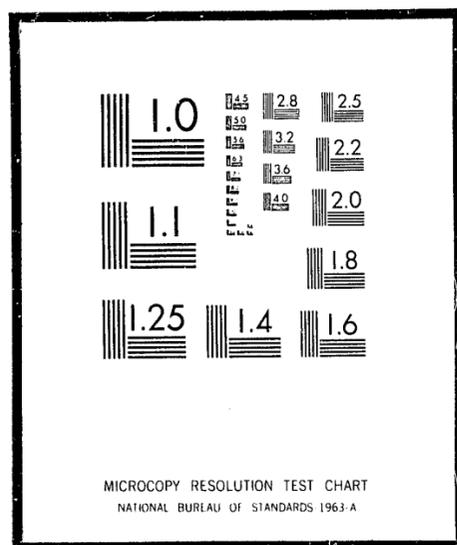


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## Computer Aided Dispatching for Law Enforcement Agencies

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## INTRODUCTION

For years large cities have enjoyed technological advances in law enforcement that have been beyond the means of smaller police departments. This is particularly true in the case of automated dispatch systems which could cost well over one million dollars and have in the past been designed for single city use. The Computer Aided Dispatch system described in this report has been developed for the smaller cities and has been designed to allow shared use between several police departments. The sharing departments operate independently, but have the advantages of cost-sharing a centralized mini-computer facility and immediate back-up capability during emergencies. The Automated Interactive Dispatch (AID) system has been in daily use by police departments in Oak Park (population 62,500), River Forest (population 14,400), and Forest Park (population 16,000) since April of 1974 (see Figure 1).

The AID system is a law enforcement tool designed to assist in opening up the communications bottleneck which exists in nearly every police radio room. The radio room is the nerve center of modern police operations. Radio dispatchers, monitoring the activities and maintaining the status of a fleet of patrol units, are the recipients of vital information which must be recorded, organized, and used in making operational and administrative decisions. The radio dispatcher's effectiveness depends critically on his ability to manage this data as



Figure 1

The AID System  
Oak Park Police Department Console

rapidly as possible, with a minimum of wasted effort.

The AID system is an integrated, intelligent terminal system capable of semi-automating the processing of radio tickets, maintaining dynamic mobile unit status, providing a rapid and efficient automated interface with the real-time criminal justice information system, and generating management reports. It is designed to replace the manual dispatch ticket system, the manual radio log or desk blotter, and the present criminal justice information system terminal device. AID is operated by the radio dispatcher and, in some departments, by a telephone complaint clerk and the dispatcher working together.

The AID system provides the radio dispatcher with a preformatted electronic dispatch ticket, which automatically captures data in machine-sensible form as it is entered. This greatly increases the efficiency of data collection, and as a by-product gives the dispatcher immediate access to the status of all mobile units, plus a dynamic backlog of unassigned incidents. The equipment automatically formats information on persons and vehicles into correctly structured inquiries which are routed to local, regional, state or federal criminal justice systems with no further effort on the part of the dispatcher. Full use is thereby made of the tremendous potential of the inquiry system as an operational tool.

The AID system automatically generates reports from the data it has in storage. These reports include the daily log

sheets, unit activity reports, ticket listings, and others.

The major goal during the developmental phase was to produce a system which would easily integrate into the dispatching procedures used by most departments and to make the dispatcher's job easier, not harder. Consequently, the system has evolved into a practical tool capable of assisting the dispatcher in performing his normal duties.

#### BACKGROUND

The concept of a dispatch ticket (or radio ticket, complaint ticket, incident ticket, etc.) as a data collection mechanism has been in use by police departments throughout the country for a number of years. These tickets, although varying in size, shape, color, and content from department to department, are still basically the same and are used to record, at the minimum, some basic facts about each assignment, event, or incident that requires the use of a police department's primary resource--manpower.

Some of the more common data elements recorded for each incident include:

1. Name, address, and telephone number of complainant;
2. Name of victim;
3. Time complaint was received;
4. Type of incident;
5. Location of incident;
6. Car number assigned;
7. Time dispatched;
8. Time of arrival on scene;
9. Time assignment was concluded;
10. A complaint or control number

Depending upon the size of the department, the dispatch tickets may be completed entirely by the radio dispatcher or by a telephone complaint clerk and radio dispatcher acting sequentially.

