



# Operating and Service Manual

TC4000B

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Model

10013568

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Part Number

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Serial Number





# INSTRUCTIONS FOR SAFE OPERATION

## BEFORE APPLYING POWER

Review this manual and become familiar with all safety markings and instructions.

Verify that the equipment line voltage selection is compatible with the main power source.

Protection provided by the equipment may be impaired if used in a manner not specified by AR RF/Microwave Instrumentation.

## INTENDED PURPOSES

This equipment is intended for general laboratory use in a wide variety of industrial and scientific applications. It is designed to be used in the process of generating, controlling, and measuring high levels of electromagnetic Radio Frequency (RF) energy. Therefore, the output of the amplifier must be connected to an appropriate load such as an antenna or field-generating device. It is the responsibility of the user to assure that the device is operated in a location which will control the radiated energy such that it will not cause injury and will not violate regulatory levels of electromagnetic interference.

## HAZARDOUS RF VOLTAGES

The RF voltages on the center pin of the RF output connector can be hazardous. The RF output connector should be connected to a load before AC power is applied to the amplifier. Do not come into contact with the center pin of the RF output connector or accessories connected to it. Place the equipment in a non-operating condition before disconnecting or connecting the load to the RF output connector.

## SAFETY GROUND

This equipment is provided with a protective earth terminal. The main power source to the equipment must supply an uninterrupted safety ground of sufficient size to the input wiring terminals, power cord, or supplied power cord set. The equipment **MUST NOT BE USED** if this protection is impaired.

## PHYSICAL DAMAGE

The RF amplifier should not be operated if there is physical damage, missing hardware, or missing panels.

## MAINTENANCE CAUTION

Adjustment, maintenance, or repair of the equipment must be performed only by qualified personnel. Hazardous energy may be present while protective covers are removed from the equipment even if disconnected from the power source. Contact may result in personal injury. Replacement fuses are required to be of specific type and current rating.

## SAFETY SYMBOLS



This symbol is marked on the equipment when it is necessary for the user to refer to the manual for important safety information.



Dangerous voltages are present. Use extreme care.

**CAUTION:** The caution symbol denotes a potential hazard. Attention must be given to the statement to prevent damage, destruction, or harm.



Indicates protective earth terminal.

## RANGE OF ENVIRONMENTAL CONDITIONS

This equipment is designed to be safe under the following environmental conditions:

- Indoor use
- Altitude up to 2000M
- Temperature of 5°C to 40°C
- Maximum relative humidity 80% for temperatures up to 31°C. Decreasing linearly to 50% at 40°C.
- Main supply voltage fluctuations not to exceed  $\pm 10\%$  of the nominal voltage or minimum and maximum autoranging values.
- Pollution degree 2: Normally non-conductive with occasional condensation. While the equipment will not cause hazardous condition over this environmental range, its performance may vary.

## COOLING AIR

Care should be exercised not to block the cooling air inlets or outlets. Cooling air blockage can result in damage to the RF amplifier or intermittent shut-downs.



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# 1. GENERAL INFORMATION

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## 1.1 GENERAL DESCRIPTION

This manual provides operating, interfacing, and selected service information pertinent to the AR RF/Microwave Instrumentation (AR) ARcell TC3000B and TC4000B test cells.

The ARcells TC3000B/TC4000B are passive shielded enclosures designed for conducting pre-compliance radiated Electromagnetic Compatibility (EMC) testing. ARcell passive shielded enclosures offer a unique combination of features that are useful in conducting experimental and pre-compliance radiated immunity and radiated emissions evaluations of moderate-sized objects. ARcells are used by installing the Equipment Under Test (EUT) in the designated test area inside the cell on a small, non-conductive table or stand. The EUT is re-oriented during testing to enhance its probable radiated RF immunity or radiated RF emissions. The EUT is connected and used in a manner as close to its normal mode of operation as practical within the space constraints of the cell. Expected problem configurations can be easily checked.

Early experimental evaluation helps to promote an awareness of the technical issues involved in creating EMC-compliant products. The ARcells TC3000B/TC4000B are designed to offer this testing capability to researchers engaged in evaluating electronic hardware at various stages in the product development process.

## 1.2 SUGGESTED APPLICATIONS

While primarily utilized for conducting radiated immunity testing, ARcells also offer a convenient means of conducting radiated emissions testing, avoiding the site-dependent and time-dependent ambient interference problems commonly encountered when such testing is conducted in open areas.

ARcell test sets complement ARcells to offer an economical series of practical, easy-to-set up, easy-to-run systems for experimental evaluation and for pre-compliance radiated immunity and radiated emissions testing. The ARcells TC3000B/TC4000B offer a unique combination of features that facilitates the addition of peripheral (active) components to create a complete test set. The resulting test set configuration provides a practical, easy-to-set up, easy-to-run system for conducting experimental evaluation and pre-compliance radiated immunity and radiated emissions testing. An ARcell test set is most appropriate for groups that are developing electronic equipment to which regulatory radiated immunity specifications apply, or equipment that must be able to function reliably and operate safely in moderate Radio Frequency (RF) field environments. These applications include regulatory European Community (EC) and military requirements, and automotive and medical environments.

## 1.3 SPECIFICATIONS

Refer to the detailed specification sheet at the end of this section.

## 1.4 INSTALLATION

The ARcells TC3000B/TC4000B are assembled at the user’s site. Before installing the ARcell at their sites, the user should allow sufficient floor space for the unit, including enough space to permit easy user access. Check to see if doorways, elevators, and other obstructions will permit movement of the cell’s components to the cell’s designated location.

