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NATIONAL LAW ENFORCEMENT COMMUNICATION NETWORK (NALECOM) USERS INTERFACE GUIDELINES

1200-168

June 6, 1974

JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA

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FOREWORD

The following personnel contributed to preparation and review of this document:

Richard Cowdery
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Don Gallop
Glenn Garrison

Their consultation and advice has been most helpful, and the author wishes to extend his appreciation to them for their contributions.

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I. INTRODUCTION

The National Law Enforcement Communication Network (NALECOM) Users Interface Guidelines has been prepared for the National Criminal Justice Information and Statistics Service, Law Enforcement Assistance Administration, United States Department of Justice, in response to a statement of work in JPL Proposal No. 51-213A, dated June 12, 1973. This statement of work has been incorporated into task order RD-152, Amendment No. 22 (basic) of contract NAS7-100 and the LEAA-NASA Interagency Agreement LEAA-J-1AA-037-73.

This project was supported by the Law Enforcement Assistance Administration, United States Department of Justice, under the amended version of the Omnibus Crime Control and Safe Streets Act of 1968. Points of view or opinions expressed herein are those of the authors and are not intended to represent the official position of the United States Department of Justice.

The NALECOM system, as conceived, is to provide for rapid interstate communication between criminal justice agencies. This communication is a combination of state-to-state communication including controlled automated access of state-based files, and state-to-national communication with automated access of a central national crime data file. The states retain control over crime data and determine which data can be accessed. Regional switching centers will be utilized to facilitate network linkage, but no regional data banks are being considered.

The NALECOM network is a network design intended to serve the interstate and national communication needs of criminal justice agencies for the next decade.

To be responsive to users and to be cost-effective, the NALECOM network is designed to be implemented in phases. The network is initially a two-region land line net later phasing into a one-region combined land line satellite net. The regional switcher message handler functions are primarily network control, error recovery, and network operational status communiques.

1.1 PURPOSE

The purpose of this document is twofold:

1) To provide the user with a description of the NALECOM system as presently conceived, and identify basic user requirements.
2) To provide a focal point for user reaction. It is desirable for users to review the document, identify potential user interface problem areas, and convey these concerns to JPL/LEAA via written reports. These reports can then be evaluated to provide development of a compatible network to serve the criminal justice agencies.

The final issue of this document will provide a refined definition of the interface guidelines. It should be noted that this document is not a "Users Guide" or an "Operators Manual."

1.2 SCOPE

This document provides a basic description of the NALECOM network's operational procedures, line protocols, message formats, configurations, and other features, as presently conceived.

Although some minor changes of the configuration are probable, the techniques should not be appreciably changed.

1.3 APPLICABLE DOCUMENTS

Preliminary National Law Enforcement Telecommunications Requirements. JPL Document 1200-133, Jan. 7, 1974.

ALECS System Manual
Automated Law Enforcement Communications System
Mar. 26, 1973.

Teleswitcher System Operating Manual (LETS)

Updated National Law Enforcement Telecommunications System (NLETS) Users Guide. Dec. 15, 1973.

CLEAR/CJIS User Manual (with Updates). April 1, 1973.

1972 Directory of Automated Criminal Justice Information Systems
U.S. Department of Justice, Law Enforcement Assistance Administration, Dec., 1972.

National Crime Information Center (NCIC) High Speed USASCII Interface Standards.

Proposed American National Standard for Advanced Data Communications Control Procedures (ADCCP).
ANSI X3S34/475, 7th draft, Dec. 13, 1973.

NCIC Operating Manual (plus revisions).

IBM Systems Reference Library Publication GA27-3004-2, "General Information-Binary Synchronous Communications."

IBM Systems Reference Library Publication GC30-2004-7, "IBM System/360 Operating System Basic Telecommunications Access Method."

1.4 GLOSSARY

Administrative Message	A free-form message used for information transfer not necessarily file oriented.
ASCII Code	An eight-level code entitled, "American Standard Code for Information Interchange."
Asynchronous Transmission	Transmission in which each information character (or sometimes each word or small block) is individually synchronized usually by the use of start and stop elements. The gap between each character (or word) is not necessarily a fixed length. This document assumes that teletype model No. 37 ASRs with a 150 word/minute line rate are presently used by all states not having computer interface.

Binary Synchronous Communication (BSC)	A uniform procedure using a standardized set of control characters and control character sequences for synchronous transmission of binary-coded data between stations in a data communication system.
BPS	Bits per second.
Character	One of the letters A through Z, numerals 0 through 9, punctuation marks, or any other symbols acceptable for use in the system.
Data Rate	The number of bits of data capable of being transmitted per unit length of time; e.g.: 2400 BPS implies that 2400 bits are capable of being transmitted in one second.
Destination ORI	A two- or nine-character code identifying the ultimate terminal destination of the message. The two-character code will be the state code. The agency identifier codes to be used for the nine-character code are the appropriate NCIC Agency Identification Codes (ORI) defined in the NCIC Operating Manual Part III.
Delimiter	A character used in a message to separate predefined fields of data in the header or predefined fields of data in the text. The period (.) will be used to separate fields in the NALECOM header. The comma (,) will be used to separate consecutive destination ORIs when more than one destination is included in the header. The last field in the header will not be followed by a period.

Field	An assigned area in a message reserved for a specific type of data.
Format	A predetermined arrangement of characters, fields, delimiters, lines, and punctuation marks with regard to messages.
Full Duplex (FDX)	A communication facility capable of transmitting in both directions simultaneously.
Half Duplex (HDX)	A communications facility capable of transmitting in only one direction at any given time.
Header	A set of characters in a predetermined arrangement, starting with the Start of Header (SOH) character. Used for message control by the switcher.
Interface	A common boundary between computers, or a terminal and a computer, enabling data exchange.
Manual System	Those system terminations not possessing a binary synchronous interface capability.
Originating ORI	A 2- or 9-character code identifying the message originator. Code identifiers are the same as Destination ORI.
Segment	The maximum number of characters to be transmitted prior to allowing contention for the transmission line. This differs from a message block as message blocks do not allow for line contention until all blocks are transmitted.

Transparent Text Mode	A mode of transmission which allows normally restricted data-link line control characters to be transmitted as "bit patterns."

II. NALECOM NETWORK DESCRIPTION

2.1 SYSTEM TERMINATIONS

The NALECOM network is designed on the basis of 52 system terminations. A "System Termination" is the point at which the network interfaces with a state data base or the National (NCIC) data base. These terminations shall be located in the state capitals, Washington, D.C., and at the National Crime Information Center, also in Washington, D.C.

Each system termination having the capability will interface with a switching center at a line rate of at least 2400 BPS, using Binary Synchronous Communication (BSC) half duplex line control procedures and ASCII coding conventions.

The system termination interface with switching centers shall be dedicated to the criminal justice function and shall be located in controlled facilities which provide adequate physical security against unauthorized personnel.

It shall be the responsibility of each system termination user agency to provide screened operating personnel to operate the network equipment at his termination and the responsibility of the NALECOM controlling agency to provide operating personnel at the switching centers when required.

System terminations still using asynchronous devices will interface via the Western switcher.

2.2 NETWORK FUNCTIONS

The prime function of the NALECOM network is to provide system users with a rapid reliable means of interstate/national communications routing of criminal justice digital data.

With one system termination interface per state for the NALECOM network, each state will be responsible for routing intrastate data and for determining which data from their data bases may be made available to other states.

The specific functions of NALECOM are as follows:

1) Interstate communications routing of:
   - a) Inquiries/responses.
   - b) Administrative messages.
   - c) Digitized graphic data.
   - d) Error messages.
   - e) Status messages.
   - f) Video.*
2) State to NCIC communications routing of:
   - a) Item 1) above.
   - b) Digitized fingerprint data.
3) Routing capability:
   - a) Between any two system terminations.
   - b) From any system termination to five or less system terminations. **
   - c) From any system termination to all other system terminations. **
   - d) From any system termination to all other system terminations within the same region. **
4) Priority handling of messages by type.
5) Message and line usage statistics.
6) Transmission error detection and retransmission (or request for retransmission) of messages.
7) Maintenance of network routing status and provide status messages.
8) A minimum service of a 2400 BPS synchronous transmission, half duplex, 4-wire system using contention type line control.
9) A 24 hour/day, 7 day/week operation with a design goal of 0.993 availability. (Outage of less than 10 min/day for any single routing.)

