FACTORY TRAINING

Scope:

The Southern Avionics factory training course offers lectures, 'hands-on" training and in depth discussions on all aspects of NDB ownership and operation. Class size is limited to a maximum of ten (10) students. The training course is held at our factory located at 5055 Belmont Street, in Beaumont, Texas U.S.A.
Classes are scheduled 9:00 a.m. to 5:00 p.m., Monday through Friday, with a one (1) hour lunch break.

Types of Certifications:

- System Operation – 2 -3 days
- Authorized Service Technician – 5 days

The following topics are covered:

- Overview of Southern Avionics' history, products, and quality processes
- Overview of NDB technology
- Basic operation of NDB equipment
- Site Acceptance tests
- Preventive maintenance procedures
- Southern Avionics technical support procedures
- Warranty policy and returns
- Installation considerations and `best practices'
- Low frequency transmission and antenna theory
- Detailed circuit theory
- Troubleshooting and fault resolution
- Factory Acceptance tests

Prerequisites:

- CV or resume for each attendee should be sent to the instructor via email prior to the course start date in order to get the full benefit of the training course. Students are required to have a good working knowledge of electronics, technician-level RF experience and related skills.
- All attendees must be able to speak and understand the English language. The training course is delivered in the English language.

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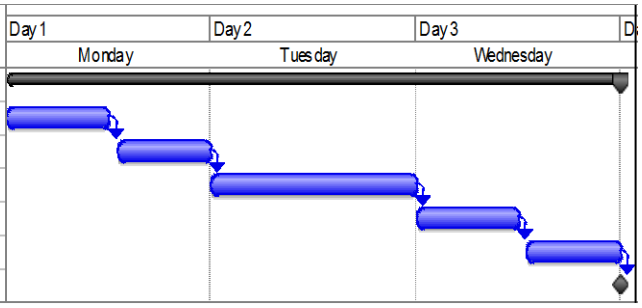
System Operation Factory Training Course
Basic Outline

Training Plan

ID	Task Name	Duration
1	**NDB Training Course**	**3 days**
2	NDB Familiarization, Manuals, ADF Use	0.5 days
3	LF/MF Antennas and NDB Theory	0.5 days
4	TX and ATU Operation	1 day
5	Setup, Calibration and Maintenance	0.5 days
6	Practical Exam for 10 Students	0.5 days
7	Course Complete	0 days



After completing this course, the student will be able to:

- Use the Installation and Technical manuals to locate assemblies and parts as well as understand manual layout and information available
- Understand differences in performance for various LF/MF Antennas
- Operate all front panel adjustments on the Transmitter and ATU
- Operate the Transmitter under normal AC/DC Voltages
- Set the operating frequency, modulation level, modulation tone and identifier (call sign), review log files, establish network settings and activate shutdown tests
- Understand the purpose of and use test equipment such as artificial loads and antennas
- Determine if a NDB system is operating at peak performance through the use of Built In Test Equipment readings such as PA Voltage, PA Current, Forward and Reflected Power, Tune, Antenna Current etc.
- Tune and Match the ATU at any frequency using various methods
- Mitigate Identified safety risks related to RF voltages and RF Field levels
- Include optional equipment into the NDB System solution
- Calibrate all front panel readings and verify their accuracy

<u>NDB Background and Familiarization</u>:

The first time slot is filled with a brief company tour and introduction to the NDB system components which will be the focus of the training course. The instructor begins to assess and become familiar with the background and abilities of each student while encouraging an open line of communication. This dialog builds confidence in the students as to the instructor's ability to lead the course.

A general overview is made, explaining various applications of the NDB; how a pilot utilizes

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the signal to navigate via ADF; practical considerations which were used in locating the installation site; as well as a general question and answer session.

In this time period the student gains a practical awareness of the equipment on which they will train, as well by as be given a preliminary review of the technical manuals.

The student is encouraged to look over the equipment manuals and become familiar with the style and function of the manuals after hours.

