequency range. Each tuner contains a Motorola 68000 (sixteen bit microprocessor), RF converter, IF amplifier strip, synthesizer and internal power supply. The tuners are capable of operating in a linearly swept or synthesized fixed frequency mode providing the ability to address either "set-on" or "scan" requirements.

The SMR-1660 Tuner may be configured in a large multi-channel system or used as a stand-alone unit. Stand-alone applications may involve control directly from an external computer via the RS-422 interface. This provides an inexpensive solution to signal down conversion. The system flexibility is enhanced with the ability to remote the tuner up to 1000 feet from the operator position without degradation of system performance. The internal synthesizer has the flexibility of working with an external reference or it may use its internal ovenized crystal oscillator. Switching is accomplished automatically when an external source is connected to the tuner. The tuner is available with a range of IF center frequencies (160, 250, and 1000 MHz) and bandwidths up to 500 MHz.

The SMR-1660 "Display" output is a digitized video employing the Manchester Encoding Scheme. The output can be routed to the SMR-1641 Digitally Refreshed Display where RF scan information is displayed in four user definable  $F_1$  to  $F_2$  sector sweeps from one tuner, or four independent  $F_1$  to  $F_2$  sweeps from four tuners.

The SMR-1660 tuner is housed in an enclosure 3.5 inches high, 8.5 inches wide, and 22 inches deep.

### Performance

The SMR-1660 is designed to provide the ultimate in tuner performance. The enhanced synthesizer design achieves phase noise of less than 1 degree rms. Due to the broadband preselector employed, the tuner achieves low differential group delay. The SMR-1660, because of the low phase noise and group delay, contributes to the excellent NPR performance of the system which approaches 45 dB. The SMR-1660 is also useable in digital reception applications where phase noise and group delay are important considerations.

### Control

The SMR-1660 tuner, when employed in the SMR-1600 system, is controlled by the SMR-1611 controller via the SMR-1615 interface. The SMR-1611 acts as the communications link between the controller and the other components of the system. If the SMR-1660 tuner is used in a stand-alone application, the tuner is controllable over the RS-422 serial interface.

All SMR-1660 functions except power on/off are controllable over the RS-422 serial interface.

The functions of the SMR-1660 are:

Frequency	Sweep Rate
Sweep Limits	Modes
Step Size	$F_1$ - $F_2$
Marker Frequency	FO
BITE	Full Band
	Set-On

A variety of different scan modes are available to optimize swept performance.

**$F_1$ - $F_2$ :** Allows operator-definable sector scan limits to be set anywhere within the tuner's frequency capability. Sweep Rates are operator adjustable from 0.1 to 33 Hz. Up to four separate  $F_1$ - $F_2$  sweeps can be programmed to be swept and optionally displayed on the SMR-1641 Digitally Refreshed Display.

**Delta FO:** The tuner sweeps about the selectable center frequency at a sweep rate of 0.1 to 33 Hz.

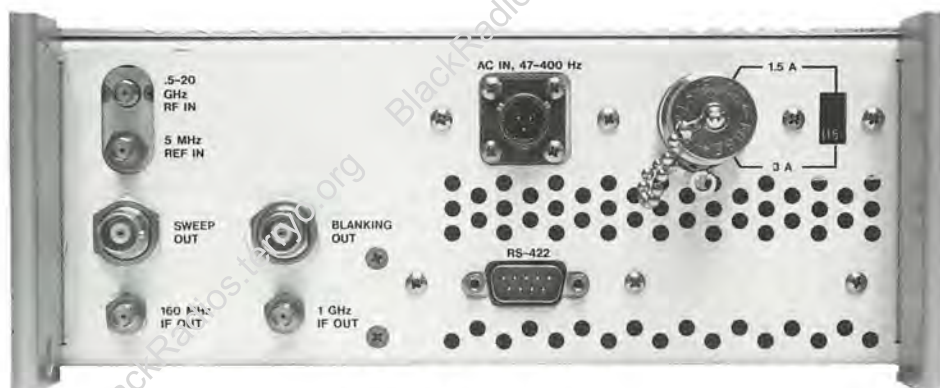
**Full Band:** The tuner scans its entire range at a sweep rate operator-adjustable from 0.1 to 33 Hz.

