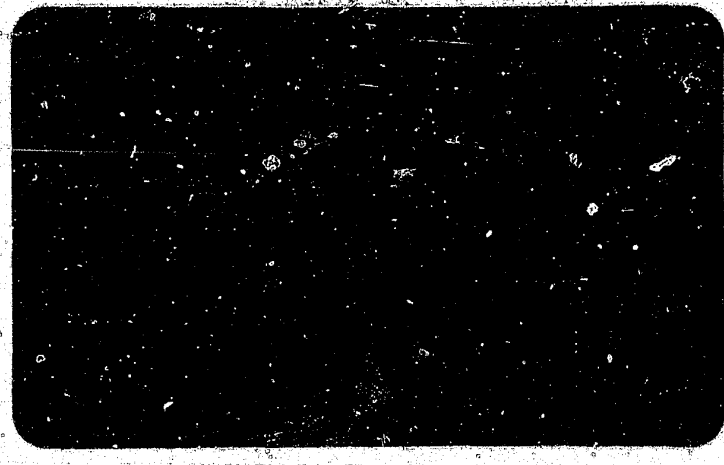
CANADIAN POLICE INFORMATION CENTRE



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ROYAL CANADIAN MOUNTED POLICE

OTTAWA

CANADIAN POLICE INFORMATION CENTRE

FUNCTIONAL SPECIFICATION

MOBILE RADIO DATA

SYSTEM DEVELOPMENT

JULY, 1976

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ROYAL CANADIAN MOUNTED POLICE
OTTAWA

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GLOSSARY

This glossary consists of simplified definitions of terms and abbreviations utilized throughout the document.

ACTIVITY	Activities make up the discrete units of work (tasks), which in turn make up a function. For example, in the case of the complaint taking function, obtaining a preformatted form on which the event details will be entered is an activity.
A/D CONVERTER	Analogue-to-Digital converter, a device that translates information from an anologue into a digital form.
ANSI	American National Standards Institute. One of the organizations responsible for standardization in the computer world. ANSI is recognized by all leading computer manufacturers.
APPLICATION PROGRAMS	All programs necessary to meet the requirements of the system processes.
ASCII	American Standard Code for Information Interchange. This code has been established as a standard by the American Standards Association.
ASYNCHRONOUS	Without regular time relationship. Random start-stop data requiring special start-stop information in each character. The speed of operation is not related to any frequency in the system to which it is connected.
BATCH PROCESSING	A method of processing in which a number of similar input items are accumulated away from the computer and submitted together for processing.
BAUD	A unit of signaling speed. In an equal length code, one baud corresponds to a rate of one signal element per second.
BIT	A unit of information content. Contraction of "binary digit". It is usually designated one and zero.

B.O.T.	Beginning of Tape. This is an indicator at the beginning of each reel of magnetic tape.
BYTE	A sequence of eight adjacent binary digits or bits, operated on as a unit.
CAD	Computer Aided Dispatch. A computerized system utilized by police agencies in the automation of event handling and dispatch.
CENTRAL PROCESSING UNIT	The component of a computing system which contains the arithmetic, the control unit and the internal storage unit.
COMMUNICATIONS CONTROLLER	A programmable device that performs the data routing function associated with the communications channels and terminal equipment.
COMPLAINT	The initial request for police service. Also referred to as incident, occurrence and event.
CONSOLE	The work station utilized to house all equipment necessary to or required by a functional position.
CRT	Cathode Ray Tube, a television-like picture tube used in visual display terminals.
CURSOR	An indicator utilized on a visual display screen to indicate the next print position.
D/A CONVERTER	Digital-to-Analogue converter, a device that translates information from digital format into analogue form. Refer A/D Converter.
DATA BASE	An organized set of files so structured that appropriate applications draw from these files and updates them but do not themselves constrain the design or contents of the files.
DATA BASE INTERFACE	The common or shared boundary between two systems or two devices.

DIGITAL COMMUNICATIONS	The encoding, transmission and decoding of messages utilizing a digital format.
E.I.A.	Electronics Industries Association. One of the organizations responsible for developing standards intended to assist in maintaining manufacturing standards within the electronics industry and permit compatibility between equipment of different manufacture.
E.O.T.	Refers to the mark or indicator on the end of a reel of magnetic tape (End of Tape).
EVENT	Recorded complaints or calls for service.
EXTERNAL FILES	Those files not embedded in the MRDS data base structure utilized in performing the operational duties of the agency.
FAIL SOFT	Refers to a computing system going into a degraded mode of operation rather than failing completely as a result of component malfunctions.
FILE	A set or collection of related records that contain specific data or information about a particular topic.
FLEXIBILITY	Synonomous with adaptability. The ability to make changes to the hardware and software modules to fit individual needs.
FUNCTION	The sum of a number of uniquely identifiable tasks which when viewed as a whole are related by operational or physical bounds. The complaint taking function and dispatch function are examples.
HARDCOPY	A printed copy of machine output in a visually readable form, e.g., printed reports, etc.
HARDWARE	The mechanical, magnetic, electrical and electronic devices or components of a computer.
HIERARCHY	Any group arranged in a rank structure.
INTERNAL FILES	Those files embedded in the MRDS data base structure utilized to perform the operational duties of the system.

INSTRUCTION SET	A group of different types of instructions which can be executed by a particular computer or used in a particular programming language.
INTERRUPT	A break caused by a signal which causes the central processor to cease its normal execution of instructions. These instructions can be resumed from that point at a later time.
LINE DRIVER	An electronic circuit which provides the input for another electronic circuit.
M.I.S.	Management Information System. Refers to those computer systems utilized in the automation and collecting of supportive and/or administrative information.
MESSAGE SWITCHING	The moving of information between various system elements as well as between the system elements and external sources.
MODEM	(Modulator/Demodulator) - a device which converts data signals into a form suitable for transmission over a communications channel.
MODULAR	A structure constructed with standardized units or dimensions for flexibility. Modular construction permits expansion in terms of new features and capacity due to growth.
MRDS	A Mobile Radio Data System consists of a radio system, the electronic equipment necessary to digitize message traffic, the equipment required to encode and decode information, and the equipment and programs required to process and provide output to permit action by operational personnel.
MTBF	Mean Time Between Failures.
MTTF	Mean Time To Fail. Refers to the expected failure rate.
MTTR	Mean Time To Restore or Mean Time To Repair.
MULTIPLEX	The division of a facility into two or more channels. The operation of a single path for the transmission of more than one set of signals simultaneously.

ONLINE MODE	A system which accepts input directly from the area where it is created. It is also a system in which the output, or results of computation, are returned directly to the area where they are required.
OPERATING SYSTEM	An integrated set of processing and control programs designed to supervise and control the total operating effectiveness of a computer.
PROCESS	A predefined set of one or more tasks which may be executed without regard to functional bounds. For example, a query to the CPIC data base employs the data base access process.
PROCESSOR	The main element of the computer system. For the purposes of this document, a collection of hardware and software which automate subsets of function, tasks, activities and processes.
QUEUE	A temporary storage area of information.
RADIO TRANSCEIVER	A device which combines the function of transmitter and receiver in a single package.
REAL-TIME CLOCK	A digital component using either the line frequency or a crystal to count increments of time.
REAL-TIME MODE	The processing of data in a sufficiently rapid manner so that the results of the processing is available in time to influence the process being monitored or controlled.
STATUS	Messages covering service conditions of patrols such as out-of-service and in-service.
STORAGE PERIPHERALS	Those devices into which data can be entered, stored and retrieved at a later time.
SOFTWARE	The collection of programs and routines associated with a computer.
SWITCHERS	A programmable or hardwired device utilized in an automated communications system as a mesage handler.

SYNCHRONOUS	Occurring with a regular or predictable time relationship. Speed of operation is related to the frequency of the rest of the system.
SYSTEM NUCLEUS	The common, centralized system elements, both hardware and software, to which the peripherals utilized by the functional positions are connected.
TASK	A discrete unit of work performed within the bounds of a function. Recording of complaint details by the complaint taker, assignment of a patrol unit by the dispatcher or accessing a data base by the information support function are all examples of a task.
TERMINAL DEVICE	An input/output device designed to receive or send source data in an environment associated with the job to be performed and capable of transmitting entries to and obtaining output from the system of which it is a part.
V.D.U.	Visual display unit. A device which provides a television like picture.

PART I
GENERAL INTRODUCTION

SECTION 1 - GENERAL

I.1.1 Introduction

With the advent of cost effective computer based communications systems, the Canadian Police Community is becoming involved in the planning, selecting and implementing of such systems to meet their operational needs. These needs include event processing and dispatching, identification of service condition of field units, status reporting and accessing of information sources by field units in a real-time mode. This is expensive due to development costs and, in all cases to date, has resulted in a system restricted in its ability to interface with data bases available or shortly to become available.

Police management must select a system that can meet specific needs, is flexible for expansion, is capable of meeting existing and planned data base interface requirements and yet is cost effective. This document will serve to provide both management and operational personnel with the information necessary to identify needs, develop a system structure, approach suppliers with the aim to purchase, and to evaluate the commercial offerings available. In addition this document establishes the groundwork to providing a standard for the Canadian Police community, in terms of a common interface to formalized data bases, basic systems structural requirments, and common software requirements to meet the operational needs of a mobile radio data system.

I.1.2 Purpose and Objectives

The purpose of this document is to define and state the requirements of a Police oriented Mobile Radio Data System (MRDS).

The system structure will address the operational needs and requirements of the police community. These needs and requirements are based upon the analysis of the User Requirements Questionnaire as presented in the CPIC document, "Police User Profiles", dated January 1976.

As a result of the commonality of needs, a basic structure will be defined to meet these needs, resulting in:

a) Cost reductions.

b) System flexibility to expansion.

c) Interface standardization.

The objectives of this document are:

a) To provide the terms of reference and detailed system description for the development of the system design specifications.

b) To identify the requirements that an acceptable Mobile Radio Data System (MRDS) must meet, including a catalogue of user requirements.

c) To provide the basis upon which Police Management may consider the applicability and detailed system requirements necessary to meet their needs.

d) To provide a basic MRDS system description to the operational personnel of the police agency.

e) To provide the system description and specifications in sufficient detail to support the acquisition process.

I.1.3 Application

This document has been produced such that it can be utilized:

a) To explain the basic terminology of MRDS and system concepts.

b) To serve as an educational aid and instructional document in computerized MRDS.

c) As a guide for requirement analysis.

d) As a tool to assist in the planning and implementation of an MRDS.

e) As a design guide to be utilized in the selection and incorporation of the system parameters.

f) As a procurement aid to assist in site preparation requirements, cost analysis and budgetary forecasting.

g) As a benchmark reference to which a system must perform in the operational mode.

This document is addressed to two general categories of user.

a) Police Agency users, including management and operational personnel. Included in this category of users will be support service personnel such as systems analysts, designers and engineers.

b) Consulting groups such as municipal or private consulting firms, system design contractors and/or invited system suppliers.

SECTION 2 - CONTENT

I.2.1 Method of Presentation

This specification is presented on a hierarchical basis starting with the broad view and progressing to a detailed description.

The document is partitioned with each part addressing a specific requirement. Each part has been sectionalized such that all information relating to a particular topic or operational function is contained in one area. The intent is to provide sufficient modularity to permit distribution of the document to the functional area being addressed. Elements common to several of the operational functions have been presented as self-contained sections and are cross referenced as required. Appendices are utilized to provide equipment details, required characteristics and derivations of field and file sizes. Where applicable, these are referred to in the text.

I.2.2 Source Material

The information forming the basis of this functional specification came from the following sources:

a) Analysis of User Requirements Questionnaires.

b) Material gathered as a result of interviews with Police Agencies across Canada.

c) Direct interactions with Calgary PD, Ontario Police Commission CADRE Study, RCMP Telecommunications, Vancouver PD.

d) Contact and correspondence with the major US police agencies utilizing MRDS systems.

e) Support studies, analysis and documentation from the System Contractor involved in this project.

f) Reference material - including LEAA publications, supplier's documentation, technical journals, and trade journals.

I.2.3 Scope of Document

This functional specification includes the following elements related to an automated communications system.

a) Complaint Entry and Validation.

The hardware and software requirements and equipment configuration required to support the activities associated with Complaint Entry and trouble occurrence reporting and validation of this information. This is discussed in Section III.4.2.

b) Status Reporting

The hardware and software requirements of an MRDS necessary to support status reporting is discussed in several sections of the document. Primary coverage is found in Sections III.4.4 and III.4.5. Included in this element are the system storage requirements, methods of updating and displaying unit status and the transmission of the message.

c) Computer Aided Dispatch (CAD).

The hardware and software requirements necessary to support computer aided dispatch. For the purpose of this document, CAD refers to the assignment of an event to a patrol unit(s) via an automated system. This element is inherent in all sections although the actual dispatch activities are presented in Section III.4.4.

d) Query/Response.

Query/response capability from terminal equipped patrol units to various data base systems including the MRDS data base. This is discussed in all sections although the end user in all cases is the patrol function.

Section III.4.5 covers the patrol unit requirments.

e) Narrative Messages.

Digital narrative message capabilities from car to car, car to base and base to car are discussed. These include standard requests and repetitive messages.

f) Data Base Interfacing.

The specifications necessary to permit interface of the MRDS to internal and external data base systems. This includes both data base systems presently available and those that will be available in the near future.

g) Supervisory and Control.

Included in this element are those items pertaining to system monitoring, personnel supervision, and control of system operation.

h) Activity Logging.

This item pertains to gathering and storing of statistical and basic management information by the system.

In addition to the preceding points, this document identifies system structure and configuration. The areas addressed include the following:

a) System Size - both upper and lower limits in respect to system capacity and operational size. This includes the number of peripheral devices that can be supported, the number of mobile units, file size, and so on.

b) Modularity - in regards to the basic structure and range of options both hardware and software. This addresses the ability of the system to provide a "building block" type structure to enable an agency to assemble a system to meet its specific needs.

c) Flexibility - the capability to change, add to, and expand in regards to system software and hardware.

d) Structural Requirements - includes items such as radio channel requirements, RF system configuration, computer system requirements, as well as work station and equipment requirements.

PART II

SYSTEM OVERVIEW

SECTION 1 - INTRODUCTION

II.1.1 Definition of an MRDS

A Mobile Radio Data System (MRDS) as defined in this document consists of all radio equipment (the RF system), the electronic equipment necessary to digitize message traffic, the equipment necessary to encode and decode information, and the equipment and programs necessary to process and provide output to permit action by operational personnel.

II.1.2 Definition of Digital Communications

Digital communications includes the encoding, transmission and decoding of messages utilizing a digital format. The information is encoded into a sequence of bits (a bit being either a zero or one condition). The resulting bit stream is transmitted over the communications medium and decoded at the receiving end.

II.1.3 Benefits of Digital Communications

Several benefits are derived as a result of digitizing messages. These include:

a) Privacy - messages are transmitted in digital form so that more sophisticated monitoring techniques are required by unauthorized listeners.

b) Speed - reduction in the transmission time necessary to pass the information over the communications medium.

c) Improved Channel Utilization - due to the effective reduction in pauses and delays inherent in voice communications, there is a reduction in time to communicate the same amount of information over the channel.

d) Increased Message Volume - due to reduced transmission time as well as more effective channel utilization, the number of messages that can be transmitted in a given period, increases.

e) Accuracy

   i) there is a reduction in the requirement for interpretation of message content since the information is presented in a format readily understandable by the computer.

   ii) there is an increased capability for error correction without total repetition through the use of digitized error detection/correction technique imbedded in the computer system.

f) Reduces repetitive voiced messages - due to the capability of the computer to retain prepared text which can be transmitted upon request. Repetitive messages include canned messages, status messages, bulletins and standard broadcasts.

g) Data Base Access - ease of access is increased as digital messages are in a computer compatible form. By interfacing directly to a Local computer, access to CPIC, Local and Provincial data bases all become possible. Responses can be returned directly to the unit.

h) Text (Narrative) Messages - provides a more efficient and effective method of communicating text oriented messages between units and/or the com-centre.

i) Utilization of Computer Aided Dispatch (CAD), Management Information Systems (MIS) and Complaint Dispositions by the operational forces.

SECTION 2 - SYSTEM FUNCTIONS, PROCESSES AND HARDWARE

II.2.1 System Functions

The terms "function" and "functional position" will both be used in this document. "Function" is a generic term describing the sum of operationally or physically related tasks while a "functional position" is the position held by the member responsible for performing that function. The term "functional position" is also used in a physical sense.

A description of the system functions and their associated tasks may be found in Part III of the document "Police User Profiles", dated January 1976. A general description of each function with reference to the aforementioned document follows. Figure II.2.1 shows the system functional configuration.

II.2.1.1 Complaint Taking Function

The complaint taking function interacts through the media of telephone, mail, computer terminal, telex or in person to identify occurrences that require some type of police action. The complaint taking function records event details, verifies its correctness as much as possible, and routes this information to the appropriate function within the agency. Refer to "Police User Profiles", Section III.1.

II.2.1.2 Dispatch Function

The dispatch function transcribes event details received from the complaint taking function into a form appropriate for radio transmission and sends this information to the patrol units. The dispatch function is responsible for both monitoring the

status and the assignment of activities to the field units of the agency. This function serves as the interface between the com-centre functions, the patrol and patrol supervisor functions. The tasks and activities associated with this function may be found in Section III.2 of "Police User Profiles".

II.2.1.3 Information Support Function

The information support function accesses and interacts with paper files, other police agencies and both internal and external data bases, to supply support information to com-centre based functions (com-centre supervisor, dispatch, complaint taking, system) and to field functions (patrol, patrol supervisor). The information support function is also responsible for gathering and processing statistical data for management use. See "Police User Profiles" Section III.3.

II.2.1.4 Patrol Function

The patrol function serves the public in a protective, preventative and investigative role. The patrol function is performed in the field either on foot or in a patrol car. Patrol assignments are a result of information obtained from the com-centre, public contact or from situations encountered in the course of general patrol. The patrol function records, reports and requests information related to the event assigned. The patrol function acts on this information to resolve events. Refer to "Police User Profiles" Section III.4.

II.2.1.5 Com-Centre Supervisor Function

The com-centre supervisor function is responsible for the control and supervision of com-centre activities. This includes both com-centre equipment and personnel. The com-centre supervisor also serves as the interface between operational personnel and management. Refer to Section III.5 of "Police User Profiles".

II.2.1.6 Patrol Supervisor Function

The patrol supervisor function works to optimize patrol resource utilization by controlling and providing direction to patrol units within an assigned area. To perform this function, the patrol supervisor must be aware of the activitites of his assigned units. The patrol supervisor also performs the activities associated with the patrol function when required. Refer to "Police User Profiles" Section III.6.

II.2.1.7 System Function

The system function includes the system nucleus, described in Part III Section 3 of this document, as well as associated peripherals. It serves as a support function providing communications between various functional positions, it provides the means of accessing organized information sources and generates statistical data for management personnel.

The system function is comprised of all of the hardware and software that keeps the com-centre operational (e.g., file maintenance, message switching, data base accessing etc.) See Section III.7 of "Police User Profiles".

