SMR-3822A

Wideband Microwave Receiving System

Data Sheet

iRF

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FEATURES

- 0.1-20 GHz, extendable to 40 GHz
- IF outputs at 1 GHz, 160 MHz, and 70 MHz
- Built-in spectrum display processor for RF sweep and IF pan
- Eight IF bandwidths: 250 kHz to 100 MHz
- AM, FM, and log detectors
- Controlled from workstation or laptop
- Built-in test functions
- F1-F2 sweep and fixed frequencies
- Ethernet 100BaseT control
- CE Mark tested

DESCRIPTION

The SMR-3822A Receiver, a member of the SMR-3000 family of high-performance synthesized microwave receivers, covers 0.1 to 20 GHz. Extension of the tuning range to millimeter wave frequencies is possible using the FE-3820 Frequency Extender. An internal Spectrum Display Generator (SDG) generates data that can be used to develop RF Sweep and IF Pan spectrum displays on a remote workstation or laptop. Simultaneous wideband IF outputs are provided at 1 GHz (500 MHz bandwidth) and 160 MHz (100 MHz bandwidth) in addition to a post filtered 160 MHz IF output. All IF outputs have a noninverted spectrum; in addition, there is operator selectable inversion of the IF up to 20 GHz tuned frequency.

Remote Control by Laptop or Workstation

Remote control of the receiver is via the Ethernet 100BaseT LAN or RS-232 port. Graphical User Interface (GUI) software is included for control of the receiver from a remote laptop or workstation. The software runs under the Windows operating system and provides spectrum display windows for RF Sweep or IF Pan plus all receiver control functions that are available in the two operating modes using the optional Spectrum Display Generator (SDG). The included Display/Control software is implemented as Microsoft® Windows application. The Display/Control software application looks and behaves in a typical Microsoft® Windows manner and thereby promotes visual and functional consistency with other Microsoft® Windows applications. Additional information about the SMR-3822A GUI software is contained in a separate data sheet.

Spectrum Display Generator

The Spectrum Display Generator provides formatted digital data which can be used by a host computer to provide a graphical display of spectral data. The SDG supports operation in both the RF Sweep mode and in IF Pan mode. In the RF Sweep mode, the operator may view from one to six separate scans as wide as the entire receiver input tuning range of 0.1 to 20 GHz. In IF Pan mode, up to a 100 MHz wide bandwidth is centered at the receiver fixed tuned frequency. Enhanced hardware design implementation provides increased functional capability, including high dynamic range (>110 dB, 70 dB instantaneous), a wide range of selectable resolution bandwidths, video filtering, zero span mode with video triggering, logarithmic or linear amplitude display, adjustable vertical scaling, and increased amplitude measurement accuracy. This provides capabilities equivalent to a full-function spectrum analyzer.

RF Sweep Mode

During an RF sweep, the SDG LO is fix-tuned to process the 1 GHz IF center frequency. The tuner front end is then swept over the desired RF range. While the tuner is swept, the SDG Controller collects spectral data which is then formatted for display. In the RF Sweep mode, the full spectrum, 0.1-20 GHz, can be scanned in less than 120 ms with a 10 MHz or wider resolution bandwidth (RBW).

This equipment does not contain provisions for the installation of an intelligence database (i.e. threat signal parametric data).

This equipment may be subject to U.S. Government export controls. Consult factory for details.

IF Pan Manual Mode

IF Pan spectrum data is generated when the receiver is tuned to a fixed frequency and the synthesized LO in the SDG is swept across the desired IF Pan display range. The bandwidth resolution is determined by selecting one of six switched filters. Bandwidths ranging from 10 kHz to 10 MHz are provided. In the IF Pan mode, a maximum sweep width of 100 MHz is available, and the spectrum may be swept in 30 msec.

RF Inputs

Key RF parameters include low noise figure, high intercept point, and high dynamic range. Excellent LO phase noise performance ensures clean down-conversion and low distortion of signal modulation characteristics.

To remove receiver front end gain variations, a gain controlled RF component is set automatically by the microprocessor, based on internal calibration tables. Removing the front end gain ripple allows accurate signal amplitude data to be collected.

IF Outputs

The internal 1 GHz IF from the RF front end is preamplified and power divided. One of the divider outputs is filtered to a 100 MHz bandwidth and down converted to a 160 MHz center frequency. The IF filter module provides eight selectable bandwidths.

Integral to the IF/Demodulator module is an IF/AGC Amplifier module which provides 70 dB of AGC/MGC gain control range.

The AGC/MGC module generates the narrowband (post-filtered) IF output as well as the input to the demodulator module. The receiver provides fixed gain IF outputs at nominal 20 dB gain, a gain controlled post-filtered IF output, AM Video, FM Video, switched AM linear/AM stretched/FM Audio, and Log Video outputs.

The FM video is derived either from the post-filtered 160 MHz IF signal or optionally from the 1 GHz IF. Switching is determined by operator selection of FM Video mode.

The SMR-3822A Receiver is powered from the ac mains by an internal autosensing power supply. Built-In-Test (BIT) status of receiver phase lock, power supply voltages, and operating temperature limits are provided.

Extensive mechanical and environmental testing ensures that the SMR-3822A will perform in the most demanding environments.