Dispatch ticket systems can and do serve a variety of purposes. Possible uses include:

1. Providing a single, event-oriented document which can be used as a recording medium by the complaint clerk and/or dispatcher to note certain facts about an incident;
2. Serving as an activation mechanism for a light board intended to keep the dispatcher informed of the status of the mobile units under his command;
3. Providing the dispatcher with a place to note all requested name or license checks;
4. Serving as a physically transferable document between the dispatcher and the operator of the automated criminal justice information system terminal (which may not be in immediate proximity to the dispatcher) in the event that a name or vehicle check is requested by the mobile unit;
5. Providing an easy origin point for a tight document control system;
6. Collecting all of the information necessary to construct an historical data base from which future operational plans may be constructed.

While a manual dispatch ticket operation is certainly better than no system at all or one in which only a simple chronological radio log is maintained by the dispatcher, there are some basic disadvantages, most of which relate to efficiency.

First, if this data is used as it should be for input to an automated management information system, there is a duplication of effort because the information must be recorded twice--once by the dispatcher in handwriting and once by the keypuncher in computer sensible form.

Second, when inquiries for the real-time criminal justice information system come in from the mobile units, there is a duplication or triplication of effort because the data must be recorded two or three times--once by the dispatcher in handwriting, once by the terminal operator for entry into the system, and once, perhaps, by a keypuncher so that a record may be made in some file that a check was run on this person or vehicle on this date, time, and address.

Third, the movement of a physical document between the complaint clerk, the radio dispatcher, and possibly a terminal operator is an awkward, inefficient process. Also intermediate filing and retrieval, perhaps several times, of an individual radio ticket during the normal progress of an incident only adds to overall inefficiency.

The typical criminal justice information system has wanted person, stolen property, and stolen vehicle information available for inquiry. This may be a state operated system having terminals located in police agencies throughout the state, a regional system, or, in some large city departments, it may be an in-house departmental information system. Most of these systems have a link, either directly or indirectly, to the NCIC in Washington, D. C.

In most agencies, the terminal having the highest volume of use, if there is more than one, is located in the radio room and is operated by either the radio dispatcher or a special terminal operator. This location is the most logical since, almost without exception, it is the closest practical point to the information system's ultimate user, the officer in the mobile unit, who is linked to this site by voice radio.

The information systems consist of computers, automated files, communications equipment, telephone lines and terminal devices. Generally, these systems have been developed and implemented at an enormous cost, often reaching several million dollars. Operating at fantastic speeds, the automated portions of these systems have a tremendous capacity for processing inquiries. These systems are obviously intended to be used and used heavily. And so they should, since, as is the case with any other type of event having a probability factor associated with it, the more inquiries made, the more "hits" or positive responses will be received. In fact, it would be extremely good police practice to run a name and/or vehicle check on the persons or cars involved in every police contact. Only in this way can the system provide its maximum benefits in protecting the officer on the street and increasing the criminal apprehension rate.

Unfortunately, most criminal justice information systems are not used to their maximum potential in actual operation. The reason, however, does not normally lie within the automated facets of the system itself, but rather in how the total system (in the

larger sense of the word) was defined. Systems are not limited in composition to computers, automated files, terminals, etc., they include most importantly, but also most overlooked, users and the users' operational environment.

Many operational criminal justice information systems suffer from restricted user access and it is in this area that bottlenecks occur which prevent the automated system from delivering all of its potential benefits.

The problems which cause the ultimate bottleneck can be made up of many elements. First, there may not be enough radio air time available to permit a high level of inquiry use by mobile units. Second, incoming inquiry particulars are usually recorded in handwriting by the dispatcher on the dispatch ticket from which the dispatcher or a terminal operator must immediately re-record it by typing it into the terminal device. Third, the terminal device itself may be located across the room from the dispatcher and not near his primary work station, the radio console, thereby causing him or the terminal operator to physically move across the room to process the request. Fourth, the inquiry must be translated into a rigid and unforgiving format, in which one misplaced comma will cause the entire message to be rejected. Fifth, where unbuffered terminals are being used, many agencies prepare a punched paper tape first and then feed this into the terminal so that it may transmit at full speed, but thereby slowing the total turn-around time for the inquiry.