*Video usage and capabilities are presently undefined.

**These routing capabilities are not provided for fingerprint or graphics data.

10) Flexibility for expansion including added interfaces or relocation of interfaces.
11) Providing system users with ability to phase into NALECOM without degradation or interruption of present usage capabilities.
12) An asynchronous interface, via the Western switcher only, for users not yet having a 2400 BPS or more line interface capability.

2.3 NETWORK USER REQUIREMENTS

The NALECOM system is designed to provide rapid communication interchange between state and national agencies. NALECOM will also provide minimal message content checks and storage.

It will be the users responsibility to:

1) Comply with the standard message header format developed for NALECOM system usage.
2) Ensure that message content complies with the message recipients standard by correctly formatting messages to the various system terminations.
3) Provide status messages to the system when planned service interruptions are expected, and when service is restored.
4) Segment all administrative messages and Computerized Criminal History (CCH) messages into 1000 characters or less and all other types of messages into 400 characters or less. Sequence numbering of segments will also be done by the users.
5) Re-transmit messages when a transaction is not completed due to recipient's inability to respond. (The NALECOM system will not perform a long-term store and forward capability.)
6) Transmit messages in order of priority with officer safety items taking precedence over other types of messages, e.g., if a user is transmitting an administrative, graphic, or fingerprint message consisting of a number of segments, he should transmit the officer safety message following the last segment transmitted rather than complete the total transaction prior to sending the top priority messages.

2.4 FUNCTIONS NOT PROVIDED

1) Voice communication.
2) Unscrambling, decoding or modifying messages.
3) Interface with terminations not dedicated to criminal justice functions.
4) Intrastate message switching capability.
5) Message text editing or format checking of message content other than message header.
6) Capability to route a given message to more than five system terminations. The exception to this is the All Points Bulletin message which will go to all system terminations.
7) System termination service for users having less than a 2400 BPS bi-synchronous, half-duplex interface capability following the established line control procedures, will not be provided at the Eastern switcher.

2.5 PHASE III CONFIGURATION

The Phase III NALECOM network configuration will be a Terrestrial Line Communication system with two switching centers connecting system terminations. Phases I and II of NALECOM are study efforts leading to the network concepts to be implemented in Phases III and IV.

Figure 2-1 shows the typical Phase III configuration interface, and Table 2-1 depicts the line rate assignments for the system terminations. These assignments are present estimates only.

2.6 PHASE IV CONFIGURATION

The Phase IV NALECOM network configuration culminates in a combined terrestrial and satellite communication system with a single switching center. Figure 2-2 shows the typical phase IV configuration interface, and Table 2-2 depicts estimated line rate assignments for the system terminations.

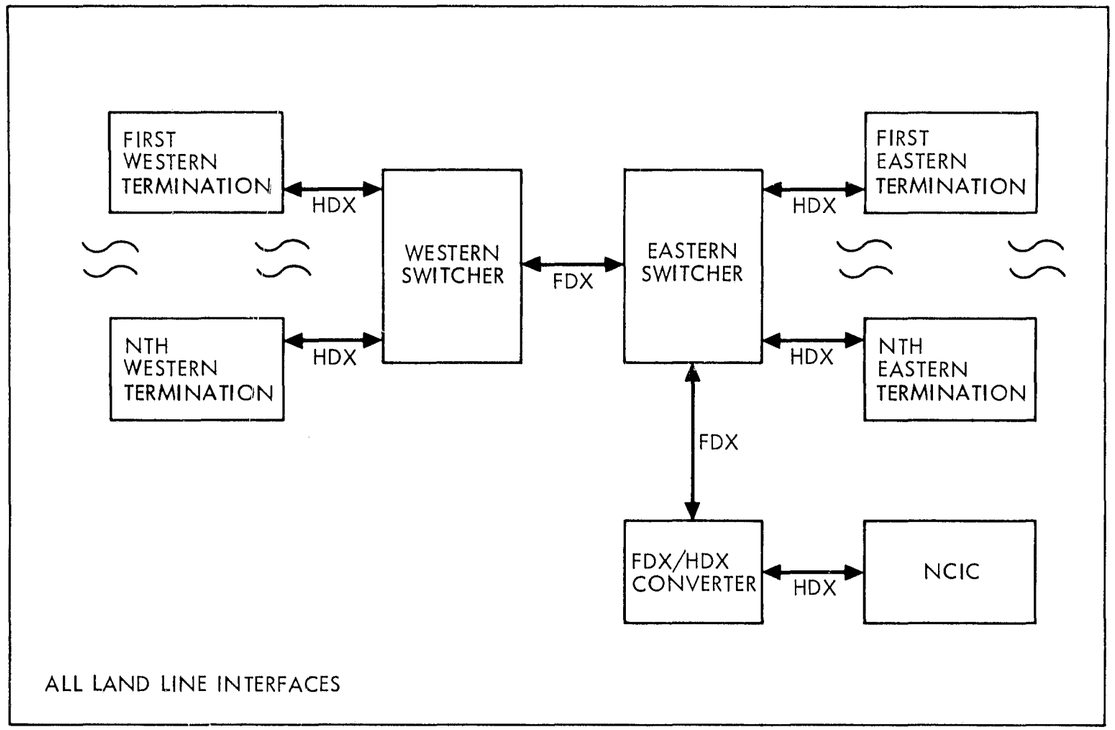


Fig. 2-1. Phase III configuration

Table 2-1. Estimated line rate assignments for Phase III configuration

State	Switch Center	2400 BPS	4800 BPS	7200 BPS	HDX	FDX
1. Alabama	E		X		X	
2. Alaska	W	X			X	
3. Arizona	W		X		X	
4. Arkansas	E	X			X	
5. California	W		XX	XX	X	
6. Colorado	W		X		X	
7. Connecticut	E		X		X	
8. Delaware	E	X			X	
9. Florida	E		XX	X	X	
10. Georgia	E		XX		X	
11. Hawaii	W	X			X	
12. Idaho	W	X			X	
13. Illinois	E		X	X	X	
14. Indiana	E		X		X	
15. Iowa	E	X			X	
16. Kansas	W		X		X	
17. Kentucky	E		X		X	
18. Louisiana	E			X	X	
19. Maine	E	X			X	
20. Maryland	E			X	X	
21. Massachusetts	E		XX		X	
22. Michigan	E			XX	X	
23. Minnesota	E	X			X	
24. Mississippi	E	X			X	
25. Missouri	E		XX		X	
26. Montana	W	X			X	
27. Nebraska	W	X			X	
28. Nevada	W	X			X	

Table 2-1. Estimated line rate assignments for Phase III configuration (contd)

State	Switch Center	2400 BPS	4800 BPS	7200 BPS	HDX	FDX
29. New Hampshire	E	X			X	
30. New Jersey	E		XX		X	
31. New Mexico	W	X			X	
32. New York	E		X	XXX	X	
33. N. Carolina	E		XX		X	
34. N. Dakota	W	X			X	
35. Ohio	E		X	X	X	
36. Oklahoma	W	X			X	
37. Oregon	W		X		X	
38. Pennsylvania	E			XX	X	
39. Rhode Island	E	X			X	
40. S. Carolina	E	X			X	
41. S. Dakota	W	X			X	
42. Tennessee	E		X		X	
43. Texas	W		X	XX	X	
44. Utah	W	X			X	
45. Vermont	E	X			X	
46. Virginia	E			X	X	
47. Washington	W			X	X	
48. W. Virginia	E	X			X	
49. Wisconsin	E		X		X	
50. Wyoming	W	X			X	
51. Washington, D.C.	E	X			X	
52. NCIC	E			(14)X	X	*
53. West Switch	E		X	XXX		X

*FDX from Eastern Switcher to Converter, HDX from Converter to NCIC.