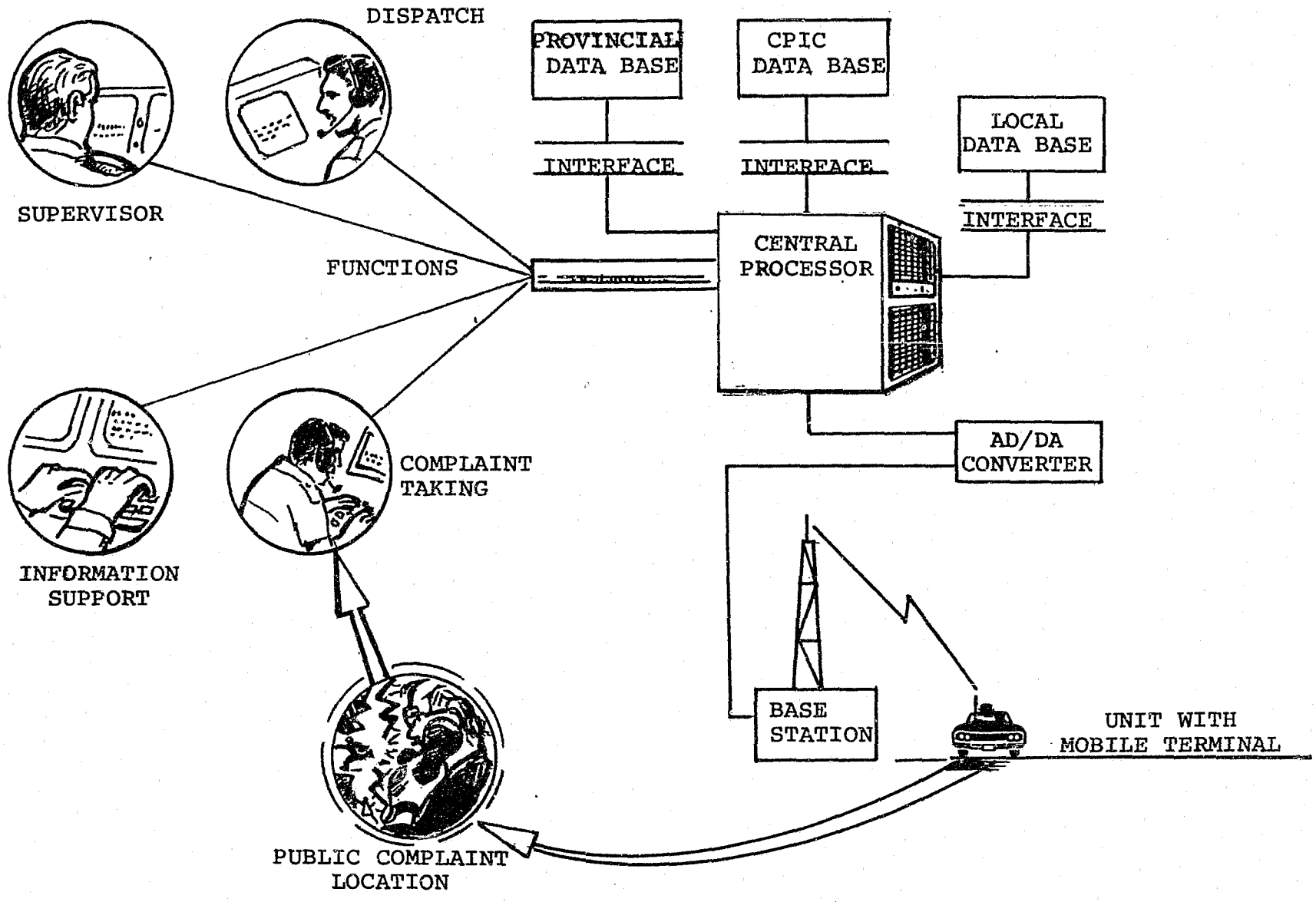

FIGURE II.2.1
SYSTEM FUNCTIONAL CONFIGURATION

II.2.2 System Processes

A large number of the tasks comprising the various functions are carried out by means of the system processes. The following paragraphs provide a brief description of the major system processes.

II.2.2.1 Message Handling Process

The message handling process involves the transfer of information between various system elements (functions, processor, peripherals) and from system elements to and from external sources (external data bases, other municipal services). This, for example, includes message switching and identification in the case of two or more messages going to or coming from diverse sources simultaneously. This process is accomplished by software control of hardware elements. For example control of switchers, line drivers, multiplexors, AD/DA converters etc.

II.2.2.2 Data Collection Process

The data collection process is statistically oriented. It provides the operational statistics necessary for management to measure the effectiveness of the system, the efficiency of the agency operations, and the occurrence activities in their jurisdiction. It involves counting the frequency of occurrence of agency specified events. For example, an agency may wish to determine the number of radio transmissions received per day on a given channel. By means of the data collection process, a count is maintained and continuously updated. This data is then immediately available for further study or processing by the agency.

Data collection is accomplished mainly through the system software although in some cases meters may record the time or number of cycles between service calls for some of the system hardware.

II.2.2.3 Status Maintenance Process

The status maintenance process entails the listing and continual updating of the status of all system resources both manpower and equipment. This is either realized automatically from information gathered during the data collection process or entered manually by a system function. For example, a patrolman may advise that his status is "enroute" and then change this to "at scene". In another case the agency may be advised that repair of a peripheral is necessary.

II.2.2.4 Identification Process

The identification process is the means through which authorized terminals and personnel are recognized and allowed system access. This process is controlled by supervisory personnel within the agency and ensures system integrity. Authorized personnel are only allowed access, through this process, to the information necessary for the performance of their duties.

II.2.2.5 Date/Time Process

Date/time recording is achieved through the date/time process. This process is usually dependent on a crystal or line frequency controlled real-time clock. It is used to provide date/time information on event forms, for scheduling system dependent activities and providing information to any system user.

The automatic recording of date/time information relating to various activities performed by the system is of considerable importance in the system design. The information must consist of a Julian date with the time recorded to te nearest second.

The recording of this information, in regards to the various activities, will vary between agencies and

should be discussed prior to time of system implementation.

II.2.2.6 Date Base Access Process

To enter data or to perform file maintenance on files in both internal and external data bases, the data base access process must be used. This process employs interfaces, using appropriate protocols, to allow the MRDS processor to interact with its mass storage devices and other systems' processors in efforts to receive and/or transmit data. This process also performs the necessary file formatting and stripping to permit efficient transfer of the information.

II.2.2.7 Briefing Process

The briefing process is used to enter data relevant to the next shift to assume "on-duty" status. It serves as the repository for briefing data, which can be accessed by agency personnel.

II.2.3 System Hardware

The major hardware components required for an MRDS are shown in Figure II.2.3. A brief description of these elements follows. A detailed description of the required equipment characteristics and specifications may be found in Appendix B of this document.

II.2.3.1 Central Processor and Storage Peripherals

The central processor controls the processes of the MRDS system. It consists of four basic elements: The central processing unit (CPU), the Arithmetic Logical Unit (ALU), Bus lines and Memory. The CPU is able to control peripherals and communicate with the other CPU's through the bus lines and interfaces. The ALU performs arithmetic operations and comparisons which allows the CPU to execute its instruction set. The user agency uses this instruction set to control the Central Processor.

Memory, as distinct from storage peripherals, connotes the area in which the CPU performs its processing. As such, memory size is an indication of processing power. Examples of types of memory in common use today are, in order of increasing speed and sophistication: core, MOS and bi-polar.

Storage peripherals store data as required for processing. These devices are used for both input and output of data. For example, data may be read from a disk, processed, and the results of the processing may be written to that disk. Typical storage peripherals are: disks, magnetic drums and tape. Of these disks and drums exhibit the fastest data transfer rates and should be considered for storing data where rapid response is critical.

II.2.3.2 Communications Controller

The communications controller, typically a mini-computer, is basically a device that performs a data routing function. The controller may either be imbedded in the Central Processor or may be a separate device. With reference to Figure II.2.3 the controller has been included as part of the Central Processor.

Any data to go to the central processor is stripped of non-essentials such as field labels, assembled in the proper order, tagged with some type of identification and concentrated by the communications controller to lessen the load on the central processor.

The communications controller assures that only authorized terminals gain access to the CPU. Data returned to the communications controller by the CPU is identified and sent back to the appropriate terminal. This may be done over communications lines or, through a radio interface, by radio to mobile terminals.

II.2.3.3 Encode/Decode Equipment

This equipment can be inserted at the option of the user agency to provide a higher level of privacy. This equipment can range from simple data privacy or scrambling equipment up to full encryption and decryption devices.

II.2.3.4 Data Communications Equipment (Modems)

Most modern digital computers handle data signals at very low voltage levels in form of digital pulses or "bits". These signals must be converted to signal forms which can be easily transmitted over the communications channel. The electronic device which does this conversion is the modem (or data set). An example is the conversion of TTL level digital signals to audio frequency tone signals to allow communications, over ordinary phone lines, between a terminal and the central processor.

III.2.3.5 Mode Select Equipment

This equipment is required to route the messages to the appropriate devices. It separates the voice receptions from the data and combines the voice and data traffic so that there is no cross-interference during transmission. It also serves the purpose to identify busy channel conditions for communications purposes.

II.2.3.6 Radio Transceivers

Radio transceivers transmit and receive radio messages, in this case both voice and digital, on one or more frequencies. The base station radio, in-car mobile radios and personal portable radios are examples of transceivers.

II.2.3.7 Com-centre Terminal Device

The com-centre terminal device is similar in layout to a typewriter and is used by com-centre personnel to communicate with the central processor, other agencies and external data bases.

Two types of terminals will be used in the com-centre: one a hard copy type and the other a visual display unit. Examples of these are impact printer and teletype-like units and CRT terminals respectively.

II.2.3.8 Mobile Terminal Unit

The mobile terminal device consists of an output medium, typewriter style keyboard and status keys. It allows the patrol function the ability to communicate digitally with other functional positions or directly with the MRDS central processor.

The current generation of mobile terminals use either hardcopy printers or visual display units (VDU) as output media. For the purposes of an MRDS, the latter is preferred and recommended.

II.2.3.9 Com-centre Printers

Two types of printers may be utilized by agencies with an MRDS; one a high speed line printer and the other a comparatively slow speed device.

The high speed line printer will normally be located outside of the com-centre to minimize com-centre noise levels. It will be used for any lengthy printouts, for statistical reports, for printing data received from other data bases, and for generating hard copies of system files.

The slow speed printer will be used inside the com-centre for hard copies of VDU screen contents or for hard copies of data received from other agencies.

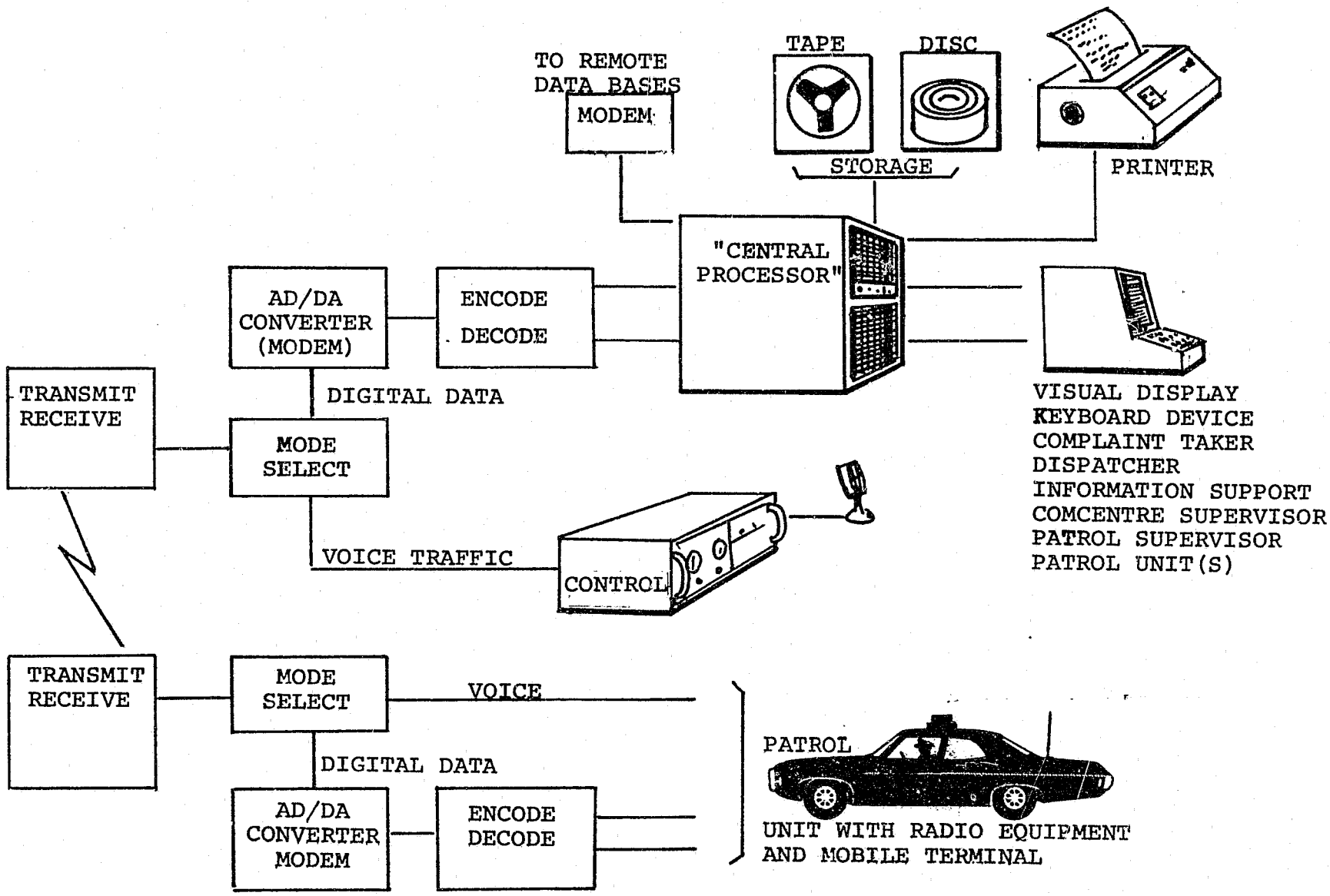

FIGURE II.2.3

SYSTEM HARDWARE CONFIGURATION

SECTION 3 - DATA BASE OVERVIEW

II.3.1 General

The MRDS data base is in fact a composite structure made up of at least the first, and dependent on the agency, part or all of the following data bases:

a) System data base.

b) National data base (CPIC).

c) Provincial data base.

d) Local data base.

The following paragraphs describe the information resources available to an MRDS from these data bases as well as some of the major interface requirements. Detailed interface requirements will be provided at time of system design, either as a result of development by the agency or as documentation provided by the organization responsible for the data base operation.

II.3.2 System Data Base

The system data base is made up of those files described in Section III.2 of this document, as well as any agency requested information files.

These files reside in storage peripherals such as disk, drum and magnetic tape. Agency size will determine file requirements and these in turn will dictate the capacity required of the storage peripherals.

Access to the system data base will be restricted to authorized personnel. Functions will only be allowed access to those files deemed by the agency as necessary to perform their functional tasks.

Maintenance and updating of the system data base will be primarily the responsibility of the Information Support Function and Supervisory

personnel. In the case of dynamic (constantly updated, changing) files, such as the event summary file, the system will perform the file maintenance and updating role automatically.

II.3.3 National Data Base (CPIC)

The Canadian Police Information Centre (CPIC) data base is a centralized depository of police-relevant information. This information is available on-line to all accredited Canadian police departments having access to a CPIC terminal.

MRDS processors will be allowed query access to Vehicle, Persons, Property and Boats and Motors files in this data base. In addition, authorized com-centre terminals (e.g., Information Support) will be permitted access for Hit Confirmation and Narrative purposes. File maintenance will be through a CPIC terminal only. MRDS processors may only access CPIC files by means of an interface conforming to the specifications found in the document "CPIC/MRDS Interface Specifications". This document will be provided, on request, to accredited Canadian police agencies.

II.3.4 Provincial Data Bases

Provincial data bases are in the process of becoming established and/or operational. At present, these data bases will be providing motor vehicle and licencing information only.

An MRDS system will access this data base through an interface meeting the provincial data base interface specifications.

II.3.5 Local Data Bases

"Local" is defined as within the area of jurisdiction of a particular police agency. An MRDS may have to interface to a variety of local data

bases. These may include municipal data bases and corporate data bases. For example, a police agency may access the hydro company's data base to get up-to-date address information when necessary. An MRDS will be provided with information such as outstanding fines or warrants issued in cases of bylaw or traffic violations. This information may come from the municipal data base.

In areas where more than one municipality or agency share an MRDS, consideration should be given to allow the MRDS sufficient, flexibility and expansibility to handle multiple local data bases as they are established.

SECTION 4 - FLOWS AND INTERACTIONS

II.4.1 Function - Function

The interactions between the various functional positions within an agency are fully described in the CPIC document "Police User Profiles" dated January 1976. The installation of an MRDS by an agency must not decrease those interactions presently encountered in a manual system.

The primary information flow between MRDS equipped functional positions is via the system components, both hardware and software. The flow for non-MRDS equipped functional positions will remain as presently encountered in manual systems, or modified as required.

II.4.2 Function - Process

In an agency equipped with an MRDS, the flow of information is a result of interactions between the functional positions and the system processes.

The functional positions within an agency and the system processes were described in Sections II.2.1 and II.2.2 of this document.

The digitization of messages and the automation of functional tasks will be the result of the interaction of those tasks with one or more processes of an MRDS.

II.4.3 Process - Process

The information flow between the system processes varies depending on message type. A process interacts with one or more of the other processes in completion of a functional task. These flows occur internally to the system and must be inherently possible by system design. For example, the functional task of data base query would cause an

interaction between the identification, message handling and data base interface processes.

PART III
DETAILED SPECIFICATIONS

SECTION 1 - INTRODUCTION

Detailed specifications of the functions and equipment component requirements of a mobile radio data system (MRDS) are presented in the following sections. Where appropriate, sections have been divided into logical subsections to permit the distribution of pertinent material to the appropriate personnel within the police agency.

Section 2 defines File Requirements and identifies the file structure utilized in an MRDS and gives the file specifications for the internal files. In addition Appendix A provides supportive documentation on file requirements.

Section 3 defines the System Nucleus and describes its structure. It also identifies the peripheral devices that the nucleus supports. A functional description of the hardware and software elements is given along with their required characteristics. Appendix B contains detailed hardware specifications and operational characteristics of each device.

Section 4 presents a detailed specification for each of the principal functions supported by an MRDS. The tasks associated with each function and the activities comprising each task are referenced in specifying the supporting hardware and software required. Factors influencing the design and physical layout of work stations for each function are also included. Required operational characteristics for each of the major hardware components are contained in Appendix B.

SECTION 2 - FILE REQUIREMENTS

III.2.1 Internal Files

Internal files are defined as those files that are imbedded in the MRDS data base structure and utilized to perform the operational duties of CAD, Complaint Entry and Validation, Status Reporting, Narrative Messages, Supervisory and Control, Activity Logging and Management Information Reporting. These include all files that do not require use of an interface process to access a remote data base.

III.2.1.1 Requisite Files

Requisite Files consist of those internal files as described in the following paragraphs that must be included in any system. Information pertaining to the file size and data field size within each file is contained in Appendix A.

Event File

The event file provides storage for data recorded as a result of requests for service. Included in this file are complaints (incident) details. Not included are case reports or the results of lengthy investigations. The system must provide storage of events through all stages of processing from active to historical. Events should be stored on the system to permit real-time access for the time period specified by the user agency. This generally should be a 30 day period. The storage space required will be dependent on the number of events recorded.

Direct access mass storage should be sufficient to store events for 24 hours from time of entry. The minimum design capacity should be 250 events per 24 hour period and the maximum should be 2000.

An index must be maintained that identifies the location of any event within the system and its status. The index must also identify completed events in the file that have not been transferred to archival storage.

The system must produce a warning to a position designated by the user agency when the file reaches 80% capacity.

Input/output (I/O) response time from the event file must be less than one second.

The file must produce on request, a preformatted display to facilitate recording of event details. The operator will fill in the appropriate data fields by means of his terminal keyboard. Data field headings will be defined by the user agency, however should include the following:

Complainant's name.
Complainant's address
Complainant's telephone number
Location of occurrence
Name of victim or firm
Time and date of receipt
Complaint taker ID
Details of event
Date and time dispatched
Time of arrival at scene
Time completed
Event number
Code (type of event)
Priority code
Zone
Unit assigned
Dispatcher ID
Officer(s) assigned
Event disposition details

Appendix A shows the field size required.

When the operator has completed recording the details, the data should be routed to the processor by depressing a function key.

Event Summary File

The event summary file is an abbreviation of the active event file, consisting of predetermined data fields from the event file. This file must be generated automatically by the system. The event summary file will produce a continuous display used by the dispatch function and displayed on request at any of the other functional positions.

Any changes to the information in the event file must result in the same change to the data field in the event summary. There are no archival requirements in regards to the summary file.

The data fields within the event summary file should be as follows:

Event number
Event type
Priority code
Location of event
Unit assigned
Time and date of receipt
Zone
Present status of unit assigned

Final choice of the fields to be included is the responsibility of the user agency. Appendix A shows the field size required for this file.

Unit File

The unit file provides storage of information pertaining to agency patrol units. The number of units in the file is dynamic and determined by the user agency. The system should be capable of storing the files for a minimum of 30 units and a maximum of 300.

The data fields in this file should include the following information for each field unit:

Unit identifier
Identification of officer(s)
Unit type
Unit (vehicle) number
Assigned area
Assigned event number
Time of event assignment
Current status plus qualifier
Time of last status change
Previous status

NOTE: Previous status is desirable when an emergency status is transmitted, i.e.,

Previous status - 'Vehicle check LIC: 123456'

Current status - 'Emergency - Officer needs assistance'

Refer to Appendix A for field sizes required.

A dispatcher must be capable of adding to and/or deleting unit records from this file while the system is in an on-line mode. Modifications to the data in this file will also be performed on-line from terminal equipped patrol units.

Unit Summary File

Associated with the unit file is a unit summary file consisting of pre-selected data fields from the unit file as identified by the user agency. The output from the unit summary should be in the form of a dynamic display of the following data fields:

List of units by status condition.
Event number assigned to unit(s).
Emergency messages or indication.

This file must be updated automatically by the system as a result of changes to the information contained in the Unit File. The changes must be immediately displayed on the dispatcher's display screen.