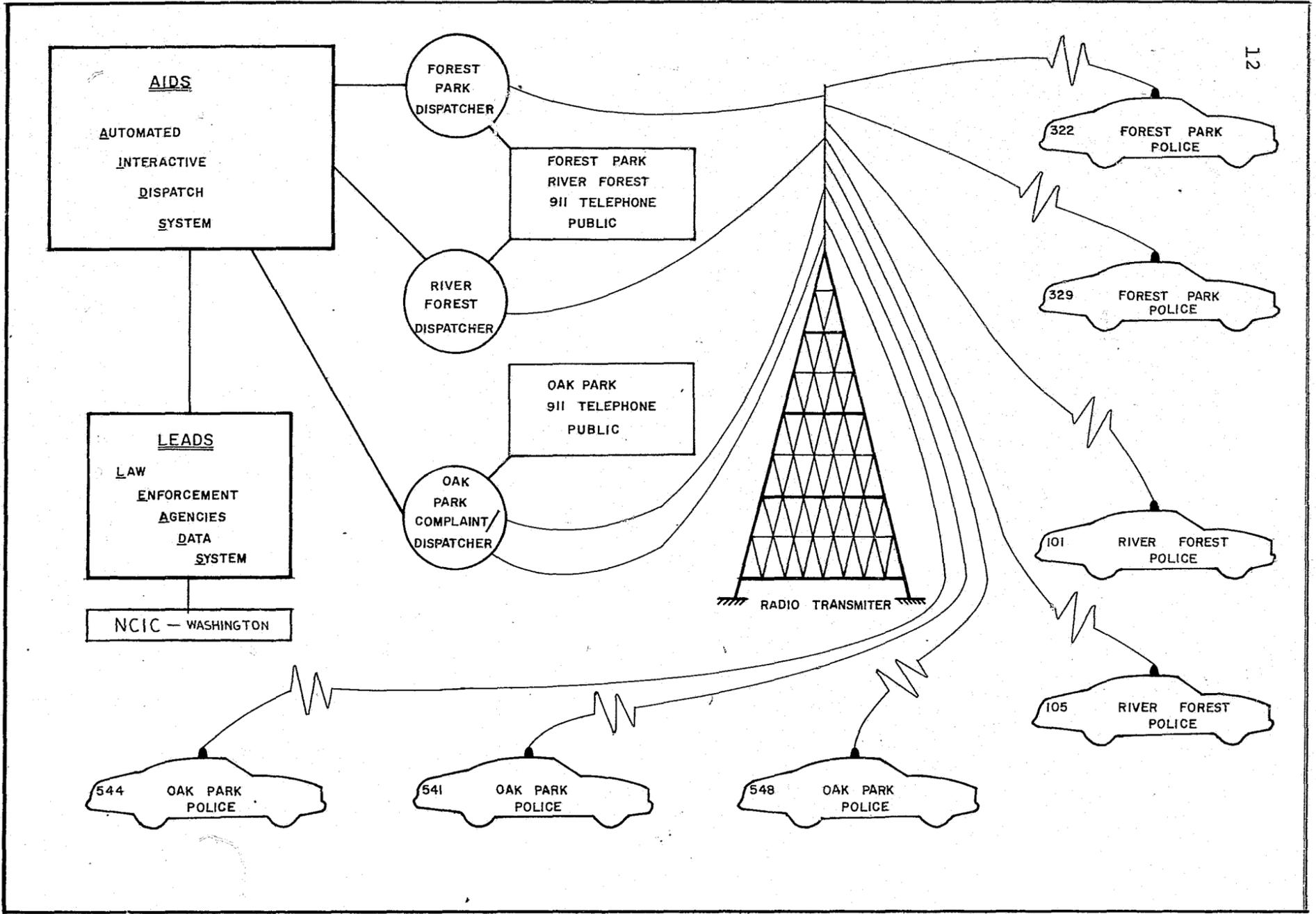
It is readily apparent, then, that there are many obstacles between the information system user, the patrolman on the street, and the information system itself which prevent maximum utilization. From the user's point of view, therefore, the system often appears unresponsive to his needs within his timeframe and, consequently, he uses the system only when absolutely necessary and not as a part of the normal operating sequence.