Antenna and NDB Theory:

Based on the results of the previous time slot, the instructor opens his discussion on general theory. During this time the instructor will further gauge the technical abilities of the student and adjust the curriculum as necessary.

As a rule, the least understood aspect of the NDB system is the antenna. We have learned over the years 90% of the unreliability or failure of an NDB system is a result of an antenna problem. Because of this we focus on LF/MF antenna theory, practical antenna designs and considerations, and share our knowledge base of worldwide antenna experience.

The period is interspersed with verbal tests and practical calculations as well as theoretical discussion of general communication antennas and principles in order to discern the differences in experience among the students.

Because of the overall importance and vital necessity of a stable and functional antenna, the majority of the first day and at times a portion of the next are spent on the antenna system.

The next time period is spent on the Antenna Tuning Unit (ATU) and those aspects of the ATU not covered or explained in the antenna discussion. This generally involves one half day.

Next is the discussion of the NDB transmitter beginning with a block diagram. As the class progresses, the functionality of each block is further subdivided to the depth which the students have questions or the instructor gauges relevance.

The student will be exposed signal adjustment, calibration, verification and testing. The content of this period includes, but is not limited to frequency generation, transmitter Morse code keyer, power supplies, modulators, transmitter control, etc.

As a rule, at least one course day is spent on the transmitter. This period is also interspersed with verbal "pop tests", practical calculations, considerations, safety issues, as well as theoretical discussion of general communication transmitters to meld the differences in experience. The student is now encouraged to study sections 2, 3 and 4 of the SA manual and/or 3, 4, 5, 9 and 10 of the SE Installation manual and section 2.1 of the SE Technical manual after hours depending on the system or systems being taught.

Transmitter and ATU Operation:

While in the classroom environment, and during the discussions of the antenna, ATU and

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transmitter, many of the theoretical and practical aspects of equipment operation have been touched upon and thoroughly discussed.

During this time period, generally on the third day, further considerations involving the operation such as the interconnection and interface of the various system components are covered. Typical equipment of the same or equal type is displayed for the student. The student must demonstrate the location, type, and expected results of each control and adjustment on the transmitter system.

After this session, the student is again encouraged to study sections 2, 3 and 4 of the SA manual and/or 6, 7 and 8 of the SE Installation Manual because the instructor expects the students to ask detailed questions in the next session.

Setup and Calibration:

The "hands on" portion of the course is continued during this fourth time slot. The equipment is powered up and a detailed inspection of meters, BITE information, performance benchmarks, test equipment usage, etc. is performed and recorded. Again, practical experience, techniques, problems and solutions are shared with the student.

It is generally at the end of this time period the student has achieved confidence in equipment operation as well as his own ability to verify its performance. The student will have adjusted the operating frequencies (RF, key rate, audio tone), demonstrated programming and reprogramming techniques of frequency, identification, establish operating levels, calculate and verify system impedance and antenna current.

The student will have completed and verified the calibration of all field and factory settings. After a series of practical on the spot tests and demonstrations of familiarity the next session commences.

Practical Exam:

After the completion of group setup and calibration, each student is individually asked to perform a series of system operations determined by the instructor. This practical exam is designed to challenge the student and test their system understanding while simulating the pressure experienced in the field. Each student will be given information on how to communicate with technical staff at SAC to request online or phone support. The practical examination accounts for 90% of the student's final grade while the other 10% is earned through the student's classroom participation during lecture and question and answer sessions.

Certification:

An overall satisfactory final combined grade of at least 70% is required for certification.

Upon satisfactory completion of the course, a System Operation Certificate is issued to each student by carrier and email after the instructor returns to the office.

