A PRIMER ON

RADIO COMMUNICATIONS

Part III: System Configurations

With the intent to cut through the "technical mystique" that seems to surround the field of radio communications, ***jems*** began a series of articles by communications expert Harlan Felt. This month the various types of radio system configurations are described. In future months radio field units and hospital console/display units will be covered. Felt is director of EMS at Foster G. McGaw Hospital of Loyola University in Maywood, Illinois and has been active in EMS since 1973. He has lectured and consulted extensively around the nation on communication systems and components.

In the last issue we discussed some of the characteristics and considerations of the three different radio frequency bands that are available for Emergency Medical Services. This time we will show a few of the typical radio system configurations utilized for EMS.

Radio equipment or hardware utilized in the different radio bands are typically as follows: Base stations — having the hardware as shown in the illustration. Mobiles — comprised of the receiver/transmitter box that usually mounts in the rear of a vehicle and the control head, speaker, and microphone that mounts in the front of the vehicle. Portable—an all-in-one package, similar to the mobile but of a much lower transmitter power, either hand-held or about the size of a briefcase.

by Harlan Felt

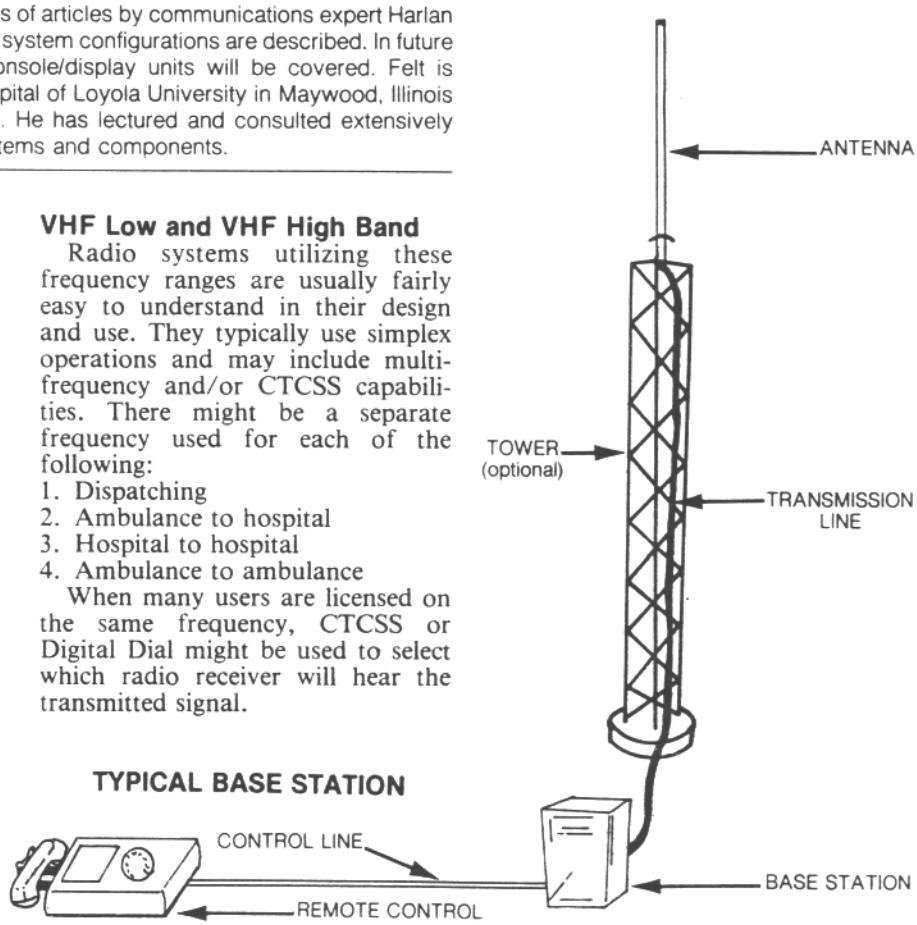
VHF Low and VHF High Band

Radio systems utilizing these frequency ranges are usually fairly easy to understand in their design and use. They typically use simplex operations and may include multi-frequency and/or CTCSS capabilities. There might be a separate frequency used for each of the following:

1. Dispatching
2. Ambulance to hospital
3. Hospital to hospital
4. Ambulance to ambulance

When many users are licensed on the same frequency, CTCSS or Digital Dial might be used to select which radio receiver will hear the transmitted signal.

TYPICAL BASE STATION



use of telemetry (the transmission of data vs. voice) is not allowed on these frequency bands.

UHF Band

The UHF band allows for more sophisticated radio systems to be developed. Due to their complexity as well as the number of combinations possible, only a few of the basic configurations will be described.

Duplex is the most commonly used mode of operation.

The UHF frequencies available may be utilized as shown in Table 1. The 458 frequencies are for portable to vehicular repeater use. The 462/467 channels are for dispatch and coordination. MED 1 thru MED 8 are used for a mix of medical direction and telemetry.