To cope with these problems, the attack must be launched at the nucleus of the difficulty, the radio room itself, its operating personnel and procedures and the operator-information system interface. To the degree possible the radio dispatcher must be provided with an integrated mechanism for handling his normal dispatching and data collection duties and also interfacing with the automated information system in the most efficient manner.

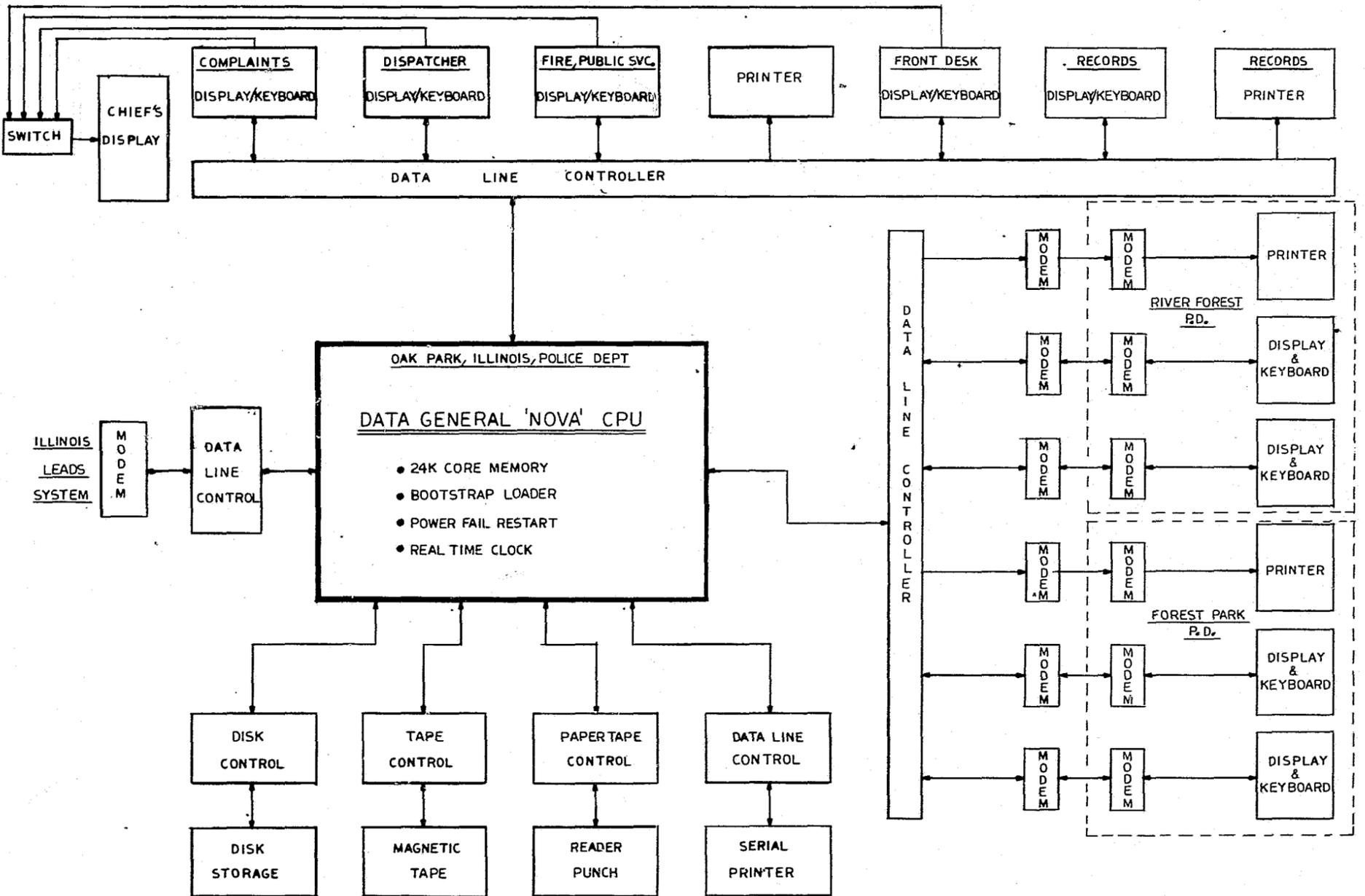
#### A MULTI-CITY SYSTEM

The first AID system for a multi-city operation is presently in operation in the villages of Oak Park, River Forest and Forest Park, Illinois, located in the near-west suburban area adjacent to the city of Chicago (see Figure 2). This system will serve as a model to describe in detail a typical multi-city AID system (see Figure 3). Throughout this description, please bear in mind, this system was tailored to the specific requirements of these users. Any other installation may differ on an operational level; however, the fundamental structure and function of all AID systems will remain basically the same.