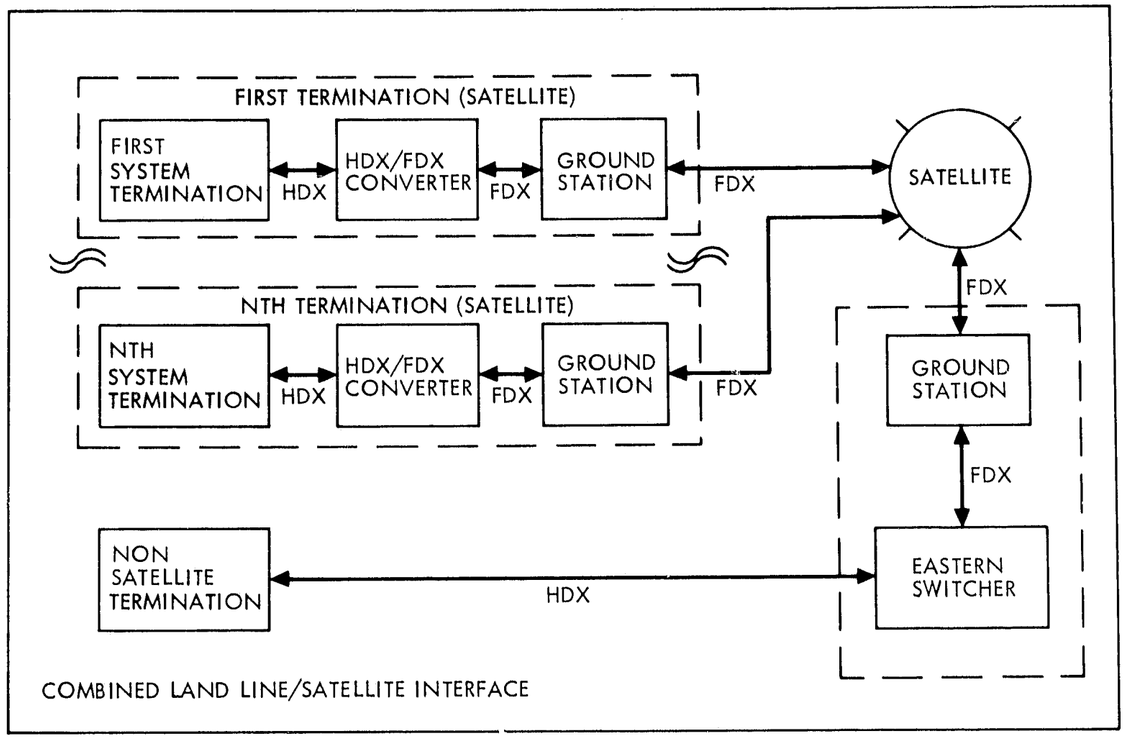


Fig. 2-2. Phase IV configuration

Table 2-2. Estimated line rate assignments for Phase IV configuration

State	Switch Center	2400 BPS	4800 BPS	7200 BPS	HDX	Satellite Data Links 28 KBPS-FDX
1. Alabama	E		X		X	
2. Alaska	E	X			X	
3. Arizona	E		X		X	X
4. Arkansas	E	X			X	
5. California	E			XXX	X	X
6. Colorado	E		X		X	
7. Connecticut	E		X		X	
8. Delaware	E	X			X	
9. Florida	E			XX	X	X
10. Georgia	E		XX		X	X
11. Hawaii	E	X			X	
12. Idaho	E	X			X	
13. Illinois	E		X	X	X	X
14. Indiana	E		X		X	
15. Iowa	E	X			X	
16. Kansas	E		X		X	
17. Kentucky	E		X		X	
18. Louisiana	E			X	X	
19. Maine	E	X			X	
20. Maryland	E			X	X	
21. Massachusetts	E		XX		X	
22. Michigan	E			XX	X	X
23. Minnesota	E	X			X	
24. Mississippi	E	X			X	
25. Missouri	E		XX		X	X
26. Montana	E	X			X	
27. Nebraska	E	X			X	

Table 2-2. Estimated line rate assignments for Phase IV configuration (contd)

State	Switch Center	2400 BPS	4800 BPS	7200 BPS	HDX	Satellite Data Links 28 KBPS-FDX
28. Nevada	E	X			X	
29. New Hampshire	E	X			X	
30. New Jersey	E		XX		X	X
31. New Mexico	E	X			X	
32. New York	E			XXX	X	X
33. N. Carolina	E		XX		X	X
34. N. Dakota	E	X			X	
35. Ohio	E		X	X	X	X
36. Oklahoma	E	X			X	
37. Oregon	E		X		X	
38. Pennsylvania	E			XX	X	X
39. Rhode Island	E	X			X	
40. S. Carolina	E	X			X	
41. S. Dakota	E	X			X	
42. Tennessee	E		X		X	
43. Texas	E		X	XX	X	X
44. Utah	E	X			X	
45. Vermont	E	X			X	
46. Virginia	E			X	X	
47. Washington	E			X	X	
48. W. Virginia	E	X			X	
49. Wisconsin	E		X		X	
50. Wyoming	E	X			X	
51. Washington D.C.	E	X			X	
52. NCIC	E			(14)X	X	XX

2.7 PERFORMANCE GOALS

The performance goals are based on an estimated traffic load on the system of approximately 90 thousand BPS by 1983.

2.7.1 Period of Service

The Network will be in operation 24 hours per day, 7 days per week.

2.7.2 Availability

The Network will be available for use 99.3% of the time; i.e., any system termination shall have a probability of 0.993 of being able to communicate with any other system termination.

2.7.3 Response Time

The response time of the network is defined as the time interval between the time a line is requested at a system termination and the time the message is completed at the addressed system termination. Response time goals are established by the priority of the message. The response time goals for a given message type are listed below.

Message Type	Response Time Goal
Officer Safety (priority message)	3 seconds
Graphics and fingerprint data	30 seconds per segment
Administrative and all other types	7.5 seconds per segment

These response times are the maximum time allowed for transmission of 90% of the messages at the level given. However, they will not be valid for users interfacing with line rates less than 2400 BPS.

Delay incurred on input or output by system terminations for line change of direction response are estimated to be <4 milliseconds/ message.

III. SYSTEM INTERFACES

This section describes the NALECOM system interfaces. The description includes a paragraph for asynchronous communication interface for those users that may not initially have a synchronous interface capability at system implementation time. The switcher/switcher interface paragraph is included for user information. This interface is a NALECOM responsibility.

The defined boundary at the system termination is the data terminal side of the modems.

3.1 NETWORK TO USER

These definitions apply to both network and user.

3.1.1 Data Rates

Each system termination will be expected to have at least the minimum service of 2400 BPS half-duplex capability. The Phase III configuration and Table 2-1 depict the present plan for line rates for each system termination. Some system terminations are expected to have multiple lines with line rates of 2400, 4800 and 7200 BPS to accommodate their state traffic.

Line rates of 9600 BPS are also under consideration, but they are not shown.

Although the system is designed to provide a minimum 2400 BPS service, it is recognized that some users may not have the capability to handle the minimum line rate or higher line rates and will be restricted to interfacing via 150 BPS asynchronous lines. These users will be able to use the system by interfacing via the Western switcher.

3.1.2 Line Protocol

NALECOM system users having interface capability of 2400 BPS or greater will interface using the half duplex protocol described in Appendix A.

Although the Phase IV interface for satellite communication will be full duplex, the user interface will still be half duplex to the HDX/FDX converter (see Fig. 2-2). However, use of full duplex protocol with system terminations is desirable, if feasible.

Fingerprint and graphic messages may be transmitted using transparent text mode. All other messages normally will be transmitted using non-transparent text mode.

Conversational and reverse interrupt (RVI) modes of binary synchronous transmission are planned to increase line efficiency.

Users interfacing with the system via asynchronous devices will be required to use the 8A1 line conventions described in Appendix B.

3.1.2.1 Error Checking. A combination of vertical and longitudinal redundancy error checking (VRC/LRC) will be used for non-transparent text transmission error checking.

Recoverable error conditions will be retransmitted. (Refer to Appendix A.)

Cyclic Redundancy Error Checking (CRC) will be used for transparent text mode transmission.

3.1.3 Message Formats

A NALECOM message will consist of a message header and message text. Message text may consist of any ASCII characters the user wishes to send, including control characters. The message header will be checked for valid state ORI characters.

The NALECOM system does not intend to add, modify, or delete any data from messages.

NALECOM expects normal message lengths of 400 characters or less. The message type will be checked against the message segment length. A segment is defined as the maximum number of characters that a sender may transmit before allowing line contention. The segment therefore may be a complete message or a portion of a complete message. Messages exceeding 400 characters will be rejected unless they are Administrative or Criminal History Records. In this case, the message segment length must not exceed 1000 characters.

