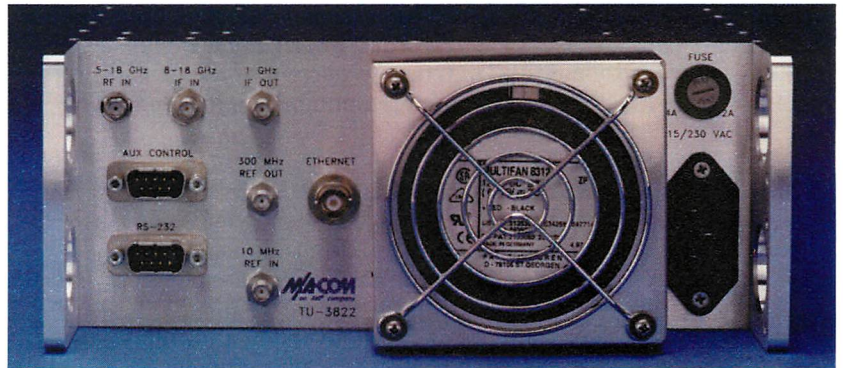




## TU-3822/IFD-3822 WIDEBAND MICROWAVE RECEIVING SYSTEM

### FEATURES

- 0.5 to 18 GHz (20 GHz optional), extendable to millimeter wave frequencies
- IF Outputs centered at 70 MHz, and 160 MHz
- Built-in Spectrum Display Processor for RF Sweep and IF Pan
- Eight IF bandwidths: 250 kHz to 50 MHz
- AM and FM Demodulators
- Digitally Controlled from PC or front panel controls
- Built-in Test Functions
- 100 Channel Memory. F1-F2 Sweep and Fixed Frequencies (optional)
- Remote Tuner/Local Demodulator-Controller or Optional Integrated Tuner/Demodulator/Controller
- Ethernet 10base-2 control



TU-3822 TUNER



IFD-3822 IF/DEMODULATOR

puts at 70 MHz and 160 MHz (140 MHz optional). Additionally, one post filtered IF bandwidth centered at 70 MHz is provided. All IF outputs have a non-inverted spectrum. The receiver system allows one Controller to control multiple TU-3822/IFD-3822 receiving systems simultaneously.

Only three pieces of hardware are required to field a system: The Remote (Laptop Control) or Local Controller, (CP-3801), Microwave Tuner and IF/Demodulator. No external power supplies or booster amplifiers are required for operation up to 400 ft. separation between the Microwave Tuner and the IF/Demodulator.

The Tuner (TU-3822) and the IF/Demodulator (IFD-3822) both contain internal AC power supplies. All System components are fully interchangeable between systems. The system is field configurable for any combination of local and remote tuners via a software Graphical User Interface (GUI) on the laptop. Field configuration only requires the operator to tell the system which Tuner is connected to which IF/Demodulator as well as the interconnecting cable length. A single coax cable connects the Tuner IF output to the IF/Demodulator. A second cable provides the reference frequency from the IF/Demodulator to the tuner. All

### DESCRIPTION

The TU-3822/IFD-3822 Receiver, a member of the SMR-3000 family of high-performance synthesized microwave receivers, provides complete coverage from 0.5 to 18 GHz (20 GHz optional) with frequency extension to millimeter wave frequencies available. The receiver provides two wideband IF out-

## TU/IFD-3822

All Tuner and IF/Demodulator control and status information is transferred via Ethernet 10 base-2 LAN or RS-232 (RS-422 optional).

Key electrical parameters include low noise figure, high intercept point, and wide dynamic range.

Excellent LO phase noise performance, typically less than  $0.6^\circ$  rms over the entire frequency range, ensures clean down-conversion and low distortion of signal demodulation characteristics. The TU-3822/IFD-3822 Receiver can be linearly swept across the full band or any portion of the band. For local, manual or remote control tuning, the frequency resolution is 1 kHz.

One of the customizable features of an IFD-3822 is a filter module which provides eight selectable IF bandwidths. The Filter Module can be replaced in the field, using hand tools (no soldering), to adapt to changing mission requirements.

The IF/Demodulator unit contains IF conversion and filtering, IF gain and demodulation stages. This unit provides IF outputs at nominal 20 dB gain, a gain controlled post filtered IF output, AM Video, FM Video, and switched AM/FM Audio outputs.

