We’re In The Business Of Making Your Life Easier

RF Conducted Immunity Testing to IEC, Military & Automotive Standards

If you are tired of mixing and matching various components, try AR’s complete line of RF Conducted Immunity Test Systems. We now make five fully configured and stand alone CI Systems from 4 kHz to 3 GHz with output powers designed to meet the latest commercial, custom and military standards.

Each CI System has the built-in flexibility to conduct standard and customized tests using our included user friendly software that can generate reports directly into Microsoft® Word or Excel.

Our job is to make your job easier.
CI00400A

75 Watts, 10 kHz–250 MHz

Complete Testing Solutions to the following standards: EN/IEC 61000-4-6, IEC 60601-1-2, EN 501340, EN 61006-1-2, EN 55024

Internal Test Specifications*
IEC/EN 60601-1-2, IEC/EN 501340, IEC/EN 61326, IEC/EN 61006-1, IEC/EN 61006-2-6, CISPR 24/EN 55024

Signal Generator Specifications
Frequency range 9 kHz to 1.2 GHz
Resolution 1 Hz
Power range -140 to +13 dBm
Resolution 0.1 dB
Modulation AM, FSK, Pulse, FM, Phase, External Pulse

Power Meter Specifications
Channels 3
Power heads 1
Type diode
Frequency 10 kHz to 8 GHz
Gain 49 dB minimum

RF Solid State Amplifier Specifications
Frequency range 10 kHz to 250 MHz
Power rating 75 Watts minimum
1dB compression 50 Watts minimum
Harmonic Distortion -20 dBc at 50 Watts
Mismatch tolerance 100% of rated power without fold back. Will operate without damage or oscillation with any magnitude of source and load impedance.

General
Power 115/230 VAC
50/60 Hz, single phase 16A
Breaker 2 pole, 20A
Cooling active cooling, air ventilation
Environmental conditions
10°C - 40°C
Dimensions, 50.3 x 42.2 x 52.1 cm
19.8 x 16.6 x 21.7 in
Weight 20.5 kg (45 lb)

PC Requirements
Computer Pentium IV, 1 GHz Recommended
Operating system Windows XP, Vista & 7
RAM 1 GB Minimum
Screen Resolution 1024 x 768
Ports 2 available USB ports

*Specifications can be met using AR-specified external accessories (injection probes, monitor probes, cal interfaces, CDNs, attenuators, etc.). Option are available on all systems. See specification sheet for detailed information.

**The use of a spectrum analyzer may be necessary on some of the low level bulk current injection tests.
This is especially true on power and I/O lines with a great amount of ambient noise.
AR CI00250A, CI00400A, CI00401A

Conducted Immunity Systems contain all components necessary to perform conducted immunity testing to the most widely used standards, with the AR CI00401A specifically designed to perform test in accordance with most auto manufacturers. In addition, AR offers amplifiers and test equipment necessary to perform 11452-4 Component Test Methods for electrical disturbance from narrowband radiated electromagnetic energy - harness excitation methods (1 MHz - 3 GHz).

**Tubular Wave Coupler Test Set-Up**

1. DUT (connected to ground if specified in the test plan)
2. wiring harness or harnesses
3. load simulator (placement and ground connection according to section 7.5 of ISO 11452-4)
4. stimulation and monitoring system*
5. power supply
6. Artificial Network (AN)
7. optical fibers
8. high-frequency equipment*
9. 50 Ω load*
10. tubular wave coupler
11. ground plane (connected to the shielded room)

12. low relative permittivity support (\( \varepsilon_r \leq 1.4 \))
13. shielded room

*Required equipment not shown in diagram

Examples of test severity levels for TWC are shown on the right. Specific values may differ depending on the manufacturer's requirements.

