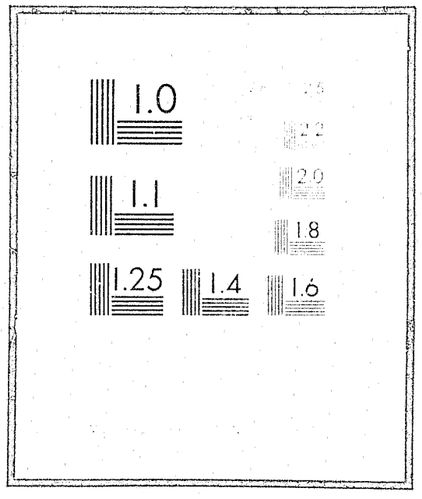

TECHNICAL REPORT NO.11

CLIS
CRIMINALISTICS LABORATORY INFORMATION SYSTEM

VOLUME 1
A Conceptual Design

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TECHNICAL REPORT NO.11
MAY 1975

CLIS
CRIMINALISTICS LABORATORY INFORMATION SYSTEM

VOLUME 1
A CONCEPTUAL DESIGN

Final report on work performed under Law Enforcement Assistance Administration Grant No. 73-SS-99-4309, awarded to the California Crime Technological Research Foundation for Project SEARCH. In 1974, Project SEARCH was incorporated as SEARCH Group, Inc., and the project was continued to completion under its guidance.

Submitted by SEARCH Group, Inc.
Criminalistics Laboratory Information System
Project Committee
Thomas M. Muller, Chairman

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PREFACE

The model for a criminalistics laboratory information system described in this report was developed by Project SEARCH (now SEARCH Group, Inc.) as part of its ongoing program of facilitating the application of advanced technology to the administration of criminal justice. The project, funded by the Law Enforcement Assistance Administration, addressed itself to three topics:

- definition of the information needs of criminalistics laboratories throughout the nation
- conceptual design of an automated information storage and retrieval system
- creation of a plan for implementing the system.

Future efforts will include the detailed design, implementation, and evaluation of a pilot system and, eventually, full system implementation.

SEARCH Group, Inc. (Project SEARCH) is a private, non-profit justice research organization owned and operated by the fifty states, the District of Columbia, Puerto Rico, and the Virgin Islands, which fosters research of greater magnitude than can normally be undertaken by individual states.

Thomas M. Muller served as CLIS Project Chairman and Fred Wynbrandt as Vice Chairman. Subcommittee Chairmen were Edward Bigler, Richard Fox, and Frank Madrazo. Administrative staff services for the project were provided by the California Crime Technological Research Foundation; technical support was provided under contract by PRC Public Management Services, Inc.

In addition to this report, four volumes providing detailed information about specific aspects of the project will be published:

- Volume 1 — *Identification of User Needs*
- Volume 2 — *Systems Design For a Conceptural Model*
- Volume 3 — *System and Organizational Impact*
- Volume 4 — *Implementation Plan*

Copies of these volumes are available from SEARCH Group, Inc.

PART ONE: PROJECT BACKGROUND AND OBJECTIVES

Forensic science has played and will continue to play a vital part in the criminal justice process. Present demands on services provided by crime laboratories far exceed their capabilities. This is basically due to the fact that the facilities and manpower have not kept pace with an ever-increasing workload. Further, crime laboratories frequently adopt new technical procedures and instrumentation resulting from advances in the field of science. Such applications have become highly specialized and, due to the complex techniques and equipment involved, they are availably only in the few more sophisticated laboratories. These advanced disciplines produce an abundance of hard-to-manage data not generally available or disseminated to the average crime laboratory.

A Criminalistics Laboratory Information System (CLIS) can improve the efficiency and effectiveness of crime laboratory functions by speeding up the scientific process through immediate access to information from centralized data bases. Such a system also will improve the quality of crime laboratory services through immediate communication capability among the community of crime laboratories, as well as provide a "tool" for broader and more effective standards. The ultimate goal, of course, is to improve public safety and criminal justice by benefiting from the greater use of documented crime laboratory evidence for the investigator, prosecutor and the courts (to clear the innocent and convict the guilty).

Phase I of the CLIS Project has as its objectives:

Determination of Users' Needs. This requires definiton of the "user", identification of the crime laboratory population and collection of relevant data to indicate both informational needs and priorities.

Development of Conceptual Design. This includes definition of the general system configuration, exploring data structures and organization, and providing an overall systems definition of major application without necessarily specifying manufacturers' hardware or software systems.

Develop a Cost Comparison Analysis for Various Alternative CLIS Configurations. Provide for each alternative configuration, design detail and cost analysis for the four basic hardware components of the system: User Terminals, Communications Network, Computer Processing and Data Storage.

Determination of Organizational Impact. Perform analysis to consider alternative organizations which would operate the CLIS system; analysis to establish fair and objective criteria for agencies accessing CLIS; analysis to determine whether sufficient statutory or administrative authority is vested in operating organization, and to define data security and system discipline.

Develop Implementation Plan. Includes the identification of activities and performance milestones; the development of a schedule showing the relation of activity and performance milestones to each other and the established time schedule; the identification of personnel requirements for each of the major activities defined in the implementation process; the development of budget requirements of the implementation process; and the identification and scheduling of important decision points at which progress may be reviewed and subsequent activities reevaluated.

Profile of Potential CLIS User Laboratory

The identification and Analysis of the needs of laboratory users is based upon responses to detailed questionnaires received from 168 laboratories supplemented by on-site staff interviews with a representative sampling (17) of these laboratories and by the collective experience of project staff members.

The laboratory sector involved in criminalistic activity is essentially supported publicly as part of the overall law enforcement sector. There are probably a few private laboratories which do some criminalistic work, but their volume of work would be so small as not to warrant their inclusion in a survey of this type.

Laboratory size varies from one-man labs analyzing several hundred samples a year to the FBI laboratory with over 400 employees processing one-half million cases in 1973. Laboratory organization and administration are equally disparate: some accept only drug and narcotics analysis; some are concerned only with general identification cases (fingerprints and photography); others are fully capable of analyzing all crime scene evidence. Administrative control of a crime laboratory may rest with the county sheriff, the local police department, the medical examiner's office, the prosecutor's office, a statewide crime laboratory organization or a federal agency. All of the variations of these attributes make it difficult to develop a description of the "average" laboratory.

