

## **SIR-4100 Series**

**MICROWAVE WIDEBAND RECEIVER UP TO 40 GHz**



**WIDE FREQUENCY RANGE:  
0.1 - 40 GHz**

### FEATURES

- High Dynamic Range
- Fast Switching Synthesizer with 20 Hz Tuning Resolution
- Excellent Phase Noise Performance:  $< 0.5^\circ$  RMS
- Wideband Output: 1.8 GHz CF Output, with 1000, 500, 200 and 100MHz BWs
- IF Output: 160 MHz CF IF Output with selectable BW
- IF Output: 70MHz Reconstructed with selectable BW from 3.2kHz-40MHz
- Manual Gain Control with Adjustable Threshold
- Advanced Front Panel Graphical Display
- Ethernet 10/100 BaseT, RS 232, RS 485
- 2 U, 19" Rack

### APPLICATION

- ELINT
- Synthetic Instrumentation
- Emission Compliancy Testing
- SATCOM
- Radar Warning Receivers (RWR)



## OPERATOR INTERFACE

- Color Spectral Display (LCD) with Front Panel Control
- Multimode Panoramic and IF Spectral Display with up to 80 MHz BW
- Ability to edit Sweep and Scan mode from the front panel
- Multicolor function designators
- Configuration Restores automatically after off / on iteration
- Temperature Monitoring and automatic shut down
- Interactive Main and Temporary Frequency List Mode editing from the front panel
- Ability to choose threshold levels of the ANRT
- Front Panel IF Bandwidth Selection (10 MHz / 20 MHz / 40 MHz / 80 MHz)

## REMOTE INTERFACE

- Audio and Spectral Display Over Ethernet with GUI
- Ethernet and RS 485 Control
- USB 3 for uploading recorded I/Q

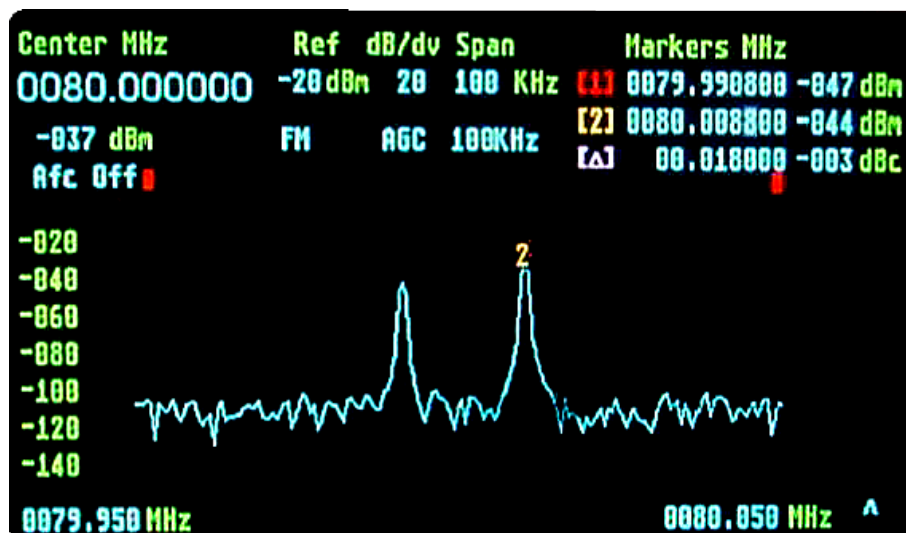
## IF DIGITIZER

- 100 dBFS (dB Full Scale) Spurious Free Dynamic Range, 16 BIT ADC
- 40 MHz Signal Processing Bandwidth (80 MHz Optional) Contact Factory

## SDR SOFTWARE DEFINED RADIO

- Low Power STRATIX 5 FPGA Implementation
- IF Filtering From 10 KHz Up to 40 MHz
- AM, FM, LOG, CW, ISB Demodulation
- 90 dB Manual or Automatic Gain Control (MGC, AGC)
- IF Up Conversion to 70 MHz
- Adaptive Noise Riding Threshold Squelch