**BCI Test Set-Up**

1. DUT (connected to ground if specified in the test plan)
2. wiring harness or harnesses
3. load simulator (placement and ground connection according to section 7.5 of ISO 11452-4)
4. stimulation and monitoring system*
5. power supply
6. Artificial Network (AN)
7. optical fibers
8. high-frequency equipment*
9. optional current measurement probe*
10. injection probe (represented at 3 positions)
11. ground plane (connected to the shielded room)

12. low relative permittivity support (\( \varepsilon_r \leq 1.4 \))
13. shielded room

*Required equipment not shown in diagram

Examples of test severity levels for BCI are shown on the right. Specific values may differ depending on the manufacturer's requirements.
New 3 GHz RF Conducted Immunity Test System

Test Levels up to 500 mA
Testing from 10 kHz to 3 GHz for:
- IEC
- MIL-STD
- DO-160
- ISO
- Automotive Manufacturer’s Standards

Testing up to 3 GHz?
The components below are the new standard.

Main Components Of A BCI & TWC System*
AR 150A400M3, RF Amplifier, 100kHz-400MHz, 150 Watts CW
AR 30W1000BM3, RF Amplifier, 1-1000MHz, 30 Watts CW
AR 20S1G4M3, RF Amplifier, 700MHz-4.2GHz, 20 Watts CW
Signal Generator, 9kHz-3GHz
AR PM2003, 3 Channel Power Meter
Spectrum Analyzer, 9kHz-3GHz
Network Analyzer, 100kHz-3GHz
AR SC1000M1, System Controller
AR Control PC with EMCWare software

* Miscellaneous components such as directional couplers, clamps, attenuators, etc are also necessary for this set up.

Testing up to 400 MHz

<table>
<thead>
<tr>
<th>Freq. (MHz)</th>
<th>BCI Probe</th>
<th>Required Calibration Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Calibration Fixture</td>
</tr>
<tr>
<td>1 - 400</td>
<td>BI00401</td>
<td>CF00400</td>
</tr>
<tr>
<td>400 - 3000</td>
<td>BI30000</td>
<td>CF30000</td>
</tr>
</tbody>
</table>
Conducted Immunity and Emissions Tubular Wave Couplers

Our series of compact, versatile, affordable Tubular Wave Couplers is suitable for immunity testing and emissions measurement of power leads or other connection lines. The BI30000 Series features a bandwidth from 400 MHz to 3 GHz for immunity testing and 150 kHz to 3 GHz for emissions testing.

Immunity testing, using the BI30000 Series, is similar to a BCI probe as used in ISO 11451-2, ISO 11452-4, or IEC 61000-46, and emission measurements can be taken as a current probe according to EN 55025 (CISPR 25). With the proposed standards coming up in the automotive industry, the BI30000 Series will provide a low cost alternative to perform conductive testing up to 3 GHz.

### Tubular Wave Coupler Calibration Kit

AR offers the CF30000 calibration fixture. This fixture is designed to work with the BI30000 Series Tubular Wave Couplers for the purpose of level setting prior to conducted immunity testing.

<table>
<thead>
<tr>
<th>BI30410</th>
<th>BI30413</th>
<th>BI30416</th>
<th>BI30520</th>
<th>BI30526</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISL Value &lt;10 dB</td>
<td>0.50–2.80 GHz</td>
<td>0.60–2.80 GHz</td>
<td>0.80–2.50 GHz</td>
<td>0.60–1.40 GHz</td>
</tr>
<tr>
<td>ISL Value &lt; 20 dB</td>
<td>0.15–1.00 GHz</td>
<td>0.15–3.00 GHz</td>
<td>0.20–3.00 GHz</td>
<td>0.15–2.50 GHz</td>
</tr>
<tr>
<td>Size (LxW)</td>
<td>40 x 40 mm (1.575 x 1.575 in.)</td>
<td>40 x 40 mm (1.575 x 1.575 in.)</td>
<td>40 x 40 mm (1.575 x 1.575 in.)</td>
<td>50 x 50 mm (1.97 x 1.97 in.)</td>
</tr>
<tr>
<td>Internal Diameter</td>
<td>10 mm (0.394 in.)</td>
<td>13 mm (0.512 in.)</td>
<td>16 mm (0.630 in.)</td>
<td>20 mm (0.787 in.)</td>
</tr>
</tbody>
</table>

M1 versions of the above models are available with ISO 17025-compliant calibration.