Please contact AR RF/Microwave Instrumentation if additional installation information is needed.

## 1.5 PARTS AND ACCESSORIES FURNISHED WITH THE UNIT

The Arcell TC3000B/TC4000B is furnished with an unterminated 3-wire cord that is used to provide primary Alternating Current (AC) power to the cell (as detailed in section 2.1 of this manual). The following additional items are also furnished with the unit:

- Two (2) Rewirable IEC Plug Power Connectors—To be used to provide AC power to the EUT (see section 2.5).
- One (1) Halogen Lamp—Replacement lamp for the cell’s interior light (see section 4.2).

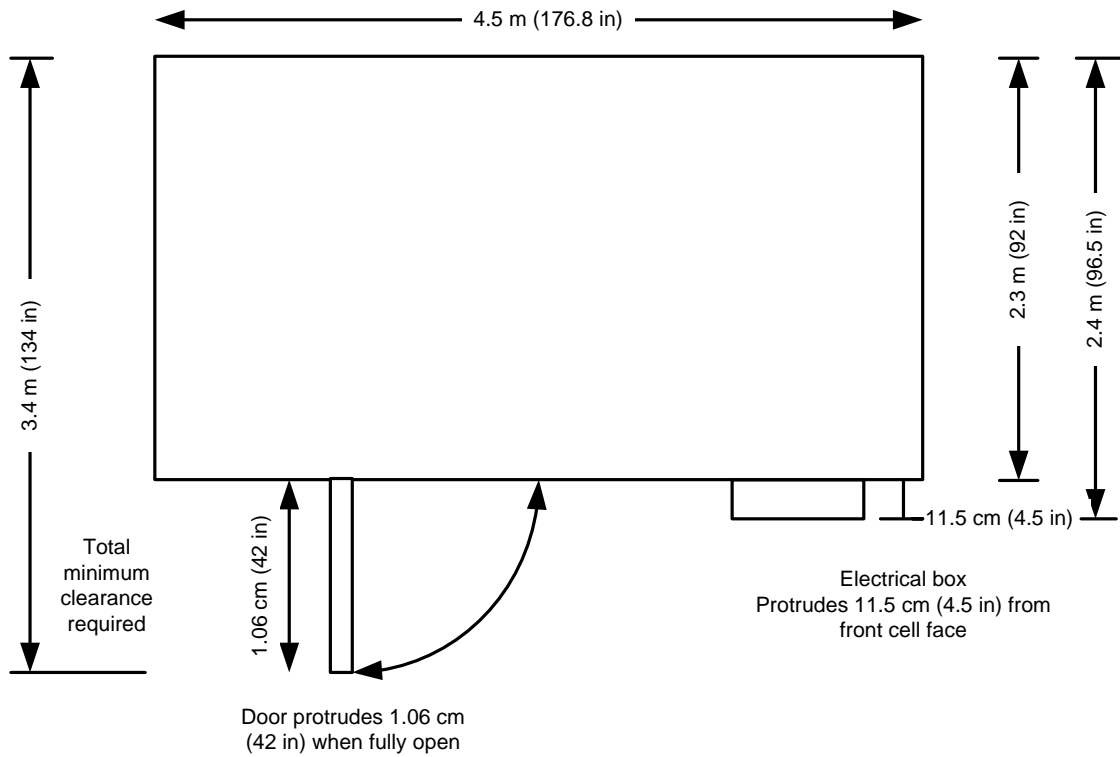
## 1.6 ARCELL PHYSICAL DIMENSIONS/WEIGHTS

Arcell Model No.	Dimensions (W x H x D)	Maximum Equipment Under Test (EUT) Size	Weight (cell only)	Total Shipping Weight (including crate)
TC3000B	2.4 x 2.6 x 4.5 m (96.5 x 102.2 x 176.8 in)	100 x 100 x 100 cm (39.4 x 39.4 x 39.4 in)	To Be Determined	8600+ kg (18,960+ lbs)
TC4000B	2.4 x 2.6 x 5.7 m (96.5 x 102.2 x 224.4 in)	100 x 100 x 100 cm (39.4 x 39.4 x 39.4 in)	To Be Determined	To Be Determined

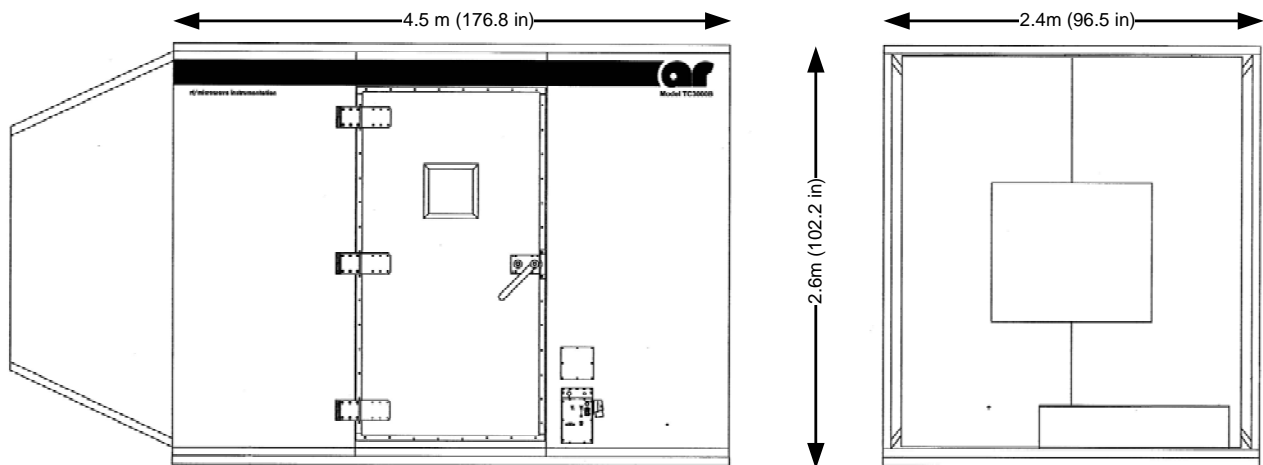
Brief descriptions of each model and a drawing showing each model’s “footprint” (i.e., the lab bench or floor space that the cell occupies, including the clearance needed to fully open its access door), as well as front and side views, and are presented on the following pages. *(NOTE: The footprint drawings are not to scale.)*