## TYPICAL DISPLAY





## SPECIFICATIONS AT 25°C

### FREQUENCY

Frequency Tuning Range:	0.1 – 40 GHz (see ordering matrix page 8 for input frequency options)	
Tuning Resolution:	20 Hz	
Synthesizer Tuning Speed:	50 usec	
Frequency Accuracy vs. Temp (Internal Ref):	< +/- 0.1 PPM	
Long Term Aging (Internal Ref):	< 1 PPM per year	
External Reference Input:	10 MHz at 0 +/- 3 dBm, Auto locking	
Phase Noise (Typ.):	0.5°RMS Integrated from 100 Hz to 10 MHz	
	<u>&lt;26.5GHz</u>	<u>26.5-40GHz</u>
Offset 100 Hz:	-68 dBc/Hz	-68 dBc/Hz
Offset 1 KHz:	-87 dBc/Hz	-87 dBc/Hz
Offset 10 KHz:	-95 dBc/Hz	-95 dBc/Hz
Offset 100 KHz:	-101 dBc/Hz	-100 dBc/Hz
Offset 1 MHz:	-117 dBc/Hz	-112 dBc/Hz
Offset 10 MHz:	-130 dBc/Hz	-125 dBc/Hz

### SCAN AND SWEEP

Sweep Mode:	F1 to F2 at Selected Frequency Step
Sweep Rate:	<500 usec in-band
Dwell Time:	From 0 to 60 sec, 1 sec step or Stop on Detection
Adjustable Threshold Detection (Squelch):	1 dB step from -15 dBm to -150 dBm at RF Input
External Trigger:	Strobe Input

### RF SECTION

Input VSWR:	2.5 : 1
RF Preselector:	10 Bands (GHz): 0.1-1.33, 1.33-1.75, 1.75-2.0, 2.0-6.0, 6.0-7.5, 7.5-10, 10-13.5, 13.5-18, 18-26.5 and 26.5-40
Noise Figure (30dB Gain):	15 dB (Max.) from 0.1-26.5GHz 17 dB (Max.) from 26.5-40 GHz
Max Input Level (without damage):	+20 dBm (0.1 - 26.5GHz), +10 dBm (26.5 – 40GHz)
Max Input Level (operating):	-15 dBm (20 dB gain)
Conversion Sense:	Non Inverting
RF Gain Variation:	+/- 1.5 dB vs. RF Input Frequency Range



## SPECIFICATIONS AT 25°C

### DYNAMIC RANGE

Linear Dynamic Range:	80 dB with 1 MHz BW
Image Rejection:	< -70 dB
LO Re-radiation:	< -80 dBm at RF Input
Input IP3:	-5 dBm @ 20 dB Gain
Input 1 dB Compression:	-15 dBm @ 20 dB Gain
In Band Spurious, Carrier Dependent (30dB Gain with -15 dBm output level):	-60 dBc typical, -50 dBc max
Internally Generated with 20 dB Gain:	-85 dBm typical, -75 dBm max (equivalent to Input)

### WIDEBAND L BAND OUTPUT

Center Frequency:	1.8 GHz
Bandwidth ( 3dB):	1000MHz, 500MHz, 200MHz, 100MHz selectable (2-40GHz) 200MHz (1.33-2GHz) and 100MHz (0.1-1.33GHz)
RF to IF Gain:	30 dB
Gain Ripple Over 80% IF BW:	+/- 2 dB (Typ), +/- 2.4 dB (Max) from 0.1-40GHz
Gain Slope over 80% IF BW:	< 2.5 dB
Group Delay Variation:	3 nsec max over 80% of 3 dB BW (1000, 500 MHz BW) 6 nsec max over 80% of 3 dB BW (200 MHz BW)
Manual Gain Control (MGC):	Settable 0 to 30 dB, 1 dB Resolution
Automatic Gain Control (AGC):	No AGC
Impedance:	50 ohms
VSWR:	2:1 Max
Wideband Signal Monitor:	-20 dBc Typical



## IF OUTPUT

Center Frequency :	160 MHz
Bandwidth (3 dB):	1, 5, 10, 20, 40 & 80 MHz selectable
Gain Flatness Over 80% IF BW:	+/- 0.8 dB (Typ.), +/- 1.2 dB (Max.)
RF to IF Gain:	30 dB
Manual Gain Control (MGC):	Settable 0 to 30 dB, 1 dB Resolution
Automatic Gain Control (AGC):	Not Available
Automatic Overdrive Protection Level:	sets automatic overdrive protection for IF level over +5dBm in order to prevent digitizer overdrive (will automatically reduce analog IF gain)
IF Output Impedance:	50 ohm
VSWR:	2.0:1 Max
IF Signal Monitor:	-20 dBc (Typ.)