<table>
<thead>
<tr>
<th>Model CF30000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
</tr>
<tr>
<td>Calibration Power (max. watts)</td>
</tr>
<tr>
<td>Input Impedance</td>
</tr>
<tr>
<td>Connectors</td>
</tr>
<tr>
<td>Max. Diameter of TWC</td>
</tr>
<tr>
<td>Length of coupling line</td>
</tr>
<tr>
<td>Weight</td>
</tr>
<tr>
<td>Size (approx.)</td>
</tr>
</tbody>
</table>
**RF Conducted Probes and Clamps**

The following accessories are for use with our RF Conducted Immunity CI systems, models CI00250A, CI00400A and CI00401A.

**Coupling/Decoupling Networks**

AR offers a full line of coupling/decoupling networks to couple mode signals onto power supply lines. Designed to meet IEC 61000-4-6 specification requirements. All models are available in 16, 25, 32, 50, 100, 200 or 300 amps and available in 1 to 5 conductor cables.

- CD10000 Series – 1 conductor
- CD20000 Series – 2 conductors
- CD30000 Series – 3 conductors (L-N-PE)
- CD40000 Series – 4 conductors (3 phase with neutral)
- CD50000 Series – 5 conductors (3 phase with neutral and PE)

Also available are coupling/decoupling networks (CDN’s) for:
- Non-balanced lines – available for 2, 3, 4 or 8 lines
- Screened cables – available for 2, 3, 4, 9, 15 or 25 cables
- Unscreened balanced pair – available in 1, 2 or 4 pair

Matching calibration adapters for our CD and CDN’s and 1 or 50 watt, 50 ohm termination resistors are available.

**Bulk Current Injection Probes**

AR offers several models of bulk current injection probes for coupling disturbances onto unshielded cables in their specified frequency range.

- BI00250: 10 kHz – 250 MHz, 40mm ID, used for testing IEC 61000-4-6 RF Conducted Immunity
- BI00251: 10 kHz – 250 MHz, 66mm ID, used for testing IEC 61000-4-6 RF Conducted Immunity
- BI00400: 10 kHz – 400 MHz, 40mm ID, used for testing MIL-STD 461, CS114 and DO160 RF Conducted Immunity
- BI00401: 1 – 400 MHz, 40mm ID, used for testing to ISO 114524 and SAE J11134 Automotive RF Conducted Immunity
- BI01000: 100 kHz – 1000 MHz, 40mm ID, used for testing Automotive RF Conducted Immunity

**Current Monitor Probes**

AR offers a line of clamp-on monitoring probes that are used to measure RF currents flowing through the conductor onto which the probe is placed. The following models are available:

- BP00100: 100Hz – 100MHz
- BP00100A: 10 Hz – 100MHz
- BP00400: 10 kHz – 400 MHz
- BP00251: 10 kHz – 500 MHz
- BP00250: 1kHz – 250MHz
- BP01000: 100 kHz – 1000 MHz

**Electromagnetic Clamps**

AR’s highly efficient electromagnetic clamps are for testing to IEC 61000-4-6 RF Conducted Immunity specifications. They operate in the 10 kHz – 1000 MHz range and due to their aperture size, are ideal for testing multiple conductors at once. 2 models are available, along with calibration fixtures for all current injection clamps we carry.

- EM10123A (23 mm aperture)
- EM10132A (32 mm aperture)

**Coaxial Cables**

Available in 50 Ω

For more information about selecting accessories for our Conducted Immunity Systems, please see Application Note #46.
We Have The Solution To Your System Needs

Fully Integrated Test Systems For Any Application from DC to 50 GHz

Whether you choose one of our standard test systems – or have AR build a system to your specs – you'll be amazed at how easy, accurate, efficient, and affordable testing can be. Everything you need is right at your fingertips. It all works together perfectly, because everything has been carefully selected and assembled by AR engineers, using the most dependable and most innovative equipment on the market today.