Figures 1-1 and 1-2 show the footprint and front and side views for the TC3000B. Figures 1-3 and 1-4 show the footprint and front and side views for the TC4000B.

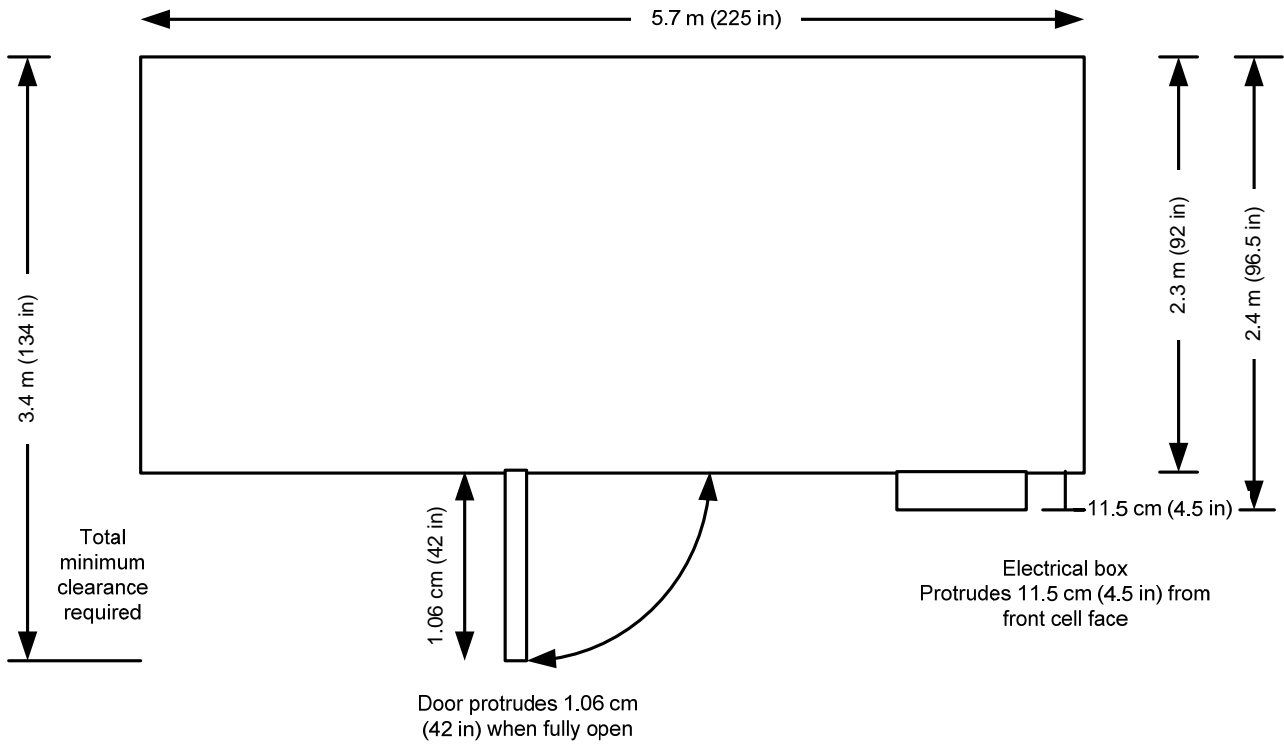




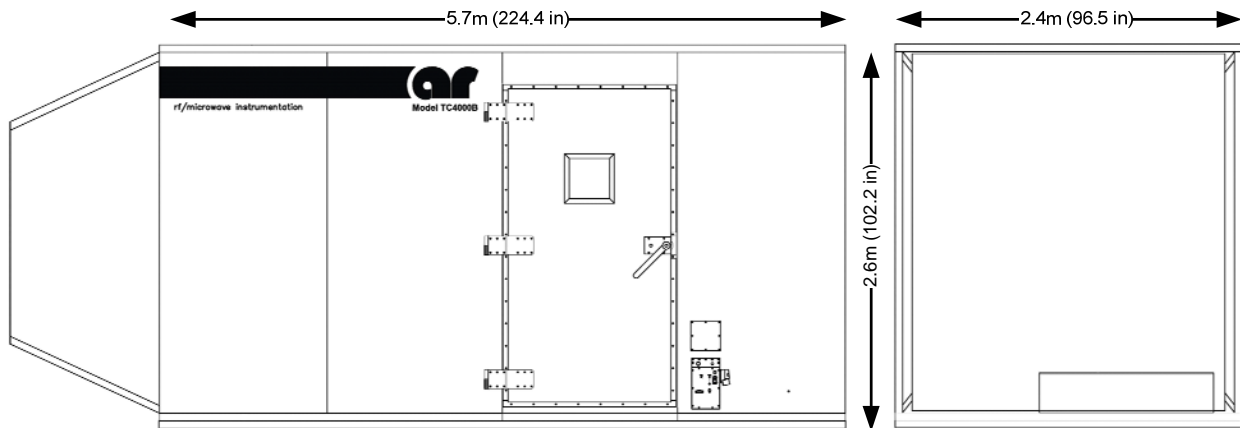
**Figure 1-1 ARcell Model TC3000B Footprint**



