Indoor Cellular Networks
Americas Region (NAR/CALA)

eLearning & Webinar Training

CommScope offers a variety of eLearning and webinar training. Individuals can attend the training at their convenience

Instructor Led Training

CommScope offers Classroom and Virtual training for groups/individuals. Private training sessions are available upon request.

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Introduction

ANDREW® Indoor Cellular Networks Training group provides a variety of learning opportunities related to products and technologies, including the all-digital DAS platform, ERA®. Registered users can utilize a variety of self-paced eLearning courses in addition to attending live training events, such as distance learning Virtual Trainings sessions along with focused workshops and product-based classroom instruction. Users have access to the ANDREW University Learning Management System (LMS), where they can track their in-progress and completed courses, review transcripts and pull information in training completions and certifications.

New User Registration

To enroll in courses, you must first be registered in the learning portal, ANDREW University (AU). The following steps need to be followed to complete the registration proves.

- Go to https://www.andrew.com/

- Click on Login (My ANDREW) at the top of the page

- Click on the "*Sign up"'* button at the bottom of the page

- Complete the "*New User Registration*" form

- After My ANDREW registration is complete login

- On the My ANDREW page click on the Training portal tile for access

- On the Dashboard select the Mobility Solutions tile to access to the desired training

Here is a link to a tutorial video that will walk you through the registration process for setting up a My ANDREW account and then requesting access to ANDREW University - AU Registration

Registered User Login

If you are already a registered user with ANDREW Indoor Cellular Networks Training, you can login using the steps below.

- Go to https://www.andrew.com/

- Click on Login (My ANDREW) at the top of the page

- On the My ANDREW page click on the Training portal tile for access

- On the Dashboard select the Mobility Solutions tile to access to the desired training

Course Enrollment

At the ANDREW® University Dashboard you identify and enroll in the desired course using the steps below.

Find the desired training

Use one of the following methods to find the desired training:
1. Search for training by typing search words in the 'Search' bar
   OR
2. Click on the "Indoor Cellular Networks Training" tile, then select a course from the desired catalog

Enroll in the training

E-Learning Courses

Identify the desired course and click on the "Enroll" button on the course tile. The "Enroll" button will change to the "Start" button. Click on the "Start" button and then simply follow the requirements for that course to completion.

Instructor Led Courses

1. Identify the desired course tile
2. Click on the button with a shopping cart and dollar value listed
3. The "dollar value" on the button will change to "added to cart", click on the button again.
4. Proceed through the checkout process.
   a. If you have a coupon code for a discount on the dollar value enter it and click "Apply"
   b. Click on the "Proceed to Checkout" Button, and a second time to confirm.
   c. Enter in the needed information and Click on the "Proceed to Checkout" Button
   d. The "Order Complete" window will appear. Click on the "View Course" button
5. Click on the "Enroll" button for the course, the button will change to "View", click on it to see the available dates for the training.
6. Click on the "Enroll" button for the desired training date. At this point you are enrolled in that date. You do have the option to either change or cancel the session at that point. Here is a link to an external Training Calendar to view schedule of upcoming Instructor led training sessions, so you can identify the desired date before you enroll.

Here is a link to a tutorial video that will walk you through navigation in ANDREW University and Indoor Cellular Networks Training.

Private Training Sessions

Any of the instructor-led courses are available as a private training class.

We can work with you and your local ANDREW sales representative to develop a customized program that best fits your needs. Venue and cost for such training sessions will be determined on a case-by-case basis.

Please contact us at icn_training@andrew.com

eLearning Courses

This section of eLearning courses will give the learner a better understanding of ANDREW® Indoor Cellular Networks and supporting technologies. These eLearning courses and instructional videos will give the learner a head start when attending our Instructor Led Training, so they can be more involved in class from the start. These courses offer preparation for any training that is attended in either a Classroom or Virtual environment.