3.1.3.1 Message Header. The NALECOM message header is intended to accomplish the following functions.

1) Provide routing information for:
   a) Originating ORI.
   b) Destination ORI.
   c) All points/all region indicators.
   d) Multiple Destination ORI (5 or less).
2) Indicate type of message.
3) Provide message continuity for multi-segmented messages (message number identifier).
4) Provide segment number for multi-segmented messages (message segment number) and an indicator of last segment.
5) Provide efficient transmission by minimizing the amount of data required to be transmitted for routing (variable length header).

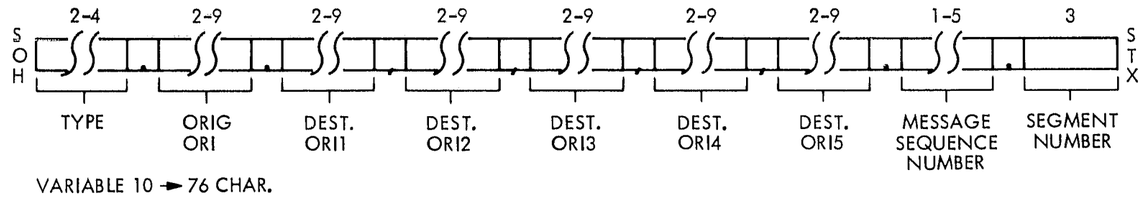
The NALECOM system switchers will utilize the header data for message routing but will not assemble segmented messages for sequential transmission. The message number identifier and the message segment number are optional header fields included for user utilization when needed.

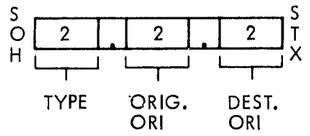
The switchers will require the header on all messages and will transmit the header as received with the exception of multiple destination ORI and All Points or All Region indicators. Multiple destination ORI indicators in the header will result in the messages being transmitted to the destinations specified.

The All Points and All Region messages will be identified as special message types. These messages will be routed by the switcher to a control console. The message will be confirmed or denied by the Regional Switching Manager. If confirmed, the switcher will be notified to send the message to all applicable system terminations. If denied, the switcher will be notified to send the originator a denial message.

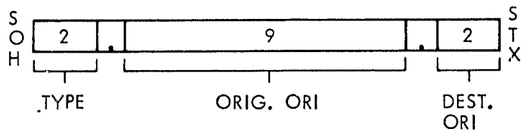
The NALECOM header is described in Table 3-1. The header will consist of message type, originators ORI, destination ORI, message sequence number, and message segment (block) number.

Table 3-1. NALECOM header

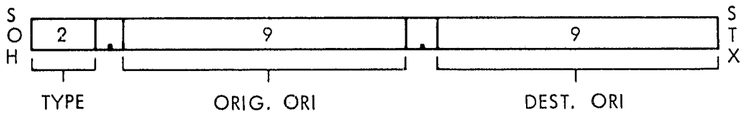




MINIMUM HEADER (10)



NORMAL HEADER TO NCIC (17)



NORMAL HEADER STATE/STATE (24)

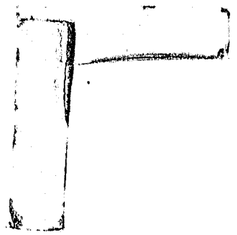
The message header fields are of variable lengths and will require a period (.) between fields for a delimiter. The last field will be followed by a "start of text" (STX) character.

The type, originators ORI and destination ORI fields, are required. The message sequence number and message segment (block) number fields are optional and are normally used only for messages that have multi-segments. Each segment of a message will require a message header. The message sequence number will be the same for all segments of any one message. The message segment number field will be incremented by one for each segment of any one message, and the last message segment will contain an "L" in the leftmost position of the message segment field followed by the segment number of the last segment.

The NALECOM header contains all the required data presently in the NCIC and National Law Enforcement Telecommunications System (NLETS) headers except the NCIC numeric type indicator. The NALECOM header does not provide for an optional control field. The data added to the header by NLETS was not considered in the NALECOM header.

3.1.3.2 Message Text. All messages received from state or national sources will be routed as sent, with no modification. It will be the responsibility of the state or national recipient to check the message text, determine whether the message is acceptable, and generate error messages for unacceptable messages. It is incumbent upon each user to provide a description of what message types and/or text is acceptable at his termination and to keep such description current.

Messages addressed to the switcher will be restricted to status messages and all points/all region bulletins. It will be the switchers responsibility to maintain the status of system terminations and to notify other system terminations of current status based on the latest status message from individual system terminations. Status of individual terminals within a state will not be kept by the switcher.



Transparent text mode of transmission may be used for fingerprint and graphic data. All other messages will use non-transparent text mode for transmission.

3.1.4 Message Prioritization

A message transmission priority system will be utilized by NALECOM for all output messages. All system terminations should prioritize their transmissions by the same standards.

Message priority will be determined by message type with first priority given to officer safety messages (inquiries/responses on wanted persons, stolen vehicles, guns, license checks, etc.). Administrative messages (those messages not involving specific file access) and criminal history file messages will have second priority. Lowest priority will be assigned to lengthy messages such as fingerprint and graphic data. Table 3-2 gives the priorities of messages, types of messages, and files that may be accessed presently and potentially. Potential files are not given a transmission priority. Such priority will be determined when these files become available.

The switcher will check the message type of all incoming messages and transmit the outgoing messages in order of priority based on the type and on a non-preemptive basis. Non-preemptive means that any message segment being transmitted will not be prematurely terminated in order to send the higher priority message.

Users having the capability for message queuing should send the higher priority messages first. If a long message is being sent (multi-segments), the user should send the higher priority message following the message segment presently being sent (interleave).

3.1.5 Message Generation Procedures

All messages handled at the NALECOM switcher will require a header. The ASCII character set will be expected for message composition.

The system will interface with each state via one system termination. This enables the switcher to route messages by the two-character system termination identifier. It will be the responsibility of the

Table 3-2. Priority assignments

	Query			File Manipulation						Adminis-trative	Service	
	Inquiry	Response	Test	Entry	Modify	Cancel	Locate	Purge	Clear		Error	Status
NON-FILE DATA	X	X	X	X	X	X	X	X	X	2		
FILES												
Vehicle Reg. (STATE)	1	1	X	X	X	X	X	X	X	X	1	1
Drivers Lic. (STATE)	1	1	X	X	X	X	X	X	X	X	1	1
Stolen Veh. (NCIC)	1	1	2	2	2	2	2	X	2	X	1	1
Stolen Lic. (NCIC)	1	1	2	2	2	2	2	X	2	X	1	1
Stolen Art. (NCIC)	1	1	2	2	2	2	2	X	2	X	1	1
Stolen Gun. (NCIC)	1	1	2	2	2	2	2	X	2	X	1	1
Stolen Sec. (NCIC)	1	1	2	2	2	2	2	X	2	X	1	1
Stolen Boat. (NCIC)	1	1	2	2	2	2	2	X	2	X	1	1
Wanted Persons (NCIC)	1	1	2	2	2	2	2	X	2	X	1	1
Criminal History (NCIC)	2	2	2	2	2	2	2	2	2	X	1	1
Fingerprint Proc.	3	3	3	3	3	3	3	3	3	X	1	1
Crime Lab. Graphics	3	3	3	3	3	3	3	3	3	X	1	1
POTENTIAL FILES												
Crime Trend												
Crim. Assoc.												
Modus Operandi												
Org. Crime												
Uniform Crime Rep.												
Missing Pers.												
Warrant Cont.												
Research/Stats.												
Case Control												
Assig. Att. Court, Judge												
Inmate records												

X = Not applicable.

originating system termination controller to identify and route the reply messages for intrastate terminations.

All messages will be segmented (see Para. 3.1.3). The segmenting allows messages to be handled on a non-preemptive priority basis per segment. Higher priority messages must be interleaved with lower priority messages to maintain rapid response time.

3.1.6 Message Routing

Message routing will be accomplished by the switcher, utilizing the destination ORI Code in the message header. The ORI Code should match the code as specified for NCIC Agency Identification System termination for the desired states destination termination. Any detected errors in ORI will result in an error message being sent to the originating termination by the switcher and the message in error being disregarded by the switcher.

It is the message recipients responsibility to accept or reject messages and provide response, if required.

When multiple destination ORI(s) are indicated in the message header, it will be the switchers responsibility to generate separate messages and transmit the message for each system termination.

When an All Points or All Regions message is indicated, it will be the switchers responsibility to route the message to a console at the switching center for confirmation. If confirmed, the switcher will then generate and transmit the message to all system terminations. If the message is not confirmed, an error message will be generated and sent to the originating system termination.