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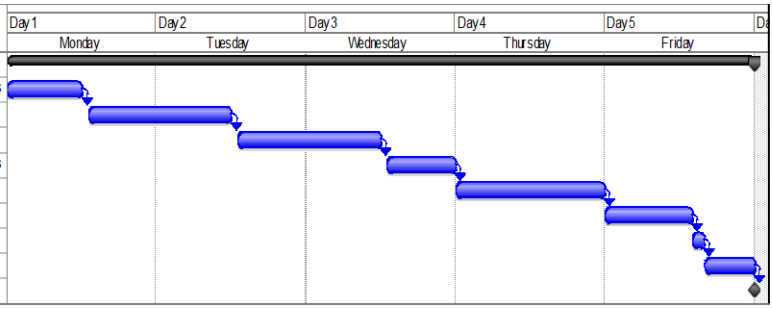
Authorized Service Technician Factory Training Course
Basic Outline

Training Plan

ID	Task Name	Duration
1	**NDB Training Course**	**5 days**
2	NDB Familiarization, Manuals, ADF Use	0.5 days
3	LF/MF Antennas and NDB Theory	1 day
4	TX and ATU Operation and Installation	1 day
5	Setup, Calibration and Maintenance	0.5 days
6	Troubleshooting Techniques	1 day
7	Practical Exam for 10 students	5 hrs
8	Written Exam (25 questions)	2 hrs
9	Test review	1 hr
10	Course Complete	0 days



After completing this course, the student will be able to:

- Use the Installation and Technical manuals to locate assemblies and parts as well as understand manual layout and information available
- Understand differences in performance for various LF/MF Antennas
- Operate all front panel adjustments on the Transmitter and ATU
- Operate the Transmitter under normal AC/DC Voltages
- Set the operating frequency, modulation level, modulation tone and identifier (call sign), review log files, establish network settings and activate shutdown tests
- Understand the purpose of and use test equipment such as artificial loads and antennas
- Determine if a NDB system is operating at peak performance through the use of Built In Test Equipment readings such as PA Voltage, PA Current, Forward and Reflected Power, Tune, Antenna Current etc.
- Tune and Match the ATU at any frequency using various methods
- Mitigate Identified safety risks related to RF voltages and RF Field levels
- Include optional equipment into the NDB System solution
- Calibrate all front panel readings and verify their accuracy
- Plan and install a complete NDB system including Transmitter, ATU, Antenna, Receiver, Remote Control Unit etc.
- Size breakers and wiring for the transmitter and ATU
- Use the troubleshooting method, signal flow and test equipment to analyze faults down to the Lowest Repairable Unit
- Act as SAC's Authorized Service Technician with full authorization to Install, Operate, Calibrate and repair equipment covered in this course

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NDB Background and Familiarization:

The first time slot is filled with a brief company tour and introduction to the NDB system components which will be the focus of the training course. The instructor begins to assess and become familiar with the background and abilities of each student while encouraging an open line of communication. This dialog builds confidence in the students as to the instructor's ability to lead the course.

A general overview is made, explaining various applications of the NDB; how a pilot utilizes the signal to navigate via ADF; practical considerations in locating the installation site; as well as a general question and answer session.

In this time period the student gains a practical awareness of the equipment on which they will train, as well as given a preliminary review of the technical manuals.

The student is encouraged to look over both Installation and Technical manuals and become familiar with the style and function of the manuals after hours.

Antenna and NDB Theory:

Based on the results of the previous time slot, the instructor opens his discussion on general theory. During this time the instructor will further gauge the technical abilities of the student and adjust the curriculum as necessary.

As a rule, the least understood aspect of the NDB system is the antenna. We have learned over the years 90% of the unreliability or failure of an NDB system is a result of an antenna problem. Because of this we focus on LF/MF antenna theory, practical antenna designs and considerations, and share our knowledge base of worldwide antenna experience.

The period is interspersed with verbal tests and practical calculations as well as theoretical discussion of general communication antennas and principles in order to discern the differences in experience among the students.

Because of the overall importance and vital necessity of a stable and functional antenna, the majority of the first day and at times a portion of the next are spent on the antenna system.

The next time period is spent on the Antenna Tuning Unit (ATU) and those aspects of the ATU not covered or explained in the antenna discussion. This generally involves one half day.