Figure 2



12



13

Figure 3

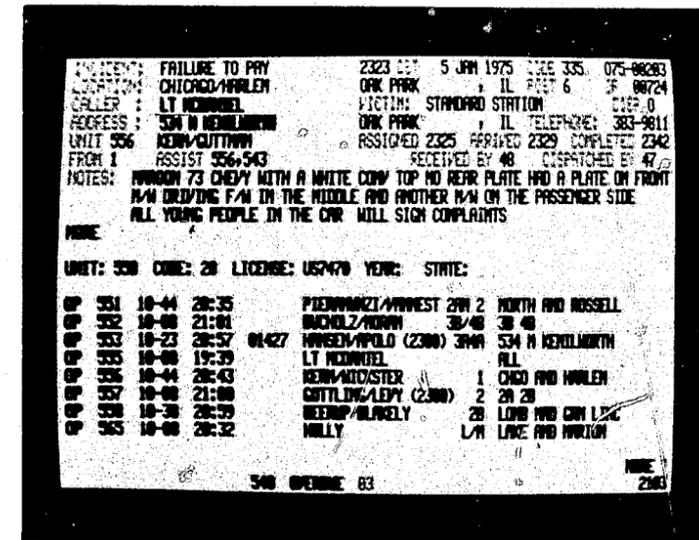
Oak Park System Block Diagram



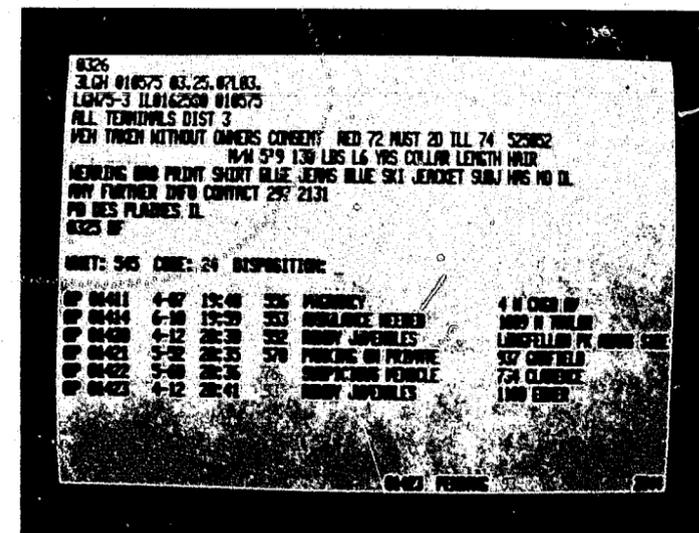
places, depending upon the department's normal operating procedure. All other equipment may be located in a separate room.

Operationally, the display screen is divided into four distinct areas, each reserved for specific uses. The top area is used to display dispatch tickets or responses from the criminal justice information system. The second area is a single line reserved for conversational interaction between the AID system and the operator. The operator uses this line for inquiries into the criminal justice information system or unit status updates. Unit and ticket status tables are displayed in the third area. The bottom two lines are used to display messages to the operator from the AID system regarding system status, or from other operators. Messages indicating a unit is overdue, a high-priority incident is waiting dispatch, or a response has been received from the criminal justice system appear in this area.