System termination status messages will be routed to the switcher where the status of all system terminations will be maintained.

3.1.7 Message Handling on Reception (Exclusive of Line Protocol)

3.1.7.1 Switcher. The NALECOM switcher will accept input messages, check the header for destination ORI, and transmit the message, including header, to its destination, if the destination ORI is valid and system termination is up.

The switcher will handle multiple ORI destinations and All Point and All Region messages as described in Para. 3.1.6.

No message editing or content checks will be made by the switcher. It will be the receiving terminations responsibility to accept or reject the message content.

The switcher will maintain a queue for messages that cannot be sent immediately due to line usage conflicts; however, the switcher will not maintain a long-term store and forward capability. If the queue is full, the switcher will not accept any more messages for that destination.

If a system termination is out of service and a message is received for that termination, the switcher will respond to the originator with the message header and a status message.

It is anticipated that all users will have automated interfaces with the switcher and will insert the proper control characters necessary for their terminal interfaces. However, the Western switcher will consider asynchronous input from manual system states prior to acquisition of an automated interface.

3.1.7.2 System Termination. The system terminations will provide any message editing or reformatting that may be required for communication with intrastate terminals or systems.

Reordering of message segments that may have been transmitted out of sequence will be the system terminations responsibility.

System terminations will generate error messages for any message they receive that does not agree with their required format or contents.

Intrastate terminal status will be maintained by the system termination and any response necessary will be generated by them.

3.2 REGION TO REGION

Initially, the NALECOM system will consist of two switching centers. These switching centers are referred to as the Western and Eastern switchers. The switchers will interface via high speed, full

duplex, land line communication. The Western switcher will be phased out when satellite communication is phased into sufficient states. All system terminations still on land line communication will be routed to the Eastern switcher.

3.2.1 Data Rates

The full duplex interface between switchers will be sized to handle the western state traffic for the life span of the Western switcher.

Data rates of 2400, 4800, 7200, 9600, and 50K BPS are being considered for interregion usage.

3.2.2 Line Protocol

The same full duplex line protocol is required between switchers and between the Eastern switcher/NCIC FDX/HDX interfaces. This protocol, when fully developed, will also serve for satellite communication. Each state with satellite communication will interface via FDX/HDX converters. Preliminary information regarding the full duplex protocol is available in Appendix A.

3.3 SPECIAL WESTERN SWITCHER CHARACTERISTICS

The Western switcher and the Eastern switcher will provide the same switching functions, except the Western switcher will also provide the user with an asynchronous interface capability.

3.3.1 Asynchronous Interfaces

The NALECOM system designers are presently considering the use of the current NLETS method of interfacing with the manual states, with the following exceptions: (1) NALECOM requires its header on all messages; (2) the characters TXT will not be supported as a delimiter between heading and message text. This will require the state system termination to strip all extraneous data following the header and preceding the message text, when inputting messages to the NALECOM system. (3) Input and output messages will start with SOH; and (4) the STX symbol will be used to delimit the header and message text.

It is expected that the manual system states will update to automated systems with a minimum line rate capability of 2400 BPS as rapidly as possible and thereby eliminate the need for asynchronous considerations. The response times given for NALECOM are not valid for users employing line rates of less than 2400 BPS.

3.4 EFFECTS OF SATELLITE COMMUNICATIONS

The goal for the addition of satellite digital data channels to the NALECOM network is to make the use of the satellite capability transparent to the network users. That is, data interface to the network will be identical to that used without the satellite. Video capability provided by the satellite system, plus the possibility of using the satellite for intrastate data transfer, may be new capabilities which must be incorporated into the system. All satellite usage will be through leased satellite transponders or segments of transponders, as required.

3.4.1 Data Rates

Satellite data channels will be designed for a standard data rate, or a few standard rates, in order to provide standardization of coding and modulation equipment. The initial estimates are for 28 KBPS channels with one full duplex channel from each system termination (to be implemented with the satellite capability) to the Eastern switcher. The exception to this is the NCIC which will have two full duplex channels.

3.4.2 Line Protocol

The satellite data channels will use full duplex line protocol. This protocol is mandatory to provide efficient communications with the approximate 1/4 second one-way transmission delay through the satellite link.

Full duplex line protocol will be used from the Eastern switcher to the state, where a full- to half duplex converter will be provided in order to interface with the states using half duplex protocol. If the state can update to use a full duplex interface, dollars will probably be saved and system complexity reduced.

3.4.3 Message Handling

No changes in data message handling procedures will be incurred due to data routing through satellites.

3.4.4 Message Routing

The Eastern switcher will be the master satellite ground station. As system terminations are equipped with ground stations, they will communicate only to the Eastern switcher for digital data transmission/reception. Thus a state which may have had a direct interface to the Western switcher, once equipped with satellite communications, will interface to the network through the Eastern Switcher. Routing to Western states from a satellite state will be through the Eastern switcher, via a second communications link to the Western switcher then to the desired state.

3.4.5 Video

The exact usages for video have not been identified. A follow-up study to identify video usages is planned. The study may lead to usage of analog or digital video with full or slow scan capability. If the usages require security, then techniques for preventing undesired access to video transmission will be developed. In any case, it is expected that video transmissions could be initiated at any system termination that has satellite transmission capability and received by all other stations. Video usage could also be provided for intrastate transmission, if desired.

IV SECURITY/PRIVACY

4.1 GENERAL NETWORK ACCESS

The NALECOM system will only interface with those system terminations dedicated to the criminal justice function. The system termination interface location will be determined by the responsible state agency. The system termination will be located in controlled facilities meeting the security constraints of deterring unauthorized personnel admittance.

4.2 DATA SECURITY

Security of the communication lines to guard against clandestine devices being used to monitor, create, or alter system communication will not be considered as a portion of network design; however, NALECOM will not be responsible for the information content of the messages routed over the network.

Only screened personnel will be allowed physical access to the NALECOM operating equipment.

4.3 VIDEO SECURITY

As discussed previously (Para. 3.4.5), a full definition of possible video usage has not been completed. As video usages are defined, security requirements will be identified, and system characteristics necessary to provide the security will be outlined.

APPENDIX A

NALECOM HALF DUPLEX HIGH SPEED LINE INTERFACE

1. NALECOM Half Duplex High Speed Line Interface

This section contains line control conventions to be used in establishing the high-speed (2400 baud minimum) interface between the NALECOM switching centers and system termination points.

The interface is a point-to-point contention system guided by the conventions and standards of the IBM binary synchronous communications procedures as defined in IBM Systems Reference Library Publication GA27-3004-2, "General Information – Binary Synchronous Communications."

Specific input/output commands to be employed by system terminations interfacing with NALECOM are defined at the macro level within IBM publication GC30-2004-7, IBM System/360 Operating System Basic Telecommunications Access Method.

It is recognized that the exact input/output macro commands used by a particular interfacing state computer may deviate to some degree from those defined in this section, depending upon computer manufacturer and hardware/operating system configuration employed. However, the macro functions (as described in the above referenced manual) must be supported at a system termination to successfully interface with the NALECOM network.

1.1 NALECOM Half Duplex Data Link Conventions and Restrictions

1.1.1 All messages transmitted through the network will be subject to the following message length restrictions:

1.1.1.1 Inquiry and Response - 400 characters/message

1.1.1.2 Administrative Messages - 1000 characters/message. Administrative information more than 1000 characters in length will be transmitted as multiple complete message segments, each terminated by an "End of text" (ETX) character.

1.1.1.3 CCH Input Messages - 1000 characters.

CCH Responses - 1000 characters/message. A 2000 character response will be transmitted as two 1000 character segments, each terminated by an ETX character.

1.1.1.4 Fingerprints and Graphic Data - Each type will be transmitted in 400 character segments, terminated by an ETX character. Provisions will be made for segment sequence numbering, and inclusion of a final segment indicator for fingerprints, graphics, CCH responses, and any other multiple segment message. Determination of successful transmission of any multi-segment message will be made by receipt of all contiguously numbered segments and the final segment indicator, rather than receipt of an ETX character.

1.1.1.5 Other Message Types - All other message types will be subject to a 400 character/message restriction.

1.1.2 ALL messages, as defined in restriction one, will be transmitted as complete messages, terminated by an ETX character.