The average total laboratory size is 16 persons; of these, approximately 9.5 are technically trained. This averages out to be approximately 6.5 chemists, one firearms/toolmark examiner, one document examiner, and one toxicologist per laboratory. Note that these are gross averages and do not include the FBI laboratory. The majority of these labs are classified as main laboratories and are administered at a state or county level.

The case loading for all laboratories indicates an increase from year to year. The average case load for 1972 was 18.8 percent higher than that of 1971. The average case load for 1973 was 22.1 percent higher than that of 1972. Based upon these figures, it is to be expected that the 1974 case load will be 25.4 percent greater than that of 1973. The most active category of analytical work is Drugs and Narcotics.

Almost all of the responding laboratories had capabilities in gas chromatography, infrared spectrophotometry and ultravioletspectrophotometry. More than 85 percent of the laboratories have an infrared spectrophotometer and 84 percent have at least one ultraviolet spectrophotometer. This commonality of instrumentation suggests that analytical/identification support by CLIS would initially center upon the use of one of these instruments.

Few laboratories make use of external standard reference files with routine frequency. In fact it appears that most of the laboratories rely upon their own in-house standard reference and evidence files.

The general conclusion is that the responding labs and data provided is representative of the laboratory population surveyed.

INFORMATION NEEDS

A composite listing of general laboratory information needs as assigned by responding laboratories follows:

Application	Composite Priority
Analytical I/D Support	1
Statistics to Determine Specimen Uniqueness	2
Sources of Standard Evidence	3
Literature Abstracts	4
Rifling Specifications	5
Bibliographic Information	6
Sources of Knowledge	7
Sources of Reagents	8
Computation Capability	9
Explosive Tagging	10

In order to propose a rational implementation sequence, a number of factors were taken into account:

- The above priority list established by the potential users
- The need to initially concentrate on highly visible and easily implementable functions that are useful to a number of laboratories
- The strategy of using available data bases that can be incorporated into CLIS with little or no modification
- The concept of showing preference to applications that are useful to the greatest number of laboratories
- The delaying of functions that are highly sophisticated or difficult to implement
- Consideration of the time that must elapse for the implementation of each application.

Applying the above criteria to the priorities selected by respondents and considering the comments and recommendations of the CLIS Committee, the following implementation sequence is recommended:

- Rifling specifications
- Analytical and ID support for IR for drugs, using the Sadtler pharmaceutical and HOCRE files as the data base
- Bibliographic and abstracting services
- UV analytical and ID support for drugs
- Expansion of IR data base to support analyses of nondrug samples
- Sources of evidence samples and reagents
- Implementation of the remaining analytical /ID support functions:
  — GC, MS and GC/MS
  — UV for nondrugs
  — Fluorescence spectroscopy and X-ray diffraction.

This sequence (subject to modifications suggested by further experience) will result in an orderly implementation and a realistic system structure.

PART TWO: CONCEPTUAL DESIGN

To be effective and responsive to the laboratory community, the function, operation, and system resource requirements necessary to implement each application area should be integrated into a single CLIS system, under a central organization, which would exercise management control of day-to-day operations.

Table 1 summarizes the estimated demands that each application area would make of system resources. It is readily apparent that the number one priority area, analytical/ID support, requires far more system resources than the other application areas combined.

Data Storage

The implementation of on-line data files for mass spectrophotometers will require a considerable amount of data storage. Prior to the implementation of this file, the data storage requirements will be quite minimal. The total requirement of 400 million characters is well within the scope of present equipment. The estimated growth rate indicates that there will be a 50% increase in data storage requirements in the first five years.

Communications

The estimates made for character traffic were generally based upon daily usage. To break these figures down to an hourly rate would depend largely upon laboratory working hours and system availability. Assuming a worst case of 6.4 million characters per 8-hour day, the bit rate requirement of any central node of the communications net would average approximately 2000 baud. This is fully within the range of present-day technology.

File Maintenance

Application files may be modified for a number of reasons: addition of new data, modification of data to correct errors and deletion of data that has met specified purge criteria. Depending upon the types of file management systems used, maintenance may have to be performed periodically to prevent over-use of file overflow areas and the subsequent increase in file search time. Should the CLIS configuration be organized around a central processor complex, file maintenance must be carefully scheduled so as to maximize system up-time. Errors in file data should be corrected on a daily basis while full file updates scheduled as required on a periodic or "as the data accumulates" basis.

Processing Capability

Processing functions will largely be the responsibility of the real-time teleprocessing monitor(s) and its subordinate application processors (computer programs). It is apparent that a single application processor could be used for the three "inquiry/response" applications while specialized applications processors would be required for the bibliography, rifling and analytical support applications. The rifling application processor would be relatively simple and the bibliographic processor could be generated by slight modifications to currently available systems. The processing functions of the analytical processor will require a substantial effort to develop and implement on a nationwide, all-encompassing basis.

All data input will be edited as much as possible prior to being passed to an application processor so as to maximize concurrency of simultaneous operations. It will be the responsibility of the teleprocessing monitor(s) to efficiently schedule operations to be performed and allocate system resources.

As can be seen from the intricacy and variety of its component application areas, CLIS will be a complex system. Its users will be separated not only geographically, but also by size, work load and in some cases by functional responsibility. The system must be responsive over a wide range of system usage and heterogeneous processing and data storage requirements.

A CLIS configuration with centralized processing and data storage, using an established government network, and which is not hierarchical but has

the capability of growing into a hierarchical system, is recommended. This configuration is diagrammed in Figure 1.

Advantages:
- Flexibility
- Centralized control
- Easy coordination of file maintenance
- Local processors can handle specialized non-CLIS data peculiar to each laboratory
- Multiple terminal capability for high-volume users
- Potential of acquiring/reducing data directly from instruments
- Ease of expansion from basic terminal through intelligent terminal and local processor capabilities.

Disadvantages:
- Configuration may not be optimal for the specialized needs of some application areas
- Possible peak-period competition for system resources, resulting in response delays
- Increased complexity resulting from communication between local and main processors
- Increased cost of local processors and data storage
- Local systems and programming support must be provided.