North American Region Courses \ Audience		Installation & Commissioning	System Operations	System Engineering	Project Management
Online Learning					
ND4110	Introduction to ION-B	X	X	X	X
ND4111	ION-B System Operations and Commissioning Overview	X	X		X
ND5100	AIMOS General Overview	X	X	X	X
ND5101	Avoiding PIM in DAS Installation	X	X	X	X
ND5102	Return Material Authorization (RMA) Process	X	X		X
ND5103	Understanding dB and dBm	X	X	X	X
ND5104	Wireless & DAS 101	X	X	X	X
ND6431	ION-M Installation & Commissioning (Recertification)	X			
ND6432	Introduction to ION-M	X	X	X	X
ND6441	ION-U Installation & Commissioning (Recertification)	X			
ND6442	ION-U Solution eLearning	X	X	X	X
ND6463	ERA Overview	X	X	X	X
ND6464	ERA RF Design		X	X	X
ND6465	ERA Interleaved MIMO		X	X	X
ND6468	ERA WCS Airflow	X	X	X	X
ND6469	ERA Installation & Commissioning (Recertification)	X			
ND6479	Node A Repeater Systems	X	X	X	X
ND6500	Public Safety Repeater Installation, Configuration, Operations & Maintenance	X	X	X	X

[ND6463] ERA® Overview

Overview

ANDREW® ERA digital DAS solution is our new C-RAN platform. This platform is fully compatible with ANDREW ION-E platform. Both platforms can be combined within a single deployment, providing even more flexibility.

Target Audience

Anyone who would like to learn about the new ANDREW C-RAN platform, ERA, and those who would like to take the instructor led certification course, [ND6460] ERA & ION-E Installation & Commissioning.

Objectives

This ERA Overview video will provide:

- ERA Overview
- Deployment Examples
- System Modules
- CWDM Solution Overview

Est. duration (27 mins)

[ND6464] ERA RF Design

Overview

The video will explain the configuration of the ERA RF design templates.
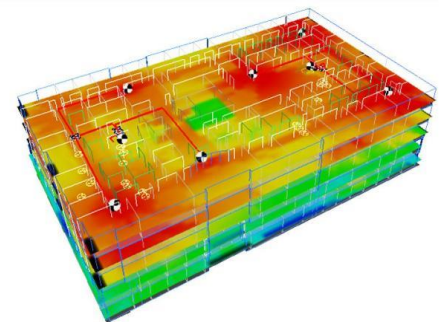
Target Audience

Any personnel/DAS engineer involved in using iBwave to design ANDREW ERA digital DAS system.

Objectives

Upon completion the learning will be able to:
- Describe the process of configuration of the ERA system and RF design
- Define how the design involves the CAN, SCAN, TEN, WIN, UAP and CAP L
- Identify Service Group Associations

Est. duration (1 hour)

"I really appreciated the eLearning. It's easy to use and easy to come back to the needed information. Great!"

-   Anonymous student

[ND6465] ERA® Interleaved MIMO

Overview

An alternative to co-located MIMO is ANDREW® ERA digital DAS Interleaved or software defined MIMO. Interleaved MIMO, also known as I-MIMO, can provide near-full MIMO performance without the cost of additional cabling or equipment.

Target Audience

Any personnel/DAS engineer involved in using ANDREW ERA and ION-E Systems.

Objectives

Upon completion the learning will be able to:

- Describe ANDREW ERA Interleaved or software defined MIMO.
- Define how I-MIMO can provide near-full MIMO performance without the cost of additional cabling or equipment

Est. duration (1 hour)
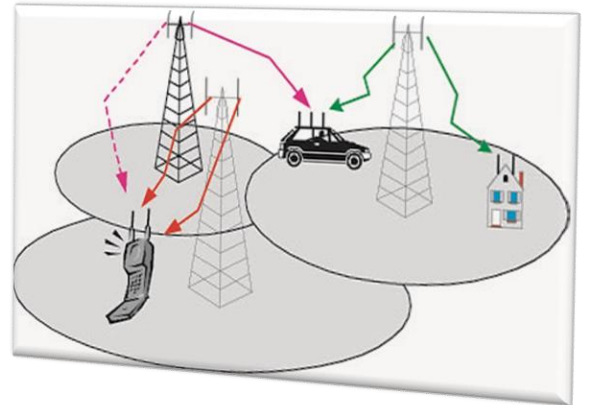
"I really appreciated the eLearning. It's easy to use and easy to come back to the needed information. Great!"