**Figure 1-2 ARcell Model TC3000B Front and Side Views**



**Figure 1-3 ARcell Model TC4000B Footprint**



**Figure 1-4. ARcell Model TC4000B Front and Side Views**

**TC4000B**  
**Free Space Test Cell**  
**27MHz-4.2GHz**

The Model TC4000B test cell is one of a series of ARcell test cells that bridge the gap between size limited TEM (transverse electromagnetic) cells and expensive anechoic chambers for making pre-compliance radiated immunity and radiated emissions measurements on large test objects. The interior of the ARcell enclosure, lined with a radio frequency absorbing material, creates a self-contained, semi-anechoic enclosure that includes field launching/receiving devices. An internal log-periodic antenna acts as a launching/receiving device at higher frequencies, while an (optional) bowtie antenna is used at the lower frequencies. Vertical or horizontal polarization is user selected.

The high-efficiency launching device allows 80-4.2GHz, 10V/m field strengths with 80% AM modulation to be generated at the preferred 3 meter distance with a 150 watt RF source (Amplifier Research Model 150W1000) for immunity compliance testing. Testing from 27-80MHz is facilitated by adding the optional Model BT3400 Bow-Tie Antenna.

Radiated emissions is implemented by first calibrating the ARcell using a known emitter. This is usually accomplished by using a calibrated noise emitter (CNE), such as the AR model NE3000. As an alternative for *verification* of a production product, the emissions received from the production product can be compared to emissions from a similar product with known emissions characteristics. In each case, the object is moved to detect the maximum emitted signal levels.

Refer to AR Application Note No. 34 for information on use of the ARcell for both immunity and emissions testing. Amplifier Research offers test systems (ARcell Test System) for use in immunity and emissions evaluation using the TC4000B.

Features of the cell include:

- large access door for installation and removal of the equipment under test (EUT).
- viewing window (located in the access door) to observe the EUT.
- interior light with external on/off switch (requires 110 or 220 VAC power at AC power external connector).
- 16 Amp resettable circuit breaker
- door-open interlock
- user-modifiable access plate
- 3 meter Antenna to EUT Distance

The Model TC4000B test cell is assembled at the customer's site.

**SPECIFICATIONS**  
**Model TC4000B**

EUT SIZE.....	Up to 1.0 m/side (39.3 in/side)
ACCESS DOOR OPENING (W x H).....	1.0 x 1.8 m (39.3 x 70.4 in)
USABLE FREQUENCY RANGE.....	27MHz-4.2GHz (27-80 MHz use requires optional bowtie antenna)
INPUT RF POWER .....	500 watts maximum
FIELD UNIFORMITY.....	0 to +6dB at a minimum of 7 of the 9 test probe positions located in a 1.0 x 1.0m test plane, at 80% or more of the IEC 1000-4-3:1995 test frequencies, from 80 to 1000MHz
POLARIZATION.....	Vertical or Horizontal
<b>CONNECTORS</b>	
RF Input .....	N (f)
Auxiliary +12VDC output (switched).....	BNC (f)
AC Power External (110 or 220VAC).....	16 Amp industrial plug with cable (user supplies plug to wall outlet)
AC Power On Indicator.....	Amber
Earthing Stud .....	8.0 mm (0.315 in)
<b>ENCLOSURE PENETRATIONS FOR USER ACCESS</b>	
Door-Open Interlock .....	BNC, filtered
AC Power Internal .....	2 x IEC 10A sockets
RF.....	N (f) through wall, outside and inside
Signal.....	25 pin D type, filtered, female outside, male inside, 200V, 3A, 2.5kpF
Waveguide Below Cutoff .....	2.2 cm (0.87 in) diameter tube (for fiber- optic cables and other non-conductive access.)
DIMENSIONS (W x H x L) .....	2.4 x 2.6 x 5.7 m (94.3 x 102.2 x 224.4 in)

## 2. OPERATING INSTRUCTIONS

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### 2.1 POWER INPUT CONNECTION AND POWER-UP

The ARcells TC3000B/TC4000B operate on 110 or 220 Volts Alternating Current (VAC), 50/60 Hz. The units are furnished with an unterminated 3-wire cord. To use this cord, it should be terminated with a suitable plug to a 110 or 220 VAC, 50/60 Hz single-phase source as follows:

Color		Function
International Harmonized	North American	
Brown	Black	Line
Blue	White	Neutral
Yellow/Green	Green	Safety Ground

If power is needed to operate the EUT or the unit's interior light, the unit's power cable must be connected to the "Power Input" receptacle on the front of the control panel.

#### CAUTION:



The input AC voltage to the ARcells must be within the unit's specified voltage range. The unit's nominal voltage range is 100–240 VAC, 50/60 Hz.

