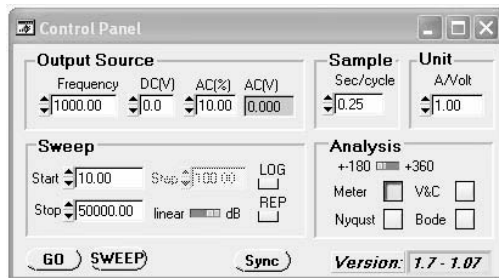


# AMREL's Frequency Response Analyzer

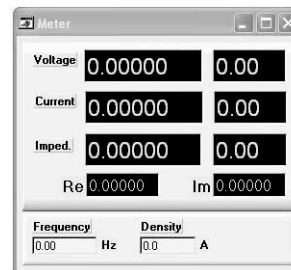


## Technical Features:

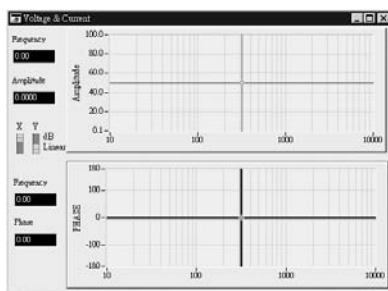
- Key Frequency Response Analyzer, Lock-in Amplifier, and Impedance Meter features packed into a single 1U box.
- Selective level meter for measuring small signals in noisy environments with micro-volt sensitivity..
- Simultaneous V/I measurement to ensure exact impedance and phase information.
- DDS Sine-wave generation, yielding frequency errors less than 0.02Hz.
- Customizable sample interval, providing tradeoff between measurement throughput and resolution.
- Dual Independent Signal Analyzers provide single channel impedance measurements or both channels to measure transfer functions, transconductance, impedance, signal analysis (FRA) data and other important parameters in polar/rectangular format.
- User-friendly features include: auto-gain, quick-set ac amplitude, signal overload (signal saturation) protection, and single entry sample interval without the complicated calculations. The above features allow the user to leapfrog application startup time and minimize errors.
- Auto-Gain Control and Flexible ranges to obtain maximum signal sensitivity and precision.
- Universal ac + dc output signals critical for Impedance Measurement/AC Modulation applications in the battery/fuel cell/electronic components & devices R&D, Testing and Production sectors.
- Auto noise/harmonic rejection to accurately measure signals in the micro-ohm range.
- GPIB/RS-232 and Optional USB//Ethernet provide state-of-the-art connectivity while satisfying diverse throughput/network security requirements (Ethernet option is field upgradeable).
- Embedded multi-channel controller (MCU-1) for simple instrument network expansion, control and troubleshooting.
- System-level Multi-channel Impedance Measurement can be achieved using the integrated MCU-1 capability and a switch matrix.
- Comprehensive application program with premium features - Nyquist, Bode, V/I, real-time display of impedance measurements and operating conditions, frequency sweeps with adjustable amplitude in log/linear format and auto-save for logged data to establish the FRA as the ultimate diagnostic tool.



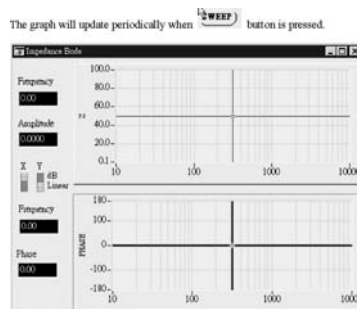
Control Panel



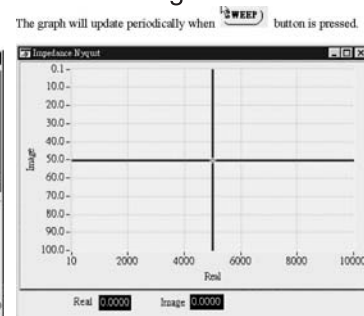
Real Time Monitoring



V/I Graph



Bode Plots



Nyquist Plots

# Frequency Response Analyzer Specifications:

## Generator

|                       |  |
|-----------------------|--|
| Waveform:             | Sine Wave  |
| Frequency Range:      | 0.1 Hz ~ 20 KHz  |
| Frequency Resolution: | 0.01Hz   |
| Amplitude:            | Up to 20% of DC Bias Setting or 1Vrms                                    |
| Amplitude Resolution: | 5mVPP  |
| Distortion:           | < 0.1%   |
| Sweep Types:          | Frequency – logarithmic and linear<br>Amplitude – logarithmic and linear |

| FREQUENCY RANGE | AMPLITUDE RANGE    | AC AMPLITUDE ACCURACY |
|-----------------|--------------------|-----------------------|
| 0.1Hz ~ 10KHz   | $\leq 0.05V_{rms}$ | 2%                    |
|                 | 0.2Vrms ~ 0.8Vrms  | 0.50%                 |
|                 | >0.8Vrms           | 2%                    |
| 10KHz ~ 20KHz   | $\leq 0.05V_{rms}$ | 2%                    |
|                 | 0.2Vrms ~ 0.8Vrms  | 0.50%                 |
|                 | >0.8Vrms           | 2%                    |

## dc Bias

|                   |             |
|-------------------|-------------|
| Range:            | 10mV ~ 5V   |
| Resolution:       | 10mV        |
| Accuracy:         | 0.1%        |
| Output Impedance: | 50 $\Omega$ |

## Analyzers - Two independent analyzers operate in parallel.

|                               |   |
|-------------------------------|---|
| Range:                        | Auto  |
| Sensitivity:                  | 1 $\mu$ V                                   |
| Dynamic Range:                | 90dB  |
| Common Mode Rejection:        | >80dB @ 100Hz                               |
| Cross Channel Isolation:      | >90dB @ 10kHz                               |
| Coupling:                     | ac (- 3dB @ 2Hz)                            |
| DC Blocking Voltage:          | 250Vdc Common Mode/500Vdc Differential Mode |
| Differential Input Impedance: | >200K $\Omega$                              |
| Maximum Input:                | 2Vp-p                                       |
| ADC (Per Channel):            | 16 bit, 400K samples/second                 |
| Sample Interval:              | 10ms ~ 10s; Default Setting: 0.25s          |
| Phase Accuracy:               | 1.0 degree                                  |

## Magnitude Accuracy:

| FREQUENCY RANGE | PEAK VRMS RANGE | VRMS ACCURACY | FREQUENCY RANGE | PEAK VRMS RANGE | VRMS ACCURACY |
|-----------------|-----------------|---------------|-----------------|-----------------|---------------|
| 0.1Hz ~ 20KHz   | .0036Vrms       | 2.00%         | 100Hz ~ 20 KHz  | .8Vrms          | 0.20%         |
| < 100Hz         | .8Vrms          | 0.50%         |                 | .16Vrms         | 0.20%         |
|                 | .16Vrms         | 0.50%         |                 | .054Vrms        | 0.20%         |
|                 | .054Vrms        | 0.50%         |                 | 0.50%           | 0.20%         |
|                 | .027Vrms        | 0.50%         |                 | .011Vrms        | 0.50%         |
|                 | .027Vrms        | 0.50%         |                 | .0054Vrms       |               |
|                 | .018Vrms        | 0.50%         |                 |                 |               |
|                 | .011Vrms        | 2.00%         |                 |                 |               |
|                 | .0054Vrms       | 2.00%         |                 |                 |               |