

A helping hand

The GVF Certified VSAT Installer Program: teaching the fundamentals with interactive, animated online training.

From the beginning, the VSAT industry recognized that VSAT installers would require training to transform a pile of cables, electronics, and antenna parts into a revenue-making VSAT terminal.

Up to now, most VSAT installer training programs have focused on how to bolt up the components and mount parts to a roof or wall, providing instructions about how to make certain indicators illuminate and/or achieve minimum levels on meters or displays.

But unintended consequences of basic 'bolt it up' training have become liabilities and cost burdens for the VSAT industry. Without a good understanding of the fundamentals of the satellite link, it is easy for installers to accidentally cause interference and difficult for them to troubleshoot problems.

Swap-outs are expensive

Without solid training in the engineering fundamentals, technicians must resort to swapping hardware to troubleshoot problems. Often the item removed is not actually defective, but it is returned anyway and joins an ever-growing pool of equipment of unknown quality circulating around warehouses, repair depots, and distribution centres.

With today's high-volume VSAT production hardware, simply evaluating and re-testing questionable equipment often costs more than manufacturing it in the first place.

Cross-pol and adjacent satellite interference impact entire networks

Further, even replacing all the parts may not solve the problem. The dish might not be aligned accurately, cross-pol may not be set correctly, or cables may have reflections due to improper connector attachment. These errors don't just affect the service quality of the particular installation — they can cause the entire VSAT network to be disrupted or can even create debilitating interference on other satellites.

Return visits sabotage customer relations

Often a simple 'shotgun' approach to troubleshooting is not successful and a return visit with additional hardware or a technician with higher-level skills must be scheduled. Not only are such repeat truck rolls extremely expensive to the service provider, they do great damage to the customer relationship. Broadband satellite services must compete with terrestrial services such as DSL and leased lines, which are generally simpler to install; the VSAT industry cannot afford a reputation of imperfect installations and frequent return visits.

The GVF responds to the industry's needs

Interference, lost hardware, site re-visits, disgruntled customers, and good hardware returned for repair could all be reduced by more thorough installer training. When technicians have a solid understanding of the fundamental concepts behind the VSAT terminal's operation, they are much better equipped to perform tasks such as peaking the antenna accurately, setting cross-pol with precision, and interacting efficiently with a satellite operator's Network Operations Centre staff to resolve problems.

The GVF responds to the industry's needs

The Global VSAT Forum is a not-for-profit association representing the VSAT industry around the world. Its 180+ members include the major satellite operators, VSAT service providers, equipment manufacturers, and other satellite industry organizations. Its activities include promotion of VSAT solutions, regulatory efforts, conference and seminar events, business development support, and education.

In 2002, responding to membership requests to address the increasing problem of interference due to improper VSAT installations, the GVF initiated a Certified VSAT In-



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staller program, comprised of a three-course sequence of classroom sessions. Classes are given periodically in the US, South America, Africa, and other venues. The Certified Installer database now lists over 200 installers worldwide. To increase the reach and effectiveness of this program, the GVF has now teamed with SatProf, Inc. to make the fundamentals portion of the training available online. SatProf, which was founded by satellite systems engineering professionals who together have over 50 years of industry and in-house training experience, has now developed techniques for highly interactive, real-time simulator-based instruction based on Web delivery to the Macromedia Flash reader in standard browsers.

The new online program takes a step beyond conventional classroom training modes with their rigid class times and places (with the attendant travel and lost labour costs). Moreover, SatProf engineers discarded the notion that distance learning material should be 'pushed' to the student in aural/visual format without interaction, as is the case with books, tapes, and videos. Instead, SatProf adapted the use of the Internet as the platform for interactive, animated training courses. SatProf courses can be accessed 24 hours per day each day of the year from any location with Internet access. The SatProf courses focus on presenting a fundamental understanding of the technical topics with heavy doses of animation and virtual reality engines to support interactive 'play' with the instruction tools. The GVF on-line training consists of two course levels. Level 1, entitled 'Introduction to VSAT Technology', presents an overview of satellite communications principles, and is followed by Level 2, 'VSAT Installation Fundamentals'.

Introduction to VSAT Technology – Level 1

In the Level 1 course, the student receives

an overview of satellite communications, with emphasis on VSAT applications, for technicians, engineers, managers, and IT professionals. It presents an overview of the technology and history of satellite communications, focusing on Very Small Aperture Terminal (VSAT) networks and how they compete with terrestrial alternatives. The fundamentals of spacecraft operation, orbits, and coverage are explained, followed by an overview of ground equipment hardware and alternative methods for sharing space segment cost. The course concludes with a discussion of the main technical, economic, and regulatory factors of VSAT networks. The student is exposed to topics and terminology such as:

- Spacecraft Signal Path Building Blocks and Flight Control Systems;
- Satellite Bandwidth and Capacity;
- Spacecraft Orbits;
- RF Spectrum Assignments allocated for Commercial Satcom;
- Channel Latency;
- Regional Coverage Footprints;
- Analog/Digital TV, IP, Voice, Media Satellite Services;
- Advantages of SATCOM;
- Disadvantages of SATCOM;
- Earth Station Varieties;
- Satellite Transmission Access Techniques; and
- Digital Video Broadcasting (DVB).