- Anonymous student

[ND6468] ERA® WCS Airflow

Overview

This course describes the requirement for proper airflow for ERA WCS cabinets. Highlighting potential issues that can restrict airflow within WCS 2 & WCS 4 subracks and common solutions to resolve the issues.
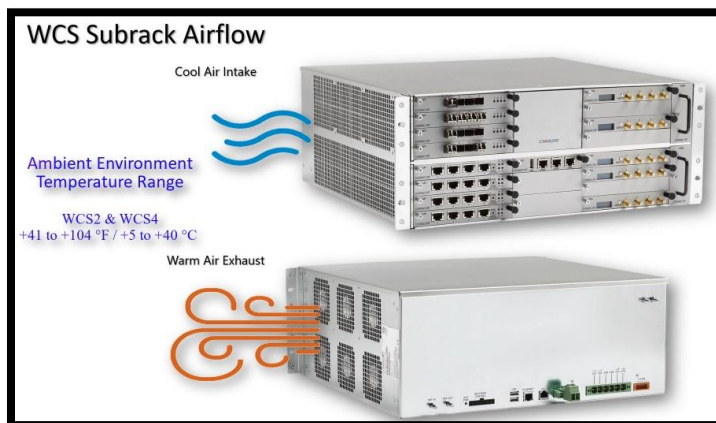
Target Audience

Any personnel/DAS engineer involved in using ANDREW® ERA and ION-E Systems.

Objectives

Topics Covered:

- Proper WCS Subrack Airflow
- Rack Mounting
- Cable Management
- Filler Panels
- Fan Units

Est. duration (10 Mins)

[ND6479] Node A Repeater Systems

Overview

This instructional video aims to educate the learner on ANDREW digital repeater system.

Target Audience

Anyone involved with or interested in repeater applications.

Objectives

The objectives of this instructional video are to have the student:

- Understand the guidelines of repeater applications.
- Have a clear picture of Node A repeater system architecture.
- Operate the Graphical User Interface to correctly set the Node A system parameters

Est. duration (40 Mins)

[ND6500] Public Safety Repeater Installation, Configuration, Options & Maintenance (UL2524)

Overview

The Public Safety Repeaters (PSR 700/800) are designed to cover the 700 and 800 MHz public safety bands and comes in two variants, one is a digital, channelized Class A repeater and the second is an analogue Class B repeater. This course will cover the Installation, Commissioning, RF Optimization, and Troubleshooting of this solution for both the Class A and Class B repeaters.

Target Audience

Anyone involved with or interested in PSR repeater applications

Objectives

- Upon completion of the course the learner will be able to:
- Understand basic Installation process
- Identify GUI activities associated with the PSR Commissioning & RF Optimization
- Understand the Troubleshooting process for both the Class A and Class B repeaters.

Est. duration (40 mins)
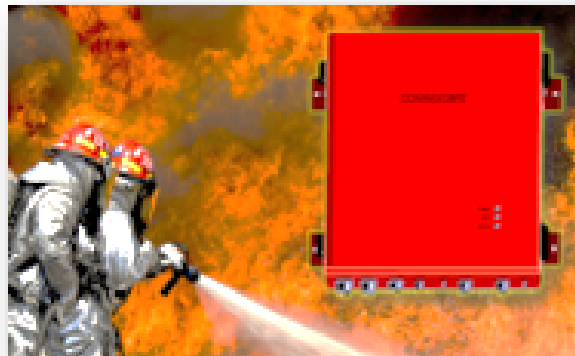
[ND5100] A.I.M.O.S. (Advanced Integrated Monitoring Operating System)