#### CAUTION:



The ARcell's internal IEC sockets may carry the cell's applied AC line voltage. Use appropriate caution when making AC connections to the ARcell. The IEC sockets are rated for a maximum current of 10 amps each; the combined current loading on both sockets must not exceed 15 amps. The unit's front panel POWER control is a circuit breaker/switch that may trip when the cell's input current exceeds 16 amps.

Once the power cable has been connected, the unit is powered up by pressing the **POWER** rocker switch on the front of the control panel to the **ON** position, which is indicated by the symbol **I**. (The **OFF** position is indicated by the symbol **O**.) This will illuminate the amber **POWER ON** indicator light on the front of the control panel. See Figure 2-1, **ARcell TC3000B/TC4000B Control Panel (Front)** for the location of the unit's controls and indicators.

The two rewirable IEC plug power connectors provided with the Model TC3000B/TC4000B can be used to supply power from the **MAINS OUTPUTS** on the rear of the cell's control panel (see Figure 2-2) to the EUT if the EUT requires AC power input but does not have a matching plug.

*NOTE: The cell includes a +12 Volts Direct Current (VDC) power supply that operates from the main power input and is used to power the following:*

- The **POWER ON** indicator light
- The interior light
- The **AUXILIARY +12VDC** switch and output

The unit's interior light (which is mounted on the right inside the cell's access door) can then be similarly turned on by flipping the **INTERIOR LIGHT** toggle switch on the front of the control panel to the **ON**

position, which is also indicated by the symbol **I**. (The **OFF** position is indicated by the symbol **O**.) See section 4.2 for instructions on replacing the light's halogen lamp with the spare lamp provided.

The **AUXILIARY +12VDC** switch can be used to control the cell's +12VDC output.

An earthing stud is located near the cell's control panel. It is recommended that this stud be used to connect the unit to an earthing rod, or to an appropriate building frame when such a connection complies with local building codes.

**CAUTION:**



**When no earthing connection is made via the AC cord, an earthing connection to this stud is required as a precaution against static charge build-up or AC leakage.**

## **2.2 CONNECTIONS TO THE ARCELL TC3000B/TC4000B**

The ARcell TC3000B/TC4000B has one required external connection. When the ARcell TC3000B/TC4000B is used to conduct radiated immunity testing, RF power must be supplied to one of two RF (Type N) connectors located on and underneath the left end (if the user is facing the door) of the cell. This RF power is routed to the connector on the left end to use the log periodic (LP) antenna field transducer inside the cell for testing above 80 MHz. When the ARcell TC3000B/TC4000B is used to conduct low-frequency (27–80MHz) testing, an optional “bowtie” antenna is placed in a designated location inside the cell, connected via a cable to a Type N connector located inside the cell, toward the left end of the cell, and the RF power to the cell is supplied to the RF (Type N) connector located under the left end of the cell.

These same connectors are used for radiated emissions testing. The RF power source used for conducting radiated immunity testing is disconnected and a spectrum analyzer with a preamplifier (or a receiver) is connected to the appropriate RF (Type N) connector.

### **2.2.1 High-Power Operation**

**CAUTION:**



**The user must observe the RF input power limitation stated on the AR RF/Microwave Instrumentation Specification included at the end of Section 1 of this manual.**

## **2.3 TRANSDUCER SELECTION**

The ARcell TC3000B/TC4000B has a crossover frequency range—i.e., the point at which the user must switch the operation of the unit from the log-periodic antenna to the optional bowtie antenna—of 80 MHz. The log-periodic antenna can be utilized for conducting testing at frequencies above 80 MHz, while the optional bowtie antenna can be utilized for conducting testing at frequencies from 27–80 MHz.

## 2.4 RECOMMENDED EUT SIZE

The ARcells TC3000B/TC4000B can accommodate EUT assemblies as large as 1 m (39.3 in.) on a side. This figure takes into consideration the dimensions of the area of uniform field (for radiated immunity testing) within the ARcell and the size of the unit's access door opening. The ARcell can accommodate EUT assemblies as large as 1.5 m (59 in.) on a side with reduced field uniformity. The cell's floor is rugged and can support at least 500 kg (1100 lbs.) if the load is uniformly distributed.

## 2.5 CONNECTIONS TO THE EUT

While some EUTs are self-contained devices (e.g., battery-powered devices for radiated emissions testing or battery-powered devices with a visual or acoustical indication for radiated immunity testing), most EUTs require connections to external equipment. Some EUTs may even require mechanical activation during a test—a computer keyboard, for example. These connections are typically fiber-optic (FO), status in/out, control in/out, and power.

When making these connections, care must be taken during radiated susceptibility testing so as not to permit excessive leakage of the RF signals from inside the cell, which may interfere with external electronic equipment or create a hazard to personnel. Likewise, care may be needed to keep external fields from entering the cell if the EUT is unusually sensitive (such as in tests of radio receiving equipment) or if internal field levels must be kept low to facilitate observations during radiated emissions testing. Although a thorough treatment of this subject is beyond the scope of this manual, some guidelines related to the ARcell follow. The first and most important step is to minimize the number of connections to the cell.

The best means of providing the required connections to the cell are fiber-optic (FO) cables (in which all information is encoded as light signals) with physically small, shielded electronic-FO (or FO-electronic) converters located near or inside the EUT. A 2.2 cm (7/8 inch) diameter metal tube allows the FO cable to pass through the cell wall. This tube acts as a “waveguide below cutoff” for frequencies in the cell's range. As long as no metal (i.e., electrically conducting) elements are passed through the tube, significant RF energy does not pass through the tube.

