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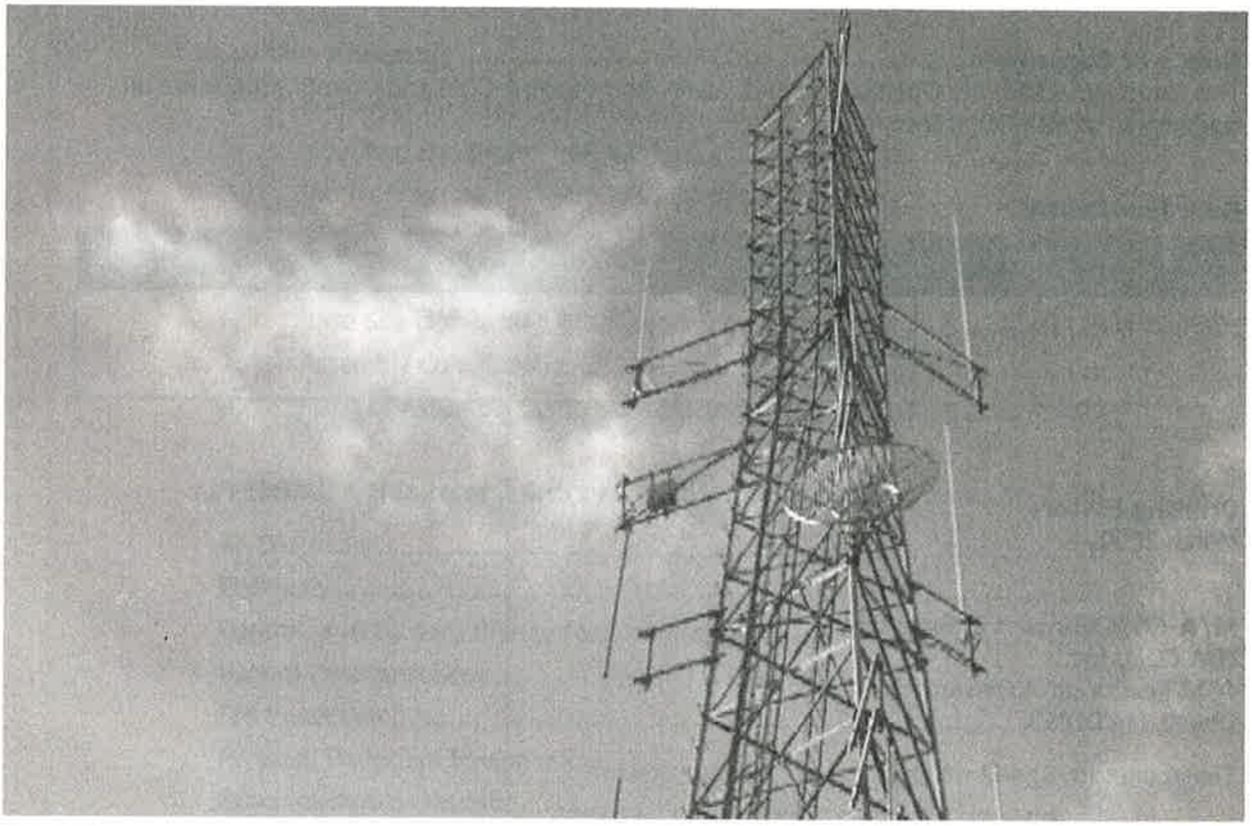
OpenSky™

OpenSky™ Base Site Equipment ASSEMBLY PROCEDURES



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General Information

This document describes the assembly of the OpenSky™ radio communications equipment to be installed at a base site as part of the Commonwealth of Pennsylvania OpenSky Network for public safety communications. Assembly takes place in the M/A-COM OpenSky Staging Area. The information in this document describes how various radio, telecommunications, network, and power components are to be assembled in electronic equipment racks and interconnected. In addition to equipment rack assembly procedures, there are also safety guidelines for protecting personnel and equipment and other information ancillary to the assembly process.