Overview

This eLearning module is designed to introduce the learner to ANDREW® Integrated Management and Operating System (A.I.M.O.S.). It will provide the learner with fundamental knowledge of A.I.M.O.S. Additionally, the module will provide basic A.I.M.O.S. terms and definitions to assist the learner with learning about A.I.M.O.S. and its features.
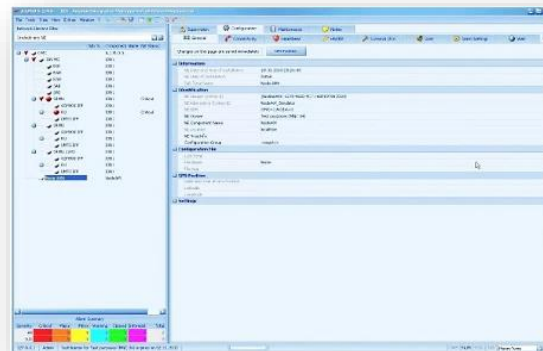
Target Audience

Sales personnel, NOC personnel or anyone involved with A.I.M.O.S.

Objectives

- Upon completion of the course the learner will be able to:
- Describe the benefits of A.I.M.O.S.
- Describe the function of A.I.M.O.S.
- Describe the purpose of A.I.M.O.S.
- Understand the best practices in avoiding and testing PIM in DAS installations.

Est. duration (35 mins)

[ND5101] Avoiding PIM in DAS Installation

Overview

This eLearning provides the learner an overview of Passive Intermodulation (PIM) and its impact on DAS installation. It also covers ANDREW® PIM calculation tool and best practices to avoid PIM in DAS installations.

Target Audience

Anyone involved with DAS installation, commissioning, optimization & troubleshooting.

Objectives

The objectives of this video for learners are to:

- Gain an understanding of PIM and how it affects DAS installations.
- Learn how to calculate PIM frequencies.

Est. duration (28 mins)

[ND5102] Return Material Authorization (RMA) Process

Overview

The purpose of this video is to make the Returns Process as efficient and painless as possible. The video will demonstrate how to successfully complete the Return process for defective and non-defective DAS and Small Cell products in warranty and non-warranty items.

Target Audience

Anyone involved in return process for defective and non-defective DAS and Small Cell products in warranty and non-warranty items.

Objectives

Upon completion the learning will be able to:
- Identify defective vs non-defective
- Describe process In-warranty and out-of-warranty
- Identify and contact Tech Support
- Obtain an RMA
- Identify roles within the RMA process
- Describe packaging, shipping, turnaround time and invoicing policy

Est. duration (30 Mins)

[ND5103] Understanding dB and dBm

Overview

This instructional video aims to educate the learner on the basic RF calculation terminology dB & dBm.

Target Audience

Anyone involved in DAS design and commissioning.

Objectives

The objectives of this instructional video are to:

- Describe the difference between dB and dBm.
- Provide examples of real-life calculations using dB and dBm.

Est. duration (12 mins)

[ND5104] Wireless & DAS 101

Overview

This course provides a fundamental understanding of the increasing need for wireless coverage and capacity, the role of distributed antenna systems (DAS) to deliver wireless service, and ANDREW® products and their applications. It provides a foundation for the subsequent ANDREW eLearning courses.
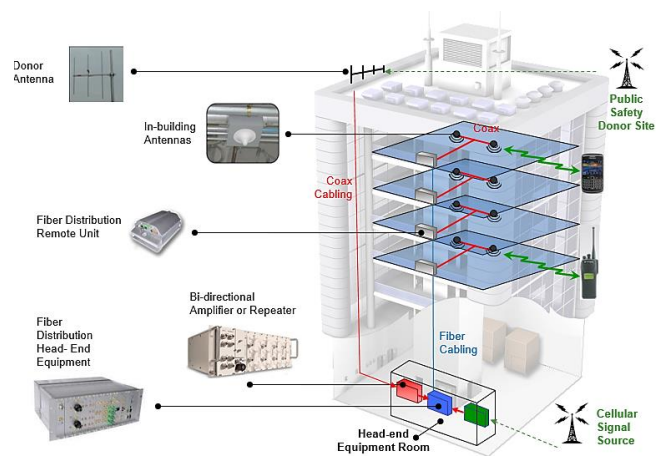
Target Audience

Any person who would like to learn the fundamentals of wireless and active DAS.