Typically, field probes intended for measurement of moderate fields are supplied with FO links. Many standard digital interfaces (e.g., RS-232, General Purpose Interface Bus (GPIB), and Parallel) and analog interfaces (e.g., National Television System Committee (NTSC) and video) are supported by commercially-available FO converters. Specialized instrumentation can be used to convert monitor points to FO signals or to create electrical control signals from FO signals. For mechanical activation, pneumatic actuators may be the best approach, with air lines passed through the cell's “waveguide below cutoff” tube. Detailed visual analysis of an EUT might benefit from the use of FO light-transmitting viewers (light pipes). An alternate approach would be to use special battery-operated television cameras with FO links for real-time monitoring.

Status and control signals that have not been converted to FO form should be wave-shaped to slow their rise/fall times and then passed through the cell wall via RF filters. The ARcell supports lightly filtered lines. Cables inside the cell that are not part of the EUT should be kept as short as possible.

AC power lines should pass through the cell wall via RF filters. The ARcell includes a moderately effective single-phase line filter with easy internal access via grounded IEC sockets located on the back of the cell's control panel (See Fig 2.2). AC cables inside the cell that are not part of the EUT should be kept as short as possible. It is recommended that AC power not be connected to the cell unless it is needed to operate the EUT or to provide internal cell lighting.

One Type N connector is provided to pass RF signals through the cell wall. Use only good quality, double-braided or solid shielded coaxial cables both inside and outside the cell.

Some EUTs require more wire or coaxial connections or improved isolation via filtering. To facilitate the use of the ARcell TC3000B/TC4000B with a wide variety of EUTs, a removable access plate is provided for custom modification by the user. For example, an EUT requiring three-phase power would require a three-phase filter, which could be mounted externally to the access plate with the wires routed via a short, solid conduit. An RF filter with an inductor toward the interior of the cell should be utilized when testing EUTs that require three-phase power.

Since safety is a primary concern in all instances, care must be taken to comply with all applicable electrical codes and to pay careful attention to the safety grounding (earthing) of the cell and the chassis of any primary power AC filters.

Since internal RF field levels during radiated immunity testing can reach hazardous levels, RF energy should not be applied to the cell when a person is inside of it, when the access door is open, when the access plate has been removed, or if there are any signs of damage that might lead to excessive RF leakage. Since proper operating procedures require positive disabling of the RF power source whenever the cell's access door is open, the ARcell TC3000B/TC4000B features a "door open" interlock line that should be connected to disable the RF source whenever the cell's access door is open. The "Door Interlock" connector offers a connection to ground when the cell's door is closed.

Individuals outside of the cell are usually adequately protected from RF test fields by proper wiring and the use of the RF filters supplied with the ARcell TC3000B/TC4000B.

The front of the ARcell TC3000B/TC4000B's control panel is detailed in Figure 2-1. The rear of the unit's control panel (which is accessible from the inside of the cell) is detailed in Figure 2-2.

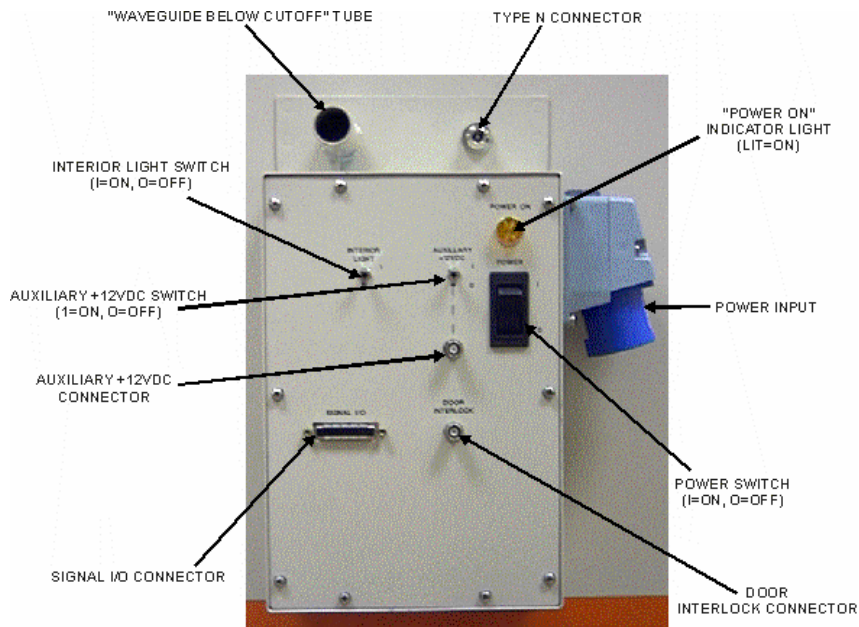


Figure 2-1. ARcell Control Panel (Front)