The unit summary display should have the capacity to allow simultaneous viewing of up to 50 patrol units. An index to each unit record in storage should be maintained by the system.

Input/output response time from this file must be less than one second.

Terminal Control File

The terminal control file consists of information governing the use of all mobile and Com-centre terminals. The file size will be in direct relation to the number of terminals on the system.

The information contained in this file should consist of:

Unit ID
Terminal ID

Functional task authorization
Data base authorization
Sign-on and sign-off information

Changes to the information in this file should be via an authorized terminal (or terminals) as specified by the user agency. It must be possible to make changes while in the on-line mode. These changes should include removal or addition of a terminal to or from the system, alteration of the tasks permitted from any terminal and authority to access any data base available to the system.

III.2.1.2 Agency Selectable Files

In addition to the preceeding files there are a number of internal files, that must be available for selection by any agency. These are as discussed in the following paragraphs. Information pertaining to the file sizes and data field size within each file is contained in Appendix A.

Address File

The address file contains a list of addresses related to frequent and/or serious complaints. This file serves to provide warning and cautionary notes for the field officers. The data fields should consist of:

Address
Name of occupant
Previous event types
Dates of previous events
Previous events by event number
Other associated information or detail

The Event Type field, Date field and Event Number field should provide space for up to 5 entries each.

The system must permit any authorized operator to add new addresses to this file as well as update any information that is presently stored.

Business Reference File

The business reference file consists of the same data that is presently stored on business reference lists. This data consists of:

Name of business
Address of business
Name of person to contact
Address of contact
Telephone number of contact
Additional details

Additions and deletions should be made only from an authorized terminal as identified by the user agency. The system should generate a warning when available file space reaches a predetermined capacity. If all available file space is depleted, any attempts to add information should result in generation of an error message until file re-organization is conducted.

Briefing File

The briefing file consists of that information gathered during a shift that must be passed on to succeeding shifts. The information includes both operational events and equipment performance. The input to this file should be free format and kept for a limited period of time as specified by the user agency. The file should be structured as a time controlled wraparound file(approximately 24 hours).

The file should consist of two separate sub-files, one for operational information and the second for Com-centre information.

Output from the two sub-files should be via hardcopy printer on a request basis. The output should consist of two separate printouts, one for operational personnel and one for Com-centre personnel.

Input to the file should be limited to the Com-centre and patrol supervisors by way of their terminal devices.

Console Usage File

This file is utilized for the control and authorization of each com-centre terminal and the statistics related to its use. The file should contain the following information:

a) Authorized functional tasks that may be performed at any Com-centre terminal.

b) Currently assigned functional tasks for each Com-centre terminal.

c) The sign-on and sign-off time as well as operator identification for each active terminal.

d) The number of times that pre-selected functional tasks have been performed by a terminal.

e) The geographical areas assigned to each dispatch terminal.

The Com-centre Supervisor must have the capability to modify selected information on this file. Changes to the information must be done on-line and should include:

Functional task authorization.
Current functional tasks.
Access authorization.
Geographical area assigned.

Special Attention File

This file consists of short term information that can be accessed by the field units. The information on this file consist of such items as:

Short broadcasts.
Premise checks (i.e., owner on holidays).
Request to locate (i.e., Tourists travelling in area to call home).
Look-out lists (i.e., list of most recently stolen vehicles).

The type of information stored on this file will vary between police agencies, depending on their requirements and preferences. File requirements

should be identified by the user agency during the design stage.

The file should be constructed in such a way to allow flexibility of informational inputs.

Inputs and changes to this file should be controlled from an authorized terminal. Each item of information should contain:

Date of entry
Expiry date
Operator ID
Free format field of limited size

The system should automatically delete each record when the expiry date is reached.

Manpower Resource File

Input and output to this file must be restricted to terminals as authorized by the user agency. The information stored consists of such items as:

Shift schedules for department personnel by:
- name
- zone
- scheduled duties

Personnel on:
- holidays
- off duty sick
- on course
- assigned to short term duties

Personnel trained for special duties such as:
- riot squad
- tact teams
- breathalyzer

This information is intended to be used primarily by supervisory and management personnel for deployment of manpower resources.

Modifications to the information on this file must be possible in an on-line mode. Response times of this file are not as critical as with the more operationally oriented files.

Narrative Files

The narrative file is a repository for general narrative messages. Messages can be input from any addressable terminal and held by the system until requested by the destination terminal. The destination terminal should be informed of any narrative message "waiting" condition.

Address Directory

The address directory file consists of a listing of addresses cross-referenced to the zones utilized by the police agency.

III.2.1.3 User Generated Files

In addition to the files identified, agencies incorporating an MRDS into their operation may generate file requirements to meet specific needs. The system must be capable of incorporating these files within its structure.

Control and regulation of all files is the responsibility of the user agency. All files must be expansible with a minimum of restructuring.

III.2.2 External Files

External files are those files not embedded in the MRDS data base structure but are utilized in performing the operational duties of the agency. Most external files are not under the control of the user agency. These files are accessed through the data base access interface. File formats and structures are as specified by the controlling organization. In all cases the data base access interface must be capable of accepting these structures. Detailed information and specifications should be provided by the user agency.

Methods of access to these external files or data bases as well as the protocol utilized will vary depending on the structure of each data base system. It is likely that the MRDS will be required to

perform a compiler function, or conversion at the interface process stage when interconnected to other systems. Detailed specifications for all external data bases will be provided by the user agency in the system design stage.

Any modifications and/or changes necessary to meet the interfacing requirements will occur at the MRDS side of the interface and not on the established system. This hold true of any future or planned data base system. As the external data base systems change and/or expand the MRDS must have sufficient capacity and flexibility to adapt accordingly.

National

CPIC provides files at a National level. The files presently available to an MRDS are:

a) Vehicles
b) Persons
c) Property
d) Boats and Motors

Access to these files is limited to accredited Canadian police agencies. MRDS terminals are restricted to query access of these files.

Provincial

Provincial data bases are at present limited to motor vehicle registration and licencing details. This information must be accessed through an interface between the data base and MRDS. Each MRDS must be capable of interfacing to one Provincial data base initially. As additional data bases become available they should accessible with minimal changes to the interface.

Local

Local data base systems are presently in limited use. These systems contain or will contain files consisting of data relating to municipal offences, personnel files and general statistics relating to volume of work and offence activity.

SECTION 3 - SYSTEM NUCLEUS

III.3.1 Introduction

Definition

The system nucleus consists of those system elements, both hardware and software, necessary to meet user requirements. The hardware includes the processing unit, associated registers and buffers, input/output controllers(s), memory and storage devices. The software includes the Operating System (OS), loaders, schedulers and the programs associated with providing the system processes as previously defined in Part II.

Purpose

The system nucleus can be considered the heart of the MRDS system.

The system nucleus provides the means through which interactions, routings and controls of system operations are accomplished. This includes the means for data transfer between system elements (peripherals, memory, operators) as well as error checking of these transfers.

The system nucleus provides reference services such as date and time information. This may include date and time stamping onto pre-formatted forms under program or operator control.

The system nucleus provides housekeeping utilities required to maintain the operational status of the system. These include user identification and authorization as determined by supervisory personnel, accounting services and performance monitoring and a summary of system status on request.

The system nucleus provides for storage of information pertaining to the on-going operation, that is, a short term memory. This information may or may not migrate to permanent storage.

The system nucleus supports the establishment of a data base which can be utilized to assist the agency in the performance of police duties. Information

contained might include local records, address lists and other files specified in Section III.2 of this document.

The system nucleus provides for rapid data transfers from external data bases. For example this may include CPIC for information regarding stolen property queries or a provincial, local or municipal data base on such matters as vehicle registrations.

The system nucleus provides memory management and protection. It assigns available core and/or mass storage and protects system files and shared subroutines from unauthorizied or unintentional alteration.

III.3.2 Structure

The structure of the system nucleus must be modular, having the flexibility to address specific agency requirements. There must be expansibility to new applications and increased capacity built into the original package. Both the hardware and software aspects must be designed to support a Mobile Radio Data System. A Block Diagram of The System Nucleus is as shown in Figure III.3.1.

Either a centralized, distributed, or hybrid architecture may be utilized as long as the performance requirements, functional requirements and operational requirements are met. These include:

a) Duplication of equipment essential to system operation in order to minimize disruptions caused by breakdown or maintenance (i.e., there must be redundant elements incorporated into the design in order to minimize the probability of a failure). A complement of spare parts must also be readily available.

b) In the event of a failure or after maintenance the system must be easily reloaded and restarted.

c) The system must, in the event of the breakdown of a processor or vital peripheral, fail soft.

The purpose of this is to minimize both damage to peripherals and data loss. Provision must be made for error detection both on restart and in the normal operational mode.

d) The system nucleus must be an interrupt oriented structure. The number of interrupt levels will be determined by the load imposed upon the system.

e) The system must perform in an on-line real-time mode. The time required for data manipulation must be consistent with the response time demanded by the process that generated the data.

f) The nucleus must be capable of expansion to handle system growth and new applications.

g) The system nucleus should utilize the latest in commercially viable state of the art technology and must be easily adapted to capitalize on future innovations.

h) The system nucleus must be structured for communications support.

i) The system must be capable of supporting and permitting both remote and internal data base access. This entails the ability to interact functionally with national, provincial, local and municipal data bases.

j) The system nucleus should support an overlay structure. This is to provide the facility to handle files where sizes are greater than the available memory.

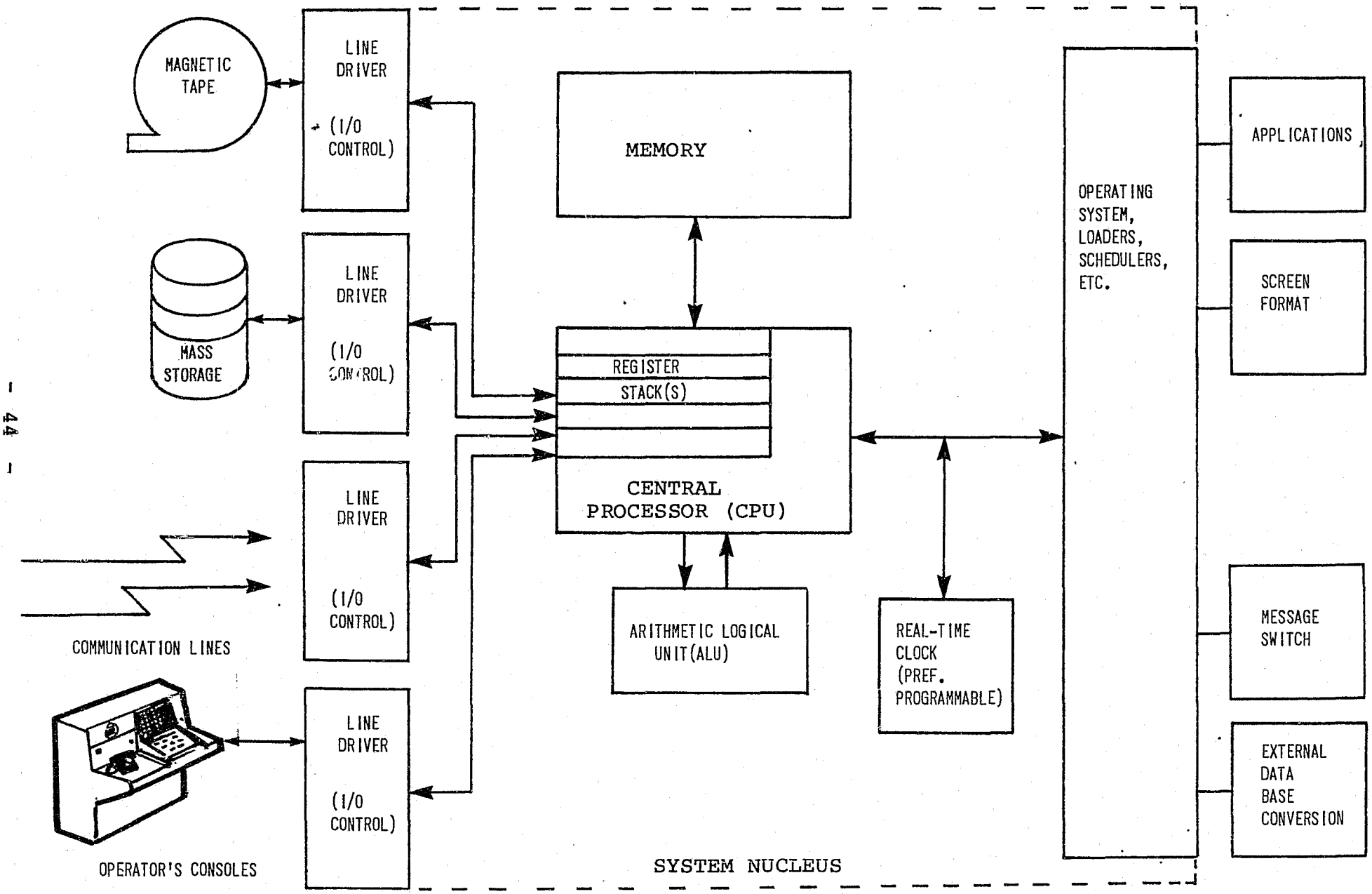

FIGURE III.3.1

SYSTEM NUCLEUS BLOCK DIAGRAM

III.3.3 Hardware Elements

Central Processor

A processor considered for the system nucleus should possess the following described attributes.

The central processing unit (CPU) should have a comprehensive instruction set including bit and byte manipulation for communications control.

The CPU must have error checking capability for:

a) Parity on data transfers

b) Detection of the existence of such conditions as arithmetic overflow or insufficient memory to continue processing and notification of these conditions to the operator.

c) Memory protect violations such as illegal memory references.

d) Detection of an invalid address and/or that an illegal code has been specified and notification of this to the operator.

The central processor must have a power fail monitor responsible for saving volatile information if the line current or voltage exceeds equipment tolerance. This includes some sort of load levelling device (i.e., power line regulation) to compensate for normal power line fluctuations.

The central processor should include a comprehensive interrupt system to queue levels of, and handle interrupts from, external sources, (i.e., peripheral equipment) and internal sources, (i.e., memory protect, powerfail, real-time clock).

The central processor must be able to address a minimum of 128K bytes of memory. It must have multi-port memory capability.

If circuitry such as MOS is used it must employ error detection and correction.

The central processor must be capable of supporting the following peripheral equipment:

Operator's console(s) - a minimum of 4 to a maximum of 25 com-centre terminals.

Line printer(s) having a minimum speed of 300 lines per minute.

Magnetic tape unit(s) which are industry compatible 1/2 inch 9 track 1600 BPI.

Disk file units, having either movable or fixed heads.

A dual floppy disk or cassette unit to permit program loading, diagnostics etc.

A varible precision real-time clock, preferably with program selectable clock rates.

Both synchronous and asynchronous communications ports capable of speeds from 300 to 9600 baud, in full and half duplex mode. The electrical interface must comply with the EIA Standard RS232-C. There must be a minimum capacity of 32 lines with expansion capabilities to 64 lines.

III.3.4 Software Elements

All supplier software must be deliverable as pretested and debugged and must be accompanied by published documentation.

The software packages seen as a minimum requirement are:

a) An Executive Program (Operating System) which must be capable of running on a real-time basis and includes:

loaders including bootstrap loader
scheduler
memory allocation
monitoring (error detection and recovery)
interrupt queueing and handling
device dependent drivers

b) An assembler program preferably with macro-coding capability.

c) Link-edit programs.

d) Library and utility programs such as a system macro library, debug packages, peripheral control programs and source and object listing packages.

e) Maintenance and service programs to provide diagnostic capabilities.

A desirable feature is a high level language compiler such as COBOL or PL/M to support the application programs.

III.3.5 Application Programs

The applications programs include all programs necessary to meet the requirement of the system processes previously defined in Section II.2.2 of this document. These programs are to be developed and provided as part of the system package and must be accompanied by formal documentation.

The language used in these programs should be easy to understand and should lend itself to modifications by the user. In this regard, self modifying code is discouraged.

All applications programs must be constructed in a structured fashion.

Program packages required include programs to provide:

Screen formats (including preformatted forms)
Message switching
Protocol conversion
File stripping to generate the summary lists of files specified by the operator.
File editing

The application programs must also include any user requested packages. The application packages required by the user agency will be completely specified during the design stage. Future

application requirements should also be identified at this time.

Information transfer must be fast and efficient with minimal probability of error in transcribing of information to the system files.

The major internal data base file utilized by the complaint taking function is the Event file. This position must be able to input data to this file.

In addition, where specified by the user agency, the complaint taker should have access to the Address file, Address Directory, Business Reference file, Briefing file, and Special Attention file. In some cases access may be confined to review only, in others, the capability to input to the file will be possible. The decision as to the extent of interaction permitted is left to the user agency and as such should be defined in the derivation of detailed specifications to meet their needs.

In most system installations, access to external files will not be required by the complaint taking function although provision for this should be made in the design.

III.4.2.2 Hardware Requirements

In addition to the support provided by the system nucleus and peripheral storage media, the complaint taking function requires various dedicated hardware components. The descriptive details contained in the following paragraphs are supported by detailed hardware requirements contained in Appendix B.

Terminal Devices

The principal interface between the complaint taker and the system must be an interactive Video Display Unit/Keyboard Device. The display unit must be of sufficient size and character density to accommodate the event file, event summary file or support information when required. These files will normally be called up consecutively with recall for cross referencing of information. Alternatively, two video display units might be considered.

Character size, spacing, colour and resolution must be such as to minimize human discomfort and fatigue when used continuously for periods of up to eight hours. Substantiating evidence to this effect from a recognized agency should be provided. Intensity and contrast controls must be provided within easy reach of the operator. Focus control should be operator adjustable.

Consideration should be given to the possible use of multi-coloured display media to delineate screen areas, separate special fields and irregular conditions etc. However, the colour technology must be such as to produce high resolution and stable displays, as human factors such as eye discomfort and fatigue will be important acceptability considerations.

The keyboard should be operationally detachable from the video display housing and provide a full complement of ASCII characters arranged in a QWERTY layout.

In addition to the ASCII character set, data manipulation function keys must be provided to effect the transmission and receipt of information to and from the terminal and control a visible cursor.

Tabbing must be programmable and operational under both local and remote control.

Keys should be provided that can be assigned specific functions by the user agency. These additional keys will be used to request various display modes and entry forms, to enhance data entry or to initiate any other system processes frequently used or requiring immediate action.

A feature to be seriously considered is a function oriented data entry format where sequential tabbing and manual cursor positioning is largely replaced with random positioning capability via field function keys, i.e., consideration should be given to the definition of an optimum combination of field keys and sequential tab control for complaint details entry.

Keytops should be of a colour, size and finish to provide ease of use.

Printer Requirements

The complaint taker must have access to a hard copy printer. Although it is not necessary for each position to support a separate printer, this facility should be available on a shared use basis. Printer requirements should be firmly established by the user agency.

The printer should be controllable from the keyboard of the complaint taker. Detailed characteristics are contained in Appendix B.

III.4.2.3 Software Requirements

Systems application computer programs (software) must be provided to support each of the eight principals tasks of the complaint taking function.

Before any task can be performed from the complaint taking position, an operator must be logged on by a sign-on procedure imbedded in the system software. This procedure should consist of special key operations or entry of an alpha-numeric code. The system must access a stored security cross-reference file to determine the validity of the sign-on information and the various system files to which access will be allowed. The identification number should then be used on all event files to identify the individual complaint taker. A sign-off procedure must also be incorporated into the system to relieve an individual from terminal responsibility. This may be implemented as either a separate function or by signing on another identification.

The video display unit should be blank when no operator is signed on.

Recording of Event Details

Complaint event details are entered into the system events file via the video display unit and keyboard device. Upon receipt of a complaint, the operator must be able to display a blank complaint entry form. This display should be composed of 'label'

fields indicating the type and location of information to be obtained and associated data fields where the data will be displayed when entered via the keyboard. The details of the complaint entry form will vary from agency to agency but should correspond to those fields in the event file.

Various data entry modes should be investigated to maximize the positioning and labelling of input data. In the case of a function oriented entry format, utilization of a blank complaint entry form display will be at the discretion of the agency.

Certain fields in the complaint event file must be automatically filled by the system at time of event initiation. These fields include:

Time and date of complaint entry.
Complaint operator's identification.
Event number.

These fields should be displayed to the complaint taker.

The system should provide data entry prompting which includes such features as:

Indication of field overflow (actual field size need not correspond to display).

Indication of improper characters in fields, such as; alphabetical characters in a telephone number, numerics in a name.

Indication of numerical values out of allowed range.

Indication of missing mandatory data upon attempted release.

The prompting must indicate the field in which the error exists but otherwise not interfere with the normal progress of the task.