### Serviceability

The SMR-1660 was designed for optimum reliability and serviceability. Built-in-test permits rapid monitoring of tuner functions to determine the operating status of the tuner at all times. The BIT feature allows the operator to rapidly determine and isolate faults in the event of a tuner failure.

The BIT tests for the performance of phase-locked loops, power supply voltage, and the internal temperature of the tuner. Any out-of-tolerance condition will be reported in the form of a system error on the SMR-1611. When notified, the operator can take corrective action to remedy the error.

Another feature of the BITE is the ability to monitor and log actual operating hours. This allows the operators to schedule maintenance and record reliability data to determine MTBF's of the system.



SMR 1660 Tuner, Rearview

## SPECIFICATIONS:

<b>Frequency Resolution:</b>	1 kHz, all models
<b>Frequency Stability</b>	0.3 parts per million after 10 minute warm-up
<b>Frequency Aging Rate:</b>	1 part per million per year
<b>RF Input:</b>	SMA connector, 50 ohms nominal
<b>Noise Figure:</b>	17 dB maximum, 14 dB typical (wideband) 15 dB maximum, 13 dB typical (narrowband)
<b>Phase Noise:</b>	<1 degree rms
<b>Tuning Speed</b>	30 msec maximum, to within 1 kHz of any frequency
<b>Input VSWR:</b>	2.5:1 maximum

<b>RF to IF GAIN:</b>	13 db $\pm$ 3 dB
<b>LO Radiation:</b>	-95 dBm, maximum
<b>IF Rejection:</b>	80 dB, minimum
<b>Image Rejection:</b>	70 dB, minimum
<b>Third Order Input Intercept Point:</b>	0 dBm to 20 GHz
<b>Spurious-free Dynamic Range:</b>	> 80 dB, typical
<b>LO Spurious:</b>	< -55 dBc
<b>Built-in-test (BIT):</b>	Power supply voltages, temperature, phase lock status
<b>Temperature Range:</b>	0 to +50 degrees Celsius
<b>Size:</b>	3.5 x 8.5 x 22 inches
<b>Weight:</b>	< 20 pounds
<b>EMC Shielding</b>	Per MIL-STD-461B, CEO3 and REO2

## SMR-1660 SYNTHESIZED TUNER OPTION LIST

Option Number	Option Description
100	Standard SMR-1660 Tuner with the following: Frequency coverage of .5-18 GHz (Opt. 33) Rack mount hardware (Opt. 5) Display capability (Opt. 1) 1 GHz IF center frequency (Opt. 20) 500 MHz wide bandwidth 160 MHz auxiliary IF output (Opt. 26)

### Tuner Options

1	Scan Display and auto-stop capability
5	Rack-mount hardware
6	Provision for SMR-1660FE Frequency extender (18-26.5/26.5 - 40 GHz)

### IF Center Frequency Options (Select only ONE)

20	1000 MHz 500 MHz wide IF Bandwidth
21	1000 MHz 250 MHz wide IF Bandwidth
22	1000 MHz 100 MHz wide IF Bandwidth
23	250 MHz 75 MHz wide IF Bandwidth
24	160 MHz 75 MHz wide IF Bandwidth
25	160 MHz 40 MHz wide IF Bandwidth

### Auxiliary IF Outputs (Select only ONE) available only with options 20, 21, 22)

26	Auxiliary 160 MHz IF output (75 MHz Bandwidth)
27	Auxiliary 250 MHz IF output (75 MHz Bandwidth)

### Frequency Coverage Options

33	.5 - 18 GHz
50	8 - 20 GHz

## WARRANTY

All of Micro-Tel's equipment is warranted for one year, except for damage caused by accident or misuse, provided the equipment is returned for repair to the plant in Hunt Valley, MD.

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