UNIVAC®

UNISCOPE 300

VISUAL COMMUNICATIONS TERMINAL

PROGRAMMERS REFERENCE

UP-7597

This manual is published by the Univac Division of Sperry Rand Corporation in loose leaf format. This format provides a rapid and complete means of keeping recipients apprised of UNIVAC® Systems developments. The information presented herein may not reflect the current status of the programming effort. For the current status of the programming, contact your local Univac Representative.

The Univac Division will issue updating packages, utilizing primarily a page-for-page or unit replacement technique. Such issuance will provide notification of software changes and refinements. The Univac Division reserves the right to make such additions, corrections, and/or deletions as, in the judgment of the Univac Division, are required by the development of its Systems.

UNIVAC is a registered trademark of Sperry Rand Corporation.

Other trademarks of Sperry Rand Corporation appearing in the text of this publication are:

UNISCOPE

CONTENTS

1. INTRODUCTION

Figure 1–1 UNISCOPE 300 Visual Communications Terminal

1.1. PURPOSE

The UNISCOPE 300 Visual Communications Terminal*, shown in Figure 1–1, is a two-way remote terminal device which makes it possible to hold time-shared direct data communications with a central processor. Each UNISCOPE terminal is keyboard operated, and it has a cathode ray tube (CRT) for message display. The CRT displays the processor Output Message, and allows Input Messages to be composed and edited before they are transmitted to the processor.

UNISCOPE terminals can communicate over any ordinary communication system with any central installation that complies with the accepted standard for serial data transmission. Interface with the communication facilities is accomplished by the use of Bell System 200 series Data Sets (or equivalent) and voice grade switched network or voice grade private lines.

1.2. SCOPE

This document contains a description of the UNISCOPE terminal characteristics, capabilities, and associated communications requirements. Appendix A describes the functions and visual responses encountered during normal operation. Appendix B lists the function codes used for communication between the processor and SSU and MSU terminals.

This manual is divided into the following basic sections:

- Functional Characteristics
- Codes and Formats
- Timing

**For convenience, references to the UNISCOPE 300 Visual Communications Terminal omit the designation 300 throughout this manual.*

2. FUNCTIONAL CHARACTERISTICS

2.1. GENERAL

UNISCOPE terminals are associated with a communications network in one of two ways: as self-contained Single Station UNISCOPE (SSU) terminals in any number, or in a group of up to 48 Multi-Station UNISCOPE (MSU) terminals connected to one Multi-Station Control Unit (MSCU). Any number of SSU terminals and MSCU's can be connected to one communications line. Each SSU or MSU is one party on the line. The SSU and MSU and its associated MSCU interface the communications facilities by the use of modems. The modem converts the digital output of the SSU and MSCU to a modulated sine wave form suitable for transmission over standard telephone facilities. A message received from the telephone facility at a remote site is reconverted (demodulated) by the modem from sine wave to a digital form which can be utilized by the UNISCOPE terminal.

Messages originating from and transmitted to the UNISCOPE terminals are designated Input and Output Messages respectively, the designation being with respect to the central processor. Input Messages originate at the UNISCOPE terminal keyboard and are displayed on the initiating SSU or MSU screen prior to being transmitted to the central processor. Output Messages are initiated by the central processor and displayed on the screen of the addressed SSU or MSU terminal. Correct receipt of each message is acknowledged by the receiving station. This acknowledgment is automatically returned by the UNISCOPE hardware in response to a poll by the central processor. (A poll is a Request For Information Message transmitted by the central processor.) Succeeding paragraphs describe in detail the following equipments and their characteristics.

- Single Station UNISCOPE terminal
- Multi-Station UNISCOPE terminal
- Multi-Station Control Unit
- Interface
- Communication Sequence

2.2. SINGLE STATION UNISCOPE TERMINAL

The Single Station UNISCOPE (SSU) terminal (Type Number 3528–00) is a self-contained unit consisting of a cathode ray tube (CRT) display, associated keyboard display generation, message buffering and control logic. The SSU can store and ultimately display 1024 characters on the CRT. Data may be entered at any character location in the display by means of the keyboard or processor messages.

2.2.1. Cathode Ray Tube Display

The CRT screen measures 10 inches by 5 inches; it is suitable for displaying 1024 alphanumeric characters in readable size. The display is presented in 16 lines of 64 characters, or 1024 character positions. In octal notation, this is equal to 20_8 lines of 100_8 characters, or 2000_8 character positions. Figure 2–1 illustrates the the plan by which each character position is assigned a unique octal identification. These octal numbers correspond to the address locations at which the data and cursor codes are stored in the Display and Control Memories (see 2.6.2.2) and represent the cursor position coordinates in the Input and Output Messages. The cursor symbol (⏋) is always visually present in the display. It indicates the position of the next entry and the starting position from which the data will be transmitted to the central processor. When the cursor is positioned over a displayable character (A⏋), the cursor and the data character will blink alternately.