The accompanying diagrams are examples of systems using standard design concepts. There are specific requirements and limitations that may apply before using equipment in a similar configuration.

In these diagrams the "D" in the small box indicates a device called a duplexer which allows the equipment to transmit and receive at the same time. DT&T stands for doctor talk (medical direction) and telemetry. The top section depicts the basic communications paths while the lower section shows the frequency utilization.

In the past few years a new design approach has been discussed in the literature and at conferences. This is the RTSS—Radio Telephone Switched System. This type of system uses two-way radio for one portion of the communications link and uses the Public Telephone Switch Network (PTSN) for the remainder of the communications path. This system is similar in operation to a mobile telephone and allows an almost unlimited number of communication points accessible by the field units. The following diagram shows the basic system components.

Summary

Hopefully by now you have a better understanding of the basics of radio communications as it applies to EMS. As can be seen, the radio systems can be very versatile tools to assist you with your day-to-day duties while at the same time they can become very confusing. It is recommended that you ask for an educational session on the radio system/s utilized in your area so that you can use them to their fullest capabilities.

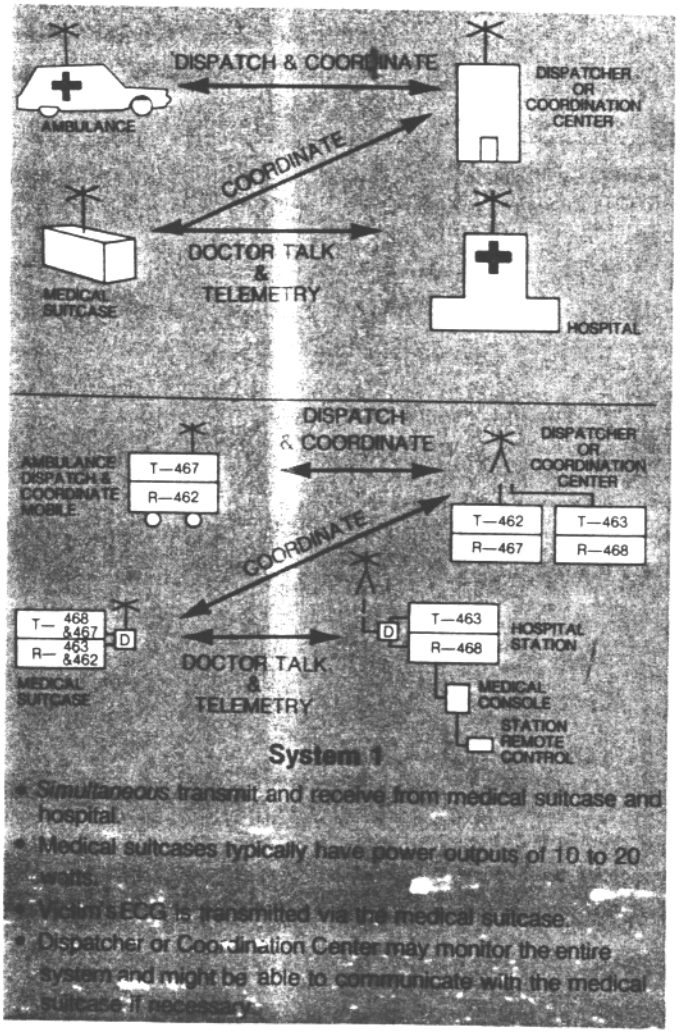
Diagrams illustrating the material described in this installment continue on pages 46, 47 and 48.

Part IV of this series will discuss the various types of EMS field units available showing features, specifications, etc.

Some of the illustrations and diagrams in this series are by courtesy of the North Carolina Office of EMS, General Electric Co., and Motorola Inc.

Table 1: UHF Frequencies

Frequency (MHz)		
458.025	Portable to vehicular repeater	
458.075	Portable to vehicular repeater	
458.125	Portable to vehicular repeater	
458.175	Portable to vehicular repeater	
Frequency base/mobile	Frequency mobile	Channel name
462.950	467.950	Up to local usage
462.975	467.975	Up to local usage
463.000	468.000	MED 1 per the FCC
463.025	468.025	MED 2 per the FCC
463.050	468.050	MED 3 per the FCC
463.075	468.075	MED 4 per the FCC
463.100	468.100	MED 5 per the FCC
463.125	468.125	MED 6 per the FCC
463.150	468.150	MED 7 per the FCC
463.175	468.175	MED 8 per the FCC



System 1

- Simultaneous transmit and receive from medical suitcase and hospital.
- Medical suitcases typically have power outputs of 10 to 20 watts.
- Victim's ECG is transmitted via the medical suitcase.
- Dispatcher or Coordination Center may monitor the entire system and might be able to communicate with the medical suitcase if necessary.