Next is the discussion of the NDB transmitter beginning with a block diagram. As the class progresses, the functionality of each block is further subdivided to the depth which the students have questions or the instructor gauges relevance.

At the least, the student will be exposed to and expected to understand signal creation, flow, adjustment, calibration, verification and testing. Some of this understanding requires component level theory and applications. The content of this period includes, but is not limited to frequency generation, transmitter Morse code keyer, power supplies, modulators, transmitter control, etc.

As a rule, at least one course day is spent on the transmitter. This period is also interspersed

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with verbal "pop tests", practical calculations, considerations, safety issues, as well as theoretical discussion of general communication transmitters to meld the differences in experience. The student is now encouraged to study sections 2, 3 and 4 of the SA manual and/or 1, 2, 3, 4, 5, 9 and 10 of the SE Installation manual and sections 1 and 2 of the SE Technical manual after hours depending on the system or systems being taught.

Installation and Operation:

While in the classroom environment, and during discussions of the antenna, ATU and transmitter, many of the theoretical and practical aspects of equipment operation and installation have been touched upon or thoroughly discussed.

During this time period, generally on the third day, further considerations involving the installation and operation such as the interconnection and interface of the various system components are covered. Typical equipment of the same or equal type is displayed for the student. The student must demonstrate the location, type, and expected results of each control and adjustment on the transmitter system.

It is also in this time the instructor becomes further aware of the particulars of the students specific installations. Expert help and recommendations are offered to ensure the NDB systems will be installed in such a manner which will allow the end user many years of reliable and trouble-free operation.

After this session, the student is again encouraged to study section 4 of the SA manual and/or 6, 7 and 8 of the SE Installation manual and sections 1 and 2 of the SE Technical manual because the instructor expects the students to ask detailed questions in the next session.

Setup and Calibration:

The "hands on" portion of the course is continued during this fourth time slot. The equipment is powered up and a detailed inspection of test points, waveforms, performance benchmarks, test equipment usage, etc. is performed and recorded. Again, practical experience, techniques, problems and solutions are shared with the student.

It is generally at the end of this time period the student has achieved confidence in the equipment as well as his own ability to operate and verify its performance. The student will have adjusted the operating frequencies (RF, key rate, audio tone), demonstrated programming and reprogramming techniques of frequency, identification, establish operating levels, calculate and verify system impedance and antenna current.

The student will have completed and verified the calibration of all field and factory settings. After a series of practical on the spot tests and demonstrations of familiarity the next session commences.

Troubleshooting:

First, the instructor reviews routine operational procedures. Next, performance benchmarks are again verified and recorded. After this, a variety of both field and factory classification problems, are introduced into the equipment. These problems range from actual component

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failure to simulated antenna problems.

At this point, under the watch of the instructor, the students are challenged against each other in the introduction of and solutions to various equipment failure modes. At the end of this session, the students generally have a heightened respect for the equipment and each other's ability to locate and remedy faults.

At the conclusion of this period, a general debrief occurs, with discussions, questions and answers on all subject matter from the start of the course.

Practical Exam:

After the completion of group troubleshooting, each student is individually presented with an instructor induced system fault. The student is given 30 minutes to troubleshoot, find the problem and recommend a solution. This practical exam is designed to challenge the student and test their system understanding while simulating the pressure experienced in the field. Each student will be given information on how to communicate with technical staff at SAC to request online or phone support. The practical examination accounts for 50% of the student's final grade.

Written Exam:

The students are then presented with a 25 question multiple-choice exam which accounts for 50% of the student's final grade. The test will cover all instructed material in both the classroom and lab environment. All questions incorrectly answered are reviewed until the question and answer is fully understood.

Certification:

An overall satisfactory final combined grade of at least 70% is required for certification.

Upon satisfactory completion of the course, an Authorized Service Technician Certificate is issued to each student by carrier and email after the instructor returns to the office.

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