In the Distributed Processor CLIS all users have access to a common communications net and selective access to a processor complex depending upon the application area they are currently using. This configuration costs out essentially the same as the centralized processor scheme. The data storage cost, however, might be greater than shown since additional controllers would be required to attach the storage devices to more than one CPU.

In the Hierarchical CLIS configuration certain high-volume or specialized users would have dedicated local processor and data storage capability (using minicomputers) with multiple terminals. Other users would still be able to have access to the CLIS files using normal terminal operations. The communications network would become the central control point of the system.

In this configuration an arbitrary 70/30 split was assumed between those localities requiring simple and elaborate terminals. The inclusion of local processor and storage capability at some laboratories adds substantially to the total system cost. As with the nonhierarchical distributed processor alternative, the data storage cost might have to be revised upward somewhat to include additional controllers.

Table 2 depicts comparative costs of the following configuration alternatives as well as the recommended Centalized Hierarchical CLIS:

The User Independent CLIS provides each user with a complete processing and data storage capability. There is no direct communication with a central system or other laboratories. Even though this alternative involves only one type of hardware component, duplicating it 200 times results in by far the most expensive configuration.

The Centralized CLIS is the simplest of CLIS configurations. All users would interface their terminals directly with a single processor complex. This configuration also provides the greatest degree of centralized control. Combination of simple terminals with a centralized processor and data storage via a communications network leads to a relatively attractive total cost. There appears to be no particular cost advantage, however, in a centralized processor.

TABLE I

SYSTEM REQUIREMENTS BY APPLICATION AREA

APPLICATION AREA		Data Storage in Characters		Communications* Characters/Day File Maintenance Record Updates	Processing Capability	Analytical/ID Support
		Initial	Growth Per Year			
Analytical/ID Support	Small IR File	4.0 M	60.0 K	1.4 M		On-Line Files
	All Known Data Bases	385.0 M	50.0 M	5.4 M	Annually and as available	Interactive Access
	All Data Except MS.	31.0 M	2.6 M	2.7 M		Extensive File Searching and Matching
Rifling Specifications		2.3 M	123.0 K	400.0 K	Weekly	Interactive Access
Bibliography & Abstracts		9.0 M	1.8 M	600.0 K	Bi-Weekly or as Citations are Developed	Language Interpreter On-Line Tutorial
Sources of Standard Samples		3.4 M	2.0 M Avg. 2 yrs.	3.5 K	Semi-annual, As Available	Inquiry/Response
Sources of Specialized Reagents		100.0 K	5.0 K	500	As Available	Inquiry/Response
Summation		401.4 M	53.9 M	6.4 M		

* Ten-fold usage increase after implementation

M - Million
K - Thousand

		"EACH" COSTS	USER INDEPENDENT CLIS	CENTRALIZED CLIS	DISTRIBUTED PROCESSOR CLIS	HIERARCHICAL CLIS	CENTRALIZED HIERARCHICAL CLIS
LOCAL TERMINALS	No. Range Median	1 $0.049-$0.37 $0.21		200 $9.8-$74 $42	200 $9.8-$74 $42	140 $6.86-$51.8 $29.4	140 $6.86-$51.8 $29.4
LOCAL CPUs AND DATA STORAGE	No. Range Median	1 $1.3-$1.5 $1.4	200 $260-$300 $280			60 $78-$90 $84	60 $78-$90 $84
COMMUNICA-TIONS	No. Range Median			1 $20-52 $36	1 $20-$52 $36	1 $20-$52 $36	1 $20-$52 $36
CENTRAL CPUs	No. Range Median	(Distributed only) $3.32-$4.48 $3.9		1 $6-$27.3 $16.65	2-6 $6.64-$26.88 $16.76	2-6 $6.64-$26.88 $16.76	1 $6-$27.3 $16.65
CENTRAL DATA STORAGE	No. Range Median			1 $5.76-$7 $6.38	2-6 $5.76-$7 $6.38	2-6 $5.76-$7 $6.38	1 $5.76-$7 $6.38
TOTALS	Range Median		$260-$300 $280	$41.56-$160.3 $100.93	$42.2-$159.88 $101.04	$117.26-227.68 $172.47	$116.62-228.1 $172.36

TABLE 2

COMPARATIVE COSTS OF DESIGN ALTERNATIVES

(MONTHLY COSTS IN THOUSANDS OF DOLLARS)