Where additional user files are present, (e.g. address file, business reference file, special attention file) the system should provide default assignments to fields in the events file, perform cross checking on the input data against the stored information, and provide appropriate indications to

the operator. Default assignments which should be considered under these conditions include:

Priority code based on event.
Dispatch zone.
Recommended unit(s).

Where default information is assigned to fields, those fields must be displayed to the complaint taker.

Cross checking of input data against existing files should provide warning of:

Irregular or criminal activity, associated with the event address and named party.

Irregular activity or dangerous situations associated with the name and location of the victim or firm.

Non-existent, or otherwise invalid address for either complainant or victim.

Special considerations or procedures associated with the victim's or firm's address.

When cross checking by the system yields relevant information, an indication must be given to the operator as to the applicable field(s). Provision for displaying the details must also be provided and those details must be permanently appended to the stored event details for future reference.

The time, relative to data entry, at which the cross checking should occur depends upon when each field of input data is forwarded to the central processor. A preferred mode of operation is to transmit each field of data on receipt of a field delimiter or cursor positioning information for the next field. With this mode of operation, cross-checking should be done immediately on receipt of appropriate fields but should not delay entry of the next field of data.

An alternative, but less desirable, mode of operation is to transmit all data on completion of the complete event details by depressing a transmit key. This mode of operation requires performing all

cross-checks after all event details have been received and may introduce some delay.

The event summary must be displayed upon request to the complaint taker to permit cross checking for duplicate events. The capability of the system to perform automatic cross checking for duplicate events could be an option selected by the user agency.

High speed access to the event file is of primary importance to both the complaint taking and the dispatch functions. This requirement should be a major consideration in the design of the system data base.

Accessing Organized Information Sources

In most installations, the complaint taker's position will not require access to external data bases. However, provision should be built into the design to accommodate this capability without major modifications to the system software.

The complaint taking software must be designed to allow for future access to a large variety of computerized information files within the agency itself.

Insertion of Additional Complaint Details

The complaint taker must be able to recall active events and modify event details or insert additional information. The extent to which modifications and additions can be made is as determined by the user agency.

The system must provide the capability to identify that this file has been modified, what modifications have been made, the originator, and the time and date of modification.

The capability should be provided to merge or link duplicate events or to cancel an active event completely. Event cancellation should be a multi-key operation to avoid accidental loss of event details. Event cancellation should be permitted by authorized terminals only.

The system must provide the complaint taker with the capability to redirect a file after modifications have been made. For example, if modifications are made to an event file for which units have already been dispatched, the complaint taker must be able to immediately redirect the event to the dispatcher. An indication must be included, that this event has been assigned but changes have been made and revised information is available.

Once an event has been terminated, it must no longer be modifiable by any system function. However, the system must provide the capability to append additional notes and details to any closed file. The appendage should be stored as part of the original event details if the event is still accessible to the system. If not, the appendage should be sent to the appropriate records functions.

Routing of Events

The complaint taker must be able to route an event to the dispatcher. The system must provide the complaint taker with the capability of indicating to the dispatcher whether the event is new or a modified event in progress. If a default type of dispatch routing is implemented, the default made should be in favour of new events.

Depending upon agency size, more than one complaint taking and dispatch position may be present. In such cases, the system must be sufficiently flexible to accommodate a variety of routing procedures between the complaint taking positions and the dispatch positions. The system must also provide the ability of changing complaint taking/dispatch routing assignments to accommodate position changes and/or the addition of positions during peak periods.

Event routing is one of the most frequently used commands on the complaint taking keyboard and hence consideration should be given to the use of the function key commands for this operation.

The complaint taker must be able to route the event details to various system functions other than the dispatch function. These functions will normally be associated with the organized information source files within the MRDS or with manual information

files within the agency. Hence, the hardware to which the reports must be sent will be either a hard copy device in which case formatting and interfacing software must be provided, or part of the MRDS data base.

In general, the routing of event details within an MRDS will vary considerably among police agencies. The system design must be sufficiently flexible so as to handle a variety of interfacing requirements in this regard.

Gather and Route Briefing Material

If required by the user agency, the complaint taker must be capable of inputting to the briefing file and referencing this file. The existence of this file is dependent upon the requirements of the user agency.

III.4.2.4 Work Station Configuration

All hardware required by the complaint taking function must be integrated into a work station/console arrangement so that each piece of equipment requiring manual interaction is within easy reach of an operator seated at the console.

The work station must have sufficient flexibility to accommodate the varying requirements of different user agencies. Existing equipment could include telephone switching equipment, information boards, a conveyor belt system, maps, and quick reference desk top files.

The console should be configured to permit incorporation of the telephone unit within the console. Outlet(s) for headsets should be provided to permit hands-free telephone operation. If required, the console must be able to house call-transferring equipment that permits the introduction of telephone monitoring by other com-centre positions. In addition, provision must be made for mounting of a short term recorder/playback device for incoming telephone calls, and an intercom to

permit ease of communication with other functions within the com-centre.

The console must provide for a writing surface of at least 40cm X 60cm. This should be transparent, having the ability of accepting an underlay (e.g. reference listing, reference phone numbers, etc).

Consideration should be given to flexibility in the positioning of both the video display unit and keyboard with respect to the operator to accommodate variations in individual preference. Vertical and horizontal rotation of the video display unit and console surface positioning are deemed desirable.

The keyboard, should be detachable from the video display housing and locatable virtually anywhere within reach on the console surface. The console should be designed for optimal use by either left or right handed personnel, male or female.

Lighting must be such as to minimize glare from the video display unit and keyboard. All surfaces should be coloured in a matt or dull finish to further minimize glare.

The work station must be configured to permit ease of maintenance and servicing. It must be operationally and aesthetically suitable for installation in the communications centre environment. The operational requirements must not be compromised by the aesthetic aspects. Console configuration is to be finalized in conjunction with personnel from the user agency at time of system implementation.

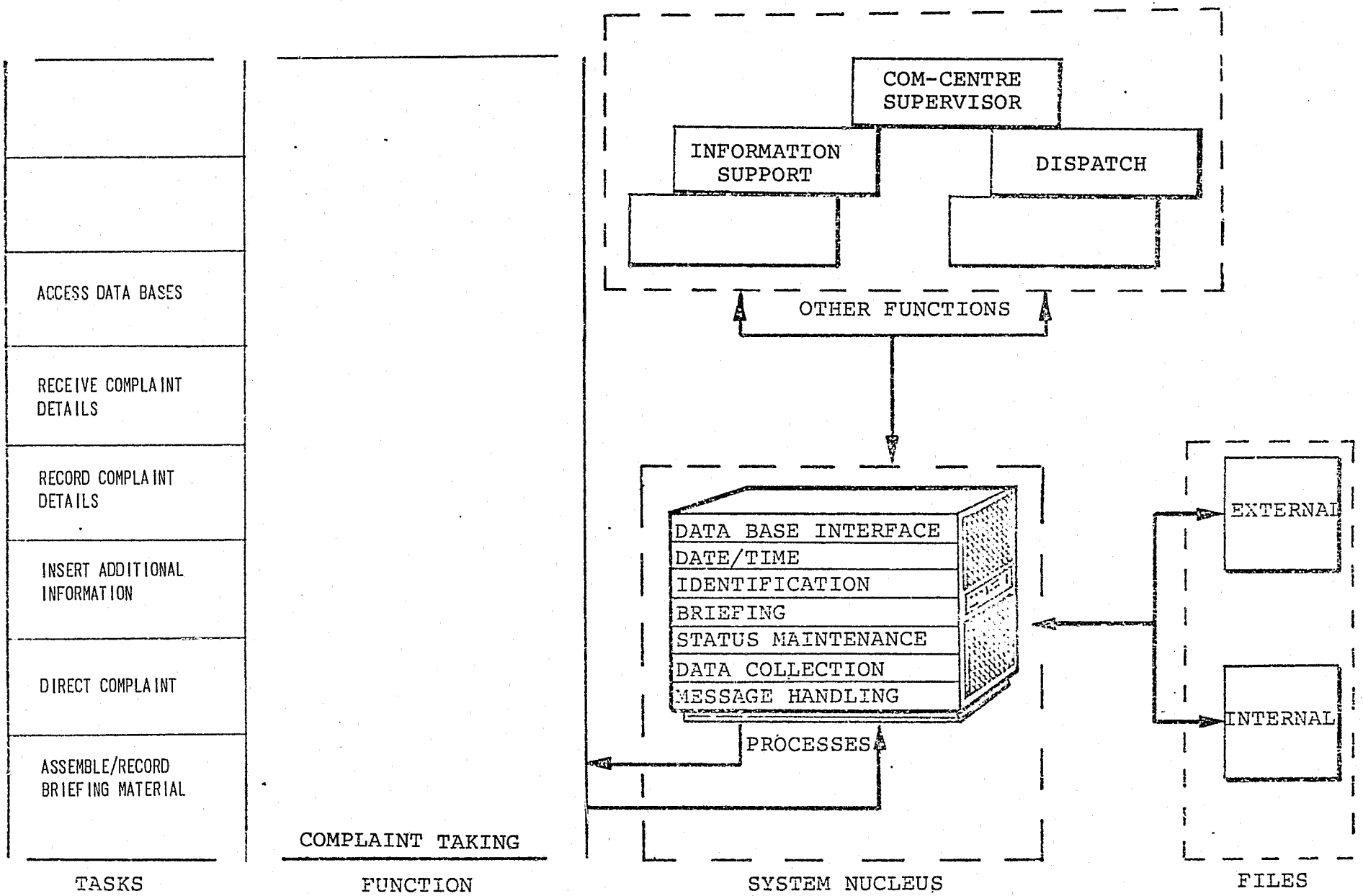

FIGURE III.4.2

COMPLAINT TAKING FUNCTION - SYSTEM INTERACTION

III.4.3 Information Suppport Function

III.4.3.1 General

The role of the information support function is to interact with other functions to maintain and provide the totality of operational information required by the user agency. This function is potentially the most diverse of the MRDS functions, dependant on such variables as:

The degree of information base computerization.

Individual agency policies concerning data base access.

External data base access restrictions.

Agency policies concerning other functional operational procedures.

The number of terminal equipped vehicles.

The tasks and activities relevant to this function are identified in Section II.2 of this document and detailed in the document 'Police User Profiles', dated January 1976. The distribution of these tasks varies greatly from agency to agency as in some cases information support is relegated to one or a combination of the other functions. Task distribution will determine the hardware and software requirements.

Figure III.4.3 shows the tasks and system interactions associated with this function.

To fulfill its role, the information support function must have query and maintenance access to most internal agency information sources as described in Section III.2. These include:

Event files.
Address files.
Business Reference files.
Briefing files.
Special Attention files.

The information support function also serves as the interface between the agency and agency files

(either manual or automated). These include records such as:

Local ordinance violations.
Impounded vehicle lists.
Missing property lists.
Outstanding local warrants.
Paper backup for some external files(i.e., CPIC).
Local agency policies.

The external files to which this function requires access includes:

CPIC.
Provincial data bases.
Local data bases.

Access to external data bases may be through a common terminal or through individual dedicated terminals.

III.4.3.2 Hardware Requirements

Terminal Device

The primary interactive device utilized by the information support position must be a VDU with detachable keyboard. The features that must be present in this device are described in Appendix B. In addition the terminal must have scrolling capability in order to handle extraordinarily long files and extra function keys to expedite queries and data base manipulations. The information support function terminal must also be able to control and direct output to a hard copy printer. This printer will in most cases be a low speed device. Alternatively, the system line printer could be utilized by some agencies. Both devices are described in Appendix B.

The information support function may require hard copy terminals for access to external data bases. These terminals will most likely be teletype type terminals with minor protocol variations depending on the data base interfaced. In rare instances this

type of information gathering may be performed by telex or telephone.

Radio

A dedicated radio channel could be utilized between the information support function and the mobile units. In this case, the information support function must be supported with a radio interface and controls. In cases where a separate channel is not provide traffic will be routed via the common radio channel. Voice messages will be relayed through the dispatcher.

III.4.3.3 Software Requirements

The software requirements for the information support function must be designed to permit file access, manipulation and maintenance, as this function provides much of the access to both internal and external data base files. This software must be capable of routing information, in either formatted or free form, to any system terminal.

The information support function must be provided with software that enables it to gather and analyze statistics in order to determine:

a) The frequency of a particular class of event or activity (e.g. no. of burglaries etc.).

b) The efficiency of resource utilization.

c) The optimum combination of resources required at any given time based on previous trends.

Consideration should be given to designing a software package to run in a backup processor to provide statistical gathering and analysis capability. This provides parallel processing capability without jeopardizing the operation of the primary processor and can be used to generate management reports.

The information files on an MRDS will require updating as events are resolved. Updating may occur daily, weekly or monthly as determined by the user agency. The system software must be such as to facilitate this updating.

III.4.3.4 Work Station Configuration

The information support work station varies from a single desk top terminal to a full console with radio, telephone equipment, hard copy unit and an interactive VDU. Regardless of the complexity of the equipment present it must be integrated into a unified work console with all controls within easy reach of the operator. The VDU must be positionable on the work surface for operator comfort and screen glare reduction. A minimum area of 40cm by 60cm to serve as a writing surface must also be provided.

The information support function may also require desk-top or larger drawer files, within easy reach. These must be incorporated into the configuration if required.

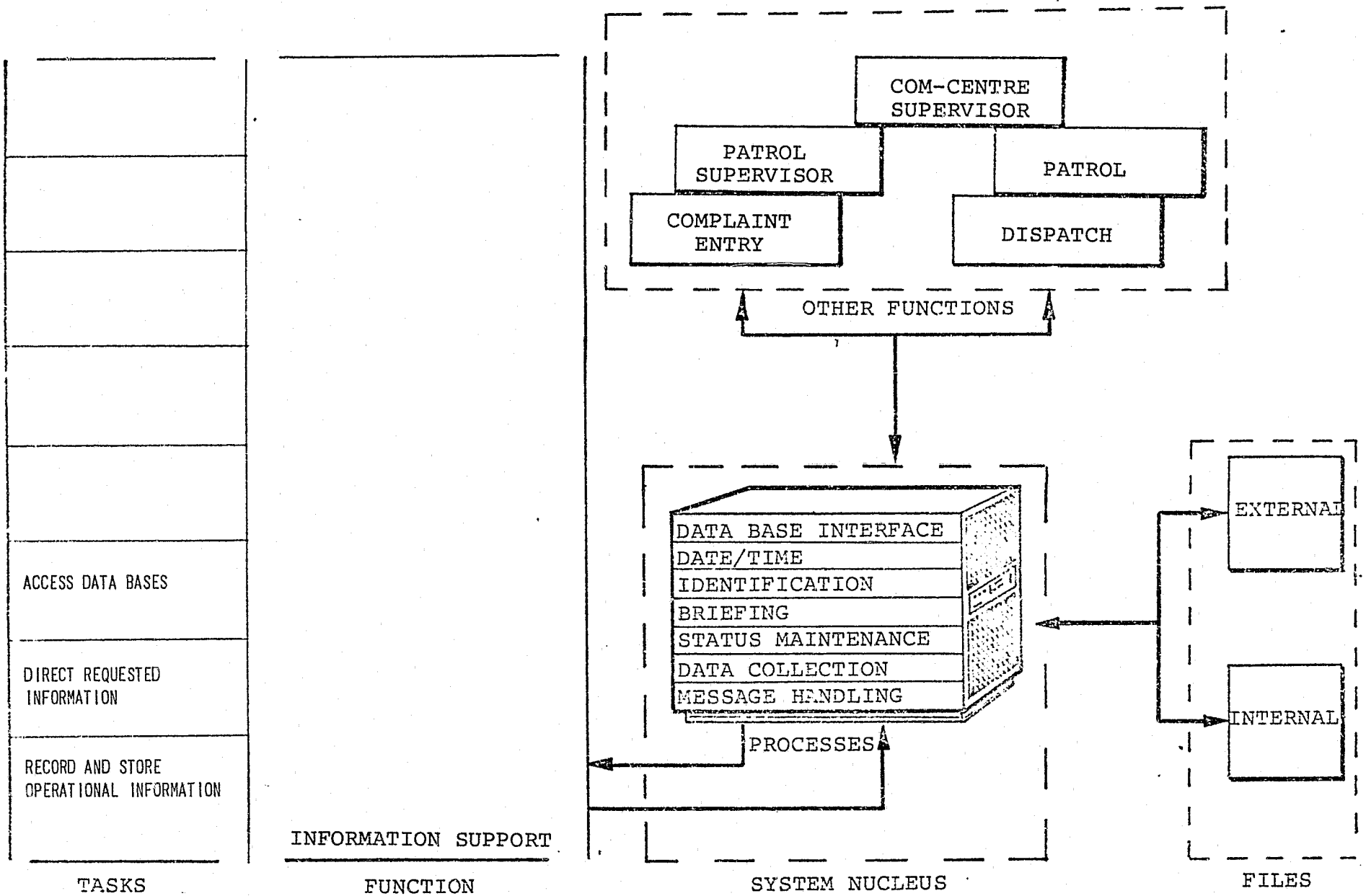

FIGURE III.4.3

INFORMATION SUPPORT FUNCTION - SYSTEM INTERACTION

III.4.4 Dispatch Function

III.4.4.1 General

The principal role of the dispatch function is the allocation of the police agency resources in response to public complaints and requests.

The dispatch function has been presented in Section II.2 of this document based on the detailed description contained in the CPIC document 'Police User Profiles'. Figure III.4.4 shows this interaction of the Dispatch Function within the sytem.

Frequently the dispatch position is involved under varying operational circumstances, in all activities and tasks of the communications centre. The design of both the hardware and software for the support of the dispatch function must embrace this magnitude of flexibility. Additional complaint details and new events can reach the dispatcher from patrol units and the dispatcher must therefore have event file modification and initiation capability. In smaller agencies, or in large agencies during off-hours, the dispatch function must be capable of assuming many of the duties of the supervisory function such as handling emergency and multi-unit dispatch events. Information retrieval, storage and cross checking are also a requirement of the dispatch function to support the requests of field units for this type of information.

The dispatch tasks are comprised of activities which interact with the central processor to effect information exchange between the dispatcher and other system functions and between the dispatcher and data base files. The specific internal data base files used by the dispatch function include: the event file, the event summary file, the unit status file and the unit summary file as presented in Section III.2.1. In addition, files as established by the user agency are referenced. These could include; the briefing file, address history file, business reference file, and special attention file.

The dispatcher must be able to access with all external data bases interfaced to the MRDS. The external data bases available will vary with the

agency but can be expected to consist of: National data base (CPIC), Provincial data base (MVB), Municipal and local files, (traffic violations, etc.).

III.4.4.2 Hardware Requirements

The dispatcher requires various hardware components to enable him to interact with the system. The descriptive details contained in the following paragraphs are supported by detailed hardware specifications contained in Appendix B.

Terminal Device

The principal interface between the dispatcher and the system must be an interactive Video Display Unit/Keyboard device. The video display capability must be greater than for the complaint taking function since a larger volume of information must be simultaneously displayed. While a variety of display 'modes' must be available to the dispatcher, the principal mode will require continuously updated displays of unit status summary and event summary.

Character size, spacing, spectral emission and resolution must be such as to minimize human discomfort and fatigue over periods of continuous use of up to eight hours. Intensity, contrast and focus controls must be provided as described in connection with the complaint taking terminal. In view of the large volume of material displayed, either multiple display units or shared units are acceptable and should be considered for this function. The configuration used will be specified by the user agency.

The keyboard should be operationally detachable from the video display unit housing. It must provide a full complement of ASCII characters arranged in a QWERTY layout. In addition to the ASCII character set, data manipulation function keys must be provided to permit, the transmission and receipt of information and the control of a visible cursor. Tabbing must be programmable and operational under both local and remote control. Special purpose

function keys must be provided with the keyboard to facilitate the dispatch function. These keys will be utilized to perform such functions as:

a) Entry into different modes of operation and requesting of associated display formats. For example; normal dispatch mode, complaint entry, complaint modification, data base enquiry.

b) Extracting and queuing of information for digital radio transmission.

c) Unit status updating.

d) Entry to Briefing Mode.

The terminal must comply to the standard RS-232-C computer interface.

Radio Equipment

The dispatch function must access both the data and voice radio interfaces for communication with units in the field. A standard complement of radio controls, channel selectors, signal strength indicators etc., is therefore required by the dispatcher. Voice communication should be via a headset to permit 'hands free' operation. Digital communication messages must be initiated and composed via the terminal keyboard. The radio and radio channel provide a 'double communication link' between the dispatcher and field units (i.e., voice and digital data exchanges). To properly perform the dispatch function and to fully utilize the capability of an MRDS, the dispatcher must be capable of alternating between the two transmission modes as the situation demands.

The rate of information transfer between the dispatch function and central processor/data base must be as fast as possible. The dispatch function is a demanding, real-time critical job and significant display delays cannot be tolerated.