This division of the screen allows the operator to maintain the current incident ticket and mobile unit status table in view and still be able to service other units requesting a change in status or a check on stolen cars or wanted persons.



- Dispatch Tickets
- Criminal Justice System Inquiries
- Unit Status
- Message Area



- Criminal Justice System Responses
- Unit Status Update
- Ticket Status
- Message Area

Figure 5  
Visual Display Format

### OPERATION

In operation, the AID system is primarily concerned with two basic sorts of entities--dispatch tickets and patrol units. The dispatch tickets represent police business--calls to be answered, incidents to be handled, or whatever. The patrol units represent the police force--teams of police officers "on the street" to respond to incidents and to perform required services. These units are known to the system as entries in a status table. This table is available at all times for display at any dispatch console, and facilities are provided for the operator to alter the status of a unit in any manner desired.

The dispatch ticket is used to record minimal information about an incident and the manner in which it was handled. Some of the information is obtained from a citizen on the telephone, and some of it is provided by an officer over the radio. Active dispatch tickets, along with those awaiting service, are recorded in a table similar to that used for monitoring the status of patrol units. This table may also be inspected from any dispatch console. When police service on an incident is completed, the corresponding dispatch ticket is dropped from the status table.

The dispatch ticket itself consists of a series of fields into which various sorts of information is entered (see Figure 5). Some of these fields are filled, directly or indirectly, by the operator, while others are automatically

filled with information already known to the system or inferred from other data on the ticket. For instance, the nature of the incident can be inferred from the code supplied, a zone or post number can usually be determined from the location entered, and the date and time are constantly updated by the system, and are thus known in advance. Table I lists the major fields of the ticket, along with the maximum length and primary source of the information they contain.

In normal practice, the operator receiving a call will be required to supply an incident code and a location, the caller's name, address, and telephone number, and a few explanatory notes for the dispatcher to pass on to the assigned unit. The dispatcher need normally make no direct entries on the ticket at all--the assigned unit, the officers names, any assisting units, the times of assignment, arrival, and completion, and the final disposition are all entered indirectly as a concurrent result of the changes in status of the units involved. A few examples will make this point clear.

When an operator, speaking with a citizen on the telephone, determines that the incident being reported indeed requires police services, he initiates the generation of a new dispatch ticket by supplying an appropriate incident code (if one is applicable) and the location as reported. When the newly created ticket appears on the display, he enters the caller's name, address, and telephone number in the fields provided, and any additional information in the notes area at the bottom of the ticket.

## TICKET FIELDS

Field	Size	Information Provided By:			Notes
		AID System	Complaint Operator	Dispatch Operator	
1. Ticket number	5	x			
2. Control number	8	x			
3. Date	7	x			
4. Time	4	x			
5. Incident Code	4		x		1
6. Incident	24	x			2
7. Location	24		x		1
8. Zone	4	x			3
9. Department	2	x			
10. Caller	24		x		
11. Victim	24		x		
12. Address	24		x		4
13. Telephone	7		x		4
14. Unit assigned	4			x	1
15. Officers	24	x			
16. Zone responding	4			x	1
17. Time assigned	4	x			
18. Time arrived	4	x			
19. Time completed	4	x			
20. Disposition	3			x	1
21. Assisting units	24			x	1
22. Received by	4	x			
23. Dispatched by	4	x			
24. Notes	216		x	x	

- Notes:
- 1 for convenience, these fields are filled by the system with information obtained from the operator expressly for this purpose.
  - 2 the information for this field is determined from the incident code, if one is supplied. Otherwise, it must be entered manually by the operator.
  - 3 the information in this field is inferred from the location.
  - 4 When Automatic Number Identification (ANI) or Automatic Location Identification (ALI) capability becomes available through the telephone system, these fields may also be automatically filled.

TABLE 1

Whenever any operator decides to dispatch a unit to handle this incident, the act of assigning that unit to this ticket causes the unit number, the officers names, and the time of the assignment to be entered into the appropriate fields of the ticket. In addition, this action forms a link between that unit and this ticket, so that, when that unit subsequently arrives at the incident location, simply reporting the arrival will automatically cause the time of arrival to be entered on the ticket as well.