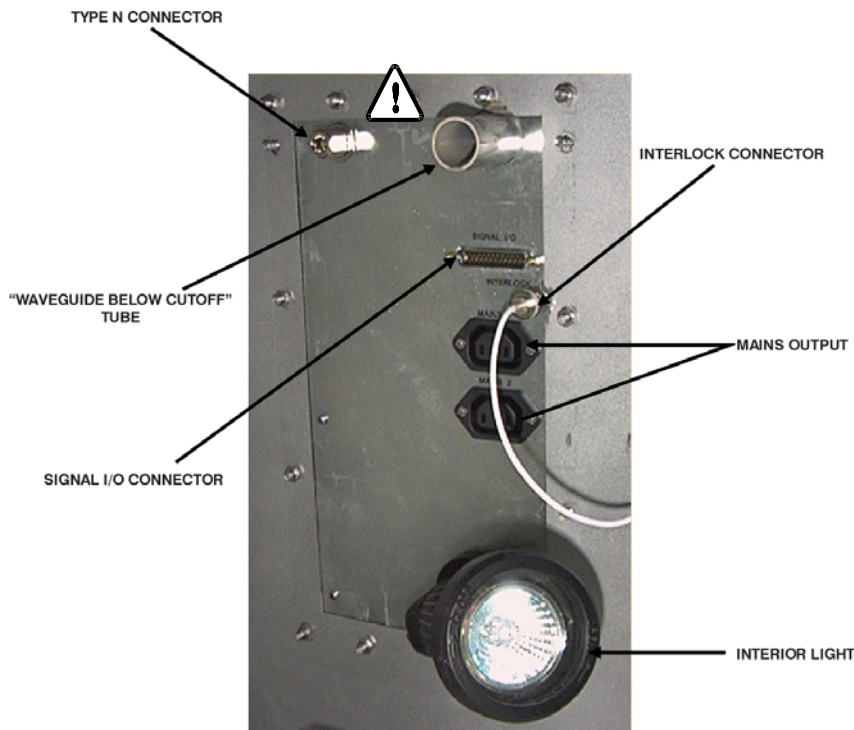


Figure 2-2. ARcell Control Panel (Rear)

## 2.6 HEAT FROM THE EUT



### CAUTION:

The ARcell is large enough to transfer the heat of typical EUTs plus the applied RF power without concern. However, when the total of RF plus EUT power dissipated approaches 2000 watts, it is recommended that the temperature of the EUT be monitored.

If excessive temperatures are noted or if testing at a controlled temperature is required, the following steps should be taken to limit the EUT temperature increase: shorten the test; add a fan inside the cell to circulate the air; use cooling gas during the test; or add forced ventilation through the cell's metal "waveguide below cutoff" tube.

If greater power handling capability is needed, the user access plate can be modified to add an electromagnetic interference (EMI) filter (e.g., a honeycomb or equivalent), and a blower or ducted air can be added to provide increased cooling. Cooled air can be introduced into the cell, provided that it is at a temperature of not less than 10°C.

## 2.7 RADIATED IMMUNITY TESTING

Testing for radiated immunity is the primary function for which ARcells were designed. User needs vary widely—from a very basic set of external instrumentation (e.g., an RF signal generator and an RF amplifier) that might be used for manual-only testing of battery-powered EUTs with built-in fault alerts, to more extensive instrumentation for semiautomatic testing, exercising, monitoring, EUT reorientation, data recording, and report preparation. The optimum choice is ultimately determined by the user's testing workload and testing budget.

Some testing applications give preference to using field probe(s) to measure and control the level of the field during testing of the EUT. This approach offers an alternative methodology and a handy approach to continuous-sweep testing. By adding field probe(s) and a probe controller, a closed-loop field leveling system can be implemented. Many different equipment combinations are possible. Refer to AR Application Note #29 for additional details regarding field leveling techniques.

## **2.8 RADIATED EMISSIONS TESTING**

Testing for radiated emissions is a secondary function of ARcells. User needs vary widely—from a very basic set of external instrumentation (e.g., an RF preamplifier and a spectrum analyzer or receiver) that might be used for manual-only testing of “self-exercising” EUTs, to more extensive instrumentation for semiautomatic testing, exercising, EUT reorientation, data recording, and report preparation. Some applications may require only a comparison of actual radiated emissions to those of a reference product.

When selecting a spectrum analyzer or receiver, users should select one with features applicable to their testing requirements. Key features include pre-detection bandwidth; detection system characteristics (e.g., Amplitude Modulation (AM), Frequency Modulation (FM), and so forth); and post-detection processing selections (e.g., “quasi-peak” and average). A suitable standard input/output (I/O) port (such as a GPIB/IEEE-488) is needed for use in an automated test system. The optimum equipment choices for radiated emissions testing are ultimately determined by the user’s testing workload and testing budget.

## 3. THEORY OF OPERATION

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### 3.1 DESCRIPTION

The interior of the ARcell TC3000B/TC4000B test cell is lined with a Radio Frequency (RF)-absorbing material to create a self-contained, semi-anechoic enclosure that includes internal field launching/receiving devices. A built-in log-periodic antenna acts as a launching/receiving device for frequencies above 80 MHz, while an optional bowtie antenna is used as a launching/receiving device for frequencies from 27–80 MHz. The unit's crossover frequency—i.e., the point at which the user must switch from the use of the log-periodic antenna to the use of the optional bowtie antenna—is 80 MHz. Both the log-periodic antenna and the bowtie antenna can be rotated to provide vertical or horizontal polarization, as is usually required for both radiated immunity and radiated emissions testing.

The RF-absorbing material used inside the cell is a carbon-impregnated foam that is selectively applied to create a practical level of field uniformity. It is hidden from view and protected from damage by rugged covering materials. The cell's log-periodic antenna is mounted in a fixed location and is similarly hidden from view and protected from damage. The cell's bowtie antenna is installed by the user, in a defined location, and only when needed, for conducting testing at 27–80MHz. The fixed location of the log-periodic and bowtie antennas and the fixed location and protection of the RF-absorbing material eliminate variations in measurements due to changes in the placement of the antennas and prevent physical damage to the RF-absorbing material.

