SECTION TWO

ESTABLISHMENT, MAINTENANCE AND OPERATION OF COMMUNICATION SYSTEMS AND EQUIPMENT

THIS SECTION PROVIDES SUFFICIENT INFORMATION FOR EMERGENCY SERVICE COMMUNICATIONS PERSONNEL TO ESTABLISH, MAINTAIN AND OPERATE COMMUNICATION SYSTEMS AND EQUIPMENT.

A FULL UNDERSTANDING OF THE INFORMATION CONTAINED IN SECTION ONE IS NECESSARY BEFORE READING THIS SECTION.

CHAPTER ONE

PUBLIC SWITCHED TELEPHONE NETWORK

INTRODUCTION

1.01 The Public Switched Telephone Network (PSTN) is designed for average day to day traffic loads and functions efficiently in these circumstances. However, at peak load times such as during an emergency or disaster, the network is prone to congestion Although the usual day to day Telecom facilities and systems are known to most Emergency Service personnel a number of specialised services are available. A description of some of these services and their capabilities are detailed below.

EMERGENCY SERVICES LIAISON OFFICER (ESLO)

1.02 TRAINED PERSONNEL

Telecom Australia provide specially trained personnel at State and Regional centres to liaise with emergency services. Due to their extensive knowledge of Telecom systems and procedures it is essential that these Officers are included in all levels of disaster management and planning. Contact with the ESLO can be made via the area Telecom Office.

1.03 SPECIALISED FACILITIES

The ESLO can provide specialised communications facilities that may be required in times of emergency. Some of these facilities may include portable telephone exchanges, satellite communication services, and disaster plan telephone lines.

EXCHANGES

1.04 GENERAL

An exchange is an extensive line switching system that permits the interconnection of a Telecom subscribers telephone to other subscribers, whether they be located within Australia or overseas. Exchanges are usually located within a community and connected to other exchanges by various means including lines, microwave bearers, optical fibres, or through Earth Stations to satellites.

1.05 PRIVATE AUTOMATIC BRANCH EXCHANGE (PABX)

The function of the Private Automatic Branch Exchange (PABX) is to switch multiple external and internal telephone connections to specific locations. The switching process may be achieved manually (operator connected) or automatically A PABX is usually installed within the subscriber's building.

1.06 ADDITIONAL PABX FEATURES

Modern PABX equipment offers the user a range of additional features such as call diversion, indialling and group pick-up. These and other features are able to be controlled by computer software and alterations can be made remotely.

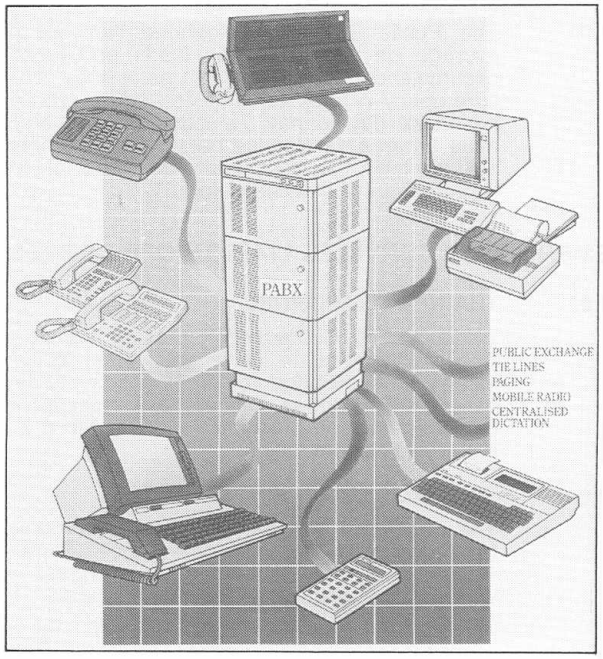

Figure 1:1
PABX

TELEPHONES

1.07 GENERAL

Telephones utilise Tone or Pulse systems characterised by the dialling speed, tone dialling being the faster of the two. A telephone that uses tone dialling is not necessarily directly interchangeable at the wall socket with a pulse telephone and vice versa. Care should be taken before interchanging telephones that they are set to the correct dialling system. However, in some installations specific wall socket configurations inhibit connection of incorrect telephone appliances.

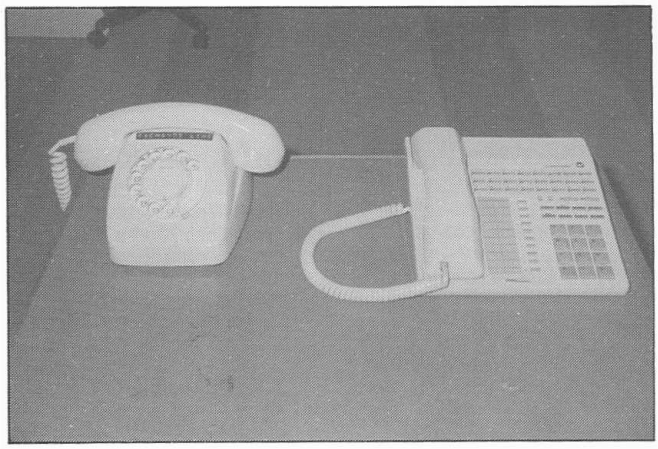

Figure 1:2
Telephones Rotary/Tone

1.08 **FIRE RESPONSE SYSTEM (FRS)**

A Fire Response System (FRS) allows individual subscriber's telephones to be linked to a common call group so that calls for assistance from the public, will cause all telephones to ring simultaneously as well as activating external audible alarms if required.