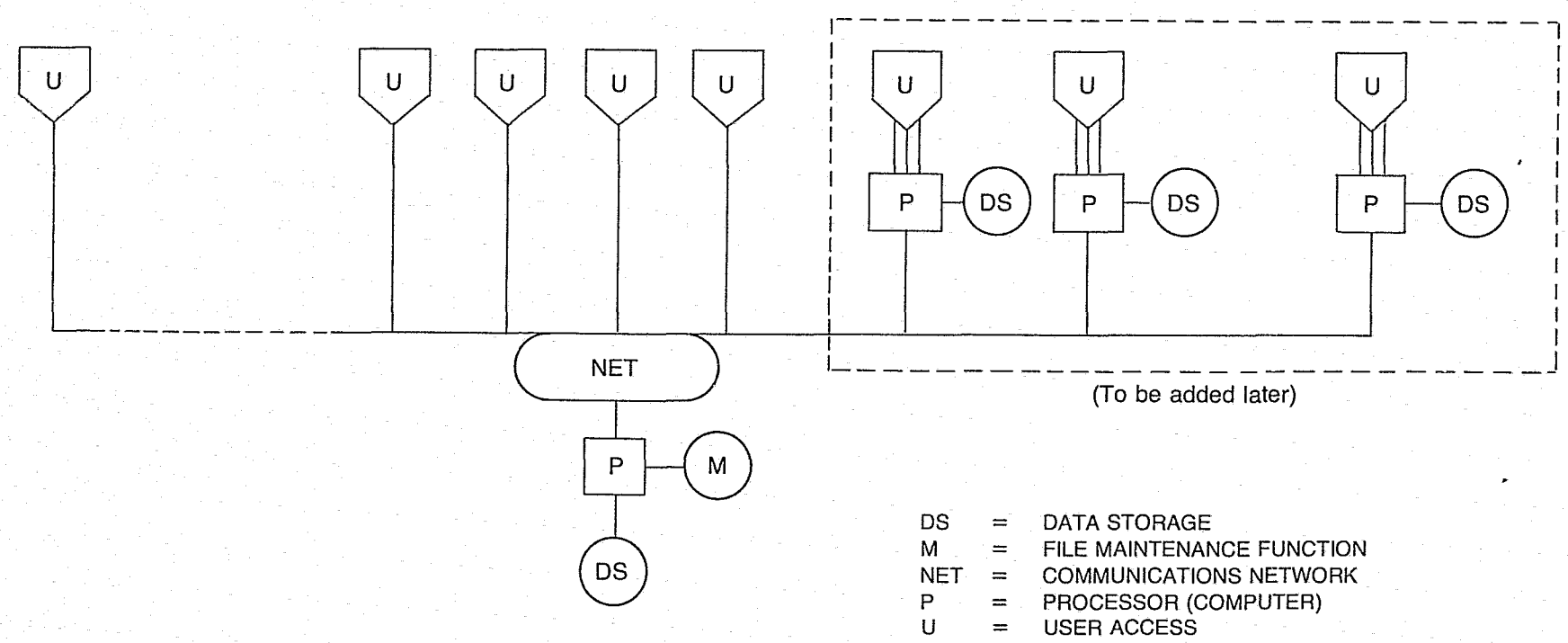


Figure 1
Recommended CLIS Configuration
Centralized Hierarchical CLIS

PART THREE: RECOMMENDED ORGANIZATIONAL STRUCTURE OF CLIS

There are two key elements in the proposed organizational structure and process of CLIS. The first aspect is the functional organization of CLIS which includes the day-to-day operation and maintenance of the system and the delivery of user services. The second consideration, equally as important, is the mechanism for making and enforcing general policies, procedures and control measures which would guide the administration and operations of CLIS.

The need for a policy control group representing CLIS users is paramount in any operational environment even though its form may be unique to a particular environment. The act of officially formulating a policy group should also be high on the list of implementation priorities.

The policy group should be vested with the authority to discharge the following broad responsibilities:

- Elect officers and establish duties and responsibilities of each.
- Promulgate rules and regulations and develop policy guidelines for the administration of CLIS.
- Define the users of CLIS.
- Establish accessing and operating criteria.
- Establish administrative staff requirements and qualifications.
- Control the employment, assignment and tenure of executive staff.
- Evaluate and approve budgets.
- Require and approve annual operations plans.
- Require periodic progress reports from administrative staff.
- Distribute periodic status reports to users.
- Execute contracts and other legal documents.
- Establish and dissolve appropriate standing and ad hoc committees.
- Hold periodic business meetings.
- Control increases, modifications or decreases in user services.

A geographic/functional representation on the policy group for CLIS is recommended. Such representation would provide: (1) a realistic mechanism for strong centralized control of CLIS staff and operations, (2) the capability to tap an unlimited personnel resource pool for policy group membership, (3) the potential for organizing a policy group which represents the interest of potential users in a most equitable manner, and (4) could be ideally implemented along with the recommendation that system operations be assumed by an existing governmental agency.

The users of each state would designate a state representative. The state representatives of each region (UCR or NLETS regions could be used) would then select a regional representative to the CLIS organization. To increase potential effectiveness, these voting members of the policy group should have a reasonable tenure (2-4 years) and should be eligible to serve at least two consecutive terms.

The eight- or nine-member group would then nominate and select four to six additional voting members. The criteria for selecting these additional members should be flexible enough for the geographic representatives, after reviewing their collective experiences and talents, to strike a desirable balance of personnel resources. This balance should include a reasonable representation of users by geographic location, type of laboratory (full service or specialty), functional disciplines (firearms, narcotics, QD, etc.), controlling jurisdictions (federal, state, region, county, city) and organization (main only, main and satellite).

Advantages:

- Guaranteed geographic representation of users
- Size of the policy group (12-15) not prohibitive to effective operations
- Larger size of policy group allows for fewer and more reasonable committee assignments among members
- Organizational flexibility enhanced by ability to select at-large members with specific expertise as either voting members of the policy group or as working members of committees.

Since the operational and maintenance demands of any of the system alternatives will not require large administrative and support staffs, the Administrative and Operations Group structure can be

very simple and uncomplicated without sacrificing efficiency and effectiveness.

Director of Operations. As the salaried staff administrator, this individual will be responsible for the day-to-day provision of user services and for the administration of policies and procedures established by the policy group.

CLIS Programmer. This position will have principal line responsibility for maintaining the application software of the system.

CLIS Operator. The operator will be primarily responsible for all "hands on" equipment operation.

Support Staff. A secretary will be needed to perform the variety of clerical and support duties required by director. These duties will include support for both the computer facility staff and the policy group and policy committee members. This individual should also be capable of operating the peripheral equipment.

The recommended organizational structure for CLIS is shown in Figure 2.

Having CLIS operations added to an existing governmental agency would have a favorable impact upon organization requirements with most benefits gained in the personnel area.

All administrative and operations staff could either be reassigned from existing personnel in the government agency or hired by the agency to fill the necessary positions. In either case the administrative burden of this activity on the policy group is greatly reduced. The policy group, however, must retain its authority to approve all personnel assignments.

A governmental agency with existing hardware and administrative and operation staff should also be capable of providing backup staff without serious difficulties in emergency situations.

Depending upon the size of operations, a governmental agency with relatively sophisticated data processing capabilities could conceivably have the necessary implementation staff (or reassign from existing staff) and later absorb those people either into the CLIS system or other inhouse ADP service areas.

In general, an established governmental computer facility with a proven track record, coupled with a strong policy/control group sincerely dedicated to its users should be a combination that generates an adequate level of user confidence and system credibility. Having to establish an autonomous administrative and operational CLIS agency from scratch would be considerably more difficult and time-consuming and might restrict user participation until the "track record" was established and positive results were achieved.

If a government host agency for CLIS is selected, it must accept the inherent responsibilities of providing user services, implementing CLIS policies and managing equipment and personnel resources with the guidelines established by users and their representatives. Acceptance by CLIS by an agency would also probably require a firm financial commitment by the accepting agency.

Use of a federal criminal justice agency as host of CLIS would carry with it the advantage of access to one of the existing national criminal justice networks.

CLIS's highly specialized applications would benefit from close association with an existing national criminal justice network in a number of ways. The need for monitoring of the input data would be satisfied and there would be access to specialized data bases pertinent to laboratory operations — e.g., gun files, vehicles, criminal histories, etc. Neither control by, nor responsibilities of, the user labs would be lost in this approach. The development program would not be retarded by the shared environment and, in fact, the responsiveness to all users should be enhanced.