III.4.4.3 Software Requirements

From a system design point of view, the dispatch function has five distinct types of operation. These are:

a) Normal dispatch of units and conveyance of complaint details to the assigned units.

b) Status monitoring and review of field unit activity.

c) Data base enquiry/response.

d) Emergency event monitoring and dispatch.

e) Message handling.

For each type of operation, different video display formats are required. Hence, considerable thought must be expended in organizing the display of information to the dispatcher. There must be at least three major display areas as previously described, one for unit summary, one for event summary and a third which, in normal operation, displays event details. The first two must always be displayed (except when the terminal is logged off), while the third can change upon request. Switching from one activity to another should be acheived by function key commands. The types of operation as described need not be operationally distinct in that the same display may be used for more than one or simultaneous displays may be used, as selected by the system user.

As with the complaint taking position, a sign on/off procedure must be built into the system to provide a unique terminal and/or user identification. Sign-off must blank the screen if commanded directly or simply transfer control if affected with a second sign-on.

Event Assignment

Upon completion of event entry and validation an event must be automatically added to the event summary file and displayed at the appropriate dispatch position.

The dispatcher must be able to identify an event in the unassigned event queue. Upon assignment the dispatcher must be able to move this event to the assigned queue (or otherwise flag it as having been assigned).

In systems where suggested assignments are automatic, the dispatcher must have the ability to override this assignment if desired.

In large installations involving several dispatchers and, zones and/or districts, the radio channels available to each dispatcher, the zone assignment and complaint routing must all be co-ordinated. A dispatcher should generally have the ability, to access the events waiting queue for any zone to which he can route vehicles via radio contact. In the event of overloading in one zone or district, several dispatch positions could then be used to clear the backlog of events waiting.

Unit Status

The system must provide the dispatcher with a continuous unit summary display which shows the status of all field unit resources associated with the position. Upon request, the dispatcher must be able to obtain the unit status details for any of the units on his summary display.

Unit status changes must be possible from the dispatchers terminal.

It should be possible to add field unit location as a qualifier to a status change by both the dispatcher and the patrol unit. The dispatcher must have the capability of a adding location information to this display, for both terminal equipped and non-terminal equipped units.

The time of the last status change enables the dispatcher to monitor the resources under his control for possible danger or difficulty encountered. A timing facility, presettable by the dispatcher, should be available whereby the time a unit is in a particular status can be checked. After the pre-selected interval, the system must warn the dispatcher, that the interval has expired.

Normally, the dispatcher must 'match up' entries in the events summary queue (and display) with available patrol units in the unit summary status display. To properly perform this task, the dispatcher must be able to request a display of the details of the event.

Assignment of unit(s) to an event should immediately result in the system automatically performing an update of the unit status file.

The dispatcher may, on occasion, be required to reassign resources from one event to another of higher priority. Therefore, the system must handle the reassignment, file and display modification required to accommodate the change without loss of event details and with a minimum amount of effort. The ease with which this procedure can be performed should be weighed against the risk of accidental double assignment.

The dispatcher must, on certain types of calls, be able to monitor the complainant's telephone conversation and dispatch units to the scene of the event before the event has been recorded. Since the mobile units will then be entering status changes such as 'en route' or 'at scene' before being assigned an event and may digitally request event details before entry has been completed, consideration must be given to designing the system software to support this eventuality. One possible procedure would be to have the dispatcher or complaint taker initiate the event number to permit correlation with the units assigned. The system should then be able to co-ordinate the activities associated with that event as they occur and consolidate details arriving throughout the system into one event file.

Modification to Event Files

The details of an event may change after arrival of the patrol unit at the scene. Hence, the dispatcher must be able to display the details of any event and make changes and additions to the file. Certain changes, such as additional descriptive details, will require only the appending of information to the file. Other changes such as assigned units, priority etc., will require requeuing and display updates. Consideration should be given in the

system design to the implications of these kind of changes in all fields.

The dispatcher, should have the ability to merge multiple complaints. This decision as well as the extent to which changes can be made rest with the user agency. Event cancellation should be permitted by authorized terminals only.

Complaint details can be received by the dispatch function from patrol units. The dispatcher should have the ability to enter and validate an event.

Once entered by the dispatcher the event must be incorporated into the system in an identical manner as other events. However, the dispatcher must have the option of either immediately dispatching units, in which case the status display is updated, or placing the event in the events waiting queue for display and future dispatch.

Patrol/Dispatch Communications

On-going communication between the dispatch function and all field units is an implicit part of the dispatch function. The MRDS must serve to enhance the inter-communication capability with the addition of the digital communication facility. It is essential that information, both structured or 'free format' be quickly and easily exchanged, in both directions.

Consideration should be given to the possibility of dedicating a portion of the display to this form of communication. This area could be used for the composition of narrative messages and for the display of received digital messages, message waiting indications, emergency signals etc.

The system must be designed so that the voice and data transmission codes are operationally interchangeable. The mobile units must be able to transmit all information either verbally or digitally as desired and determined by agency policy. Therefore, the dispatcher must be able to enter status and other information via the dispatch terminal that would normally be received directly from the mobile terminal. Similarly, the dispatcher must be able to compose and send free format and structured messages either verbally or digitally as

deemed appropriate. This same procedure should also be adopted in the inter communication among functional positions within the communication centre itself.

The structured commands or 'function commands' which can be received from mobile units will vary from agency to agency. The system must be sufficiently flexible so as to accommodate a variety of such commands and support the appropriate message routing and display requirements. The dispatch terminal is the principal destination for these messages.

In similar fashion, the dispatcher, via the terminal, must be able to communicate with all other functional positions in the communications centre.

Data Base Access

The dispatch function must have access to all internal and external data base files on the system.

For security, control and logging reasons, certain external data bases may not be accessible from the dispatch terminal. In such instances, a separate dedicated terminal may interface directly to the data base. This terminal would be shared by several communications center personnel and should be conveniently located with this in mind.

Alarms

In many instances, alarms from local buildings and institutions may terminate in the communications centre. The dispatcher must have access to procedures to be followed for each alarm condition.

Supervisory

Supervisory capabilities should be incorporated into the dispatch terminal's command repertoire to permit implementation at the discretion of the user agency.

Operational Briefing Data

The dispatch function may be able to maintain a briefing file if established as a requirement by the user agency. This file must be compliant with the file structure as identified in Section III.2.1.

III.4.4.4 Work Station Configuration

The hardware required by this function must be integrated into a work station/console arrangement wherein each piece of equipment requiring human interaction is within easy reach of an operator seated in one place at the console.

The work station must be sufficiently flexible to accommodate different agency requirements and varying amounts of equipment already present in the communications centre. This will involve the incorporation of various types of radio control, microphone and interfacing equipment, conveyor belts, information boards, maps, quick reference sheets and desk top files, paper, writing materials and intercom equipment.

Considerable care should be taken in mounting the video display unit(s) and keyboard(s) relative to the operator. The video display unit(s) should be flexible as to location of mounting and each should be independently adjustable with respect to vertical rotation. The keyboard must be operationally detachable. The keyboard and display should be mounted in the console area. Mounting locations should be discussed with the user agency during the design stage.

Radio controls and monitoring equipment should be integrated into the console area where possible in a manner to maximize ease of use. A writing surface must be provided with a minimum area of 40 cm x 60 cm. A transparent writing surface with allowance for the insertion of underlay reference material is desirable.

Keytops and display screen should be selected so as to minimize the amount of glare and reflection from their surface. All surfaces should be a matt finish where possible.

The work station must be configured to permit ease of maintenance and servicing. It must be designed to maximize operational utility while retaining the aesthetic qualities required for a communications centre environment. Console design and configuration must be finalized in consultation with personnel from the user agency at time of system design.

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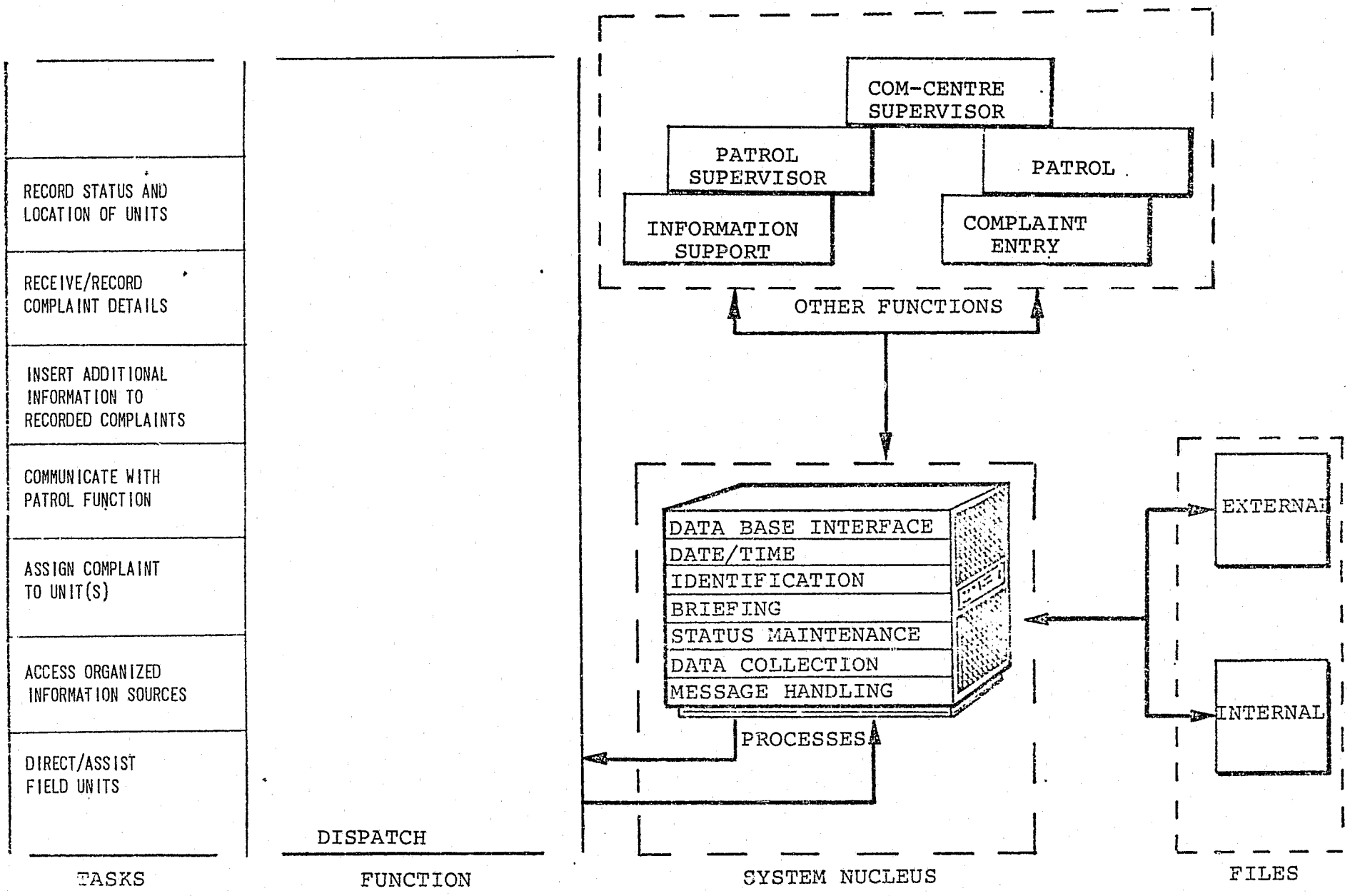

FIGURE III.4.4

DISPATCH FUNCTION - SYSTEM INTERACTION

III.4.5 Patrol Function

III.4.5.1 General

The principal role of the patrol function is the resolution of recorded complaints, general patrol duties, and preventive policing.

The patrol function was introduced in Section II.2 of this specification and discussed fully in CPIC document "Police User Profiles", dated January 1976. The interactions between the patrol function and the system is shown in Figure III.4.5.

An MRDS must be designed to permit communication between the patrol function and:

- Dispatch Function.
- Information Support Function.
- Com-Centre Supervisor.
- Patrol Supervisor.
- Other Patrols within the agency.

An MRDS must provide the hardware and software necessary for accessing both internal and external files. Detailed information pertaining to both internal and external files is listed in Appendix A.

III.4.5.2 Hardware Requirements

MRDS supportive hardware components that must be available to the patrol function consist of a terminal device including control and logic unit, and radio equipment.

Terminal Device

The terminal device must consist of the following components:

- Visual display unit.

Keyboard including status and function keys.

The video display character size, resolution, colour and spacing must be such as to be easily read under various light conditions ranging from darkness to direct sunlight. The visual display unit must be of sufficient size to allow simultaneous display of from 200 to 500 characters.

The terminal keyboard must have a 'QWERTY' typewriter character arrangement. Colour coding should be utilized to identify related groups of keys such as function and status. There must be an emergency key that is positioned to allow easy access but protected from accidental activation. The keyboard must have controllable lighting sufficient for operation in total darkness. Keyboard lighting must be such that it will not silhouette the operator or passengers in the vehicle or effect the vision of the driver at night. Depression of any key must produce a positive touch.

The terminal device, display unit and keyboard, should be housed in a single unit. This unit must be capable of being installed in the front portion of a vehicle without crowding either driver or passenger. The logic and control unit necessary to support the display and keyboard, if housed in the trunk area of the car, must be constructed so as to remain operational under conditions encountered in this space.

Detailed specifications of the mobile terminal device are as listed in Appendix B.

Radio Equipment

Any mobile terminal device must be installed in conjunction with the radio equipment presently in use. Both digital and voice equipment must be capable of interfacing in either a shared channel or dedicated channel transmission mode. The digital equipment must be interfaced with a minimum amount of radio modifications.

If a shared channel is utilized for both digital and voice tranmission, voice must have priority. A separate digital channel is strongly recommended.

To ensure MRDS and RF equipment compatibility, a minimum standard for voice equipment must be

specified by the system contractor during the design stage.

III.4.5.3 Software Requirements

The software requirements of this function must consist of that software necessary to support the functional tasks. The software may be partially supported by 'firmware' in the mobile terminal and software contained in a communications control device located between the transceiver and the system nucleus.

Internal Files

The patrol function must have access to the following internal files:

a) Event File - request for display of event detail. Input must be restricted to event disposition and insertion of additional details.

b) Address File - query/response only.

c) Business Reference File - query/response only.

d) Unit File - inputs consist mainly of status conditions although query capabilities for unit status should be possible.

e) Special Attention File - query/response only.

f) Narrative Message File - must be capable of sending and receiving narrative messages to and from any addressable terminal.

External Files

An MRDS design must allow access by the patrol function to those external files available to the user agency. Access in most cases will be restricted. The access restrictions to external files will be those imposed by the external data base authority. The patrol function will be allowed

access to the following CPIC files for query/response only.

Vehicles File.
Persons File.
Property File.
Boats and Motors File.

III.4.5.4 Equipment Configuration

The equipment required by the patrol function in each unit must be installed with a minimum of modification.

All supportive components, such as control logic units, to both the radio and MRDS equipment should be installed in the trunk portion of the vehicle. Space availability both in the front and trunk portion of the vehicles is critical and any additional equipment must be designed and arranged accordingly.

The terminal device must be positioned to allow ease of operation and viewing by both the vehicle operator and/or passenger.

All equipment must be configured to allow ease of maintenance with sufficient flexibility to allow similar configurations in all units, regardless of the manufacturer of the unit.

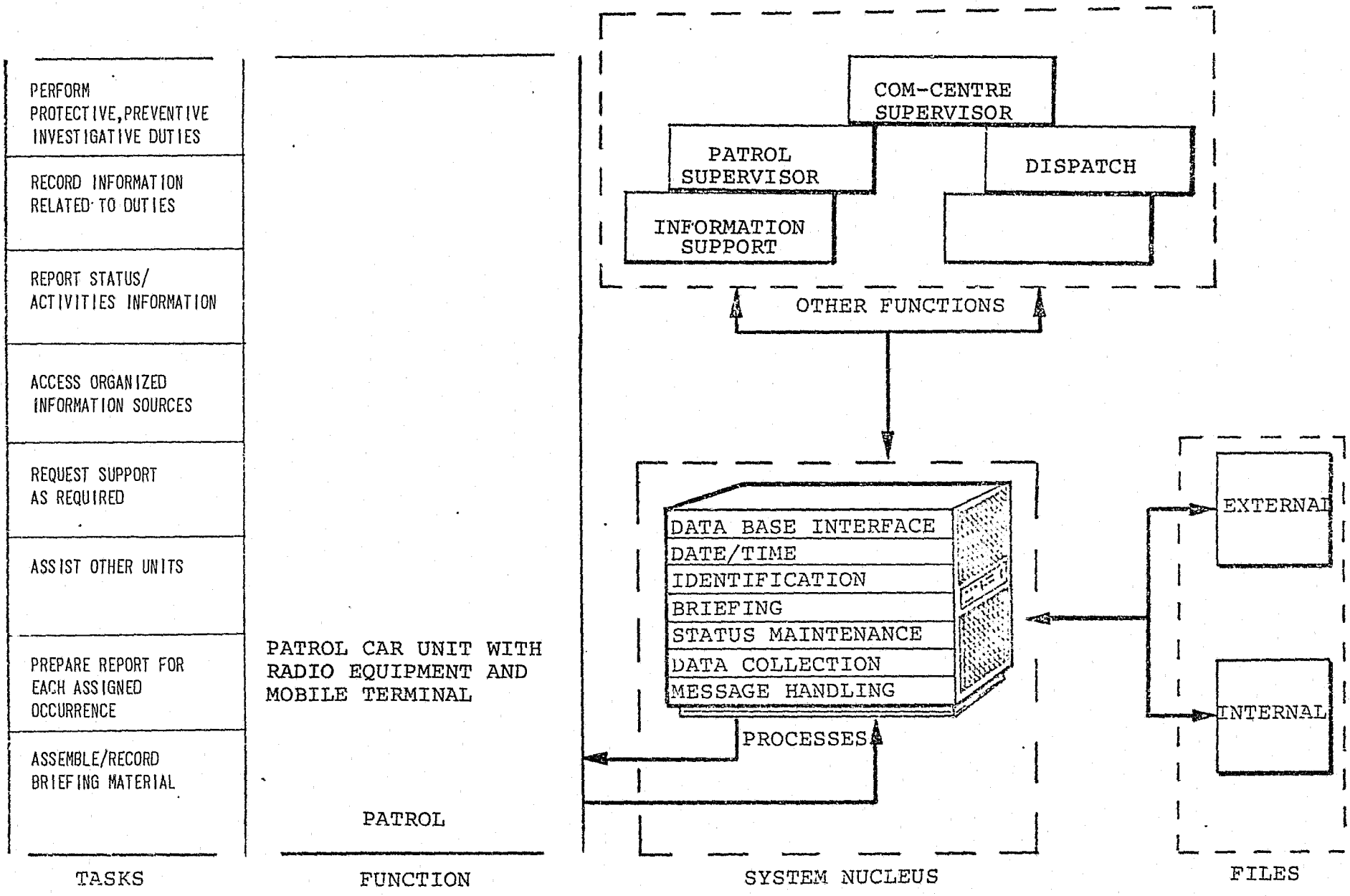

FIGURE III.4.5

PATROL FUNCTION - SYSTEM INTERACTION

III.4.6 Com-Centre Supervisor Function

III.4.6.1 General

The control and supervision of the com-centre operation is the responsibility of the com-centre supervisor function. This includes ensuring the continual availability and effective operation of all equipment and personnel.

The com-centre supervisor function was introduced in Section II.2 of this document and discussed fully in CPIC document, "Police User Profiles", dated January 1976. The interactions between the com-centre supervisor function and the system are shown in Figure III.4.6.

The design of the hardware and software of an MRDS must support this function in the following areas:

a) Must allow the capability of performing any of the com-centre functional tasks.

b) Must allow monitoring of all tasks performed within the system.

c) Must allow the capability of controlling the system functions.

d) Must allow the capability of altering the functional tasks allowed at any com-centre work station.

e) Must allow the capability of monitoring operational activities such as event handling and resource utilization.

The com-centre supervisor function must be capable of communicating through the MRDS with any of the functional positions.

This function will require access to all internal files supported by an MRDS as well as those external files available to the user agency.

III.4.6.2 Hardware Requirements

The hardware that must be available to this function consist of the following components.

Terminal Device.
Radio Equipment.
Hardcopy printing device.

Each of these components are as described in the following paragraphs with detailed specifications as listed in Appendix B.

Terminal Device

As with the complaint entry and dispatch functions, the principal interface between this function and the system must be an interactive Video Display Unit/Keyboard device. This device will be utilized for monitoring as well as for the performance of tasks associated with other com-centre functions. As a result of the varied requirements, two display units must be provided. A common keyboard should be considered which can be used to control either display.