1.1.3 All messages transmitted through the NALECOM network will use the USASCII transmission code. All messages with the exception of fingerprints and graphic data will be transmitted in a non-transparent text mode. System terminations having the operational requirement to transmit or receive fingerprints or graphic data must support transparent text read and/or write functions.

1.1.4 Transmission Error Checking - For non-transparent text transmissions, a combination of vertical and longitudinal redundancy error checking (VRC and LRC) will be used.

When the transparent text mode is used, all blocks of text, transparent text, and header information are checked with a 16 bit Cyclic Redundancy Check (CRC). Retransmission of all recoverable errors will be attempted three times.

1.1.5 Breaking Line Contention Deadlocks - To provide for situations in which the NALECOM switcher and a system termination simultaneously bid to become the transmitter, the NALECOM switcher is denoted as the primary station and any system terminations as a secondary station. To overcome these contention situations, the switcher ignores an enquiry received after sending its initial bid enquiry and repeats the enquiry until an affirmative or negative reply is received. The system termination, on the other hand, replies affirmatively to received enquiry signals if ready, and negatively otherwise.

1.1.6 An important element in the NALECOM network's requirement to meet specified response times for priority one and two message is the support of conversational and reverse interrupt modes of transmission, as defined in the following sections.

1.2 Conversational Transmission Mode

The Conversational Transmission Mode is an extension of the "Limited Conversational Mode" defined in the IBM Binary Synchronous Communications procedures. The Limited Conversational Mode is designed to permit a station to send an inquiry message to another station, which then sends back an answer message. Instead of being handled with two separate transmissions in opposite directions, conversational mode permits the direction of transmission to reverse following a message, within a single transmission. One or more text or transparent text messages may then be transmitted in the usual fashion. At the completion of reply transmissions, the new transmitter sends the EOT signal to terminate message transfer state.

To achieve a conversational mode of transmission within the NALECOM network, all interfacing computers must issue commands to transmit of the form described by the "Write Initial Conversational" and "Write Continue Conversational" macros (see Para. 1.4).

These write commands prepare the message sender to receive either an ACK0/ACK1 or a message containing text as the affirmative response to his message.

While the conversational mode is primarily defined in BSC for inquiry/response transmissions, it has also been successfully used within the framework of the NALECOM network's intended purpose; NALECOM will use the conversational mode to expedite the transmission and receipt of high priority messages and responses. Since the issuance of a conversational reply as an affirmative response to a message received reverses the direction of transmission, the following conventions/restrictions are established to maintain proper transmission sequencing within the message priority and response time requirements of the network.

1.2.1 System terminations will only issue conversational replies to transmit priority one messages.

1.2.2 System terminations will not be limited in the number of successive priority one messages that may be transmitted following the conversational reply. The NALECOM switcher, however, may in turn interrupt this sequence by another conversational reply to transmit a priority one message.

1.2.3 The initial response to a conversational reply may not be another conversational reply. After the conversational reply is acknowledged, and transmission direction reversed, any subsequent messages may be replied to in the conversational mode.

1.2.4 The NALECOM switcher may issue conversational replies to transmit a message of any priority level, subject to the following conventions:

1.2.4.1 Subsequent to its issuance of a conversational reply, the NALECOM switcher will attempt to transmit (in proper queue rank) ALL messages in its queues for the particular system termination.

1.2.4.2 If a NALECOM switcher transmission is replied to in the conversational mode by the system termination, the switcher will (as soon as possible) issue another conversational reply for any priority one or two messages queued for that termination.

1.2.4.3 The NALECOM switcher will <u>not</u> use the conversational mode to transmit a priority three message in response to a priority one message. This prohibits the interruption of a flow of incoming priority one messages except for the transmission of priority one or two messages.

1.3 Reverse Interrupt Transmission Mode

The Reverse Interrupt (RVI) control sequence is a less efficient means of obtaining line control than that provided by the conversational mode. The RVI command is a request on the part of a receiving facility for interruption of the current transmission sequence, to permit transmission of a higher priority message in the other direction.

The sending facility treats the receipt of RVI as a positive acknowledgement to its last transmitted message. The sending facility responds by sending one or more subsequent messages (as established by convention) and goes into the receive mode.

The usage of the conversational mode by system terminations is defined as being restricted to the transmission of priority one messages.

A system termination which has the functional requirement to receive priority three message sequences (multi-segment transmission of large files) must have the capability to interrupt this low priority sequence in order to transmit priority two messages.

The Reverse Interrupt sequence of BSC will be implemented within the NALECOM network in the following limited manner:

1.3.1 Since the NALECOM switcher can interrupt an incoming message sequence to transmit a message of any priority level via a conversational reply, there is no requirement for generation of a reverse interrupt sequence by the switcher.

1.3.2 System Terminations in the process of receiving priority three message sequences will use the RVI command to request the NALECOM switcher to cease transmission as soon as possible, in order to allow priority two message transmission in the other direction.

1.3.3 The NALECOM switcher will honor the reverse interrupt request as follows:

1.3.3.1 All queued up priority one and priority two messages for the system termination will be transmitted and an EOT issued.

1.3.3.2 If any priority three messages are queued for output to that termination, a maximum of one block will be transmitted prior to the EOT.

1.3.3.3 After the RVI has been honored and transmission from the System Termination to the NALECOM switcher initiated, the switcher may interrupt the sequence to send a priority one or two message in the conversational mode.

1.4 Input/Output Macro Commands

The following macro level input/output commands are required for interface with the NALECOM system:

1.4.1 Write Initial Conversational

Writes an ENQ to gain use of the line, and if the response to ENQ is ACK-0, writes message text and reads a response. If the response is message text, the text is read; otherwise the operation is posted complete.

1.4.2 Read Initial

Monitors the line for an ENQ from a sender, writes a positive response, and reads the message sequence that follows.

1.4.3 Write Reset

Writes an EOT to relinquish use of the line.

1.4.4 Read Continue

Writes a positive response to a previously received message and reads a message sequence.

1.4.5 Write Continue Conversational

Used by the station having control of the line to write message text and read a response. If the response is message text, the text is read; otherwise, the operation is posted complete.

1.4.6 Read Interrupt

Writes a Reverse Interrupt (RVI) sequence to indicate to the sending computer that the receiver wishes temporarily to stop receiving message text. The receiver then issues a read text command and receives back either additional text messages or an EOT.

1.4.7 Write Wait Before Transmit

Writes a WACK sequence to the sender and reads an ENQ, in order to temporarily halt transmission from the sender. It may be issued in place of a Read Continue or Read Repeat or in response to a conversational mode reply from the sender.

1.4.8 Read Repeat

Writes a NAK to the sender and reads a response.

1.5 Transparent Text Input/Output Macro Commands

The following macro level input/output commands are required for interface with the NALECOM system upon operational implementation of message transmissions in the transparent text mode.

1.5.1 Write Initial Conversational Transparent

Functions as Write Initial Conversational Command for transparent text transmissions.

1.5.2 Write Continue Conversational Transparent

Functions as Write Continue Conversational for transparent text transmissions.

1.6 Communication Control Characters

1.6.1 SYN-Synchronous Idle

This character is used to establish and maintain synchronization and as a time fill in the absence of any data or other control character. Two sync characters are required to precede each message to permit a receiver to establish character phase for a message. To ensure that the SYN SYN (referred to in examples as ØØ) will not be transmitted before a receiver within the network is prepared to receive, a leading pad character of the SYN bit pattern will also precede each message transmission within the NALECOM network.

1.6.2 Trailing Pad Character

BSC standards specify that a trailing pad character of all ones be added following each transmission, to ensure that the last significant character is sent before the data set transmitter turns off. It is the responsibility of the System Termination to ensure that its transmitter clock is not turned off prior to the final character of the message if the trailing pad convention is not followed.

1.6.3 Start of Header and Start of Text Characters

The Start of Header (SOH) Control Character will be the first character of each message transmitted through the NALECOM network. The Start of Text (STX) control character will end the variable length NALECOM header and signify start of actual text.

1.6.4 Acceptable control characters within the NALECOM system are defined in Table A-1.

1.7 Transmission Control Sequences

Figures A-1 through A-4 exemplify typical transmission control sequences within the NALECOM network. Figure A-1 includes all control characters contained within each message. Subsequent figures contain only those control characters relevant to the action to be taken on the message.