FAXSTREAM

1.09 Faxstream is a digital network provided by Telecom to enhance the operational capability of standard facsimile (fax) machines. The digital system improves the speed of transmission, enhances the clarity of the printed copy, and allows a simultaneous broadcast facility to other facsimile users. The normal Fax machine is only able to communicate with one other fax machine at any one time. Faxstream works by having the subscribers fax communicate with the Faxstream computer. The computer has access to multiple lines and thus can send a message to many locations simultaneously. Machines on the Faxstream network can communicate with non Faxstream machines.

CHAPTER TWO

OTHER SYSTEMS AND SERVICES

OVERSEAS TELECOMMUNICATIONS COMMISSION (OTC)

2.01 One of the services provided by OTC is the Maritime Radio Service. This is a system of HF and VHF coastal radio stations operated by OTC which continually monitors specific maritime frequencies. The Service also provides manual or automatic (direct dialling) connection to the Telecom network. Some coastal stations may be accessed by land mobile or portable stations.

ROYAL FLYING DOCTOR SERVICE (RFDS)

2.02 Royal Flying Doctor Service (RFDS) radio networks are primarily designed to provide access to medical help in remote areas. Other services include education, telegram, telephone, and general radio communications. The radio service operates in the HF spectrum and emergency response is available 24 hours per day.

WIRELESS INSTITUTE CIVIL EMERGENCY NETWORK (WICEN)

2.03 The Wireless Institute Civil Emergency Network (WICEN) is a division of the Wireless Institute of Australia, the governing body for amateur radio operators. WICEN was formed to provide specialised radio communications for the community in times of disaster. Due to the extensive range of frequencies, equipment, and expertise available to them they may be usefully included in emergency or disaster plans.

CITIZENS BAND RADIO SERVICE (CBRS)

2.04 GENERAL

Citizens Band Radio (CB) is an inexpensive form of radio communication available for personal communications on payment of the appropriate licence fee.

2.05 LIMITATIONS

There are two frequency bands available for this service, HF and UHF. All CB radio systems are open to disruption by poor operator discipline and should not be relied upon entirely for emergency operations. Both frequency bands have 40 channels available for use which include designated Emergency calling channels.

CHAPTER THREE

RADIO TRANSMISSION FUNDAMENTALS

INTRODUCTION

3.01 While a detailed understanding of the theory of how radio works isn't essential for users, a grasp of the fundamental principles involved will greatly enhance effective communications.

RADIO WAVES

3.02 DESCRIPTION

The action of a radio wave cannot be seen but can be likened to the action of the ripples caused by a stone being dropped into a pond. The resulting inner wave is high in intensity and then diminishes with distance. The wave action will continue if stones are dropped at regular intervals into the pond. Radio waves behave in a similar way except they usually travel through space rather than water. Radio waves travel at the speed of light in free space (300,000,000 metres per second).

3.03 WAVE MOTION

Wave motion can be shown diagrammatically as in Figures 3:1 and 3:2.

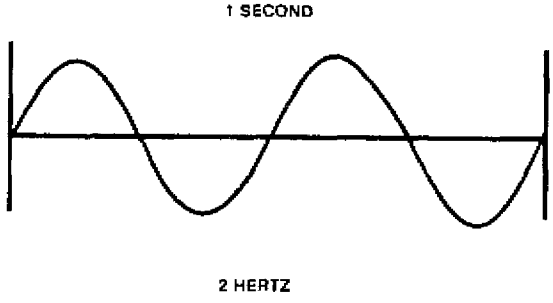

Figure 3:1

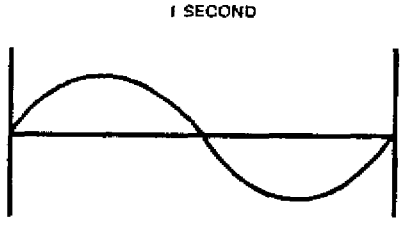

Figure 3:2

3.04 WAVE LENGTH

The length of one single wave (or one complete cycle) is also the distance travelled during the transmission of one cycle.

3.05 FREQUENCY

The number of complete waves (or cycles) passing a point in one second is termed frequency:

a. One wave per second past a given point is called a frequency of one hertz.

b. 1,000 waves per second past a given point is called 1,000 Hz or 1 KILOHERTZ.

c. 1,000,000 waves per second is called 1,000,000 Hz, or 1 MEGAHERTZ.

3.06 RADIO FREQUENCY SPECTRUM

The characteristics of radio signals vary according to frequency. For this reason frequencies are divided into 'bands' which represent significant changes in the performance of these radio signals. The bands of most interest to emergency service organisations are listed below:

Bands	Frequency Range	Uses
Medium Frequency (MF)	300 kHz - 3 mHz	AM broadcast services.
High Frequency (HF)	3 mHz - 30 mHz	Short wave broadcast, emergency services, Royal Flying Doctor, marine services.
Very High Frequency (VHF)	30 mHz - 300 mHz	FM and television broadcasting, two way radio services, emergency services.
Ultra High Frequency (UHF)	300 mHz - 3,000 mHz	Emergency services two way radio services, television broadcasting, UHF CB radio
Super High Frequency (SHF)	3,000 mHz - 30 gHz	Radar, satellite microwave links

3.07 BAND EDGES

It should be recognised that the characteristics of radio signals do not change sharply at band edges but gradually alter (eg a 27 mHz signal exhibits characteristics of both HF and VHF).