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MOTOROLA

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MOTOROLA INTRODUCES ASTRO DIGITAL TECHNOLOGY

TULSA, OK, -- August 13, 1991 -- Motorola, in a major development for land mobile radio systems, today announced ASTRO, a digital platform that will serve as a basis for future generations of its public safety and private market two-way land mobile radio systems.

The introduction, was made here at the annual meeting of the Associated Public Safety Communications Officers (APCO), a group whose membership includes local police and fire departments; county, state and federal agencies; and other public service organizations.

With this announcement, Motorola takes a quantum leap in addressing the demands placed on two-way radio systems through the 1990's and beyond. ASTRO will provide:

- Improved audio quality over existing analog and digital systems throughout more of the coverage area.

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Press Information

- Spectral efficiency with the incorporation of narrowband channels.
- Advanced signalling and control.
- Integrated voice and data.
- Enhanced encryption.
- Compatibility with Motorola's existing analog conventional, Securenet digital, and SMARTNET trunked radio systems.
- Ease of migration from current analog systems.

Motorola has targeted several markets for its ASTRO products, placing a heavy focus on public safety applications where needs for special signalling, improved voice quality and secure communications are critical. Other targeted markets will include national governments, international public safety, and other large private systems users, such as utilities, and transportation users.

ASTRO's system parameters include: 12.5 KHz channels, QPSK-C (Quadrature Phase Shift Keying-Compatible) family modulation, FDMA (Frequency Division Multiple Access), VSELP (Vector Sum Excited Linear Predictive Coding) voice vocoder, RF (Radio Frequency) band independence and a digital bit rate of 9.6 Kbps.

Audio Quality

With current two-way analog radio systems, voice or audio quality can vary as the radio moves throughout the coverage area. The further a user

travels away from the transmitter in the coverage area, the more the effects of radio signal interference and fading will degrade the audio quality of communications. ASTRO's digital audio will be consistently good throughout much more of the coverage area because it is able to correct for errors that occur as a result of variations in the RF signal. As a result, the chance for missed or garbled communications is significantly reduced.

ASTRO's new digital technology will foster a dramatic improvement in the quality of secure voice communications. Previously, opting for encrypted communications meant accepting diminished audio quality. However, ASTRO will provide enhanced audio quality for both clear and encrypted communications. As a result, users will no longer have to accept a compromise in audio quality to gain the benefits of encryption.

Spectral Efficiency

In most major metropolitan areas of the U.S., increased channel congestion is a concern of radio system users. Even high priority public safety and federal users are sometimes unable to acquire needed channels. A solution to this problem is available with ASTRO's digital technology which utilizes 12.5 KHz channels, thereby improving spectral efficiency. Only half as much bandwidth per channel is required compared to analog systems which operate with 25 KHz channels.

The net benefit of this is less congested channels, or more users per

system because potentially twice as many channels can be made available to an ASTRO system than there would be with an analog system. This 2:1 benefit is contingent upon regulatory guidelines and adjacent or co-channel assignments in a given area. In light of these and other considerations, Motorola is an active participant in the APCO/NASTD (Associated Public Safety Communications Officers/National Association of State Telecommunications Directors) Project 25 and Federal Standard-1024 initiative to help develop narrowband digital standards.

Worldwide, 12.5 KHz channels have already been allocated in many areas utilizing CEPT/ETSI (European Committee of Post and Telegraphs/European Telecommunications Standards Institute) guidelines.

Signalling

A digital process called "embedded signalling" is used by ASTRO systems to intermix system signalling information with digital voice. This special signalling is sent continuously, resulting in improved system access and reliability. And this signalling feature is available without truncating a user's voice message. With analog systems, the transmission of a "preamble" or signalling information can result in truncation of the voice transmission and the preamble itself can sometimes be lost.

Since ASTRO will have increased signalling capacity, it will be capable of supporting more advanced features, as compared to analog.