This Base Site Assembly procedures (BSAP) document is a general guide to assembly procedures that makes reference to more detailed information in other documents and resources needed to construct a base site. Supporting forms and documentation include the following:

- *Base site equipment rack drawing package*
- *Site details documentation showing site-specific information, including name, location, channels and frequencies, and any special instructions*
- *Site Assembly Checklist for process control, quality assurance, and audit trail*
- *Exception Resolution form for recording, disposition, tracking, and resolution of any problems, defects, or other exceptions occuring during assembly procedures*

The BSAP is one of four documents that together constitute the complete set for a specific base site. The other manuals in the set are the following:

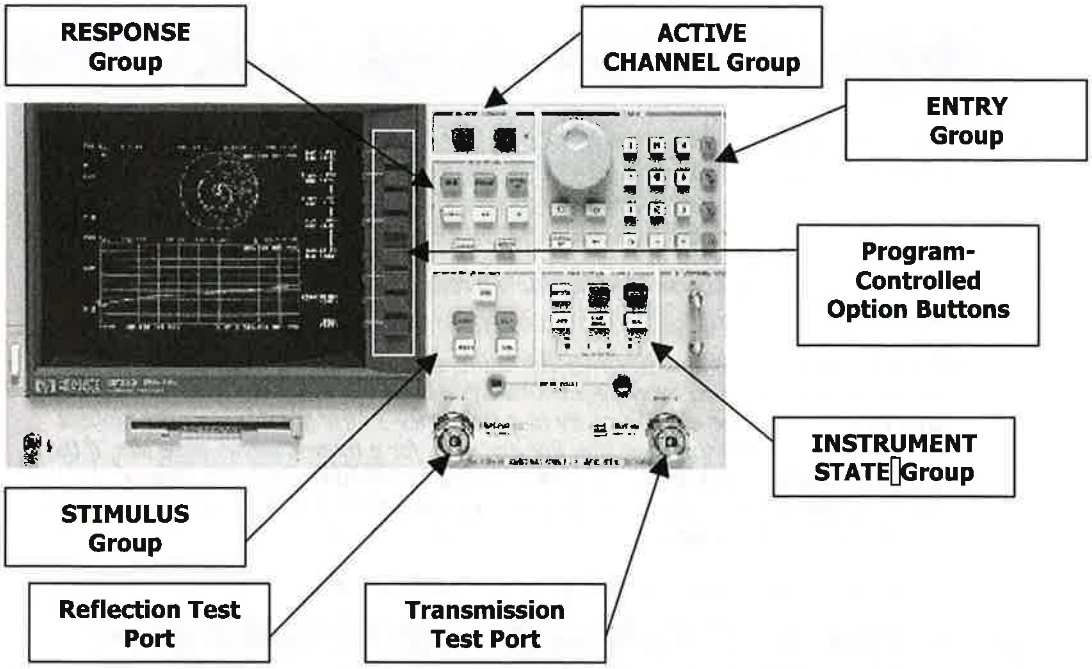
- ***Base Site Testing Procedure**—Describes the equipment testing to be performed after assembly, including manual production testing, factory acceptance testing, and field site testing*
- ***Base Site Installation Procedure**—Describes the packaging of the equipment, transportation to the field location, and installation of the base site equipment racks*
- ***Base Site Field Testing Procedure**—Describes the retesting of the equipment to verify that it remains within specification, and describes the procedure for measuring the equipment's communications coverage area*

Health and Safety

There are a number of potential hazards to be aware of in working around the OpenSky communications equipment. They may be associated with OpenSky electronic or radio frequency (RF) equipment, with the radio antennas used with these components, or with the environments in which components are housed. Keep in mind that, when working in the field, there may also be hazards associated with equipment, antennas, or environmental conditions that are part of applications other than the OpenSky radio project.

The hazards you may encounter include the following:

- RF emissions
- Electricity



4. RF Component Configuration

The result of mounting components in equipment racks and connecting them with cabling is a base site of a certain type (single- or dual-antenna, with a specific number of base station channels). This assembly is now ready for entry of site-specific operating parameters to prepare it for use at a specific base site.

Configuring RF parameters is a prerequisite to the Manual Production Test to verify correct operation of the assembled and cabled equipment racks. The primary configuration activity required is entry of transmission frequency information so that the Digital Controller/Transceiver (DCX) and the Airline Junction Transmitter Combiner (Combiner) units are configured to operate at the transmission frequencies to be used for testing. At this stage, entry of networking parameters, such as IP addresses, is not necessary.