2. NALECOM REGION TO REGION FULL DUPLEX PROTOCOL

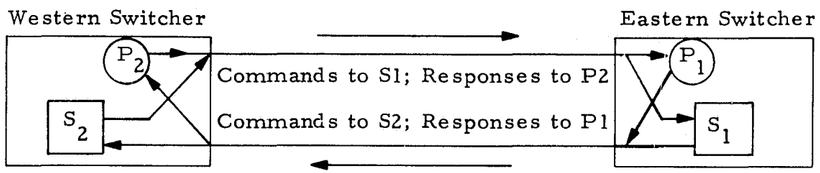
The full duplex data link between the NALECOM Eastern and Western switching centers is defined within the scope and procedures of the American National Standard for Advanced Data Communication Control Procedures (ADCCP). The seventh draft of this standard will provide the baseline specification for the full duplex NALECOM data link until such time that it is demonstrated that modification or enhancement of a given procedure will significantly improve the NALECOM network's ability to provide the following capabilities:

- Full transparency and code independence
- Efficient two-way simultaneous operation
- Reliability of both system operation and data transfer
- Adequate fulfillment of the NALECOM network's functional requirements, security and privacy constraints, or other constraints and boundaries.

2.1 Structure of the Region to Region Data Link

The NALECOM Eastern and Western switching centers comprise a primary/primary link configuration, where each center exercises both primary and secondary link control. The control of data transfer and link error recovery functions is shared between the two centers. Each center acts as primary for information initiated at its own site, and as secondary for information initiated at the other site. As a primary, each center is responsible for initialization, control of data flow, and initiation of error recovery functions

between the links. As a secondary, each center is responsible for executing commands received from the primary, and for responding when instructed by the primary.



The NALECOM regional switching centers will use the procedures defined for primary to primary Class 2-nondeferred response operations.

Commands and responses exchanged between the primary and secondary stations, as well as other message elements used to maintain line control, are defined in the seventh draft of ADCCP.

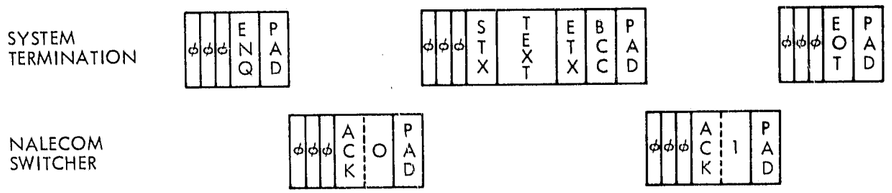
Table A-1. Communication control characters

Character	Name	Control State	Message Transfer State	ASCII Character Structure
ENQ	Enquiry	Can You Accept Transmission?	Between Blocks: Repeat Last Response.	ENQ
ACK ∅	Even Affirmative Acknowledgement	I can accept transmission.	Even Block Received And Validated.	DLE ∅
ACK 1	Odd Affirmative Acknowledgement	None	Odd Block Received and Validated.	DLE 1
SOH	Start of Header	Change to Message Transfer state; Start Computing LRC	Treat as data	SOH
NAK	Negative Acknowledgement	I cannot accept transmission	Block not validated, can accept retransmission	NAK
WACK	Wait Before Transmit	Enquire again later; delay transmission until affirmative acknowledgement is received.	Delay transmission until affirmative acknowledgement is received.	DLE;
ETX	End of Text	None	LRC follows	ETX
EOT	End of Transmission	Drop Synchronism	Drop Synchronism	EOT

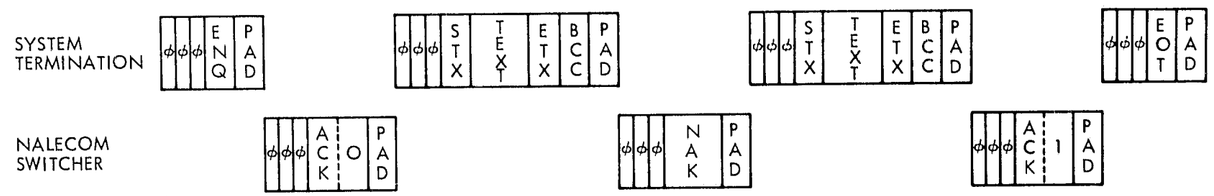
Table A-1. Communication control characters (contd)

Character	Name	Control State	Message Transfer State	ASCII Character Structure
PAD	Trailing Pad	Line Turnaround Time	Line Turnaround Time (Optional on Input Messages)	377
SYN	Synchronous Idle	Establish Synchronism	Establish Synchronism	SYN
RVI	Reverse Interrupt	Receiver wishes line control	Block received and validated; end transmission as soon as possible	DLE<
DLE STX	Start of transparent text	None	End of Header. Transparent text follows. Ignore control characters unless preceded by DLE CHAR	DLE STX
DLE ETX	End of transparent text	None	CRC follows	DLE ETX
STX	Start of text	None	End of header. Text follows.	STX

1. SINGLE MESSAGE TRANSMISSION



2. SINGLE MESSAGE WITH RETRANSMISSION REQUIRED



3. LINE CONTENTION SEQUENCE

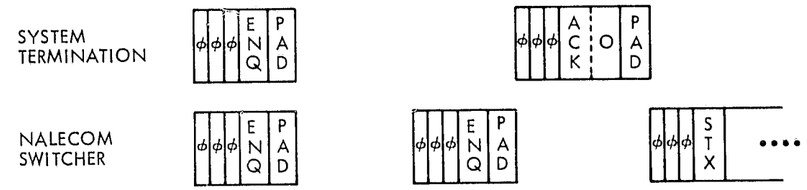
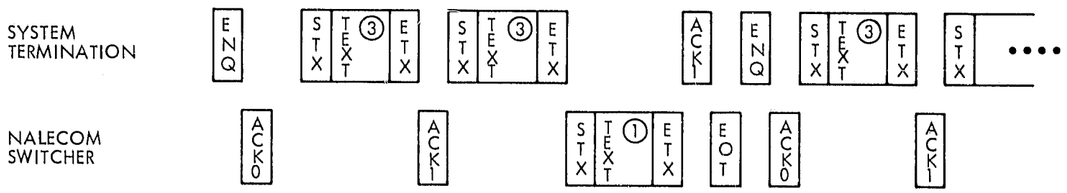
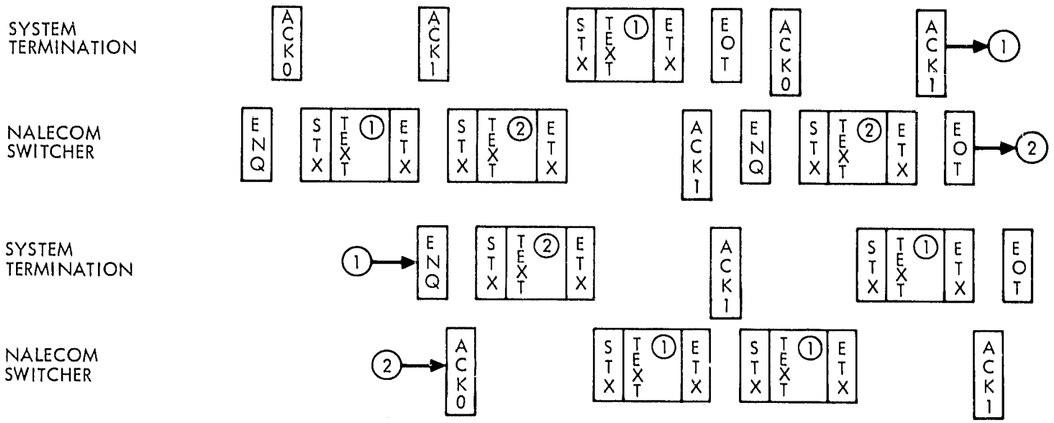