Some of the new or enhanced features that ASTRO's digital embedded signalling will support in conventional and trunking systems are:

- Continuous unit ID display.
- Improved clear and encrypted priority scan.
- Combined Alpha messaging and voice.
- Data waiting and re-direct.
- Automatic portable transmitter power control.

Integrated Voice and Data

Both trunked and conventional users of ASTRO systems will be able to use their field units in the data mode to transmit up to 7.2 kB/s of information with an additional 2.4 kB/s error correction to insure data integrity. The new digital system protocol will deliver enhanced data flexibility on conventional systems. ASTRO voice radios and ASTRO data terminals will be able to access the same channel without interfering with each other. ASTRO field units will be able to interface with certain fax machines and laptop computers through an RS-232 data port.

Encryption

Motorola's digital Securenet and Advanced Securenet systems presently provide users with effective voice encryption capabilities. With

ASTRO's new digital technology several enhanced features will be available. Each ASTRO unit, for example, will be capable of carrying two different encryption algorithms. This feature gives secure communications users interoperability with another organization that uses a different type of encryption.

Each ASTRO radio will be capable of up to 16 encryption keys. This increased multi-key capacity supports easier group partitioning for more secure talkgroups.

Multiple algorithm and key capability are included in the ASTRO system design to support multiple agency operations such as those occurring in our nation's "War on Drugs" efforts.

ASTRO will offer faster over-the-air rekeying (OTAR) with its higher speed digital technology. If an ASTRO radio is lost or stolen, it can be remotely disabled and remaining radios can quickly be rekeyed. Secure communications can resume immediately.

ASTRO will also offer a new software based encryption to provide a moderate level of security without utilizing the custom integrated circuits associated with more sophisticated government style encryptions. This cost-effective alternative is well suited for a wide range of security needs including protection against casual scanners.

Compatibility

Backward compatibility is probably one of ASTRO's most important features since it will allow a user to gradually replace equipment while maintaining complete compatibility with existing systems.

ASTRO systems can function in analog or digital modes and perform with either encrypted or clear speech. ASTRO technology will make it possible for these radios to operate on new narrowband as well as on existing wideband channels, and in conventional or trunked systems.

Motorola, aware that most of its targeted users have long design and budget cycles, opted to announce the new technology at this time to enable prospective customers to start their planning processes for a move towards implementation of digital technology as it becomes available. Careful consideration went into the implementation of migration features, as the company, sensitive to the fact that its customer base has an extremely large capital investment in two-way land mobile radio equipment, did not want to take any action that would make existing equipment unusable with the announcement of the ASTRO digital platform.

Migration

Graceful migration to the next generation of digital radios and backward compatibility with Motorola's existing analog and digital radio

systems is a key feature of the new ASTRO technology. And users need only migrate as much of their systems as they require.

There are a number of ways to implement migration with an ASTRO system including radio-by-radio migration, channel-by-channel migration and region-by-region migration.

A gradual replacement of existing analog radios with ASTRO radios can provide a foundation for a later move to an all digital system. Since ASTRO radios will be able to operate as analog or Securenet units, current system services can be maintained while the groundwork is laid for a future shift to digital.

In multi-channel systems, it will be feasible to change over just one channel at a time. Existing analog units can operate on current 25 KHz channels, while ASTRO units will be able to operate on both existing analog channels and the new 12.5 KHz digital channels.

When a system includes multiple cities or geographic regions, one region at a time can be converted to digital and new units can roam throughout the entire system.

Motorola, Inc., headquartered in Schaumburg, Illinois, is one of the world's leading manufacturers of electronic equipment, systems and components for worldwide markets. Motorola products include two-way radios, mobile and portable data terminals and communications systems,

cellular telephones and systems, cellular telephones and systems, pagers, integrated circuits and discrete semiconductors, defense and aerospace electronics, automotive and industrial electronic equipment, and information processing and handling equipment.

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