Local control of the Receiver in fixed tune mode is accomplished with the CP-3801 Receiver Controller either attached directly to the front panel of the IF/Demod or mounted separately. Operational features of the Controller include user-friendly, soft key driven menus combined with a numeric keyboard and rotary tuning knob operation. A comprehensive alphanumeric LCD displays operator inputs and receiver responses. Menu routines include frequency and IF bandwidth selection, gain control, video output levels, demodulation, BIT and I/O communication information.

### Tuner/Demodulator Specifications

The Tuner unit can be separated from the IF/Demodulator unit at the 1 GHz IF. In the remote configuration, up to 400 feet of RG-214 can be inserted between the Tuner and the IF/Demodulator. No additional external amplifiers, dc power supplies, or cables are required for remote operation. All Tuner and IF/Demodulator control is through the Receiver System Ethernet LAN. The TU-3822 Tuner is packaged to separate the existing demodulator functions and incorporate a Spectrum Display Generator.

To remove front end gain variations, a gain controlled amplifier is used. This amplifier's gain is automatically controlled by the microprocessor based on internal calibration tables. Removing the front end gain ripple allows accurate RF and IF spectrum data to be generated.

The Spectrum Display Generator is used to generate both RF and IF spectrum data. IF spectrum data is generated when the receiver is tuned to a fixed frequency and the synthesized LO in the Spectrum Display Generator is stepped across the desired IF PAN display range. The bandwidth resolution is determined by selecting one of five switched IF filters. Bandwidths ranging from 10 kHz to 10 MHz are provided. The Spectrum Display Generator generates spectral data which is formatted by the Tuner Controller and transmitted down the Receiver LAN.

RF spectrum data is generated using the same hardware. In an RF sweep, the Spectrum Display Generator LO is fixed to the 1 GHz IF center frequency. The Tuner is then swept over the desired RF range. While the Tuner is swept, the Digital Controller collects spectral data which is formatted and sent via the Receiver LAN.

### IFD-3822 IF/Demodulator

The IFD-3822 IF/Demodulator accepts a 1 GHz IF input from the Tuner and produces three IF and three demodulated outputs.

The 1 GHz IF from the tuner is preamplified and power divided. One of the divider outputs is filtered to an 80 MHz bandwidth and down converted to a 160 MHz (140 MHz optional) center frequency. The other output is filtered to a 50 MHz bandwidth and converted to a 70 MHz center frequency.

Following the switched filter bank is an IF/AGC Amplifier module which provides over 70 dB of AGC/MGC dynamic range. The AGC/MGC module provides the narrowband (post-filtered) 70 MHz IF output as well as the input to the Demodulator module.

### Receiver System Controller/Display

One Ethernet 10Base-2 port is provided and is used to control multiple Tuner - IF/Demodulator systems through a single coax connector.

### Display/Control Software

The Display/Control software is implemented as an optional Microsoft® Windows NT™ 4.0 application. The Display/Control software application looks and behaves in a typical Microsoft® Windows manner. This promotes visual and functional consistency with other Microsoft® Windows applications.

From a small System Manager Window a separate Graphic User Interface window may be opened for each tuner. The GUI has a minimum 511 point spectrum trace containing IF PAN or RF SCAN data. Parameters are modified by typing in a new value, operating graphical controls or through use of the COMCAT rotary pointing device (see photo at end of data sheet). All other pop up windows or menus are not greater than one level deep.

### RF Scan Mode

The receiver is capable of scanning between two selectable start and stop frequencies, or a center frequency with span. The RF Scan is updated continuously and the scan parameters are displayed and controllable. Selectable markers are provided for amplitude, delta amplitude, frequency and delta frequency. The display has controls for decay rate, log or linear amplitude, threshold, error messages and tuner ID.

### IF PAN Manual Mode

An IF PAN display is provided when the receiver is tuned to a particular RF Frequency. The IF spectrum is displayed using Start-Stop frequencies or a Center-Span readout. The IF PAN is updated continuously and the scan parameters are displayed and controllable. Selectable markers are provided for amplitude, delta-amplitude, frequency and delta-fre-

## TU/IFD-3822

quency. The display has controls for decay rate, log or linear amplitude, threshold, error messages and tuner ID.

Built-In-Test (BIT) status of receiver phase lock, power supply voltages, and operating temperature limits is provided by color-coded LED indicators on the rear panel.