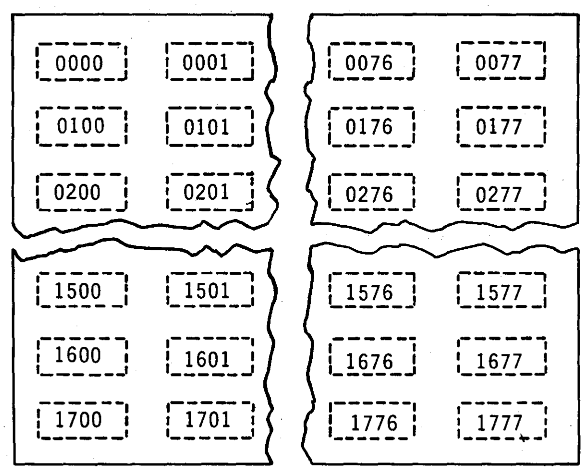


Figure 2–1. Octal Identification of Character Positions

2.2.2. Keyboard

The keyboard (Figure 2–2) is functionally divided into the following sections:

(1) Alphanumeric Keys

(2) Format Keys

(3) Editing Keys

(4) Cursor Control Keys

2.2.2.1. Alphanumeric Keys

The alphanumeric keys are used to compose the message which is displayed on the CRT prior to being transmitted to the central processor. The touch and location of the alphanumeric keys are similar to those of a standard electric typewriter.

2.2.2.2. Format Keys

The format keys provide characters for special assignments. These keys are optional. Feature Number F0967–02 includes five keys, located above the alphanumeric keys; Feature Number F0967–03 includes these five, and also a group of 35 keys to the right of the alphanumeric keys. The UNISCOPE terminal keyboard with a full complement of 40 format keys is shown in Figure 2–2. The functions of the keys in the group of 35 can be varied by means of overlays that fit over the group. The overlays are cards each of which has an edge formed according to an identifying code; when an overlay is in position, the coded edge causes the operation of some combination of seven switches controlling the significance of the function keys. On the face of the overlay, and appearing adjacent to the format keys when the overlay is in place, are markings to indicate the corresponding use of each key. One hundred and twenty-two different overlays can be used, enabling representation of as many as 4000 different functions. Typically, the different overlays can be used to identify stations, operators, applications, or security requirements. In addition to initiating a function, each key produces on the display a unique symbol, which is engraved on the face of the key.

Figure 2–2 UNISCOPE Terminal Keyboard

2.2.2.3. Editing Keys

The editing keys are at the upper left corner of the keyboard. By means of these keys, the display may be edited; that is, deletions and insertions can be made.

- The DELETE key is used to delete the character indicated by the cursor. If the shift key is at lower case (not pressed) during deletions, the resulting space is filled by reducing the coordinate number (Figure 2–1) by 1, of each succeeding character to the end of the line. If the shift key is pressed, all succeeding characters to the end of the display are thus affected.

  If the space is not to be filled after deletion of a character, the CHARACTER ERASE key is used instead of DELETE.

- The INSERT key increases by 1 the coordinates (Figure 2–1) of the character marked by the cursor and of all succeeding characters to the end of the line, if the shift key is at lower case, or to the end of the display if the shift key is at upper case. If the last character so moved falls outside display limits, it is lost. The space resulting from the movement of the characters may be filled as desired.
- There are three ERASE keys. One erases the display from under the cursor to the end of the line; another erases from under the cursor to the end of the display. The third erases a single character; it is not usually considered an editing key, because it is most frequently used to make an immediate correction of a typographical error.

2.2.2.4. Cursor Control Keys

The cursor control keys located at the lower left corner of the keyboard permit the cursor to be moved in any of four directions on the CRT display. This allows the cursor to be positioned at any character location on the display. The CURSOR TO HOME key moves the cursor to the upper left corner of the display. With the cursor so placed, the ERASE TO END OF DISPLAY key will clear the entire display.

2.2.3. Display Generation

Display generation involves a Display Memory, a Character Generator, and display regeneration logic. When information from the keyboard or central processor is to be displayed on the screen, the information is stored in Display Memory, the characters that compose the message are read from memory, sequentially displayed on the screen, and (because the display has no visual persistence) regenerated or rewritten at a 60 cycle rate to maintain a flicker-free presentation.