Objectives

- Provide an overview of wireless technology.
- Provide an overview of active DAS.

Est. duration (30 Mins)

[ND6432] Introduction to ION-M

Overview

This video provides the learner an overview of ION-M, one of ANDREW® high power DAS platforms.

Target Audience

Wireless operators, and ANDREW partners and System Integrators.

Objectives

After studying this video, the student is expected to be able to:

- Understand the general architecture of an ION-M system.
- Determine how ION-M could be deployed in various applications.
- Understand the various optimization parameters available through the ION-M Graphical User Interface (GUI).

Est. duration (40 Mins)

[ND6432] ION-U Solution eLearning

Overview

This video provides the learner an overview of ION-U, one of ANDREW DAS platforms.

Target Audience

Wireless operators, and ANDREW partners and system integrators.

Objectives

After studying this video, the student is expected to be able to:

- Understand the Architecture, Components and Connections for the ION-U system.
- Determine the routing of subrack cabling, subrack controller options, ethernet vs. bus communications, rules of subrack addressing and cabling.
- Understand the ideal DAS deployment process.

Est. duration (40 Mins)

[ND4111] ION-B System Operations and Commissioning Overview

Overview

This eLearning training flow is designed to provide an overview of the basic Operations and Commissioning tasks for the ION-B system.

Target Audience

Wireless operators, and ANDREW® partners and System Integrators.

Objectives

After studying this video, the student is expected to be able to:

- Understand the overall ION-B System Architecture.
- Navigate the ION-B Graphical User Interface (GUI).
- Describe the ION-B Commissioning Process.
- Recognize common ION-B issues and the process to resolve them.

Est. duration (3 Hours)

Instructor-Led Training

ANDREW® Indoor Cellular Networks instructor-led courses offer students in class training that typically runs from 1 to 2 days. Our instructor-led courses are offered virtually, via online training platforms, or at the ANDREW training center in Richardson, TX (USA). The installation and commissioning certification training courses include PowerPoint presentations, hands-on exercises covering equipment configuration and GUI (Graphical User Interface) operations. Any certified training can be requested as private training for groups of 8 max individuals and will be quoted on an individual basis. For more information on private training, see Private Training Sessions.

ANDREW – North American Region Courses \ Audience		Installation & Commissioning	System Operations	System Engineering	Project Management
Instructor Led Training – Delivered Virtual and In-Classroom					
ND6430	ION-M Installation & Commissioning (2 Days)	X			
ND6433	ION-M Maintenance (1 Day)		X		
ND6440	ION-U Installation & Commissioning (2 Days)	X			
ND6446	ION-U Maintenance (1 Day)		X		
ND6460	ERA Installation & Commissioning (2 Days)	X			X
ND6462	ERA Technical Solution Overview (1 Day)	X	X	X	X
ND6467	ERA Operation & Maintenance (1 Day)		X	X	X

Certification

Upon completion of a certification course the learner will receive a 2-year certificate. Once the certification expires, the student may recertify by completing either the eLearning recertification course to receive an additional year of certification or by completing the ILT certification course to receive an additional 2 years of certification.

[ND6460] ERA® Installation & Commissioning

Overview

This 2-day *Certification* course is designed to enable learners to install and commission an ERA digital DAS system. This is an instructor led classroom course that includes PowerPoint presentations and hands-on exercises.

Target Audience & Class Size

All ANDREW® Partners directly involved in the installation and commissioning of an ERA digital DAS system. The class min/max size is 4/8.

Objectives

Upon completing this ILT course, students will verify they're able to:

- Define ANDREW ERA digital DAS system components, specifications and architecture
- Demonstrate how correctly install an ERA digital DAS system to prepare the system ready for commissioning
- Properly commission an ERA system in a lab environment

Certification

Upon completion the student will receive a 2-year ERA Installation & Commissioning certificate. If you need to recertify on ERA Installation & Commissioning, see the Recertification section in this document.

[ND6462] ERA® Technical Solution Overview

Overview

This ½ day course will provide a detailed summary of the ERA digital DAS solution. It highlights the benefits of implementing the solution, the system components and connectivity requirements. This is an instructor-led course that includes a PowerPoint presentation along with live GUI demonstrations.