RF SPECIFICATIONS AT 25° C

RF input	Single SMA connector, 50 Ω input impedance
Max input without damage	+20 dBm +30 dBm with optional limiter
Input VSWR	2.5:1, maximum
Frequency range	0.1-20 GHz, standard Extendable to 40 GHz with FE-3820
Long term frequency stability	<1 ppm/Yr
Frequency accuracy vs. temperature	$<1x10^{-6}$ over 0° to 50° C
External frequency standard	10 MHz at 0 dBm ± 3 dB, autoswitching
Reference output	10 MHz, +10 dBm, typical
Tuning resolution	1 kHz
Linear dynamic range	≥90 dB, RF to IF, 1 MHz BW
Input 1 dB compression point	≥ −15 dBm, −10 dBm, typical
Single tone spurious free dynamic range	>60 dB, RF to IF, 1 MHz BW
Two tone spurious free dynamic range	>65 dB, RF to IF, 1 MHz BW f1 - f2 <25% of IF BW
Third order intercept point	0 dBm, typ.; −3 dBm, min.*
Image rejection	>70 dB
LO reradiation	≤ −95 dBm at the RF input
Noise figure **0.1-12 GHz** **12-20 GHz**	 ≤11 dB ≤13 dB
Noise figure w/options **One option installed**	 0.1-12 GHz 12 dB 12-20 GHz 14 dB
Two options installed	0.1-12 GHz 14 dB 12-20 GHz 16 dB
Three options installed	0.1-12 GHz 16 dB 12-20 GHz 18 dB
RF to IF linear differential group delay	≤1.5 nsec over 80% of the 160 MHz WB IF BW* ≤ 3 nsec over 80% of the 1 GHz IF BW*
RF scan time	<65 msec, 0.5 to 20 GHz in a RBW of 10 MHz <85 msec 0.1 to 20 GHz in a RBW of 10 MHz
Settling time	≤50 ms for any step size across the full tuning range, MGC mode, settling within 1 kHz

*Applies to 80% of the 0.5-18 GHz tuning range at 1 GHz and 160 MHz WB, in the nominal 20 dB gain state.
Specifications subject to change without notice.

SMR-3822A
RF SPECIFICATIONS AT 25° C (cont)

Phase noise (typical)	**Offset dBc/Hz** 100 Hz −73 1 kHz −97 10 kHz −102 100 kHz −110 1 MHz −134 10 MHz −150
Integrated phase noise	≤ 0.48, 100 Hz to 100 MHz* ≤ 0.68, over the input range of 0.1 to 0.5 GHz
Tuner RF to IF gain	20 dB ±1 dB
Built in test	Activated during power up and on command. Monitors power supply voltages, temperature, and phase lock.

SYSTEM SPECIFICATIONS

Operating power	90-260 Vac, 47 - 63 Hz 0.99 Power Factor
Power consumption	165 watts nominal
RFI/EMI	Designed to meet MIL-STD 461E; CE102 & RE 102 Tested for CE Mark to EN61000-6-1:2001, EN61000-3:2001
Safety	CE Marked tested to EN60950-1:2001
Enclosure size	3.5 x 8.5 x 22.5 inches (8.6 x 24.1 x 57.2 centimeters)
Weight	26 pounds (11.8 kg) maximum.
Operating temperature	0° to +50° C
Altitude	10,000 feet
Control	RS-232 & Ethernet 100BaseT

IF OUTPUT SPECIFICATION

IF OUTPUT PORT	GAIN	NOISE FIGURE	BANDWIDTH
1 GHz	20 dB ±1.5 dB (FIXED)		500 MHz, min.
160 MHz Wideband	20 dB ±2.0 dB (FIXED)		100 MHz, min.
70 MHz	20 dB ±2.0 dB (FIXED)		50 MHz, min.
160 MHz Post Filtered	• Selectable MGC/AGC • 0 dB to 70 IF attenuation range • Rated output selectable −5, −10, −15 or −20 dBm • Gain/BW normalized	12 dB, maximum at 0 dB to 30 dB IF attenuation	Selectable 250 kHz 8.0 MHz 500 kHz 24 MHz 2.5 MHz 40 MHz 5.0 MHz 100 MHz

NOTE
Actual IF bandwidth is 10% of fo when the tune frequency is in the range of 0.1 to 0.499999 MHz.

Video Outputs **AM video *(selectable Lin/Log)*** **Lin mode**	0 to 1 V, 75 Ω, Adjustable 5% to 100%
Log mode	0 to 1 volt, 75 Ω
WB Log mode	Derived from the 1 GHz IF, 500 MHz BW. 1.5 Volt output specified at −14 dBm receiver input. Dynamic range ≥60dB, 25 mV/dB, 10 nsec risetime

Video Outputs (cont) **FM video NB mode**	1 Vp-p, 75 Ω, for deviation of 2/3 IF BW; Adjustable 5% to 100%
Audio outputs rear panel	15 kHz bandwidth, 600 Ω, 2.5 Vpk-pk, min. 3.5 Vpk-pk, max, 80 dB attenuation control range. Mode selectable: FM, AM linear, AM stretched

OPTIONS*

- **WB FM**
- **RF blanking**
- **Front-end attenuator**
- **Input power limiter**
- **Modified IF filter bandwidths**
- **Antenna band select**

RF blanking
Front-end attenuation not allowed with this option installed. All other options are available when RF blanking is installed.

** Some options may affect basic unit specifications. Contact factory for specific details.*

SMR-3822A Front Panel

WARRANTY

All intelligentRFsolutions 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, Maryland U.S.A

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