Use the frequencies assigned to the base site for permanent use, if known. If the frequencies assigned for the OpenSky system are not known at this point, use the default frequencies to which the Combiner cavities have been pretuned at the factory, or some other appropriate set of frequencies chosen for testing.

This section describes the following configuration procedures:

- Tuning Combiner cavities to target frequencies
- Entering target frequencies in the DCX Base Station Controller

Figure 4—Agilent Technologies 8752C Network Analyzer Front Panel

4.1.21. Set a marker on the network analyzer for the target transmission frequency by pressing the **MKR** button in the **Response** group, then pressing the option button labeled **MARKER 1**. Using the numeric keypad in the **Entry** group, enter the target transmission frequency, including unit of measure, for the cavity to be tuned.

4.1.22. Set the network analyzer to scale graphic output automatically by pressing the **SCALE REF** button in the **Response** group, then pressing the option button labeled **AUTO SCALE**.

4.1.23. Note the graphic output appearing on the analyzer's display. Tune to the target transmission frequency by adjusting the tuning plungers. Adjust to a minimum return loss and a maximum insertion loss, using the following guidelines:

- Return loss: approximately –20 dBm
- Insertion loss: approximately –3 dBm

4.1.24. Tighten the setscrew on the coarse-tuning plunger, leaving the lock ring on the fine-tuning plunger loose.

4.1.25. Repeat steps **4.1.19.** through **4.1.24.** for each of the cavities remaining to be tuned.

Fine-tuning to optimize return loss

*After completing the initial tuning of Combiner cavities, fine-tune each cavity to optimize the return loss. Adjust the return loss to the lowest level (or highest measured value) possible without significantly changing the insertion loss level, using the following procedure (similar to the procedure described above in **4.1.19.** through **4.1.24.**).*

NOTE

In applying the fine-tuning procedure to each cavity in turn, once again begin with the cavity for the lowest assigned frequency, tuning each cavity in sequence and ending with the cavity for the highest frequency.

4.1.26. Reconnect one end of an RF test cable to the analyzer's **Reflection Test Port** and the other end to the input port of the Combiner cavity to be fine-tuned.

4.1.27. Set a marker on the network analyzer for the target transmission frequency by pressing the **MKR** button in the **Response** group, then pressing the option button labeled **MARKER 1**. Using the numeric keypad in the **Entry** group, enter the target transmission frequency, including unit of measure, for the cavity.

APPENDIX A
Health and Safety

This appendix contains more detailed information about the potential hazards associated with base site technologies, equipment, and environments than that included in the body of this document.

Anyone visiting or working at a site containing M/A-COM equipment or property ***must*** *follow all applicable procedures and guidelines established by M/A-COM. The following sections contain general guidelines that should help in understanding safe practices, but keep in mind that they do not replace M/A-COM's specific requirements.*

While there has been a conscientious effort to present accurate information in this appendix, please refer to M/A-COM's EHS Department and to the library of official procedures and guidelines for complete and authoritative information. This appendix attempts to present an overview, containing the information most likely to be useful and important to assemblers and other workers involved in base site assembly, implementation, and maintenance.

RF Emissions

RF emissions are a type of nonionizing radiation, whose biological effects are of the following kinds:

- Heating of internal body tissues
- External burns
- Electrical shock from induced current
- Other effects (nonthermal, nonelectrical)

Internal Heating: Of these, the principal hazard in this portion of the electromagnetic frequency spectrum is rapid heating of internal tissues, especially in those areas of the body where there is insufficient blood flow to disperse heat quickly. The effect is the same as that which makes microwave cooking possible. This kind of heating in the human body can occur unnoticed, since there are few nerve endings in interior body parts that are capable of sending warning signals (heat or pain) to the brain.

External Burns: RF emissions can also cause skin burns from induced energy. The danger of external burns exists only if there is direct contact with parts of the antenna or with objects such as guy wires that may become energized by proximity to RF transmissions.

Electrical Shock: Similarly, electrical shock can occur from stored energy induced by RF emissions. This danger, like that of external burns, exists only with direct contact to parts of the antenna or objects close to the antenna.

Other Effects: Although there is research in the area of biological effects of nonionizing radiation other than thermal or electrical effects, there is no general agreement among scientists or regulatory and standards agencies on the existence,