## 70 MHz RECONSTRUCTED IF OUTPUT

Bandwidth ( 3 dB):	3.2 KHz, 6.4 KHz, 10 KHz, 15 KHz, 20 KHz, 30 KHz, 50 KHz, 100 KHz, 200 KHz, 300 KHz, 400 KHz, 800 kHz, 1 MHz, 2MHz, 5 MHz, 10 MHz, 20 MHz, 40 MHz
Group Delay:	Linear phase FIR design for 3.2 KHz to 40 MHz IF BW (all of the above)
Gain Flatness over 80% of IF BW:	$\pm 0.4$ dB (Typ.), $\pm 0.6$ dB (Max.)
Manual Gain Control (MGC):	Settable 0 to 90 dB, 1 dB Resolution
Automatic Gain Control (AGC):	90 dB Range, Fast Attack, Programmed Decay
Fast Attack:	2 msec for 45 dB Change, 2 msec During Sweep or Scan
Decay Time:	Programmed from 1 msec to 1 second
IF Output Level:	Programmed from -20 dBm to +5 dBm, 1 dB Step
Output Compression Level:	+5 dBm



## PRF TONE OUTPUT (70 MHz IF Out)

Stretched Audio  
(for bandwidths of 40MHz, 20 MHz, 10MHz, 5 MHz, 1MHz only)

## LOG VIDEO OUTPUT (70 MHz IF Out)

Dynamic Range: 70 dB  
Output Level: 1.0 VDC Full Scale  
Linearity:  $\pm 1.5$  dB  
Impedance: 50 ohms

## FM VIDEO DEMODULATOR (70 MHz IF Out)

Output Level: 1 Vp-p for 2/3 of selectable IF Bandwidth  
Coupling: DC  
Video Response (3 dB): 40% of IF Bandwidth  
Video Gain: 30dB, 1dB step  
Connector Type: BNC-F  
Impedance: 50 ohms

## AM VIDEO DEMODULATOR (70 MHz IF Out)

Output Level: 1 Vp-p  $\pm 10\%$  for +5 dBm IF Output  
Coupling: DC  
Video Response(3 dB): 40% of IF Bandwidth  
Video Gain: 30dB, 1dB step  
Connector Type: BNC-F  
Impedance: 50 ohms

## AM AUDIO OUTPUT (70 MHz IF Out)

Level: 1 Vp-p  $\pm 10\%$  for +5 dBm IF Output  
Response: 300 Hz to 3.3 KHz, -3 dB  
Audio Level Range: 0.1 to 1Vp-p adjustable  
Connector Type: BNC-F  
Impedance: 600 ohms  
Phone Output: 1/8" Phone Jack, Front Panel

## FM AUDIO OUTPUT (70 MHz IF Out)

Level: 1 Vp-p  
Response: 300 Hz to 3.3 KHz, -3 dB  
Audio Level Range: 0.1 to 1Vp-p adjustable  
Connector Type: BNC-F  
Impedance: 600 ohms

*Note: Demod outputs above are for 70 MHz IF output only*

**PHONE OUTPUT:** 1/8" Phone Jack, Front Panel



## **BUILT IN TEST (BIT)**

Power Supply Voltages, Three Phase Lock Alarm, Over Temp.

IF Output Level monitor, based on settable squelch level

## **CONTROL**

Local Manual Control: All Functions, via Alphanumeric Display Keyboard and Rotary Knob

Remote Programming: Ethernet 10/100 base T , RS 485 and RS232

## **ENVIRONMENTAL**

Operating Temp Range: 0° to +50 °C

Non Operating: -30° to +85°C

Relative Humidity: Up to 95%, Non-Condensing

Altitude: 10,000 Feet

EMI: Designed to Meet MIL-STD-461C, CE03 and RE02

Shock: MIL-STD-810G, Method 516.6, Procedure VI

Vibration: MIL-STD-810G, Method 514.6, Procedure I

AC Power: 95 to 265 VAC, 47-63 Hz, 180 Watts (40GHz) or 150 Watts (18GHz)

## **MECHANICAL**

Size: 19", 2U (3.5" H X 23" D X 17" W)