Target Audience & Class Size

This course is designed for management and technical support personal needing a more in-depth understanding of the ERA digital DAS solution. The class min/max size is 6/15.

Objectives

Upon completing this ILT course, students will be able to:

• Understand and define common terminology regarding the ERA digital DAS system

• Explain the possible different architectures of the ERA digital DAS system

• Explain the purpose and function of the major components

• Identify the major signal paths through an ERA digital DAS system

• Identify Graphical Users Interface Uses

"Your visual assisted training was exceptional compared to other DAS training provided. The pace and quantity of content was just right for my desired learning."

Anonymous student

For more information visit our Training Web Page

[ND6467] ERA® Operation and Maintenance

Overview

This 1-day course is designed to enable learners to operate, troubleshoot and maintain an ERA digital DAS system. This is an instructor led classroom course that includes PowerPoint presentations along with live GUI sessions.

Target Audience & Class Size

All ANDREW® partners directly involved in the operations and maintenance of an ERA digital DAS system. The class min/max size is 4/8.

Objectives

Upon completing this ILT course, students will verify they're able to:

- Understand and define common terminology regarding the ERA digital DAS system
- Explain the possible different architectures of the ERA digital DAS system
- Explain the purpose and function of the major components
- Explain the major signal paths through an ERA digital DAS system
- Use the Graphical Users Interface to troubleshoot common alarms
- Identify how to resolve alarms using ANDREW documentation

"The instructor did an excellent job of gauging my level of understanding and would use analogies to convey the subject matter. I have been removed from the technical aspect of DAS and I appreciated that."

Anonymous Student
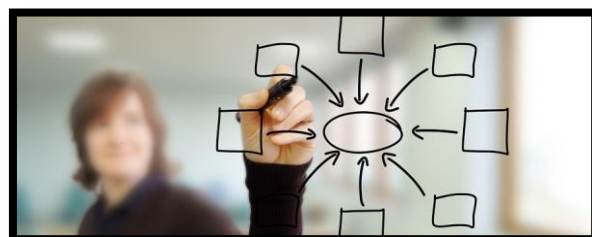
[ND5111] A.I.M.O.S. Technical Solution Overview

Overview

This ½ day course is designed to enable students to perform, network operation from A.I.M.O.S. visualization.

Target Audience & Class Size

All ANDREW® partners and NOC engineers involved with or need a detail understanding of A.I.M.O.S. operation. The class min/max size is 4/8.

Curriculum

- Explain the basic A.I.M.O.S. architecture/structure
- Explain the communication principle between Repeater and A.I.M.O.S.
- A.I.M.O.S. GUI usage
- Integrate DAS/Repeater into A.I.M.O.S.
- Login DAS system with A.I.M.O.S. and perform basic operations
- Interpret incoming alarms
- Fault management
- Configuration management
- Performance management
- Network Element Management

ANDREW® an Amphenol company   For more information visit our Training Web Page
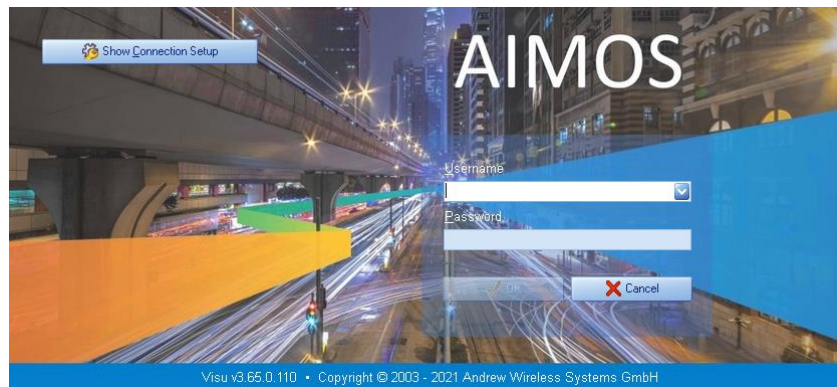
Re-Certification