Character size, spacing, spectral emission and resolution must all be such as to minimize human discomfort and fatigue. Controls relating to intensity, contrast and focus must be provided.

The keyboard should be operationally detachable from the display unit and provide a full range of ASCII characters. The key arrangement must be a "QWERTY"layout. The normal complement of data manipulation function keys must be provided. Function keys must be grouped in one area of the keyboard and should be of a different colour than the data keys. These function keys must be consistent with those on the complaint entry and dispatch terminal device.

The terminal must be compatible with the standard RS-232-C computer interface.

Radio Equipment

This function must have sufficient RF equipment to permit:

a) Monitoring both digital and voice communications.

b) Digital and voice communications to/from field units.

c) Channel selection.

The radio equipment must be consistent with that utilized by the dispatch function.

Hardcopy Printing Device

This function should have access to a hardcopy printing device, shared with other com-centre functional positions. This device should be a high speed printer with a full ASCII character set.

Telephone Requirements

This function must be capable of receiving and monitoring calls for service. The telephone equipment must be consistent with that of the complaint-entry function (Section III.4.2). A headset should be supplied, however use will be optional.

III.4.6.3. Software Requirements

The software must be designed to address the following operational modes:

a) Monitoring of all com-centre functional positions.

b) System monitoring including system performance monitoring and monitoring loads on the system.

c) Assuming the role of any of the functional positions within the com-centre.

d) Changing, monitoring, fine tuning or altering system processes while in an on-line mode. These control modules afford the capability of:

- recording for system maintenance.
- controlling tasks allowed from various termina s.
- performing command and control functions.

e) Modifying functional task assignments. These modifications consist of:

- authorizing terminal access.
- varying terminal functions and tasks.

f) Obtaining command and control information both on an immediate and long term basis. This information will consist of:

- System loading including dispatch, complaint and system queues.
- System file activity and/or utilization.
- System response times.
- Resource management information such as event activity in a given area or depletion of available units.
- Operational status of terminals (i.e., either sign-on or signed-off.

g) Internal data base file access.

h) External data base file access. CPIC file access will be restricted to query/response only.

i) Narrative message capabilities. These messages must be free format and may at the supervisors discretion, be sent to one or several terminal addresses.

III.4.6.4 Work Station Configuration

The hardware components utilized by this function must be integrated into a work station/console arrangement. Each component requiring human

interaction must be within easy reach of the operator seated at the console.

The console design must be sufficiently flexible to accommodate different agency requirements as well as expansible to incorporate any additional equipment presently utilized by the agency. A work or writing surface of approximately 40 cm x 60 cm must be provided.

The work station should be designed to permit complaint entry, dispatch and information support activities as well as those of the com-centre supervisor.

The work station must be configured to permit ease of maintenance and servicing. It must be compatible with the com-centre environment. Final design and configuration should be established in consultation with the user agency.

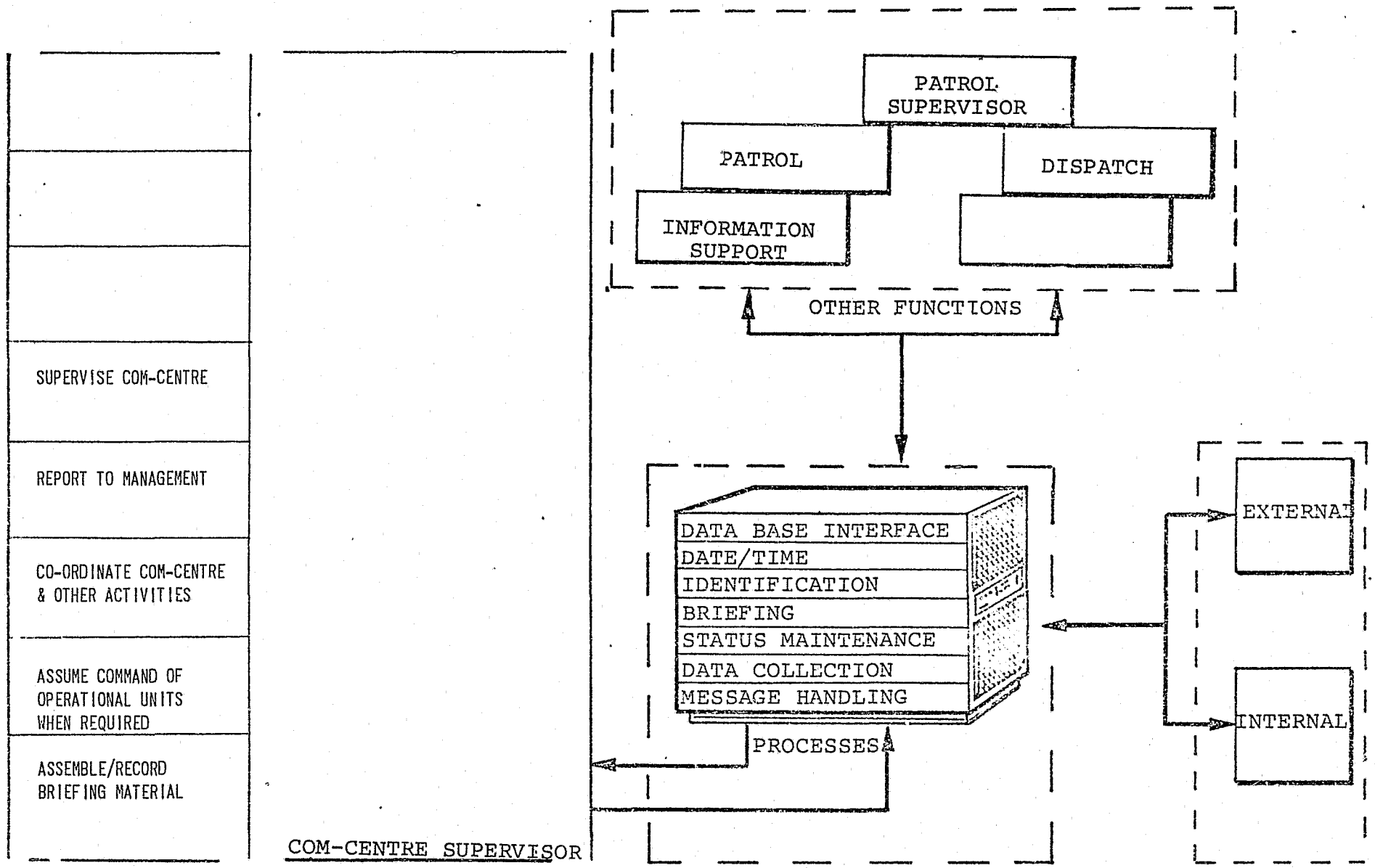

FIGURE III.4,6

COM-CENTRE SUPERVISOR FUNCTION - SYSTEM INTERACTION

III.4.7 Patrol Supervisor Function

III.4.7.1 General

The patrol supervisor function can be defined in general terms as the function responsible for directing and controlling the patrol resources. In addition to the supervisory duties, this function frequently performs the tasks and activities of the patrol function.

This function was introduced in Section II.2 of this specification and is described in detail in the CPIC document, "Police User Profiles". Figure III.4.7 shows the interactions between the system and the patrol supervisor function.

An MRDS must be designed to permit, both digital and voice communications, between this and other functions. These functions are:

Dispatch.
Patrol.
Information Support.
Com-Centre Supervisor.

An MRDS must provide the hardware and software necessary in support of the tasks of this function.

III.4.7.2 Hardware Requirements

The MRDS supportive hardware components that must be available to the patrol supervisor function consist of a terminal device including control and logic unit, hardcopy printer (optional)., and radio equipment.

Terminal Device

The mobile terminal device utilized by the patrol supervisor function must be identical to that used by the patrol function and described in Section III.4.5.2. Detailed specifications of this device are listed in Appendix B.

An optional feature that must be provided in the design, is a hardcopy printing device which can be attached to the visual terminal device.

The terminal device utilized in the patrol supervisor's office should be a visual display unit similar in design to the com-centre terminals. This device must be capable of:

monitoring.
narrative message transactions.
data base query/response.

Access to a hardcopy printing device should be provided to the patrol supervisor at the com-centre. This is in addition to any terminal device provided.

The radio equipment for this function will be the same as that described for the patrol function in Section III.4.5.2.

III.4.7.3 Software Requirements

In addition to the software requirements required to perform and support the command and control activities of this function will be that software associated with the patrol function as described in Section III.4.5.3.

The additional software requirements of this function over those of the patrol function must address the following:

a) Provide the ability of receiving all emergency messages transmitted from any unit under his command.

b) Provide the ability of receiving a summary of event details assigned to any unit under his command.

c) Provide the capability of transmitting voice as well as digital messages to more than one unit (broadcast).

The software requirements for the patrol supervisor's office must be the same as for his vehicle, with the addition of:

a) Providing the capability of obtaining a printed log of events assigned to his units.

b) Providing the ability to access briefing material stored by the system.

c) Providing the capability to access any information stored on the system that pertains to units under his command and in his area of responsibility. This information consists of such items as number of calls and response times to calls.

III.4.7.4 Equipment Configuration

The equipment configuration for mobile operations must be the same as that described for the patrol function in Section III.4.5.4.

The equipment configuration required for the office locations should include a terminal device and access to a printer. No special work station is required in the case of the patrol supervisor.

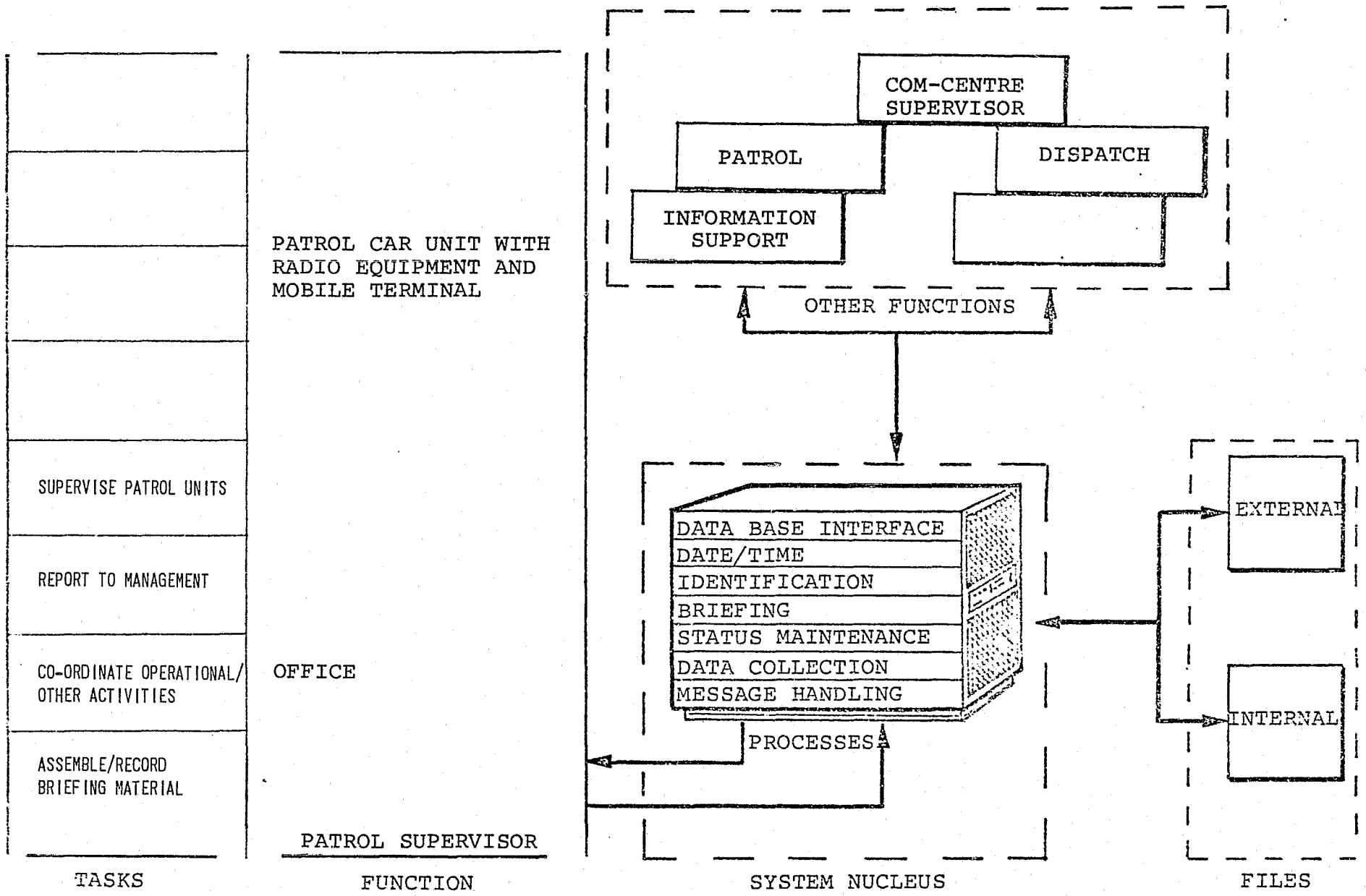

FIGURE III.4.7

PATROL SUPERVISOR FUNCTION - SYSTEM INTERACTION

PART IV

OPERATIONAL REQUIREMENTS

SECTION 1 - INTRODUCTION

The purpose of Part IV is to identify those aspects associated with an MRDS which impact the selection, acquisition, implementation and maintenance of a system. These aspects are discussed in the various sections of this Part and include:

a) Management Considerations

b) Operational Considerations

c) Resource Considerations

d) Cost Factors

The objective of Part IV is to provide the information required in resolving the above aspects and providing the constraints that must be considered in the decision making process. Although this Part is directed primarily to Police Agency Management, the design contractor must comply with the constraint aspects in the definition of an MRDS design.

SECTION 2 - MANAGEMENT CONSIDERATIONS

This section describes the basic managerial considerations involved with an MRDS. Considerations discussed in this section consist of agency size, organization, philosophy and the police operational requirement. Agency size, organization and philosophy have also been discussed in the document 'Police User Profiles', dated January 1976.

IV.2.1 Agency Size

A total MRDS is geared to those agencies policing a population of 100K or higher. This size of agency will normally utilize approximately 30 vehicles.

The MRDS design must be modular to enable smaller agencies the flexibility of selecting only those portions of a total system required to meet their needs. The degree of system implementation by an agency will be in direct relation to the amount of computing power required. If an agency utilizes a small number of vehicles but desires CPIC enquiry/response capabilities from these units, consideration should be given to sharing computing power with other nearby small agencies. This type of sharing could be utilized for any number of modules selected by those agencies.

IV.2.2 Organization

The present organization of an agency, in the command and control area, will change as a result of the installation of digital equipment. These changes will be a result of housekeeping tasks relating directly to the system hardware and software as well as an increase in informational message flow.

Data base queries can be expected to increase significantly as a result of unassisted query/response capabilities from the patrol units. Query/response capabilities from these units may result in a reduction of like tasks presently

performed by the other functional positions. The dispatch and information support functions will no longer be required to relay data base queries for terminal equipped units. The increase in data base queries will result in more 'Hit' responses and consequently generate more work and information flow between functions.

The ease, speed and convenience of transmitting messages encourages the sending of more messages. This increase in message flow will decrease the volume of work performed by some functions and increase that of other functional postions.

Depending on the extent of digitization, the workload of the dispatch function may be reduced. This reduction will be the result of automatic execution of several of the tasks presently performed by the dispatcher. Direct data base query capability also reduces the workload on the information support function and may result in the reassignment of some of the personnel in this area.

An MRDS will result in a reduction of manual statistical gathering, however more reports will be generated as the result of increase in message flow.

The utilization of computerized files and data sources will increase the requirement for personnel to input the information and update the data bases.

The response time to calls for service should be reduced as a result of more efficient channel utilization and control of field resources. This reduction in response time may result in a higher apprehension rate.

As described in the foregoing paragraphs, the volume of work will decrease in certain functional areas and increase in others. Depending on the degree of MRDS implementation, changes to the present organizational structure in the command and control area of the agency, can be expected.

IV.2.3 Philosophy

Philosophies vary between agencies as a result of various factors such as workload and manpower

availability. Some agencies utilize central dispatching while others prefer dispersed operations.

Regardless of the philosophy of any agency, an MRDS design must be sufficiently flexible to apply to all situations.

IV.2.4 Police Operational Requirements

Agencies considering an MRDS should first determine WHY a system is necessary. Secondly, consideration should be given to WHAT a system is expected to do.

The two main reasons for interest in digital communications are a result of;

a) Crowding of radio channels available for police agency communications, resulting in delays, poor transmission quality or both.

b) The computerization of operational information. A field unit equipped with a digital terminal device can access this information directly.

The MRDS must be designed such that an agency can select that portion of a complete system necessary to meet their requirements. The base station minicomputer must be capable of future expansion in the areas of hardware and software.

The size of the system required will be in direct relation to the degree of autcmation required as well as the size of the agency.

SECTION 3 - OPERATIONAL CONSIDERATIONS

IV.3.1 Introduction

This section covers those aspects of a mobile radio data system which affect the operational capability of the system. Areas covered are system size, capacity, hardware and software quality, system response time, accuracy, and security. In addition, considerations influencing the ability of the system to maintain its operational state are presented. This involves the aspects of system reliability and system availability. These factors can be used to determine the level of service expected and the degree of confidence which can be placed on the system by the user agency.

The user agency should use this section as a guide in establishing system operational requirements. Since there is such a wide variation in the requirements of a mobile radio data system across the Canadian Police Community, a degree of "customizing" of the values and requirements presented in this document could be necessary by agencies implementing such a system. Each agency should review their requirements individually and modify the system parameters identified by this document to comply with specific service and performance needs of the agency.

The System Contractor should be tasked with responding in detail to all areas covered in this section. The responses should contain the calculations upon which statements of performance are based (i.e., MTBF, MTTR calculations) supported by actual field data wherever possible. The costs associated with meeting the operational and performance requirements established must be provided, so that cost effectiveness can be assessed and cost bounds can be set.

IV.3.2 System Size

There is a minimum size below which a mobile radio data system as defined in this document, is not cost effective without major modification. The system as presented in Section II.2 and shown in Figure II.2 is capable of supporting the following modules:

a) Complaint Entry and Validation.
b) Computer-Aided Dispatch (CAD).
c) Status Reporting/Display.
d) Data Base query to:
   - CPIC.
   - Provincial Data Base
   - Local Data Base
   - System Data Base
e) Basic Case Disposition.
f) Message handling within the system.
g) Supervisory and control.
h) Activity logging and basic management information reporting.

The system should be capable of supporting these modules. Modularity must be such that additional modules as identified by the agency can be added and supported by the system, or alternatively, modules as listed can be deleted without major restructuring of the system software.

The system must be capable of being implemented by an agency incrementally with respect to both number of units supported by each module and the number of modules.

The system should be capable of supporting at least thirty (30) in-car terminals with flexibility for further growth. The system should be expansible so as to support a maximum of 300 field units.

The system should support a minimum of four (4) com-centre terminals. These terminals should be capable of being equipped to meet the following requirements:

a) Dedicated usage to one each of complaint taking, dispatching, information support and supervisory and control.

b) Split usage between any or all of the four functions on a dedicated basis. In this configuration a terminal can perform the tasks of several functions but with no changes in functional responsiblity possible.

c) Variable usage between any or all of the four positions. In this configuration a terminal can perform any or all of the functional tasks dependent upon assignment by the system control.

The maximum number of com-centre terminals that can be supported should be 24. The terminal usage must be flexible to meet user agency requirements.

The use to which each terminal is put must be alterable by the agency.

The system must be capable of terminating com-centre terminals on either a local or remote basis or a combined local and remote configuration. This requirement will be determined at time of system design. Both present and future needs should be defined during the design stage to permit future expansion.

The data base interface module must be capable of supporting additional data bases with a minimum of hardware and software changes. The basic system must initially support an interface to the CPIC system in addition to one other external interface as identified by the user agency.

Detailed interface specifications of the hardware and software required for the CPIC interface are provided by the CPIC document titled "CPIC/MRDS Interface Specification".

To interface with all other external data bases, it will be necessary for the user agency to supply detailed interface specifications at the time of system design.

The system must be provided with sufficient mass storage to meet the needs of the agency. A minimum capacity of 2.5 MBytes should be provided. Exact capacity is determined by specific requirements of the user agency. The system should be able to expand in storage capacity incrementally as requirements change.

The system must be provided with long term storage peripherals in the form of magnetic tape devices or equivalent. Tape storage characteristics are as given in Appendix B. Tape drive requirements should be determined from the storage requirements of the user agency.