Finally, when any unit assigned to this ticket reports they have completed their assignment, reporting that unit clear also causes the time of completion and the final disposition to be entered on the ticket. In all of this, the dispatcher never enters any data directly on the ticket. Rather, by simply manipulating the status of the field units, he is, at the same time, completing the dispatch tickets as well, without any extra effort.

The AID System also provides an interface with the criminal justice information system. Outgoing messages of all sorts can be prepared and transmitted from any display console in the AID system. Moreover, incoming traffic, in addition to being printed on the printer in the dispatch center, can also be displayed directly at any console as soon as it is received. Thus, an operator can perform any action required to make effective use of this powerful facility without ever leaving his station.

In addition, the data formatting and editing capabilities provided by the AID system greatly simplify the task of preparing a message for transmission--so much so, in fact, that routine person and vehicle inquiries can most often be prepared and transmitted in the same time it takes to receive the request over the radio. This serves to improve overall response, typically cutting total turnaround time by more than half.

### FUNCTIONS

AID system functions may be divided into three groups, depending upon how intimately they interact with the system's data base and how frequently they are used during normal system operation. Those which pass both tests, accessing primary structures on a regular basis, are primary functions. Those which meet only one requirement or the other are called secondary functions. The remainder, acting at infrequent intervals on secondary information, are auxiliary functions, or utilities.

Those functions with a fairly high frequency of use in normal operation (including all primaries and most secondaries) are provided with special function keys dedicated to that use alone. All other system services are obtained indirectly, using a code-name, through a special function (INVOKE) expressly devoted to that purpose. The other special keys and their functions are listed below.

The EVENT function generates a new dispatch ticket for an incident, given a location and (optionally) an incident code.

The TICKET function recalls and displays a ticket given the ticket number. It is used with STATUS to display ticket status information.

The UNIT function alters the status of a unit given the unit number, a status code, and possibly some other data depending upon the code. It is used with STATUS to display unit status information.

The STATUS function displays ticket and unit status tables. It

is also used with LEADS to display recent LEADS traffic.

The LEADS function formats and transmits messages to the LEADS computer. It is used with STATUS to display messages from LEADS.

The PRINT function prints dispatch tickets and LEADS messages.

The FILE function assigns document control numbers to dispatch tickets.

The MEMO function performs limited message switching between consoles.

The CLEAR function simply clears the display screen.

### EDITING

The AID system employs its full formatting and editing capacity in two areas--dispatch tickets, and messages being prepared for transmission to the criminal justice information system. In other cases, a reduced data entry capability is used, in which some keys are disabled entirely, and others are limited in scope. The keys used for editing under format control are listed below. Differences in operation during data entry are so noted (see Figure 5).

The TOP key returns directly to the first accessible field of the format, aborts data entry, commences editing.

The TAB key advances to the next following start of a data field, terminates data entry.

The REV key returns to the next previous start of a data field. During data entry, restarts current field only.

The ADV key advances to the first field on the next line of the format. Emulates TAB during data entry.

The Space Bar advances one character space. During data entry, erases one character before advancing.

The Backspace key backs up one character space.

The INS key inserts a single character space at the current edit position. Ignored during data entry.

The DEL key deletes a single character at the current edit position. Ignored during data entry.

The Return key erases all text to the right of the current edit position, then emulates TAB in all other respects.

### INFORMATION

The AID system is basically a real-time data acquisition, storage and retrieval system. The information gathered during the course of normal, everyday operation falls into several general categories.

#### Dispatch Tickets

This is the primary data collection medium. Each dispatch ticket is stored on the disk as a separate file, accessible independent of all others. Dispatch tickets may be continually recalled and modified, many times over. Information may be extracted from them in the preparation of various reports. The tickets may also be periodically printed out, either on paper or heavy tab card stock, for long-term storage.

#### System Log Files

The system keeps a time-ordered account of all events known to the system, as they occur. Each ticket or control number generated, and every change in the status of any unit, is noted by the system in a master log file. In addition, for control purposes, any such transaction involving a unit or control number is also recorded in a separate file, ordered by this number. All messages transmitted or received over the law enforcement information network are also recorded and saved. Any of these files may be inspected or printed, in whole or in part, at any time.