There are two existing national law enforcement networks, namely, National Law Enforcement Telecommunications System (NLETS) and National Crime Information Center (NCIC). Both NCIC and NLETS are capable of supporting CLIS in its immediate national network needs and, with some enhancement, the future expansion as well.

Reasons for Selecting an Existing Governmental Network

1. CLIS is a law enforcement function and should logically utilize a national law enforcement network.
2. CLIS as a law enforcement function needs access to other law enforcement data bases (NCIC) and agencies (NLETS) for information and communications to assure maximum effectiveness.
3. Security and confidentiality implications of CLIS are resolved on either network.
4. Cost on dedicated or commercial networks is substantially above absorption of CLIS costs by existing NCIC or NLETS networks.
5. CLIS utilization of NCIC or NLETS will ensure its smooth integration into any future national telecommunications system for criminal justice.

Both NCIC and NLETS could handle the initial communication need of a CLIS; however, at the present time, NCIC offers a greater capability in view of its more extensive coverage, line capacities and data base storage. A cost comparison would not be significant since, should NLETS assume the communication needs of a CLIS, it is unlikely that the $600 a month state cost would be increased. It is very possible that in designing a network to support CLIS that a mix of both NCIC and NLETS would be utilized. Both networks are interfaced and are servicing the same group of law enforcement and criminal justice users. Another factor in the choice of either NCIC or NLETS would be the location of the national data bases. If this results in being the Washington, D.C. area, then NCIC is the logical network from the standpoint of cost.

Location of National Data Bases

CLIS requirements have identified data bases that are more efficiently and effectively maintained at the national level and which are capable of serving all users. This concept reduces, if not eliminates, the need of duplicating such files at local, regional, state and national levels.

CLIS applications are highly specialized and the data bases require a high degree of centralized quality control.

National data bases are best maintained by a functional crime laboratory with wide forensic experience and operations.

Responsiveness of CLIS to its users and high priority development at the national level is more likely if the national data bases and the processing are maintained by a functional crime laboratory of broad experience and operations.

A well established functional laboratory is capable of obtaining and sustaining on-going funding for data base development and maintenance. Additionally, a multidisciplined laboratory can provide an active and comprehensive testing and research environment.

At the present time, one of the governmental alternatives, the FBI Laboratory, satisfies all of the above considerations and is also a source for major file conversion. In addition, the Drug Enforcement Administration also located in Washington, D.C. has a data base on drug identification which would supplement CLIS capabilities.

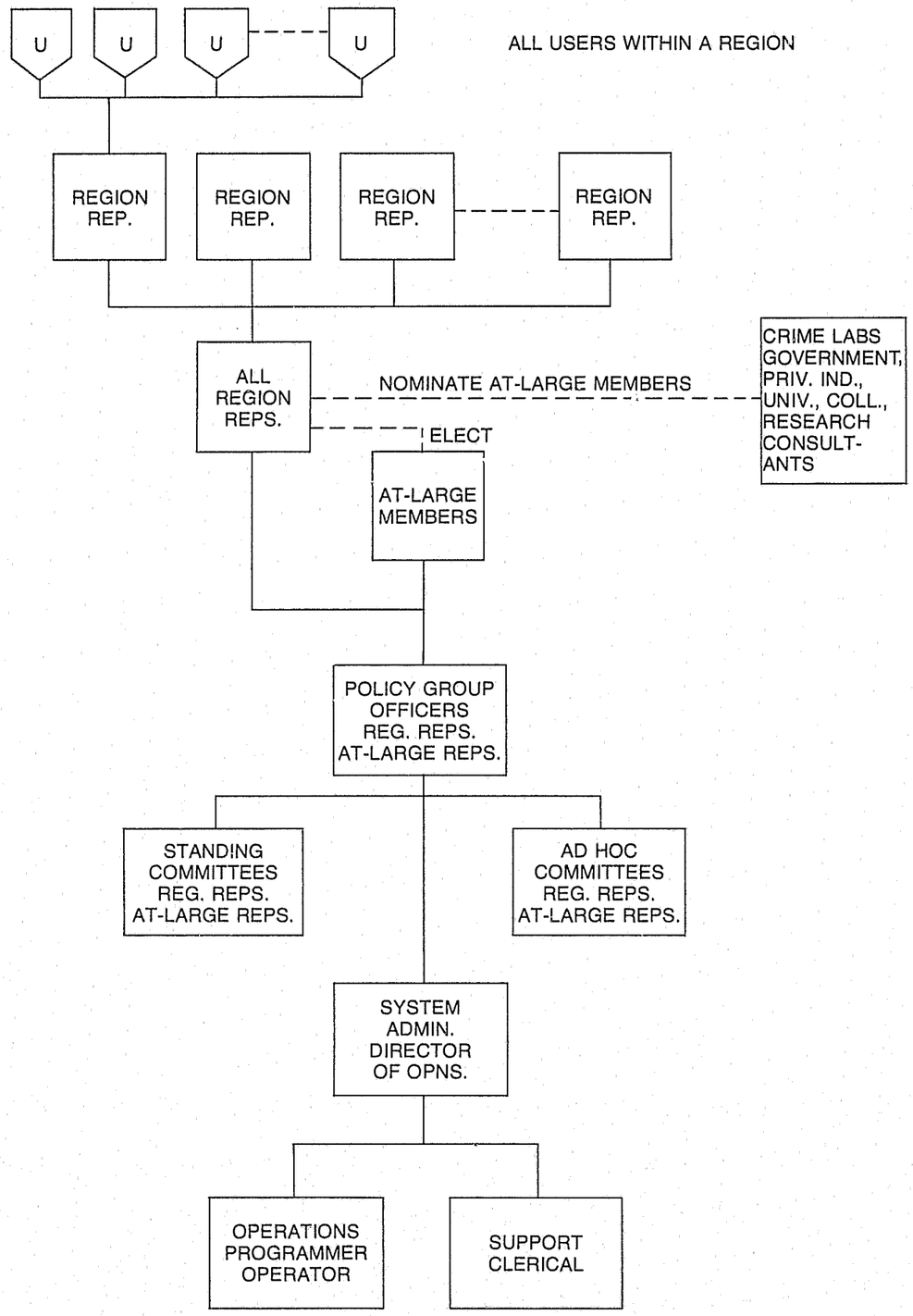


FIGURE 2
SUGGESTED CLIS ORGANIZATION

PART FOUR: IMPLEMENTATION PLAN

Major points of the recommended implementation plan for Phase II of CLIS development are as follows:

Task 1 — Organization for Policy Control

Time Frame – November, December 1974

Prior to December 31, 1974, the current CLIS committee should complete the following activities which relate to Phase II, CLIS implementation:

- Adopt a definition of potential CLIS "users"[1]
- Select laboratories to participate in the pilot system[1]
- Establish liaison with agencies which could be involved in CLIS operations (NLETS, DEA, FBI)
- Establish an interim committee to handle Phase I, Phase II transition and early Phase II activities
- Ensure that funding for implementation activities is not unnecessarily delayed.

Time Frame – First three months of Phase II

- The interim CLIS committee should prepare and distribute a request for proposal (based on the contents of Chapter VI) for a system trade-off study
- Select a contractor to conduct a system trade-off study
- Monitor the progress of the trade-off study.

Task 2 — System Trade-off Study

Time Frame – Two months

There are an infinite number of ways to develop and assemble the various components of CLIS. Many alternatives have already been presented and some decisions and assumptions have been made. There are, however, still many critical decisions which must be made. The system trade-off study will facilitate the decision making process. The general areas of the study include:

- Determination of hardware specifications and selection of a vendor
- Definition of the pilot system
- Selection of a telecommunications network and a host agency for CLIS
- Further definition of selected data bases (bibliographic/abstract, rifling specifications, mass spec)
- Determination of installation strategies.

Task 3 — Progress Assessment

Time Frame – During first four months of implementation

It is reasonable at this stage of project development (immediately after the trade-off study) for the funding and sponsoring agencies to conduct a detailed assessment of progress. This review process should be designed to supplement, not replace, the ongoing review and monitoring activities of the CLIS policy group and should address two major objectives:

- The development of an effective assessment process which provides realistic and timely feedback to the long-range planning function
- The identification of needed changes in the direction and scope of implementation activities; the incorporation of such changes into the planning process; and the commitment of the funds necessary to continue the development of CLIS.

Task 4 — Organization for Policy and Administrative Control

The trade-off study conducted during Task 2 will provide many critical decisions not available previously, particularly those relating to final hardware and hardware vendor choices, sources and locations of data bases, and the identification of those agencies that will house the processing for CLIS and the necessary telecommunications link. The interim policy committee, therefore, should have all data needed to undertake the establishment of a permanent policy and review group. An equally important

[1] These items have been accomplished by the CLIS Committee.

factor is that the interim policy committee can draw on its actual experience under implementation conditions in developing the best organization structure for the permanent policy group. Considerable input will be required from the host agency and those agencies housing distributed data bases (those not centralized in the host agency). The major activities of this task will include:

- The establishment of an organization structure for the permanent CLIS policy group
- The documentation of the duties, responsibilities, and authority of the policy group
- The identification of administrative support to be provided by the host agency and Project SEARCH Group, Inc. to the policy group.
- The organization and staffing by the host agency of administrative and operational responsibilities in a manner most compatible with existing policies and procedures and the specific requirements of CLIS.

Task 5 — Involvement of System Users

Time Frame – Four months

It is important that CLIS provide a valuable service to its users. It is more important that the service require a minimum of effort by the users. Several products can be developed that will make the total system easy for laboratories to understand and use.

- An audio-visual presentation should be prepared in a highly professional manner to be used to introduce CLIS to potential users and other interested parties.
- A comprehensive, yet simple, users' manual should be developed.
- A set of training guidelines should also be developed to ensure the adequacy of user training, both initial and ongoing.

Task 6 — Development of Pilot System

Time Frame – 6-12 months (depending upon personnel resources applied)

The development of the pilot system is one of the most critical implementation tasks. It will provide an effective test of user participation, system response, and hardware and network efficiency. The following are the major steps involved in the development of a pilot system:

- Definition of a pilot system to include system facilities, application areas, data bases, and number of terminals
- Identification of hardware requirements to include type of terminals, central processing equipment and data storage requirements
- Identification of software requirements to include both system and applications software and a software implementation sequence with appropriate manning level requirements
- Identification of the sources of pilot system data bases for the rifling and IR drug application areas.

Task 7 — Progress Assessment

Time Frame – 60 days

This is the second of the major policy/planning/funding assessment points suggested during the implementation process. This will be the first opportunity at this level for an objective assessment of actual performance as it relates to organization, user involvement and the provision of services. The process will include assessments of:

- CLIS policy group organization and activities
- CLIS audio-visual presentation
- CLIS users' manual
- CLIS user training guidelines
- CLIS pilot system.

The decisions formed after the assessment should address the following:

- Should the organization structure or process of the CLIS policy group be modified to increase effectiveness?
- Are changes required in the users' orientation and training process before they are applied in a total system environment?
- Does the experience of the pilot system suggest changes to the plan for full system implementation?
- How can any needed changes best be incorporated into the planning process?

Task 8 — Development of Full System

Time Frame – 21-42 months (depending upon personnel resources applied)

The term "full system" describes a near maximum number of users being provided a full range of services. Some of the application areas assigned for implementation during this phase, because of their complexity, will have to have been already under development in parallel with the pilot system.

The procedures to be followed for the implementation of a full system are basically those that were suggested for the development of the pilot system. The scope and sophistication, however, will be considerably greater.

Hardware Requirements. A total of 31 terminals will be utilized in the pilot system. It is estimated that 169 additional terminals will be required for the full system. The only incremental equipment needed to expand central processing hardware to full system capability will be an input/output channel controller. Three additional tape drives will be required to supplement the one drive suggested for the pilot system.

Software Requirements. Most of the system software will be completed in implementing the pilot system, and full-system modifications will be minor. Applications software programming will be considerably more extensive, since seven additional data bases will be added, and the two pilot-system data bases may be upgraded.

Sources of Full-System Data Bases. A detailed study of sources of data bases, their availability in machine-readable form, costs and data conversion problems must be completed prior to the inclusion of any new applications in the full system.