IV.3.3 System Capacity

System capacity is governed by agency size, intended system utilization, and system complexity. For this reason system capacity requirements can only be established by the user agency. With reference to the base system established in this document equipped with the modules identified in Section IV.2.2, the following minimum capacities have been assigned.

a) Complaint Entry and Validation
Each operator should be capable of processing an average of 10 complaint entries per hour (90,000 per year) with the ability to take a peak of 30 per hour for short periods of time.

b) Computer - Aided Dispatch
Each dispatch operator should be capable of a peak of 40 dispatches per hour (based on a no delay schedule of complaints through the system) and internally generated dispatches.

c) Status Reporting Display
The system must be capable of receiving, storing and displaying the status of a minimum of 30 units and a maximum of 300. The system must be capable of processing at least 300 status changes per hour to a maximum of 2200 per hour. Field sizes are as given in Appendix A.

d) Data Base Query/Response
The number of data base queries per hour will vary extensively from agency to agency. Queries will be dependent upon the number of data bases available as well as the policy of the user agency. Presently CPIC is the major data base available, which is external to the user agency.

The mobile radio data system should be designed to accommodate at least 400 queries per hour from the in-car terminals, and com-centre terminals. The maximum number of queries that the system should support is 3500. In addition the com-centre units must be able to handle 150 confirmation messages per hour minimum and a maximum of 1000 per hour.

e) Narrative Messages

The number of narrative messages through the system is dependent upon several factors including, type of activity in progress, types of policing, organizational policy, time of day and available air time. Each agency must establish at the time of detailed system design the basic level of digital messages that will be permitted.

Any MRDS installed should be capable of processing a minimum of 60 messages per hour and a maximum of 1500 per hour.

f) Supervisory and Control

The mobile radio data system must be flexible so as to meet the supervisory and control requirements as defined by the user agency. The system must be capable of supporting at least two (2) supervisory positions, one of which is fixed (located in the com-centre). It should be possible to provide the second position on either a fixed basis or as a mobile unit (i.e., an in-car terminal).

IV.3.4 System Quality

System quality pertains to both the hardware components and software modules. System quality as stated by the supplier to meet user specifications must be proven. Proof of quality will be the result of tests performed on both the hardware and software or on the overall system performance. Benchmark tests must be conducted in compliance with the ranges and constraints as listed in this document. Any deviation from this functional specification must be documented in the final test report.

IV.3.4.1 Hardware

All MRDS hardware components must meet the specifications as listed in this document. These specifications should be considered minimum. Any changes and/or non-compliance should be justified by

the supplier and expected improvements documented. The hardware quality factors which must be documented consist of:

a) Reliability (MTBF) of each hardware component.

b) Flexibility of the hardware components in serving the different and changing communications situations.

c) Servicability (MTTR) of each system component and ease of servicing.

d) Availability of hardware maintenance support as well as spare or replacement components.

e) Life expectancy of each hardware component.

f) Compatibility between various MRDS equipment as well as with the RF equipment.

g) Expansibility of the system and the limitations, ranges and constraints that exist.

IV.3.4.2 Software

The MRDS software must be tested in conjunction with the hardware components as listed in this specification. Benchmarks are as established by the user agency and as listed or implied in this document. Any deviations from this specification must be documented in the final test results.

Software tests must consider various factors such as;

a) Modularity of programs. Tests are to be conducted with the various combinations of software modules that will be utilized in a complete system.

b) Serviceability of programs must be such that certain modules can be easily modified or altered without effecting other modules.

c) Compatibility of the various software modules.

IV.3.4.3 System

The complete system software and hardware, must be tested and a document produced on the results. This documentation must be readily available to the potential police user.

The various factors in regards to overall system performance that must be tested and documented consist of;

a) Time delay incurred in conveying messages.

b) Reliability of system (MTBF).

c) Length, content and volume of messages that the system is capable of handling in a given period.

d) Interference on the voice system as a result of the MRDS equipment.

e) Average time to gain access to radio channel (should not exceed 5 seconds).

f) Maximum number of various message types (status, dispatch and queries) and the increase in response time over a minimum message load.

g) Compatibility between MRDS and RF equipment.

h) All other requirements as listed in this specification.

Any deviations from this functional specification must be identified in the test document.

IV.3.5 Response Times

Response time, in the case of a mobile terminal, includes transmission time and the time taken for a reply to reach the terminal after processing at the data base. It is a key indication of system effectiveness (i.e., for query traffic, the shorter the response time the higher the query rate per given period). It must be consistent with and allow

for, the peak volume of traffic expected by a given agency.

Some other definitions that are useful before going further into the discussion of response times are as follows:

Definitions

a) Traffic Types

1. Urgent Traffic is all traffic, either administrative or operational requiring immediate police action.

2. Emergency Traffic is all urgent traffic which involves risk or loss of human life.

3. Non Urgent Traffic is that traffic which is not affected by delays in action in such a manner as to result in serious consequences to peace, order, safety or law-enforcement resources.

b) Delay Types

1. Communications Delay encompasses the interval of time required to move a message along a communications network.

2. Message Delay describes the period of time that it takes a message to move from the data base queue or mobile terminal buffer to a communications channel.

3. Access Delay is the interval of time needed to gain access to a communications channel measured from the time that such a need arose.

4. Handling Delay specifies the length of time which a message spends being processed in the com-centre.

5. Enquiry Delay involves the interval of time required to handle a data base query (i.e., time taken to transmit a query, process that query, plus time taken to receive a response).

Response time can be said to be the sum of the first four delay types or simply the fifth, dependent on whether the message is processed by com-centre personnel or goes directly to the processor.

The requirements as seen for the various delays making up response time are:

a) The communications delay between the public and the user agency must be less than sixty (60) seconds ninty-five (95) per cent of the time.

b) Non urgent messages must not encounter a busy condition more than five(5) per cent of the time.

c) Emergency traffic must not have an access delay of greater than ten (10) seconds or a communications delay greater than thirty (30) seconds.

d) Urgent traffic must not have an access or message delay of greater than five (5) seconds on average or a communications delay greater than sixty (60) seconds.

e) Non urgent traffic must not encounter a message delay greater than five (5) seconds on average or a communications delay of greater than three (3) minutes.

f) Enquiry delays must not exceed three(3) minutes. This time includes entry of query, processing and response.

g) The MRDS throughput delay must be less than sixty (60) seconds.

IV.3.6 Error Detection and Accuracy

Due to the oftimes critical nature of material being accessed, stored and updated by any police data acquisition system, error detection as well as hardware, software and communications accuracy are a primary consideration. This is especially true when dealing with an MRDS system.

In this regard the system contractor must provide the user agency with published documentation of the various recording, transmission and transfer error rates associated with the various system devices (CPU and all peripherals). A composite specification for the system must also be provided. This specification must be guaranteed by the system contractor and be fully supported by published documentation.

The following points will ensure acceptable accuracy from an MRDS system:

a) Documentation relating past experiences with the supplied system indicating errors or problems frequently encountered and the solutions found for them must be provided by the system contractor.

b) There must be more than one operational technique for error detection inherent to each peripheral and to the CPU. For example a magnetic tape device may use both block and character parity error checking.

c) Software data validation must also be provided. This may be used, for example, to detect illegal characters in a given field such as alphabetics in a numeric field and vice versa.

d) All error detection devices must employ the latest in state of the art technology.

e) Error detection must result in successive retries to obtain correct data. If this fails an error message indicating the type of error and where it may be found must be displayed to the operator.

f) Depending on the size of the system, error statistics must be gathered and maintained on a continuing basis to help identify, predict and correct trouble spots in the system. This will be incorporated as a software feature at the user agency's request.

g) The system must be such that on detection of an intolerable number of errors from a device, automatic switching to a backup may be initiated either by the software or manually.

Automatic switching must have a manual override feature.

Although the accuracy required of the system is the responsibility of the systems designer and has not been dealt with in any detail, it should be noted for reference that at present the maximum tolerable error in communications is one in ten to the fifth (1 in 10^5).

IV.3.7 Security

The question of security in relation to MRDS's basically addresses the following topics.

IV.3.7.1 User Identification

A system user must be identifiable by the MRDS before access to the system will not be allowed. Consideration should be given to various methods or combinations of system identification. These methods may consist of firmware such as an identification key used in the terminal, software codes, or both.

All terminal users must sign-on and off the system at the beginning and end of their tour of duty. The sign-on/off information can be utilized by the system in authorizing predetermined system access.

An operator at a central location must be capable of controlling the functional authority of specific terminal devices. This operator must also be able to bar any terminal from system access.

IV.3.7.2 Data Base Protection

All mobile terminal devices must be limited to data base queries only. For external files, these queries will be restricted to specific files as determined by the data base authority.

Only authorized com-centre terminals should be capable of file maintenance. Authorization should identify the files that can be accessed as well as the extent of changes that can be made.

Considerable caution must be used if hardcopy output is utilized in the patrol unit. This is particularly true in regards to data base responses.

IV.3.7.3 Security of Hardware Components

Mobile Equipment

Several considerations must be addressed in regards to the MRDS mobile equipment.

a) The terminal device must be securely fastened to the vehicle or mounting frame within the vehicle.

b) The keyboard must be capable of being disabled or locked.

c) The display unit should be positioned to minimize its readability from outside of the vehicle by passers-by.

d) The terminal device must be removable from the patrol unit during times of vehicle maintenance.

e) Message texts must be displayed only on request.

Com-Centre Equipment

The com-centre equipment including any MRDS equipment stored in separate rooms must be protected from both deliberate and unintentional damage.

Unintentional damage can be limited by restricting access to these areas only to authorized personnel.

Several considerations must be addressed in regards to deliberate damage and protection of data.

a) Security clearance of all personnel working in equipment area.

b) All equipment should be away from public access areas.

c) All display devices must be turned away from public viewing areas such as windows and/or hallways and doorways.

d) All data communication lines should be underground to prevent sabotage.

e) All paper output from the MRDS should be treated as confidential and paper garbage should be shredded or burned.

IV.3.8 System Reliability

The definition of system reliability utilized for the purposes of this document is the probability that the system will perform for a specified time period under a given set of conditions. The time period specified is continuous and the specified condition is that the system be fully operational. It is realized that preventive maintenance will be required. On the basis that this can be scheduled and will be minimal, preventive maintenance is considered to be within the set of acceptable conditions.

The extent to which system reliability is required is at the option of the user agency. At the time of system design the user agency should specify the level of reliability expected. Alternatively, the agency may request that potential suppliers respond with recommended plans which address varying levels of reliability and the costs associated with each.

The mobile radio data system should exceed a reliability figure of ninety-nine percent (99%) across all component parts of the system, when calculated on a weekly basis. In installations where the existing radio structure is to be utilized the system contractor should identify any changes and/or modifications necessary to obtain the reliability figure. Reliability of both the

hardware and software aspects of the system must be included when establishing reliability figures.

The method by which system reliability has been calculated must be provided by the system contractor. All factors, assumptions and constraints placed upon the system configuration (both hardware and software) in the derivation of system reliability must be identified. Where calculations are theoretical only, these must be identified. Stated values should be substantiated wherever possible by field measurements.

The failure rate (MTBF) of system hardware components should be greater than six thousand (6,000) hours on the basis of continuous operation. All stated values must be identified as being theoretical or measured, and the method of derivation given.

The expected failure rate (MTBF) of the system software provided by the system contractor should be stated. The method of calculation to derive this figure must be given.

The action necessary to bring the system back to its operational state must be identified by the system designer. Failure detection for each of the major sub-systems (i.e., system nucleus, radio system) must be provided. This detection circuitry should identify both failure occurrence and location. Peripheral equipment should have failure alarms to indicate a failed condition to the system user.

The system should incorporate protective procedures to prevent loss of data and protect the data base in the event of system failure. Backup schedules should be identified which will minimize loss of service to the user. This includes identification of fallback service procedures as well as the action required to restore the system.

IV.3.9 System Availability

Although availability is normally treated as an aspect of reliability, due to the importance of continuity of service to the Police Community, this is treated separately. The definition of system

availability as it applies to a mobile radio data system is the probability that the system will be able to perform its intended function when required. The prime users of the system are the field officers. Therefore availability and continuity of service must be emphasized in providing service to the field unit.

The mobile radio data system must approach 100% availability. Although the cost effectiveness of reaching this figure is unrealistic, all attempts must be made to maximize availability, especially at peak activity periods. This implies redundancy of the major system components (eg. processing units, mass storage devices).

The system should be available 24 hours a day for operational use outside of a closely scheduled preventive maintenance period of one (1) hour a week. This maintenance should be scheduled as much as possible to coincide with any file maintenance or program maintenance required.

The system must be structured so that it is insensitive to changes in the operational status of peripheral components and modules. It must be possible to service or repair individual system elements without total loss of system availability to the users. The system modularity must be such that the failed component can be removed and replaced with a spare, or a redundant module can be switched in.

The system should be structured to permit transfer of operations from one position to another in the event of failure or servicing of the equipment used by a position. There should be group redundancy provided such that logical functional groups are provided that operate in parallel.

The system should be capable of operating in a degraded mode (fail soft). The extent of this fail soft feature must be identified and the necessary manual actions to maintain the reduced level of operation identified. The operational requirements (i.e. continuous parallel logging of system activities on magnetic tape) to permit this mode must be identified by the system contractor.

The system configuration and design must be such that sufficient resources are provided to minimize

the occurrence of extended queue lengths, long duration blockage, or deadlock. The system contractors should identify the probability of deadlock or blockage at time of detailed design.

The spares schedule required to support the system should be identified. The basis and constraints applied to the calculations must be included. Availability of on-site and off-site spares and repairs should be stated. Expected equipment life both from a manufacturing standpoint and a service life standpoint should be stated.

The time necessary to accomplish system recovery (MTTR) must be identified at time of system design. The MTTR for all hardware components must be stated. These figures should be supported wherever possible by field data. Where calculations are theoretical only, it must be stated.

The MTTR of the system nucleus and processing equipment should be less than 6 hours. For peripheral devices (i.e., mobile terminals, com-centre terminals) this should be less than 8 hours. For these devices the mean time to replace should be less than 2 hours.

The expected system availability based upon the system design must be stated by the system designer. The costs associated with achieving and maintaining the quoted availability must be included. Any constraints or factors that could influence availability must be identified.

SECTION 4 - RESOURCE CONSIDERATIONS

IV.4.1 Introduction

This section addresses the com-centre, field and support resources required by an agency. These resources consist of both personnel and equipment.

The resource considerations, in relation to the installation of an MRDS, consist of:

a) Effects on personnel assignments.

b) Physical requirements.

c) Training and service requirements.

d) Maintenance and backup equipment.

IV.4.2 Effects of MRDS on Personnel

As the result of digitization of messages, more information can be passed between the functional positions. This increase will be especially true with data base access from the vehicles.

Many tasks now performed by intermediate personnel will be assumed by the system. These include;

a) Data base queries directly from the vehicle to the stored information files.

b) Status condition of vehicles will be automatically recorded and displayed by the system.

c) Information will be recorded by the system for statistical purposes.

d) Reports will be generated by the patrol function to records through the MRDS.

An MRDS will not eliminate or replace the various functional positions, however it may result in a

reduction of personnel required to perform some functions, and an increase for others.

New tasks will appear with an MRDS, such as the monitoring of the system hardware, software and information flow within the system. There will be an increase in data base queries resulting in an increase of "hits". A more rapid dissemination of information may result in more apprehensions. All the above increases may produce more work for various functional positions.

Features of an MRDS must be practical and benefical, otherwise they will not be utilized by operational personnel.

IV.4.3 Physical Requirements

The physical requirements pertain to those items, other than the main system components, that must be or should be considered with an MRDS.

IV.4.3.1 Site Considerations

Serious consideration should be given to housing the noisier MRDS equipment in a room separate from the com-centre operational area. Only that equipment that is utilized frequently by the com-centre staff should remain in the communications room.

The equipment must be arranged to allow free movement around the devices by both operations and maintenance personnel.

The location of the MRDS equipment room in the police building should be such that equipment can be installed easily. Checks should be made in advance of receipt of equipment to identify and resolve such constraints as size of doors, passage ways, ramp and elevators.

The free standing MRDS peripheral equipment will be located in accordance to the agencies operational requirements. The location of peripherals must not

exceed the maximum limits permitted for interconnection.

Building requirements must be checked, before installation of any equipment, for floor load and availability of cable space.

Although smaller systems with a minimum of peripherals do not require raised flooring, a raised floor is desirable for several reasons, such as:

a) Protection of power and interconnecting cables.

b) Safety to com-centre personnel.

c) Flexibility for reconfiguration and expansion.

d) Minimizes cost of future layout changes.

The size of any com-centre and equipment rooms should allow for future expansion of the system. Sufficient storage space for supplies must be available.

Consideration should be given to locating training room facilities in the immediate area of the com-centre and MRDS equipment room.

IV.4.3.2 Environemntal Considerations

It is recommended by all computer manufacturers that the equipment be housed in a temperature and humidity controlled room. Nominal temperature should be maintained at 21°C ± 1°C and nominal humidity should be 45% ± 5%.

Due to the communications equipment constraints, temperature must not vary by more than 5°C. Any greater change could adversely effect the operation of any crystal based devices, resulting in partial or total communications failure.

Most equipment will be air cooled by means of fans within the device. Sufficient space must be available around devices to allow proper air circulation.

Control of the air conditioning unit operation should be located within the equipment room area.

Com-centre lighting should be controllable from the work areas to enable the operators to adjust lighting levels for optimum viewing of display screens.

If carpeting is utilized on the com-centre or equipment room floor, it should be of a type designed to eliminate the effects of static electricity.

Separately fused power outlets for each of the hardware components must be provided from a power distribution panel located in the room housing the equipment.

Power line regulation could required depending upon the voltage fluctuations and transient content of the primary power. This must be evaluated prior to system installation by testing of the power supply.

Automatic power switching with a manual override feature should be provided in the processor equipmment room area.

Dominion Fire Marshall and safety regulations for EDP equipment must be followed in conjunction with all applicable local fire regulations.

IV.4.4 Training and Service Requirements

A continuing program of maintenance, training and software and hardware development is a necessity for optimum system performance. The initial training of support personnel including such people as system operators, application programmers and maintenance personnel is of even greater significance. The following paragraphs describe the areas which should be considered by the user agency.

The user agency must be provided with the following information:

a) If, and at what cost the supplier will provide training personnel.

b) The system performance based on data gathered from a similar configuration handling approximately the same or greater volume of data.

c) A service schedule which minimizes downtime and which entails service only during off-peak (quiet hour) periods.

d) The number of and respective qualifications of the personnel required to maintain system operating integrity.

If the system supplier provides training, he must specify the type and number of support personnel required to train agency personnel in the following areas:

a) Software development in areas of user requested custom packages.

b) Modification of standard packages to meet the changing needs of the user.

c) Continuous software maintenance.

d) Programmer training.

e) Operator training.

f) Hardware maintenance.

In addition the following information must be made available:

a) The frequency, cost, location and duration of operator and programmer retraining classes.

b) The work being done by the supplier to improve the system both in terms of hardware and software.

c) The cost of implementing improvements if any and the expected downtime required.

IV.4.5 Maintenance and Backup

IV.4.5.1 Maintenance

An MRDS, like any computer system, will require periodic maintenance and component replacements. System reliability is dependent on proper equipment maintenance.

There are basically two choices for agencies in selection of a maintenance program.

a) Training of in-house personnel who are presently maintaining the RF equipment. In addition to training with respect to the electronic equipment utilized in the MRDS, arrangements must be made for shop space, spare parts and electronic test equipment. Manufacturers of system components will, if requested by an agency, supply an adequate training program for agency maintenance personnel. The training program should be part of the system contract.

b) Agencies must have the choice of contracting for a maintenance service program from the system supplier or from an independent service organization.

The quality, convenience, speed and reliability of service are all factors to be considered when selecting a proper maintenance program.

The cost of electronic maintenance equipment, spare parts, storage and work space as well as the training must be weighed against that of a purchased maintenance program.

IV.4.5.2 Backup

Not all components of an MRDS require immediate backup. Any hardware item that fails and could cause a complete system failure should be spared or readily available.

Agencies who presently backup RF equipment with older equipment must ensure that all RF backup equipment is compatible with the MRDS equipment.

The cost associated with backup MRDS equipment can be justified by some agencies if this equipment is utilized for batch processing when not required by the on-line system

If maximum reliability is required, no agency should depend strictly on a commercial power source.

The com-centre can be supplied with a backup power supply by utilizing a standby power plant. The standby power can be started either manually or automatically when required. Automatic startup should have a manual override feature to enable the user to bypass automatic startup. Any agency considering standby power must ensure that the electrical supply is sufficient to meet the requirements of the MRDS.

An alternate form of backup power may be achieved by installation of an Uninterruptible Power Supply (UPS) System. This will eliminate failures due to short duration power fails and bridge the period between time of primary power failure and auxiliary power startup. This form of power backup is the most expensive and thus the benefits to be derived should be closely evaluated prior to any decision made to implement an UPS system.

Schedules for module implementation and utilization should be established by the agency at the system design stage.