The ARcell is used by installing the EUT in the designated test area on a non-conducting table or stand. The EUT is connected and used in a manner as close to its normal mode of operation as is practical within the space constraints of the cell. The EUT is re-oriented during testing to enhance its likely susceptibility or emissions, as appropriate. Expected problem configurations can be easily checked. The log-periodic antenna is rotated to provide vertical or horizontal polarization.

The ARcell is ideal for conducting evaluation and pre-compliance testing during product development, and for monitoring the performance of production units. It permits testing of printed circuit boards (PCBs) of all sizes, as well as testing of many complete electronic assemblies.



## 4. MAINTENANCE

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### 4.1 ROUTINE MAINTENANCE

The ARcell TC3000B/TC4000B does not require routine maintenance.

The user should check areas that could potentially have been damaged during shipping and/or installation of the unit, as well as areas that could be damaged by the routine insertion and removal of the EUT. In particular, the copper “fingers” inside the cell’s access doorway should be checked periodically for possible damage that could contribute to RF leakage (see Figure 4-1).

The cell’s interior should be kept clean, dry, and free of debris at all times.

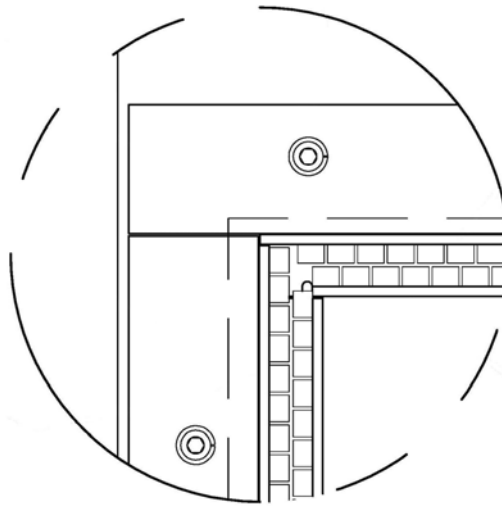


Figure 4-1. Access Door “Fingers”

### 4.2 REPLACING THE CELL’S INTERIOR LAMP

A replacement 12VDC halogen bulb/reflector assembly is provided with the ARcell TC3000B/TC4000B.



**WARNING:**

As always, all AC and RF input power to the cell should be disconnected before attempting to perform any work inside the cell. The interior light’s lens housing and bulb/reflector assembly may be very hot—be sure to switch off the light and allow it to cool off before attempting to replace the lamp.

To replace the lamp, simply rotate the interior light’s lens housing a few degrees counterclockwise (CCW), until it will turn no further, then pull off the lens housing and carefully unplug the old bulb/reflector assembly from its socket. Plug the new bulb/reflector assembly into the socket by carefully aligning the two prongs on its base with the two holes in the socket, then replace the lens housing and turn it a few degrees clockwise (CW), until it will turn no further, to tighten it.



## **WARRANTIES: LIMITATION OF LIABILITY**

Seller warrants (i) that seller has title to the goods sold and (ii) that Amplifiers (all parts excluding traveling wave and vacuum tubes), Antennas, field monitors, field probes, field analyzers, field analyzer processor units, system controllers, system interlock, power meters, leak detectors, RF conducted probes, RF conducted clamps, Multi-tone, EMI receiver systems, RF down converters, RF conducted immunity systems, conducted immunity accessories, radiated immunity test systems, safety meters, safety sensor heads, tripods, directional couplers, waveguide adapters, termination loads, load attenuators, impedance stabilization networks, and coaxial cables will be free from defects in material and workmanship for a period of three (3) years from date of shipment shown on AR RF/Microwave Instrumentation invoice.

All modules, used in the amplifiers for the 1-6 GHz, 4-18 GHz, 6-18 GHz, all HPM products, and other applications, are hermetically-sealed. This sealing process protects the internal hybrid circuitry from humidity that could compromise the long term reliability of the product. These modules are not field-repairable and should *never* be opened outside of AR's Microelectronics Lab. The modules in these product lines have a security label on two sides of the modules between the housing and lid/cover. If the security label is removed and or cut, the warranty of the module will be voided.

Vacuum tubes in the 'L' series amplifiers, traveling-wave tubes in TWT amplifiers, and power heads will be free from defects in material and workmanship for a period of one (1) year.

Contact AR RF/Microwave Instrumentation for warranty information regarding items not listed.

Seller's sole responsibility in fulfilling these warranties shall be to repair or replace any goods which do not conform to the foregoing warranties or, at seller's option, to give buyer credit for defective goods. The warranty is valid only when used in the country specified at time of order. Warranty service must be obtained from the repair facility designated at that time. If warranty service is not available in the country where the equipment is to be used, it must be returned to AR RF/Microwave Instrumentation. Warranty service will be provided only for defective goods which are returned within the warranty period, freight costs prepaid to AR RF/Microwave Instrumentation or its designated repair facility.

There are no other warranties, express or implied, including any warranty of merchantability or fitness. Seller shall not be responsible for any incidental or consequential damages arising from any breach of warranty.

No person other than an officer of Amplifier Research Corporation, has any authority to bind seller to any affirmation, representation or warranty except as specifically included in the preceding terms and conditions.