The online course medium consists of animated & interactive HTML/Flash movies presented in a self-paced screen prompt style. During the course, the student is encouraged to explore diagrams using mouse rollovers, turn knobs, adjust antennas, and tune test equipment, courtesy of the on-line simulator functions.

For example, in screen shown in Figure 1, the student is prompted to turn the 'Frequency' and 'Amplitude' knobs on a virtual RF signal generator. As the knobs are turned, the student is given a graphical representation of amplitude variation and how frequency variations affect the signal's wavelength.

Review quizzes are given after each of the ten lessons and a final test is given at the end of the course. The prerequisites for the course are simply an interest in satellite communications. Level 1 consists of approximately 100 learning pages, requiring 5-10 hours study.

VSAT Installation Fundamentals - Level 2

The Level 2 course presents the fundamental knowledge and skills that all VSAT installers need for high-quality, interference-free installations. Like Level 1, this course consists of animation and interactive HTML/Flash movies presented in a self-

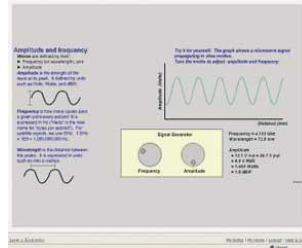


Figure 1 – Signal Generator Graphical User Interface (GUI)

paced online format. The animation and simulator-based interactivity are used even more extensively to bring critical technical concepts to life. The Level 2 student learns fundamentals of signals, noise, modulation, antennas, propagation, and link budgets. The key techniques necessary for a high quality installation are treated in detail, starting with the site survey, continuing with equipment installation and accurate antenna pointing, carrier lineup and cross-pol checks, indoor electronics installa-

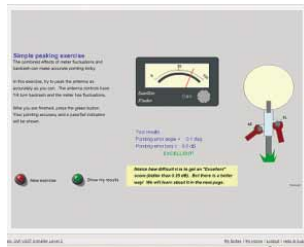


Figure 2 - the 'virtual antenna' pointing lesson

tion, and IP network configuration concepts. The course concludes with a review of the installation process, troubleshooting tips, and maintenance guidelines. The student learns topics and terminology such as:

- Decibels (dB);
- Carrier to Noise Ratio and Digital Eb/No Ratio;
- Digital Signal Primer for BPSK, QPSK, 8PSK, 16QAM;
- Antenna Primer;
- Polarization and Frequency Reuse;
- VSAT Hardware Variations;
- Forward Error Correction (FEC) Coding and Channel Bit Error Rate (BER);
- Rain Fading and Link Budgets;
- Site Survey Basics, Use of Compass;
- Virtual Antenna Pointing Exercises;

- IP Networking; and
- Trouble Shooting.

As an example, Figure 2 shows a screen shot of the 'virtual antenna' pointing lesson. The student is able to twist virtual wrenches and observe a typical signal strength meter in an exercise to 'peak' the antenna on the satellite.

(In this example, a previous student exercise had shown with simulation the proper procedure for finding the correct satellite to peak on).

The mathematical 'engine' running behind the scene for this simulation introduces the real world phenomena that complicates the actual pointing process for an installer including antenna mount wind-up, backlash, atmospheric scintillation, thermal noise, actual antenna far field radiation patterns, envelope detector response, instrument gain adjustment, etc. The student can practice pointing the antenna over and over again, and can request the final pointing accuracy score – a critical teaching step that cannot be done at all with physical equipment.

As with Level 1, review quizzes are given during each lesson and a final test is given at the end of the course. The student should expect to allocate 15 to 30 hours to navigate the approximately 180 pages, depending upon the pace the student finds comfortable.

In conclusion

The Level 1 and Level 2 courses provide the installer and the industry with a learning vehicle that provides a solid foundation for understanding the engineering basics governing VSAT system operations.

When VSAT installers are armed with a better understanding of the systems they are installing, the VSAT industry can expect to enjoy the economic benefits associated with lower levels of 'good hardware' circulating around for repair depots, fewer inefficient (or interference causing) terminals installed, and a happier VSAT customer base.

Students may self-register and start the courses immediately by following the links for Training at www.gvf.org. For more information about on-line training for satellite professionals, including additional sample pages from the GVF on-line classes and options for customer training module development, an overview presentation in the learning course format is available at:

www.satprof.com.