Re-Certification on a product can be completed in two ways, either by taking the original Instructor Led certification course again and receiving a new 2-year certification, or by completing our eLearning recertification courses (listed below) a receiving a new 1-year certification. The eLearning recertification course is a self-paced option, enabling the student to complete eLearning learning modules and instructional videos at their own pace, which is followed by a course exam. When a student successfully completes the eLearning re-certification option, they will be recertified for 1 year. After the 1-year re-certification expires, and they want to recertify again, they are required to attend the instructor led certification course and will receive an additional 2 years of certification. *Note the eLearning re-certification course must be taken within 1 month of certification expiration.

[ND6469] ERA® Installation & Commissioning (Re-Certification)

Overview

This eLearning *Re-Certification* training course allows those who have completed the [ND6460] ERA Installation & Commissioning course to recertify their certification for 1 year before having to attend a classroom certification course.

Pre-requisites

Successful completion of [ND6460] ERA Installation & Commissioning.

Target Audience

Any personnel who have successfully completed ANDREW [ND6460] ERA Installation & Commissioning course.

Objective

This eLearning training course is designed to recertify the student's ability to design, install and commission ANDREW ERA digital DAS solutions. The student must complete the eLearning training modules and pass the course exam.

Certification

Upon completion of the eLearning recertification course the student will receive a 1-year ERA Installation & Commissioning certification. After the 1-year certification has expired, the student must attend the instructor led certification course to maintain active certification for the product.

Legacy Product Support

If there is a need for training on legacy products, such as Prism, ION-B, ION-M and ION-U, we can assist you with that. You'll need to submit an email request to icn_training@andrew.com, and in the request please identify the product type, specific training need (i.e. Operations, Maintenance, etc.), the number of personal that need the training and the desired timeframe for delivery of the training. We will evaluate the request and reply with potential options to address your needs. Regarding the timeframe for delivery, there will normally be a minimum of 60 days required, from the time the desired training is agreed upon, to the delivery date of the actual training session.

Legacy Product Training Areas
ION-M Installation & Commissioning
ION-M Operation & Maintenance
ION-U Installation & Commissioning
ION-U Operation & Maintenance
Prism Installation & Commissioning
ION-B Operation & Maintenance
Node A+/AM Installation, Commissioning & Maintenance

Webinars

ANDREW regularly offers webinars on various topics that are often recorded and posted to our learning management system to be viewed for convenience or future reference. Please contact us to inquire about or request other topics. Indoor Cellular Networks Training webinars can be requested via email and will be reviewed on a case-to-case basis. To request a webinar, you can email a request to icn_training@andrew.com.

Cancellation and No-Show Policy

ANDREW® Indoor Cellular Networks Training will adhere to the following cancellation policy regarding all training courses. By registering for any course, you acknowledge that you agree and consent to the terms of this cancellation policy. ANDREW is not responsible for any losses that may be incurred due to a failure to abide by this cancellation policy.

ALL CANCELLATIONS MUST BE SENT IN WRITING TO: icn_training@andrew.com.

E-Learning Training Cancellation Policy:

The following policy shall apply to ANDREW Indoor Cellular Networks Training E-Learning Training classes. Credit Card payments will be charged upon registration for the class.

Cancellation requests must be made in writing by emailing icn_training@andrew.com Except for the issuance of a voucher to a participant in the limited circumstances as provided below, ANDREW shall not be responsible for any loss incurred by the participant as a result of cancellation.

Cancellation requests must be made within 48 hours of course registration, if none of the course materials have been accessed. Cancellations that meet these criteria will be issued a voucher* equal to the amount that the participant paid for the current registered e-learning course. This voucher may be applied toward a future e-learning training course offered through ANDREW Indoor Cellular Networks Training site. This voucher must be used within one (1) year of the original registration date. No vouchers will be honored after such one (1) year period.

* Vouchers are the customary method of resolving cancellations within the policy time period noted above. Alternatively, a participant eligible for a voucher can request for approval for a credit card refund of the amount paid by the participant for the current registered class, and ANDREW shall determine in its sole discretion whether to grant approval. Such requests for refunds must be sent to icn_training@andrew.com.