Why An AR System Is The Smart Choice

- No company has more experience and expertise in EMC test equipment than AR
- Reduced Test Time – get products to market faster
- Increased Accuracy / Lower Risk
- Performance Guarantee – AR manufactures the majority of the critical system components allowing us to match and guarantee them to meet your requirements
- Everything is fully tested before being shipped
- Single source for support & service
- More Compact & Portable – numerous systems can be on one platform
- Automated Test Software – Free

AR can deliver a solution that integrates all your testing needs: radiated and conducted immunity, radiated and conducted emissions, electrostatic discharge, lightning simulation…whatever you need. We have the expertise and experience to supply fully automated systems needed to test various standards including IEC 61000, MIL-STD 461 and 464, DO-160, wireless, automotive, HIRF and HERO.
Fully Integrated Test Systems for any application from DC to 50 GHz
We Have a "System" To Take You As Far As You Want To Go.
AR Systems Make Testing Easy and Virtually Foolproof.

We have complete test systems that perform entire tests with just the press of a few buttons. Everything you need – amplifiers, antennas, couplers, signal generators, system controllers, receivers, and more, along with the software to control it – all in one comprehensive test system.

Choose an AR Radiated Immunity Test System ...or Let Us Customize to Your Specs

The system listed below in addition to many more listed on www.arworld.us has been built to customer’s requirements.

Testing up to 40 GHz?
**AR System, AS40006 - 800 MHz - 40 GHz, MIL STD 461**

Equipment list:
- 240S1G4M4, .8–4.2 GHz, 240 Watts CW
- 200T2G8AM2, 2.5–7.5 GHz, 200 Watts CW
- 300T7z5G18M4, 7.5–18 GHz, 300 Watts CW
- 40T18G26AM2, 18–26 GHz, 40W CW
- 40T26G40AM2, 26–40 GHz, 40W CW
- SC1000M4, System Controller, DC–40 GHz
- SC1000M3, System Controller, DC–18 GHz
- PM2003 3 channel Power Meter
- 2 Model PH2010 Power Heads
  30 MHz–40 GHz
- 2 Model FL7040/Kit Isotropic E Field Probes,
  2 MHz–40 GHz, 2–1000 V/m
- Signal Generator, 100 kHz–40 GHz
- DC7154AM1 Dual Directional Coupler,
  0.8–4.2 GHz, 700 Watt
- DC7280A Dual Directional Coupler,
  2–8 GHz, 350 Watt
- DC7450M1 Dual Directional Coupler,
  7.5–18 GHz, 3000 Watt
- DC7530 Dual Directional Coupler,
  18–26.5 GHz, 300 Watt
- DC7620 Dual Directional Coupler, 26.5–40 GHz, 200 Watt
- ATH2G10 High Gain Horn Antenna, 2–10 GHz, 700 Watts
- ATH7G18 High Gain Horn Antenna, 7.5–18 GHz, 2800 Watts
- ATH18G27 High Gain Horn Antenna, 18–26.5 GHz, 350 Watts
- ATH26G40 High Gain Horn Antenna, 26.5–40 GHz, 240 Watts
- Antenna Controller (Control room desk)
- Antenna Tower
Equipment list:

- Model 150W1000M3, Amplifier, 80-1000MHz, 150W CW
- Model 50S1G6M3, Amplifier, 0.7-6 GHz, 50W CW
- Model DC6080A, Dual Directional Coupler, 80-1000MHz, 500W
- Model DC7200A, Dual Directional Coupler, 1-6GHz, 250W
- Model SC1000M1, System Controller, DC-18 GHz
- Model PM2003, Power Meter
- Model PH2000A, Power Head, 10kHz-8GHz (2)
- Model FM7004M1, Field Monitor
- Model FL7006/Kit M1, Field Probe Kit, 100kHz-6GHz, 0.5-800V/m
- Model PS2000A, Probe Stand
- All internal interconnect cables between system components
- Low Loss Coaxial cable, N male connectors, 2m, 6m, 3m
- Model emcware®, Radiated Susceptibility, Conducted Immunity, and Emissions Test Software

Size (H x W x D) 150.52 x 56.03 x 82.3 cm (59.26 x 22.06 x 32.4 in)
Weight 95.5 kg (210 lb)
Power Input 240VAC, 1-phase, 30 Amps

AR can deliver a solution that integrates all your testing needs: radiated immunity, conducted immunity, conducted emissions, radiated emissions, electrostatic discharge, electromagnetic simulation… whatever you need.