SECTION 5 - COST FACTORS

IV.5.1 Introduction

The final decision on the degree of implementation of an MRDS by any agency will be influenced greatly by an evaluation of costs versus benefits.

Benefits of digitized communications have been discussed in Section II.1 of this document.

As discussed previously in this document, an MRDS will be structured in a modular fashion allowing the agency to select only those modules necessary to meet its requirements. Due to the modularity of an MRDS and the flexibility of choice afforded an agency in areas of peripherals and of modules chosen, a general cost estimate is impossible at this time. Each agency's costs is dependent on factors such as;

a) Amount of computing power required. This is contingent upon the applications and/or functions the system is expected to perform.

b) The organizational structure of the com-centre. This applies to the number of work stations utilized.

c) The number of mobile units that will be equipped with a terminal device.

d) The number and/or type of storage media used.

e) The date that system hardware components are purchased and whether it is a quantity order or single unit purchase (i.e., one mobile terminal versus 30 mobile terminals).

f) The purchasing agreement negotiated with the system supplier.

IV.5.2 System Hardware Costs

Several assumptions have been made in order to develop an MRDS cost estimate.

IV.5.2.1 Assumptions

Police Agency 'X' is responsible for a population of 100,000 and utilizes 30 patrol units. This agency has determined that an MRDS must provide them with the following capabilities;

a) Computer Aided Dispatch (CAD).

b) Status maintenance.

c) Terminal to terminal narrative messages transmission.

d) Data base inquiry and response capabilities from/to any authorized terminals.

e) Data collection and report generation.

The organizational structure of this departments Com-centre consists of;

- 1 complaint entry work station.
- 1 dispatch work station.
- 1 com-centre supervisor's work station.
- 1 information support position.

Although this agency utilizes 30 patrol units, only 10 will initially be terminal equipped.

IV.5.2.2 Hardware Requirements

To equip agency 'X' with the basic digital communications equipment necessary to meet the requirements, the following hardware items will be required.

1 Complaint Entry position	- 1 VDU/Keyboard device (Intelligent Terminal)
1 Dispatch position	- 2 VDUs with shared Keyboard (Intelligent Terminal)
1 Com-Centre Supervisor position	- 2 VDUs with shared Keyboard (Intelligent Terminal)

1 Information Support position - 1 VDU/Keyboard device (Intelligent Terminal)

10 terminal equipped Patrol units = 10 Mobile terminal devices

1 Central Processing Unit (CPU) of 128 K bytes

1 Terminal Controller

1 Tape Unit

1 Disc Unit (having multiple drives)

1 Hardcopy Printing device

The above list is by no means a complete equipment list, however it does include the major items in regards to cost. This equipment is in addition to the RF voice equipment presently being utilized.

Additional costs could be incurred by some agencies if the RF equipment requires modification or upgrading.

The com-centre physical layout may require some modifications and/or changes to allow sufficient space for MRDS equipment.

IV.5.2.3 Cost Estimates

The following is an estimated cost for the purchase of the major hardware components of an MRDS. The prices listed are based on unit purchase.

Com-centre Terminal Devices	
6 x $5,000	= $ 30,000
Mobile Terminal Devices	
10 x $4,500	= $ 45,000
Terminal Controller	
1 x $5,000	= $ 5,000
Central Processing Unit (128K)	
1 x $60,000	= $ 60,000

Disk Device (2.5M) and Control 1 x $12,000	= $ 12,000
Tape Unit (1600 BPI, 9 TRK) and Control 1 x $15,000	= $ 15,000
Printer Device (300 LPM)	= $ 15,000
Cost of MAJOR Hardware Components of an MRDS	= $182,000
In addition there will be an overhead cost for system integration, software fee, installation, warrantee, maintenance, etc., of at least 33%	= $ 61,000
TOTAL COST	= $243,000

The cost of this hardware refers only to the major system components and does not include any backup and maintenance hardware which must be considered by any agency.

Additional costs that must be considered include;

- Cost for system installation.
- Cost of facilities remodelling.
- Cost of RF equipment upgrading.
- Cost of cabling, modems, interfaces etc.
- Cost of modifying vehicles to permit mounting of equipment.
- Cost of console or work stations for com-centre.
- Cost of backup system components.
- Cost of environmental control (i.e., Air conditioner).

Figure IV.5.1, shows a block diagram of the major hardware components required by each of the functional positions. Included in this diagram are the cost figures associated with each functional area.

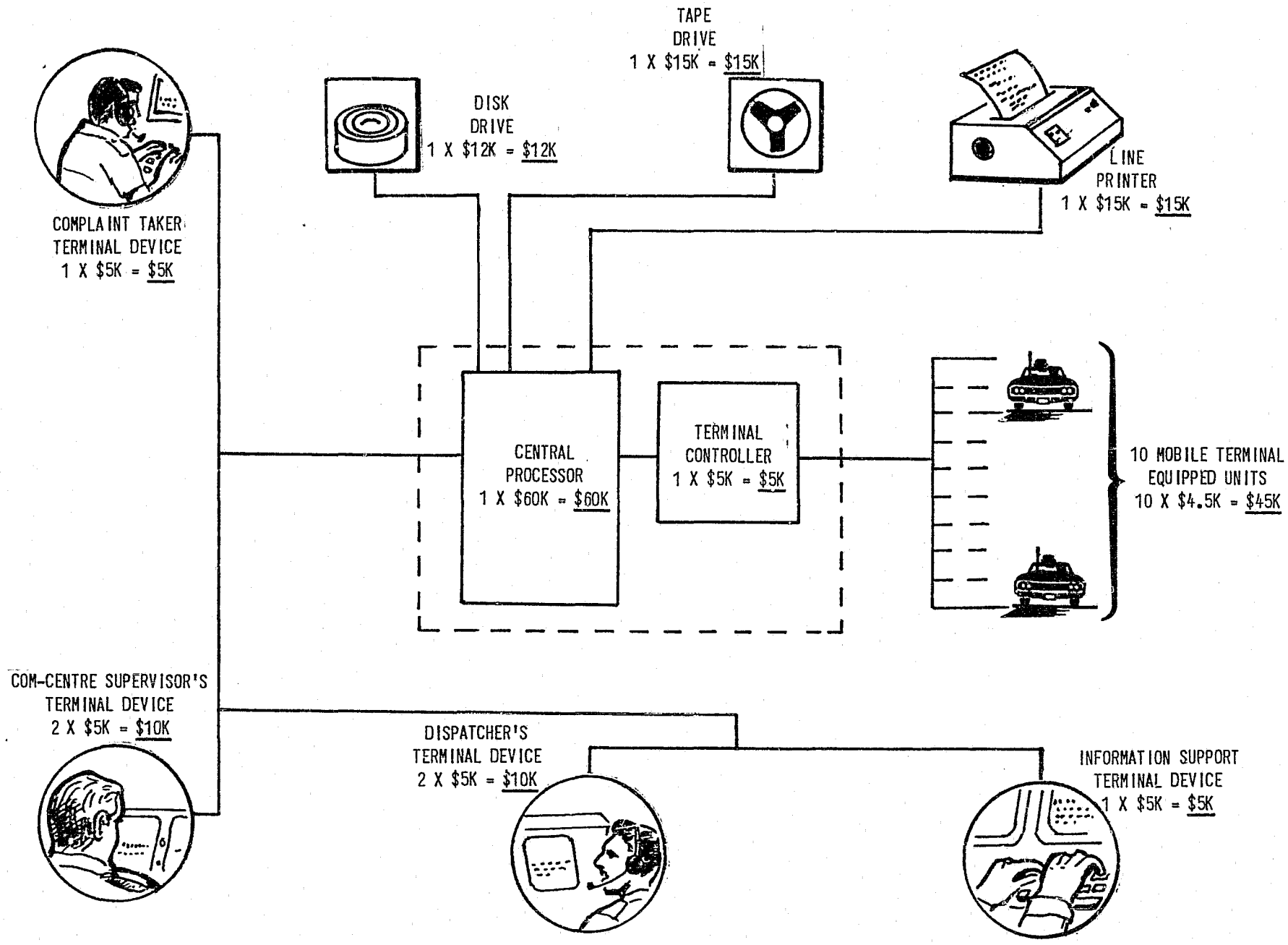

FIGURE IV,5,1

BASIC SYSTEM HARDWARE COSTS

IV.5.3 System Software Costs

The basic system software will be supplied by CPIC but all modification costs are the responsibility of the user agency. A basic operating system software costs approximately $10,000 and includes such items as Editor, Loaders, Schedulers, etc. as identified in Section III.3.

Total software costs can be expected to approach that of the system hardware costs. The more customized the system, the greater the software costs will be. In addition software costs will be dependent upon the number of modules, the number of files, and the number of interfaces required by the agency.

IV.5.4 Recurring Costs

Long term costs that can be expected with an MRDS will result from such items as;

- printer paper
- magnetic tapes
- disk packs
- system maintenance
- special forms
- program changes and revisions
- new applications

Systems can and will be expanded to include additional functions as the need arises and/or budgets permit. Any agency installing an MRDS should plan for future requirements and expansion of their system. With proper planning future costs as a result of expansion can be kept to a minimum.

APPENDIX A

FILE SPECIFICATIONS

FILE FIELD SIZE SPECIFICATIONS

The following File Field Size Specifications were arrived at after comparing data and specifications from the following sources:

1. CADRE Computer Aided Dispatch and Records Entry Functional System Description Ontario Police Commission, November 1975. Section 5.

2. CPIC Documentation.

3. Functional Specifications Miami Police Department System April 1975.

4. Computerized Command and Control, Huntington Beach Police Department, 1975.

5. Calgary, Vancouver, Winnipeg, Saint John, N.B. Interview files.

6. Design Considerations for MRDS Com-Centre Subsystem, MacDonald, Dettwiler and Associates, March 1976. Appendices 2-5.

	FIELD DESCRIPTION	BYTES
EVENT FILE		
1	Complainant's Name.	37
2	Complainant's Address.	30
3	Complainant's Telephone Number.	7
4	Location of Occurrence.	30
5	Name of Victim or Firm.	37
6	Time and Date Received.	14
7	Complaint Taker ID.	3
8	Details of Event.	100
9	Time and Date Dispatched.	14
10	Time of Arrival at Scene.	4
11	Time Completed (Cleared).	4
12	Event Number *.	11
13	Event Code	4
14	Priority Code.	1
15	Zone.	2
16	Unit(s) Assigned 3 x 4.	12
17	Dispatcher ID.	3
18	Officer(s) Assigned** 6 x 4(ID's).	24
19	Dispostion (GOA, Offender located and dealt with etc).	35
	TOTAL	372

*Varies greatly from department to department e.g.,
OPC xx-xxxxxxxx(11)
Winnipeg xxxx-x-xx(9)
Saint John xx-xxxx-xxxx(13) (CPIC)
**- officers normally enter their names or ID at log on
- on entry of unit's number the system should provide the officers names (i.e., it keeps a daily record of names and numbers)
- these names (and qualifications corresponding) will be maintained in the personnel file.

	FIELD DESCRIPTION	BYTES
	EVENT SUMMARY FILE	
1	Event Number.	11
2	Event Type.	4**
3	Priority Code.	1*
4	Location of Event.	30
5	Unit(s) Assigned 4 x 3.	12
6	Time and Date of Receipt.	14
7	Zone	2
	TOTAL	74

* 1 digit code for cross reference table.
** Statistics Canada Code.

e.g.,	Code	Priority
	1	Top priority Emergency
	2	High priorty
	3	Low priority, etc.

	FIELD DESCRIPTION	BYTES
UNIT FILE		
1	Unit Identifier (J75-121,122)	7
2	Identification of Officer(s)* 2 x 4.	8
3	Unit Type (marked, patrol, traffic etc).	10
4	Unit Number (e.g., car 54).	3
5	Assigned Area (District and zone e.g., 1A).	2
6	Assigned Event Number.	11
7	Time and date of Event Assignment.	14
8	Current Status and Qualifier.	40
9	Time of Last Status Change.	4
10	Previous Status.	15
	TOTAL	114

* See note in Event File Specifications.

	FIELD DESCRIPTION	BYTES
UNIT SUMMARY FILE		
1	Unit Number.	3
2	Status (coded).	4
3	Event Number.	11
4	Emergency Message*.	35
	TOTAL	53**

* Would be flashed along with Vehicle number, location, event assigned and event code.

**Varies with summary information displayed i.e., dependent on format chosen by department.

This information may occupy the bottom 3/4 of a screen. Emergency messages, and other messages from patrol cars may occupy the top quarter of the screen.

	FIELD DESCRIPTION	BYTES
	TERMINAL CONTROL FILE	
1	Unit ID.	7
2	Terminal ID.	7
3	Functional Task Authorization.	1
4	Data Base Authorization.	1
5	Sign-on, Sign-off Information.	10*
	TOTAL	26*

* - 10 digits + 26 alpha characters provide for 3.66×10^{15} possible combinations.
- use of non-printing characters will increase this considerably.

	FIELD DESCRIPTION	BYTES
ADDRESS FILE		
1	Address.	30
2	Name of Occupant.	37
3	Previous Event Types 4 x N (e.g., 3).	12
4	Dates of Previous Events (xx-xxx-xxx) xN.	27
5	Previous Events by Event Number 11XN.	33
6	Other Associated Information or detail.	100
	TOTAL	239*

*Depends on number of previous events

e.g., Previous Events	File Size
0	167
1	191
2	215
3	239

	FIELD DESCRIPTION	BYTES
BUSINESS RFEFERENCE FILE		
1	Name of Business.	25
2	Address of Business.	30
3	Name of Person to Contact.	37
4	Address of Contact.	30
5	Telephone Number of Contact	7
6	Additional Details	70
	TOTAL	199

	FIELD DESCRIPTION	BYTES
	BRIEFING FILE	
1	Shift gathered information to be passed on to the next	
2	shift.	
3	Wraparound, time controlled, 24 hours duration	
4	two-sub files - one operational	
5	one for Comcentre information.	
	TOTAL	*

*File size requirement would be determined by the individual agencies.

	FIELD DESCRIPTION	BYTES

CONSOLE USAGE FILE

1 List of com-centre terminals and tasks associated with terminals
2 (tasks which may be performed at a given terminal)
3 Table of tasks assigned to any terminal (currently)
4 Sign on and off times.
5 Number of times that various selected tasks were
6 performed from each terminal.
7 Geographic areas assigned to each dispatch terminal.

TOTAL *

* dependent on size and specific requirements of a given agency

	FIELD DESCRIPTION	BYTES
	SPECIAL ATTENTION FILE	
1	Names.	37
2	Addresses.	30
3	Dates.	9
4	Operator ID.*	10
5	Free Format Fields.*	150
	TOTAL	236*

* dependent on individual agency's requirements

	FIELD DESCRIPTION	BYTES
	MANPOWER RESOURCE FILE	
1	Member's Name.	37
2	Zone and District (e.g., 1A).	2
3	Assignment	9
4	Other data as described in Part III Section 2.	
	TOTAL	*

* dependent on agency requirements

	FIELD DESCRIPTION	BYTES
NARRATIVE FILES		
1	Variable Buffer size.	
2	Temporary.	
3	*Actual requirements will be specified by the user agency.	
	TOTAL	*

FIELD DESCRIPTION	BYTES
ADDRESS DIRECTORY	
1 Address (by zone).	30
*30 x number of addresses listed	
TOTAL	*30xN

APPENDIX B

HARDWARE SPECIFICATIONS

NOTES

* - Indicates that actual specifications will be determined by the needs of the user agency.

All hardware must have regulated power supplies and must be designed for 24 hour continuous use.

Terminal Device

The terminal device to be used by the various functions in the Com-Centre must possess the following attributes:

- a visual display unit (VDU)
- if a CRT is used it must have a minimum 9" diagonal screen*
- a minimum capacity of 80 characters by 24 lines*
- full ASCII character set capability*
- a minimum data rate of 2400 baud asynchronous (to 9600 baud preferred)
- contrast, intensity, and focus must be user adjustable
- the data rates must be switch-selectable
- able to operate in full and half duplex modes
- employ error checking (e.g., parity, BCC,LRCC, CRCC)
- RS232C compatible
- a minimum of 6 function keys must be available*
- anti-fatique proven and backed by supporting documentation
- capability to direct screen contents to a hard copy unit such as a line printer
- features such as field protect, back-space, settable tabs, line and/or page erase and the ability to transmit data or screen must be provided*
- the keyboard should be able to control more than one display in such areas where two or more keyboards would be unnecessarily redundant*

In addition to these features, the individual agencies should have the ability to request the following features:

- blinking cursor and/or data fields
- reverse characters
- split screen
- underline
- paging
- blanking
- word wraparound
- CPU controlled cursor (moved and/or read)
- the ability to insert and/or delete characters
- horizontal and vertical tab

- character buffer size and type.

Consideration should be given to either leasing or buying the terminal device and to maintenance plans which may be provided by the manufacturer.

Mobile Terminal Device

The mobile terminal must consist of a visual display unit and an alphanumeric keyboard with status and function keys.

Characteristics of the VDU must include the following:

- have 200-500 character display
- have scrolling capability
- be easily read in illumination conditions ranging from bright sunlight to darkness
- be anti-fatique proven for continuous use for periods of up to eight hours
- be reliability tested and backed by confirming documentation

The keyboard must provide the following features:

- capability to provide the full ASCII character set although actual requirements will be consistent with the character set selected by the user agency for the Com-Centre terminals
- a minimum of 12 status and function keys
- a plainly marked and easy to reach emergency key
- 'QWERTY' layout
- positive feel when depressing keys
- a light for keyboard illumination, this must not silhouette the officers in the vehicle.

In addition to these features the entire unit:

- must have four buffers, two for input and two for output, each capable of holding one screen of data
- must provide for some customization as deemed necessary by the user agency
- must be compatible with the latest generation of radio equipment
- must have a minimum effective throughput rate of 300 baud
- must indicate a message waiting condition
- must provide at least one contact closure activated from the base station
- must have provision for a hard copy printer
- must be able to operate from -40 F to over 140 F (-40 C to 60 C) ambient
- must be easily mounted with a minimum of car alteration

- must have security features such as terminal identification, key lock (may be easily removed and locked in car trunk)
- must have error checking circuitry built in
- a self test feature is desirable
- must be shock, liquid, dust and vibration proof
- must include a volume-adjustable audible alarm which must have an on-off switch
- must be swivel mounted in easy reach of the driver and usable by either driver or passenger
- must be positioned as close to eye level as possible without obstructing view
- must be positioned so that the screen cannot easily be read by passers-by
- must be easily interchanged from vehicle to vehicle
- trunk unit must operate from -40 to 50 C (all of the durability features mentioned above must also apply)

Disk Drive

Although such items as access time, rotational speed and track density are a design consideration the disk drive must feature:

- removable disk(s)
- high transfer rate 200K bytes per second minimum
- multiple disk drives/controller
- error checking circuitry
- write protect
- quiet operation

The actual storage space required will be determined by the individual agency but 2.5 M bytes is seen as a minimum.

- must have security features such as terminal identification, key lock (may be easily removed and locked in car trunk)
- must have error checking circuitry built in
- a self test feature is desirable
- must be shock, liquid, dust and vibration proof
- must include a volume-adjustable audible alarm which must have an on-off switch
- must be swivel mounted in easy reach of the driver and usable by either driver or passenger
- must be positioned as close to eye level as possible without obstructing view
- must be positioned so that the screen cannot easily be read by passers-by
- must be easily interchanged from vehicle to vehicle
- trunk unit must operate from -40 to 50 C (all of the durability features mentioned above must also apply)

Tape Drive

The Tape Drives may use any proven tape buffering method and must conform to ANSI standards:

- 1/2 inch IBM Compatible tape
- 9 tracks
- 1600 bits per inch

The type of mounting, recording format, read/write speeds are a design consideration and are not covered here but these must be acceptable to the user agency.

The tape drive controller is also a design consideration but it must be able to accommodate a multiple drive configuration.

Error checking, BOT and EOT detection, write protection and skew control are also deemed a must as is quiet operation.

Low Speed Printer

The low speed printer will provide hard copy output from any system terminal. It must be capable of:

- printing 80 characters per line
- a minimum print rate of 120 characters per second
- quiet operation
- using inexpensive paper
- indicating faults.

Line Printer

The line printer must possess the following attributes:

- 132 characters per line
- a minimum speed of 300 lines per minute
- self test capability
- top of form control
- some method of static elimination.
- must be able to accommodate a variety of form lengths (3-24) inches as determined by the user agency.
- must have fault indicators.
- must have provision for multiple copy printing.
- its character set must be compatible with the Com-centre terminals' character set as chosen by the user agency.

In addition consideration should be given to finding a printer which meets these requirements and possesses the lowest possible operational noise level.

The equipment configuration required for the office location should consist of a terminal device and associated printer.

END