Instructor-Led Training Cancellation and No-Show Policy:

The following policy shall apply to ANDREW Indoor Cellular Networks Training Instructor-Led Training classes. Credit Card payments will be charged upon registration for the class. If you wish to cancel or reschedule a class for which you have registered and been confirmed for in writing, we will try to accommodate your request, subject to the Cancellation Policy. Except for the issuance of a voucher or a refund to a participant in the specific, limited circumstances as provided below, ANDREW shall not be responsible for any loss incurred by the participant as a result of cancellation.

Table 1 - Instructor-Led Training Cancellation and No-Show Policy		
Policy Area	**Timing**	**Action**
Participant Cancels	10 days or more from scheduled training class	ANDREW® will issue a voucher* equal to the amount paid for the current registered class to apply toward a future in-person training offered through the ANDREW Indoor Cellular Networks Training site. This voucher must be used within one (1) year of the original class date. No vouchers will be honored after such one (1) year period.
	9 days or less from scheduled training class	No voucher or refunds will be made for cancellations within nine days of the scheduled training date.
No Shows		No vouchers or refunds will be made for "No Shows" (a "No Show" is a person who registers for the training but does not cancel or attend the training class).
ANDREW Cancels Class		If a training class that participant is registered for is cancelled by ANDREW due to circumstances beyond its reasonable control (e.g. minimum class size requirements not met, weather, natural disasters, etc.) and participant chooses not to reschedule such training class, ANDREW will issue a refund equal to the amount paid for such registered class. ANDREW also reserves the right to cancel registrations of its competitors, and no refund or voucher will be issued in such situation.
Private Training Cancellations by Requestor	20 days or more from scheduled training class	All unrecoverable expenses will be deducted by ANDREW from any payment received prior to reimbursement.
Private Training Cancellations by Requestor	20 days or less from scheduled training class	This will be reviewed by ANDREW and any unrecoverable expenses will be deducted by ANDREW from any payment received.
Substitutions for another student are allowed with at least 24-hour notice prior to the class start date.		
* Vouchers are the customary method of resolving cancellations within the policy time period noted above. Alternatively, a participant eligible for a voucher can request approval for a credit card refund of the amount paid by the participant for the current registered class, and ANDREW shall determine in its sole discretion whether to grant approval. Such requests for refunds must be sent to icn_training@andrew.com		

Contact Us

Got questions on training programs or course pricing? We're here to help!

Indoor Cellular Networks Training – 8am-5pm CST (Mon-Fri)

- Email: icn_training@andrew.com

- Website: Indoor Cellular Networks Training

Got questions on product support? We've got you covered!

Indoor Cellular Networks Technical Support – 24/7

- Website: https://www.andrew.com/support

- Phone: 1-888-297-6433 Option #1

SIMPLE
EFFICIENT
SUSTAINABLE WIRELESS SOLUTION

SINCE 1937

We provide **simple**, **efficient**, **enduring** and **sustainable solutions** to mobile network operators and enterprises, advancing seamless connectivity everywhere, **outdoor** and **indoor**.

GLOBAL PRESENCE
R&D, MANUFACTURING and TESTING

+2,220 PATENTS

Millions of **INSTALLED COMPONENTS**

+85 years of **WIRELESS INNOVATION**

4,000 global **EMPLOYEES**

"We believe sustainable practices are good for the planet and our business"

Sales and **distribution** centers in **all continents**

- Buchdorf, *Germany*
- Agrate Brianza, *Italy*
- Faenza, *Italy*
- Suzhou, *China*
- Shanghai, *China*
- Bangalore, *India*
- Goa, *India*
- Lynchburg, *Virginia*

- Richardson, *Texas*
- Euless, *Texas*
- Sterling, *Virginia*
- Reynosa, *Mexico*
- Oulu, *Finland*
- Kircaldy, *UK*
- Malton, *UK*
- Pardubice, *Czech Republic*

- ★ R&D
- ▲ MFG
- ● MFG/R&D