Costs

As described previously, the CLIS implementation plan is carefully designed to provide for properly staged efforts along with appropriate progress assessment periods. This will enable the users and LEAA to evaluate the value of CLIS as it is being developed from a small pilot system to a truly nationwide data base that will be used by every crime laboratory in the country. Figure 3 depicts the cost and time schedule for the Phase II CLIS implementation. The time scale covers three and a half years with the total cost between $5 and $6 million. The cost figures are given for both civilian and government salary levels.

As can be seen, the major portion of the cost is devoted to implementation of the full CLIS system. Table 3 is a breakout of the estimated costs for implementation of the full system over and above the costs of a pilot system. Figure 4 is a time phasing of the full-system implementation and shows the relationships between the pilot system and implementation of major application areas.

Phase I of the CLIS project has identified the potential users of CLIS and their information needs and priorities. A configuration and organizational structure has been suggested along with network considerations and a recommended implementation plan. The successful completion of Phase I is due in large measure to the cooperation and professional counseling afforded by responding laboratories and the CLIS Special Project Committee. Their efforts and contributions are gratefully acknowledged.

ESTIMATED COSTS FOR A FULL CLIS SYSTEM

One-time Costs	
Hardware (data storage)	$ 75,000
Hardware (channel controller)	14,000
Terminal Connection	16,900
Data Base Purchase	8,720
Training	3,750
Monthly Hardware Costs	
Terminals - 24 months @ $136,800	3,266,400
Terminal Maintenance - 24 months @ $6,570	157,680
Computer and Data Storage Maintenance - 24 months @ $2,616	62,784
Monthly Manpower Costs	
Coordinator - 24 months @ $2,580	61,920
Secretary - 24 months @ $860	20,640
Systems Analyst - 42 months @ $2,580	108,360
Systems Analyst - 23 months @ $2,580	59,340
Two Programmer/Analysts - 24 months @ $4,300	115,200
Two Junior Programmers - 23 months @ $2,400	55,200
Computer Operator - 24 months @ $860	20,640
Clerks - 42 months @ $860	36,120
Two Clerks - 22 months @ $1,720	37,840
Total costs incremental over pilot system (Task 8)	$4,120,494
Cost of pilot system (Task 6)	835,841
Cost of implementing CLIS system (Tasks 6 and 8)	$4,956,335
Cost of planning and administration (Tasks 1, 2, 3, 4, 5 and 7)	305,000
Total cost of planning, administering, and implementing full CLIS system	$5,261,335

Table 3

TASK	RESP.	COST K NATL. AVE.	COST K G.S. (GOVT)
1 — ORG FOR POLICY CONTROL		(A) 250	(A) 250
USER ID	PC		
LIAISON	PC		
TRADE-OFF PREP	IC		
2 — SYSTEM TRADE-OFF STUDY	CON	(C) 35	(C) 35
HARDWARE			
SOFTWARE			
APPLICATIONS			
NETWORK			
HOST AGENCY			
3 — PROGRESS ASSESSMENT		(A)	(A)
ESTABLISH PROCEDURES	PS		
REVIEW & ANALYSIS	LEAA		
4 — ORG FOR POLICY & ADMIN CNTRL		(A)	(A)
POLICY — AUTH & RESD.	PB		
SUPPORT REQUIREMENTS	PB		
ADMIN ORGANIZATION	HA		
5 — SYSTEM USERS	CON	(C) 20	(C) 20
ORIENTATION			
USERS MANUAL			
TRAINING GUIDELINES			
6 — PILOT SYSTEM		835.8	976.7
DEFINITION	HA		
HARDWARE	CON		
SOFTWARE			
APPLICATIONS			
7 — PROGRESS ASSESSMENT		(A)	(A)
ORGANIZATION	PS		
TRAINING	LEAA		
PILOT SYSTEM			
8 — FULL SYSTEM		4,120.5	4,491.0
HARDWARE	HA		
SOFTWARE	CON		
APPLICATIONS			
TOTAL		5,261.3	5,772.7

MONTHS: −3, 0, 5, 10, 15, 20, 25, 30, 35, 40

TIME SCHEDULE:

COST: (A) = PART OF TOTAL ADMIN. COST LISTED FOR TASK 1
(C) = CONSULTANT

NATL. AVE. = PRIVATE INDUSTRY
G.S. = FED. GOVT PAY SCALE

= 1 EA TECHNICAL STAFF CATEGORIES
= 2 EA TECHNICAL STAFF CATEGORIES

LEGEND: RESP. — PC = PRESENT COMMITTEE
IC = INTERIM COMMITTEE
PB = FINAL POLICY BOARD
HA = HOST AGENCY
CON = CONSULTANT
PS = PROJECT SEARCH
LEAA