We have the expertise and experience to supply turn-key and fully automated systems needed to test various standards including IEC 61000, MIL-STD 461 and 464, DO-160, wireless, automotive, HIRF and HERO.
AR can supply the systems needed to test to various standards including IEC, MIL-STD-461 and 464, DO-160, wireless, automotive, and HIRF. We can even build your ultimate turn-key system to include an anechoic chamber.

By fully understanding your specifications and requirements in the development of a system, we are able to propose a system that will meet all of your requirements. During the system development process, we will:

- Match equipment with appropriate components and guarantee performance
- Evaluate all packaging options including proper rack sizing, cooling options (air conditioning, blowers or liquid), AC power distribution, control and shielding
- Select the appropriate cabling, coax or waveguide, to match the amplifiers and accessories within the system
- Determine the best method of automation including signal routing (RF switching) and the integration of emcware EMC test software

After your system has been designed and developed, we provide onsite installation and training when necessary. Our team of experienced system integrators will go step-by-step and explain how your system operates and provide support through your testing procedures.

We have several standard systems that can be modified to your requirements. If you have existing equipment, we can integrate them into a system or leave space for future expansion to higher frequencies and power levels.

With our AS systems, we do have the capabilities to provide turn-key and fully automated systems. We also offer SP (special package) systems which are racked equipment that has been designed to work together but is not fully integrated. AR has the experience and ability to take the integration as far as you are willing to go, from a simple racking of equipment (SP) to a fully integrated state of the art facility including installation with guaranteed performance or anything in between.

Block Diagram of a 200V/m System
10 kHz - 40 GHz
AR Systems (partial list)

- **AS04226**: Automotive radiated immunity test system, 10 kHz – 4.2 GHz
- **AS06026**: 80 MHz – 6 GHz, Designed to develop fields up to 10 V/m w/ 80 % AM (18 V/m CW) at a 3 m distance
- **SP1054**: 18 – 40 GHz, Special package is a fully integrated shielded, ventilated rack, designed to house the field generation equipment necessary to perform radiated immunity tests greater than 200 V/m, at 1 m test distance.
- **AS06032**: 10 kHz – 6 GHz, IEC 61000-4-3 level 3, at 3 m test distance, and IEC 61000-4-6 level 3 test capability
- **AS50001**: M1 10 kHz – 50 GHz, designed to produce the highest AVG field strengths required by MILSTD461C, tables 2, 4, 5 and 6
- **AS18055**: 1 – 18 GHz, DO-160 radiated immunity test system designed to produce 150 V/m, from 1 – 8 GHz, at 1 m test distance, and 100 V/m, from 8 – 18 GHz, at 1 m test distance
- **AS00403**: 10 kHz – 400 MHz, Automotive ISO 11452-4 conductive susceptibility test system, capable of developing 300 mA
- **AS06028**: 26 MHz – 6 GHz, radiated immunity test system capable of developing 18 V/m CW, at a 3 m test distance
- **AS18056**: 800 MHz – 18 GHz, radiated immunity test system capable of generating 60 V/m, at 1 m test distance, test equipment is configured on a rolling platform
- **AS00403**: 10 kHz – 8 GHz, radiated immunity test system for automotive component testing, capable of producing 100 V/m, at 1 m test distance, from 10 kHz – 100 MHz, 200 V/m from 100 MHz – 8 GHz, and 600 V/m from 1.2 – 1.4 GHz and 2.7 – 3.1 GHz.

For more information on a system to meet your requirements, contact your local sales associate (listed on pages 176-177) or visit our website: www.arworld.us

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Schematic of a 200V/m System
10 kHz - 40 GHz