### SYSTEM SPECIFICATIONS

<b>RF Input</b>	Single SMA connector
<b>Frequency Range</b>	0.5 to 18 GHz (20 GHz Optional)
<b>Long Term Frequency Stability</b>	<1 ppm / Yr
<b>Frequency Accuracy vs. Temperature</b>	<10 <sup>-6</sup> over 0° to 50° C
<b>External Reference Frequency Input (TU/IFD-3822)</b>	10 MHz at 0 dBm ± 3 dB, autoswitching
<b>Reference Frequency Output (IFD-3822 only)</b>	10 MHz +3 dBm, min.
<b>Reference Output, 300 MHz (TU-3822 only)</b>	300 MHz, 3 dBm ±3 dB
<b>Tuning Resolution</b>	1 kHz
<b>Linear Dynamic Range</b>	>80 dB, RF to IF, 1 MHz BW
<b>Single Tone Spurious Free Dynamic Range</b>	>60 dB, RF to IF, 1 MHz BW
<b>Two Tone Spurious Free Dynamic Range</b>	>60 dB, RF to IF, 1 MHz BW f1 - f2 <25% of IF BW
<b>Third Order Intercept Point</b>	0 dBm, typical; -3 dBm minimum
<b>Internally Generated Spurious</b>	<-100 dBm equivalent RF input
<b>Image Rejection</b>	>70 dB
<b>LO Reradiation</b>	< -90 dBm at the RF input
<b>Noise Figure</b>	16 dB max, 0.5-18 GHz, 0° to 50° C 17 dB max when remoted 400 ft.
<b>RF to IF Linear Differential Group Delay</b>	5 ns max. over 80% of IF bandwidth

**RF Scan Time** ≥300 msec, 0.5 to 18 GHz

<b>Phase Noise</b>	<b>Offset</b>	<b>dBc/Hz</b>
	100 Hz	-70
	1 kHz	-80
	10 kHz	-95
	100 kHz	-100
	1 MHz	-120
	10 MHz	-130
	100 MHz	-130

**Integrated Phase Noise (typical)** <0.6°, 100 Hz to 100 MHz

**System RF to IF Gain** 20 dB ±3 dB

#### IF Outputs

##### *Fixed Gain IF Outputs* 1 GHz (TU-3822)

1 GHz with 120 MHz BW.  
Optional 500 MHz BW.

##### WB-IF-A (IFD-3822}

160 MHz with 80 MHz BW.  
Optional 140 MHz with 80 MHz BW.

##### WB-IF-B (IFD-3822)

70 MHz with 50 MHz BW

##### *Variable Gain IF Output* NB-IF (IFD-3822)

70 MHz selectable BW filters, AGC/MGC, Variable gain AGC (-20 dBm, min). MGC has a 70 dB range.

#### *IF Bandwidths*

Eight selectable IF bandwidths are available for the 70 MHz IF output. The bandwidth module is field changeable. The bandwidths are gain-bandwidth normalized for constant noise power output.

250 kHz	8 MHz
500 kHz	24 MHz
2.5 MHz	40 MHz
5 MHz	50 MHz

#### *IF Spectrum Conversion*

Each IF output is non-inverted

#### *Video Outputs* AM Video

0.1 to 1 V<sub>p</sub>, 50 Ohm, adjustable 10% to 100%

#### FM Video

0.1 to 1 V<sub>p-p</sub>, 50 Ohm, for deviation of 2/3 IF BW

#### Audio Outputs

15 kHz bandwidth, 600 Ohm standard phone jack, adj. 0.1 to 1.0 V<sub>rms</sub>.

## TU/IFD-3822

<b>Built In Test</b>	Activated during power up and on command. Monitors power supply voltages, temperature, and phase lock.	<b>Enclosure Size</b>	Tuner 3.5 x 8.5 x 15.5 inches (8.6 x 24.1 x 39.4 centimeters) IFD 3.5 x 8.5 x 12.0 inches (8.6 x 24.1 x 30.5 centimeters)
<b>Operating Power</b>	115/230 Vac, switch selected, 47 - 400 Hz	<b>Weight</b>	30 pounds (13.6 kg) maximum.
<b>Power Consumption</b>	200 Watts nominal continuous	<b>Temperature</b>	0° to 50° C, operating
<b>RFI/EMI</b>	Designed to meet MIL-STD-461B; CE03 & RE02	<b>Control</b>	RS-232 (RS-422 optional) Ethernet 10base-2

Specifications subject to change without notice.

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### WARRANTY

All M/A-COM SIGINT Products 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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