FIGURE 3
PHASE II COST AND TIME SCHEDULE

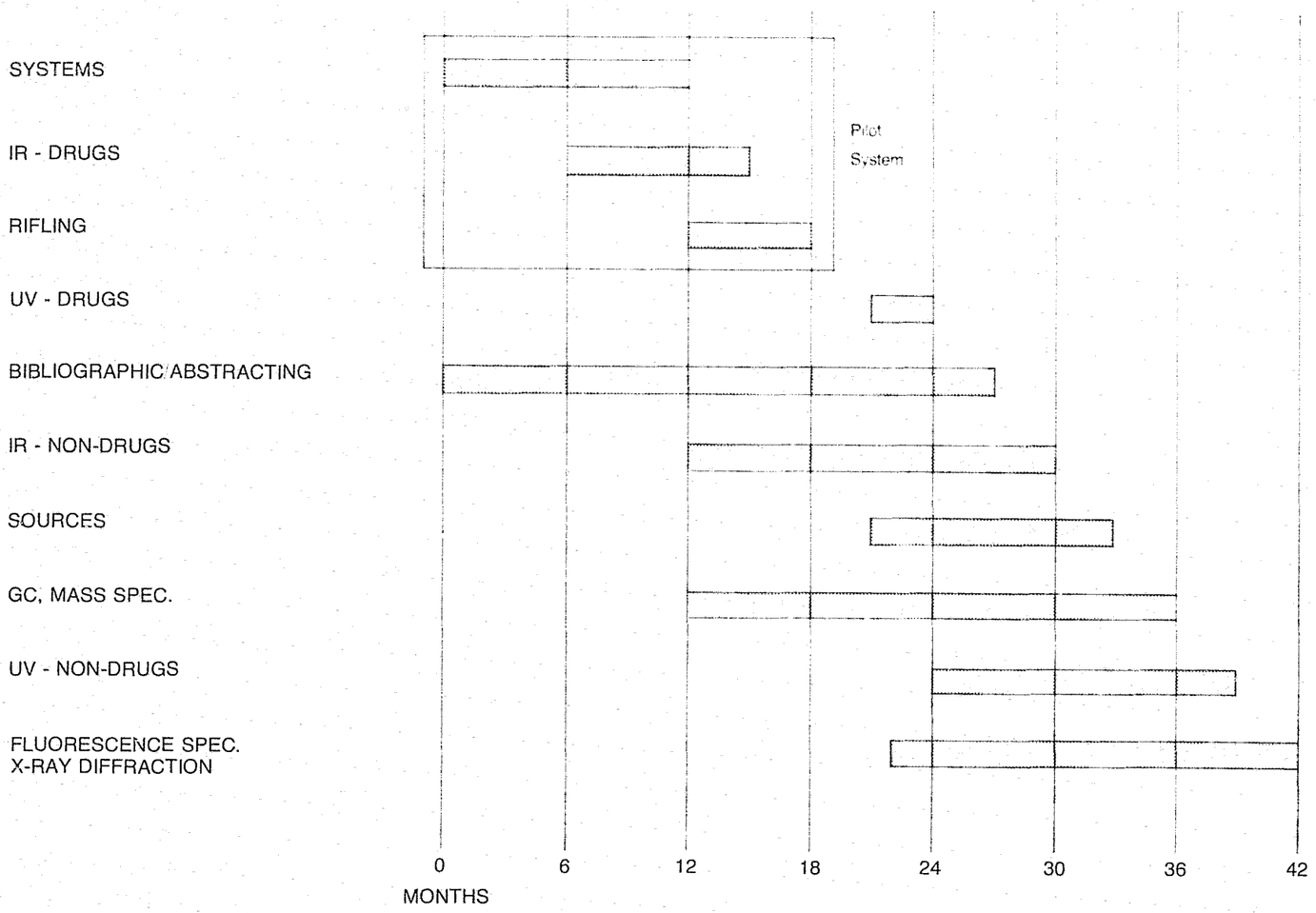
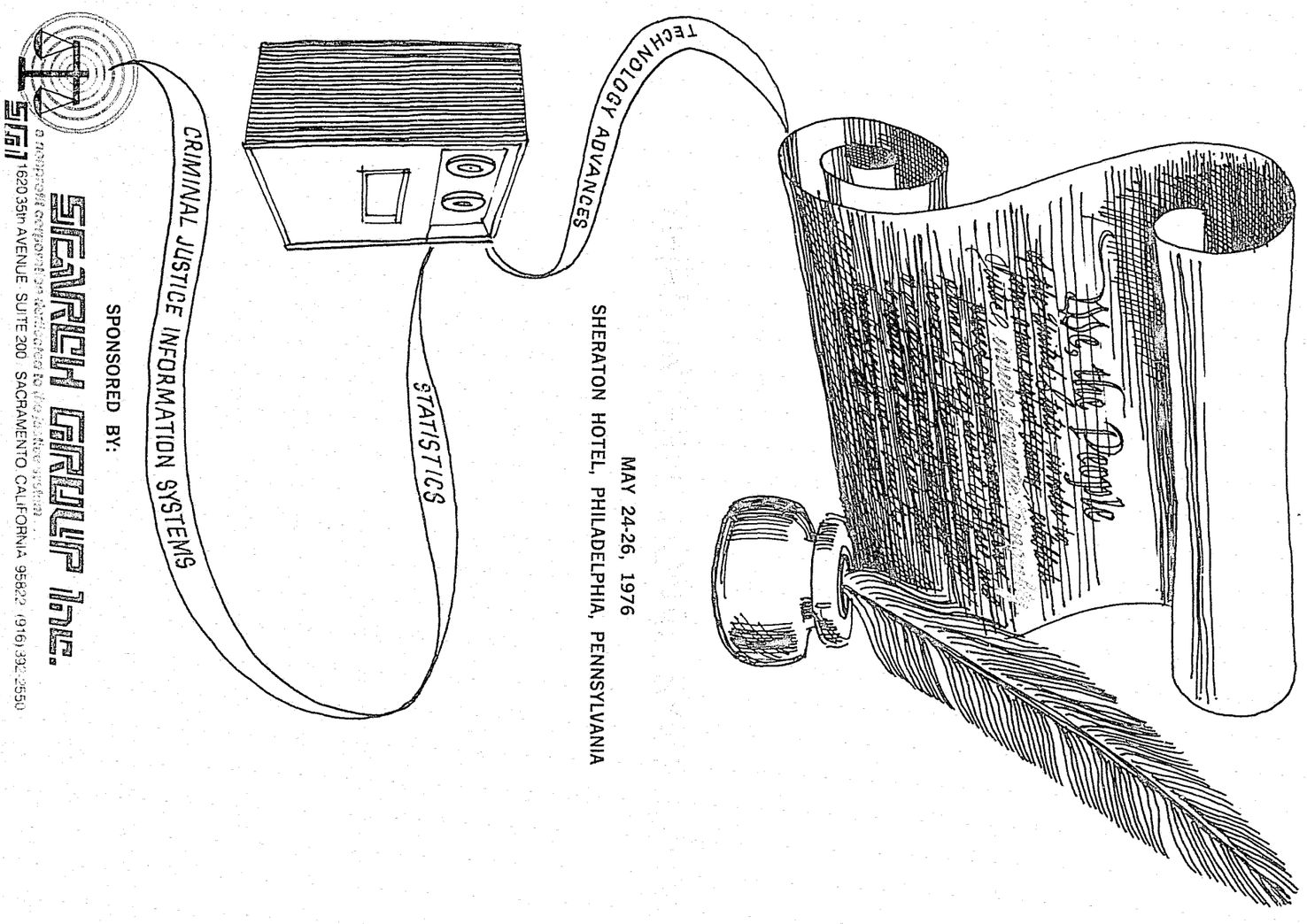


Figure 4

Time Phasing for Full CLIS System



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