Weight: 35 Pounds

## **REAR PANEL CONNECTORS**

0.1 to 26.5 GHz RF input: SMA-F

26.5 to 40 GHz RF input: SMA-F

160 MHz IF Output, IF Monitor: SMA-F

70 MHz IF Output: SMA-F

70 MHz Log Video Output: BNC-F

1.8GHz L Output, L Monitor: SMA-F

Video Output: BNC-F

Audio Output: BNC-F

External REF IN, Out: BNC-F

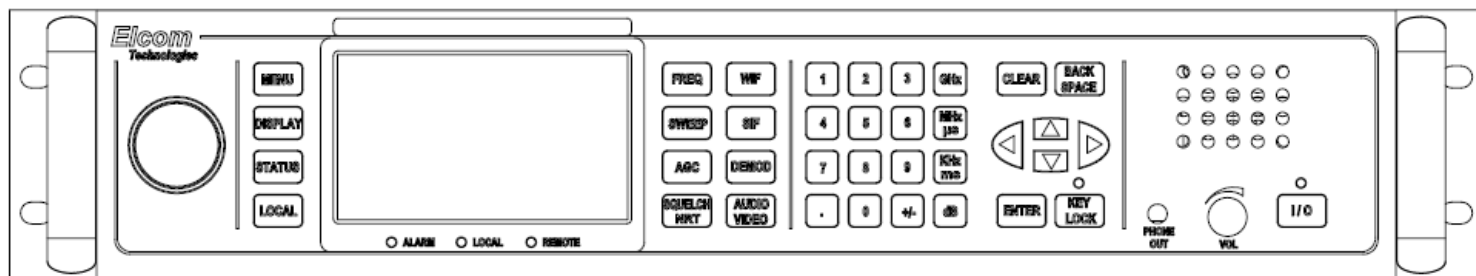
Strobe Input: BNC-F

Ethernet: RJ 45

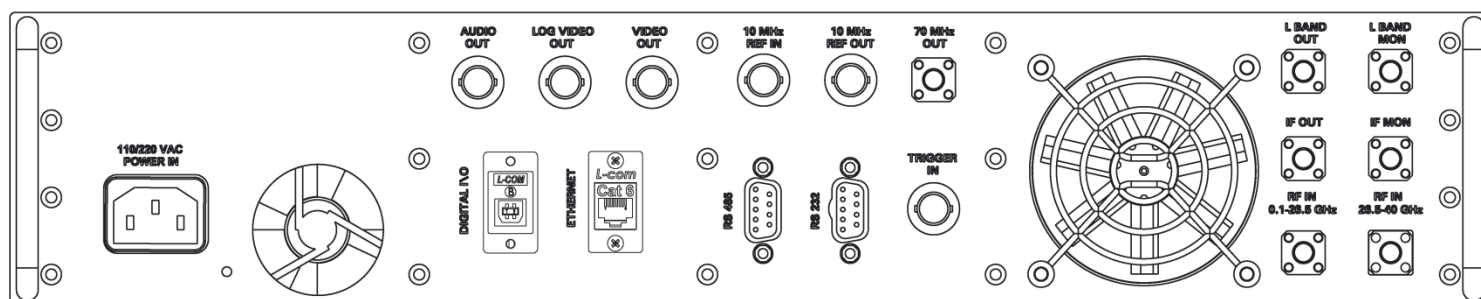
RS 232: DEM – 9S

RS 485: DEM – 9S

\*Specifications are subject to change without notice.



UNIT FRONT VIEW



Connector positions subject to change

### Ordering Matrix

Frequency Range	Wideband Output Freq.	Wideband BW	FEI-Elcom Part Number
0.1 - 18 GHz	1.8 GHz	1 GHz	SIR-4100-118
0.1 - 26.5 GHz	1.8 GHz	1 GHz	SIR-4100-126
0.1 - 40 GHz	1.8 GHz	1 GHz	SIR-4100-140
2 - 18 GHz	1.8 GHz	1 GHz	SIR-4100-218
2 - 26.5 GHz	1.8 GHz	1 GHz	SIR-4100-226
2 - 40 GHz	1.8 GHz	1 GHz	SIR-4100-240

REAR PANEL CONNECTORS	
RF INPUT (0.1 TO 26.5 GHz)	SMA-F
RF INPUT (26.5 TO 40 GHz)	SMA-F
IF OUTPUT	SMA-F
IF MONITOR	SMA-F
L-BAND OUTPUT	SMA-F
L-BAND MONITOR	SMA-F
70 MHz OUTPUT	SMA-F
TRIGGER INPUT	BNC-F
10 MHz REFERENCE INPUT	BNC-F
10 MHz REFERENCE OUTPUT	BNC-F
AUDIO OUTPUT	BNC-F
LOG VIDEO OUTPUT	BNC-F
VIDEO OUTPUT	BNC-F
RS232, REMOTE INTERFACE	DB-9,F
RS485, REMOTE INTERFACE	DB-9,F
ETHERNET 10/100	RJ-45
DIGITAL I/O	USB, TYPE B
AC POWER INPUT	IEC 60320-1 C14

### ABOUT FEI-ELCOM TECH, Inc

Elcom designs and manufactures instruments and modules in the RF and Microwave frequency spectrum for broadband and narrow band applications in ATE, Aerospace/ Defense, SIGINT and commercial communications. Proprietary technologies include low phase noise fast switching direct analog synthesis, low noise indirect PLL designs, and RF DSP up to 40GHz.

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