AUTOMATED RECORDS SYSTEMS

The AID system has been interfaced to the automated record system of the state of Illinois (LEADS) and the National Crime Information Center (NCIC). As discussed previously this interface provides the operator with many advantages over the standard terminal device connected to these systems. AIDS can be interfaced to other record systems in a similar manner. The advantages of using AIDS as the interface are:

1. Many of the data items stored in a record system are captured by AIDS during the normal process of handling the dispatch operation, thus reducing the cost associated with the collection and entry of data into the record system.
2. The AIDS visual display and printer serve as the terminal devices for the record system, reducing equipment and maintenance cost.
3. The dispatch operator has access to the record system from his primary work station providing for more efficient operation.
4. The AID system can relieve the record system of the burden of editing and formatting. The record system can establish formats that minimize processing time on each of the thousands of inquiries they receive.
5. Simplified formatting, editing and error correction allows the operator to interact with the record system in a faster and more efficient manner.

MOBILE DIGITAL COMMUNICATIONS

Mobile digital communications is one of the emerging technologies being applied in a few departments and proving beneficial in daily operation. These benefits have been well documented and include secure communications, lower channel occupancy and in systems equipped with printers the elimination of hand copying of traffic. While these benefits are significant, additional financial and operational benefits are obtained whenever a mobile digital system is combined with a computer aided dispatch system. The AID system has been designed to permit easy expansion into digital communications and provides the following benefits:

1. Mobile digital communications systems typically include a computerized control unit and dispatch operator terminals. The AID system computer will perform the functions of the communication controller without degrading the performance of the dispatch function. The AIDS dispatch terminal will serve as the communication system dispatch terminal. This elimination of equipment reduces hardware and maintenance costs, as well as saving space.
2. The combination of AIDS and a digital communication system provides the patrolman with full access to all system functions including the ability to change unit status, make direction inquiries into the criminal justice system and receive responses without any

intervention by the dispatch operator. This direct connection to the criminal justice system allows a high level of inquiries on the part of the officer.

3. In slack periods patrolmen can enter data for reports which the AID system will print out at a later time. Descriptive information can be entered directly into the incident report.

#### COST CONSIDERATION

Computer aided dispatching is really a question of departments being able to acquire a system at a price they can afford. Community Technolgo's approach to reducing the cost of the system has been to take advantage of the proven cost effectiveness of mini computer systems and to develop software to allow the system to be cost shared among several departments. The cost will depend upon several factors:

1. The number of departments willing to share the system;
2. The number of dispatch stations necessary to provide the desired level of service;
3. The number and extent of special hardware and software features requested with the system;
4. The availability of federal funds; and
5. The installation cost.

In Illinois, agencies can apply for federal funding through the state planning agency (Illinois Law Enforcement Commission - ILEC) of the Law Enforcement Assistance Administration (LEAA). Successful applicants receive 90% funding from ILEC and 5% funding from the state of Illinois, leaving only 5% to be split between the participating agencies. Obviously the state planning agency cannot fund every request and as acceptance for computer aided dispatching grows the competition for limited funds will become more severe. The successful

applicants will be those that submit their application early, have developed a well organized plan and follow the guidelines established by LEAA and the state planning agency.

#### COST SAVINGS

Improved service to the public is the major reason for acquiring a system; however, as an additional benefit, the system will generate cost reductions in several areas. In a multi-city environment an immediate savings will be realized by terminating the lease on the terminal device connected to the state or federal criminal justice information system. Connection to the criminal justice system will be through the AID system and will require one phone line rather than one for each city. Additional savings can be realized by reducing the clerical help necessary to type handwritten reports, generate data for uniform crime reports and maintain records. Increased efficiencies, reallocations and productivity generated by the system reduces the pressure for additional patrolmen and clerical personnel. These savings should significantly reduce the monthly operational cost.

CONCLUSIONS

There is little doubt that technological advances, such as digital communication with mobile terminals in patrol cars, 911 emergency telephone system, automatic location of patrol cars and computerized record systems will become standard practices in most law enforcement agencies in coming years. The AID system has demonstrated that new technology can be beneficial and can be obtained on a cost effective basis by the smaller departments.

**END**