Fig. A-1. Transmission control sequences

1. TRANSMISSION OF PRIORITY 1 MESSAGE FROM NALECOM SWITCHER TO SYSTEM TERMINATION



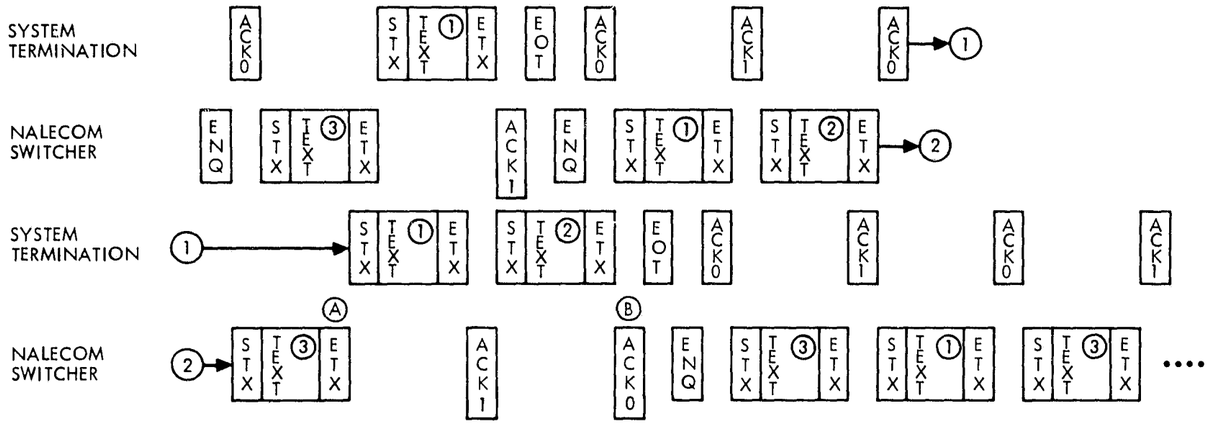
2. TRANSMISSION OF PRIORITY MESSAGES IN BOTH DIRECTIONS



CIRCLED NUMBERS WITHIN THE TEXT PORTION OF MESSAGE INDICATE THE PRIORITY OF THE MESSAGE

Fig. A-2. Transmission control sequences (conversational mode)

3. CONVERSATIONAL MODE RESTRICTED FROM USE FOR PRIORITY THREE TRANSMISSIONS

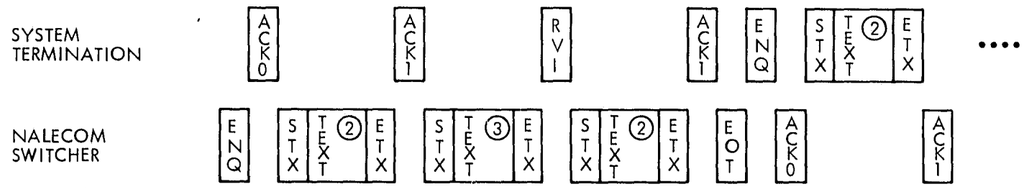


CIRCLED NUMBERS WITHIN THE TEXT PORTION OF MESSAGES INDICATE THE PRIORITY OF THE MESSAGE.

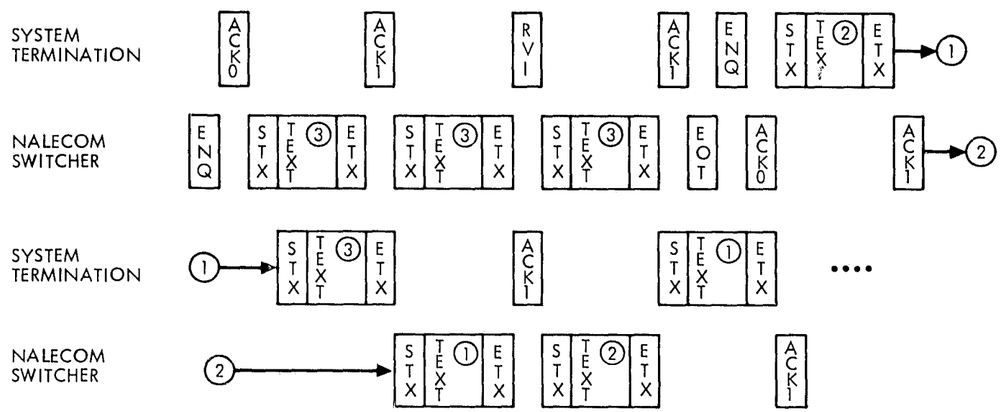
ⒶⒷ NOTE THAT AT POINT A THE SYSTEM TERMINATION HAS USED A CONVERSATIONAL REPLY TO TRANSMIT A PRIORITY ONE MESSAGE. AT POINT B THE SWITCHER REFRAINS FROM ISSUING ANOTHER CONVERSATIONAL REPLY FOR THE PRIORITY THREE MESSAGE IT HAS READY TO GO OUT. THE SWITCHER CANNOT MAKE A DETERMINATION AT THIS POINT WHETHER OR NOT MORE PRIORITY ONE MESSAGES ARE TO COME FROM THE SYSTEM TERMINATION, AND THUS WAITS FOR AN EOT.

Fig. A-3. Transmission control sequences (conversational mode)

1. SYSTEM TERMINATION INTERRUPT OF PRIORITY THREE TRANSMISSION



2. REVERSE INTERRUPT REQUEST FOLLOWED BY CONVERSATIONAL MODE TRANSMISSION



CIRCLED NUMBERS WITHIN THE TEXT PORTION OF MESSAGE INDICATE THE PRIORITY OF THE MESSAGE

Fig. A-4. Transmission control sequences (reverse interrupt sequence)

APPENDIX B

ASYNCHRONOUS LINE CONVENTIONS

8A1 LINE CONVENTIONS

The 8A1 discipline described in this section reflects the polling and calling sequences utilized. Incorporated in this are the methods of hand-shaking and message transmission reception.

To initially set up the line for operation and to reinstate the line, the following character sequence will be sent:

DLE (Data Link Escape)
300 Milliseconds of spacing
200 Milliseconds pause
EOT (End of Transmission)

Once this data has been transmitted, the line is ready for operation. If the line goes down, NALECOM will send this sequence prior to attempting to send or receive from their terminal.

The diagrams depicting the character control sequences assume that the line has been initiated and is operational.

Once the line is operational the control and message handling functions begin. Table B-1 is a list of the control characters used in the 8A1 line conventions. Table B-2 shows the polling and calling sequences to be used.

There will be no multi-block messages. All messages must begin with an "STX" and end with an "EOT." No lower case letters will be used. All lower case alphabetic characters will be translated to upper case alphabetic characters.

Table B-1. 8A1 communications control characters

Character	Function	Generated By:	ASCII Character
Acknowledgement (ACK)	Indicates "ready to receive" data or ready, but no data to send	Terminal	ZZ (2 alphas)
Call Directing Code (CDC)	Asks if terminal is ready to receive data	Processor	Unique for each terminal (2 alphas)
Carriage Return	Moves the carriage to beginning of page	Processor or terminal	CR
Restart Tape	Starts up the tape reader after an "STX" and locks out keyboard	Terminal	DC1
Delete	An unprintable pause character, used after certain control characters	Processor or terminal	DEL
Data Link Escape	Used in a set to initiate or break a line	Processor	DLE
End of Text	Used to end a message	Processor or terminal	EOT
Line Feed	Advances the paper a single line	Processor or terminal	LF
Negative Acknowment (NACK)	Indicates a "not ready to receive" status, but terminal is operational	Terminal	AA (2 alphas)
Negative Acknowment (NACK)	Indicates an alarm condition; terminal is not operational	Terminal	BEL, BEL (2 characters)
Start of Text	Indicates start of message	Processor or terminal	STX
Transmitter Start Code (TSC)	Request if a terminal has any data to send	Terminal	Unique for each terminal (2 alphas)

Table B-2. Receiving messages from stations

Processor		Station (ASR 37)
Poll Character	TSC →	
	← ZZ	Operational; no traffic to send
	← AA	Off-line but operational, (i. e. preparing a tape)
	← BEL, BEL	Non-operational, alarm condition, cannot send
	← STX, DC1, MSG. EOT	Sends a message. Machine will pause to allow on-line keyboard entry if entry is via paper tape. If no pause is desired, "DC1" should immediately follow "STX." This pertains only to paper tape input. After reception of "EOT" in the message system will return to normal polling/calling sequence. If no response is received within 10 seconds, Telecontroller will time out and send an error message back to the terminal.
Call Directing Code	CDC →	
	← ZZ	Ready to receive
	← AA	Operational, not ready to receive (i. e. preparing a tape). A light will illuminate in the terminal to notify him a message is trying to be sent. Processor will try for a reasonable period of time (30 secs) before storing message for later and less frequent attempts.
	← BEL, BEL	Non-operational, alarm condition, cannot receive data
Send Message	STX, MSG, EOT →	After "ready to receive" characters (ZZ) there will be at least a 3 sec delay before message is sent (motor must be turned on)
11/1/73	C-3	After reception of "EOT" in the message, system will return to normal polling/calling sequence.

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END