2.2.4. Message Buffering and Control Logic

The SSU contains message buffer areas (core memory) for storing Input and Output Messages. This information is stored in intermediate buffers where the data character codes are checked for correct parity to determine message validity, and then transferred to Display Memory where the information is stored for display on the screen. Readout from Display Memory is nondestructive, so that the display may be regenerated, as mentioned in 2.2.3.

The control logic provides timing signals which move data within the SSU, including the movement of input and output information and also cursor control.

2.3. MULTI-STATION UNISCOPE TERMINAL

Multi-Station UNISCOPE terminals (MSU) are available, for use when grouping is desired. If the group is to have not more than 24 terminals, each terminal is a MSU Type Number 3526-00; this unit, like the SSU, has a 1024-character display of sixteen 64-character lines. For groups of not more than 48 terminals, the MSU Type Number 3526-01 is used; this unit has a display of 512 characters, in eight 64-character lines. Regardless of the size of the group or of the type of MSU used, all of the terminals in a group are connected to a Multi-Station Control Unit (MSCU), which provides input and output control, message buffering, and character generation for each MSU terminal.

The MSU is basically a CRT display and a keyboard. The unit provides for message composition; it is dependent on its control unit for the final display on the CRT. The MSU differs from the SSU in that the SSU is a self-contained terminal device whereas the MSU is a terminal device dependent on a separately housed control unit. The SSU and the MSU are identical in appearance. The information in 2.2.1 and 2.2.2 is equally applicable to the MSU terminal. In association with the MSCU, the MSU is similar in operation to the self-contained SSU (see 2.2). The MSU terminals are connected in groups of either four or eight units (depending on the type of associated MSCU) and each terminal is identified by its individual address (address of each unit is determined by switch settings at rear of unit). When a specific MSU is addressed, the MSCU selects the group, and the individual terminal within that group accepts or sends data.

2.4. MULTI-STATION CONTROL UNIT

Multi-Station Control Unit Type Number 5020-00 provides Input and Output Message buffering, character generation, and control for one to 24 MSU terminals (Type Number 3526-00). The basic capacity is four terminals; see 2.4.1 for expansion features. Multi-Station Control Unit Type Number 5020-01 performs a similar function for from one to 48 MSU terminals (Type Number 3526-01). The basic capacity is eight terminals; see 2.4.1 for expansion features.

All Input and Output Messages to be displayed on the MSU terminals are stored in the MSCU. Along with control signals for MSU timing, each message to a specified MSU terminal is transmitted repeatedly at 60 times per second to keep the display visible (see 2.2.3).

The following optional features are available with the MSCU:

- Multi-Station Expansion
- Fallback Capability
- Dual Modem
- Character Generator Expansion

2.4.1. Expansion Features

The Multi-Station Expansion features, tabulated below, allow the number of MSU terminals connected to a MSCU to be increased.

FEATURE NUMBER	DESCRIPTION
F0924-01	Expands MSCU Type 5020-00. Provides control of the 1st, 3rd or 5th additional groups of four Type 3527-00 MSU terminals. Maximum addition of three (F0924-01) permitted.
F0924-02	Expands MSCU Type 5020-00. Provides control of the 2nd or 4th additional group of four Type 3527-00 MSU terminals. Maximum addition of two (F0924-02) permitted.
F0924-03	Expands MSCU Type 5020-01. Provides control of the 1st, 3rd or 5th additional group of eight Type 3527-01 MSU terminals. Maximum addition of three (F0924-03) permitted.
F0924-04	Expands MSCU Type 5020-01. Provides control of the 2nd or 4th additional group of eight Type 3527-01 MSU terminals. Maximum addition of two (F0924-04) permitted.

2.4.2. Fallback Capability Feature

The Fallback Capability feature increases the system reliability. A spare MSCU is required to utilize this feature. If during the course of operation a MSCU becomes inoperative, the MSU terminals can be shifted under program control from the defective MSCU to the spare MSCU. At the time of installation one MSCU is arbitrarily designated left (LFT) unit and the other is designated right (RHT) unit. If the LFT unit is the one normally used, and it should fail, the processor commands shift of the MSU terminals from MSCU (LFT) to MSCU (RHT), and renders the MSCU (LFT) inactive. The terms used for these operations are "Go Off Line", "Drive LFT Bank" and "Drive RHT Bank" (see 3.1.2). These operations can be performed dynamically by the processor software or manually by an operator.

2.4.3. Dual Modem Feature

The Dual Modem feature allows the MSCU to function with two modems, thereby affording increased communications reliability and greater volume. An independent input/output (I/O) section for each modem allows simultaneous handling of Input and Output Messages.

2.4.4. Character Generator Expansion Feature

There are two Character Generator Expansion features, F0967-00 and F0967-01. Feature Number F0967-00 adds the first 5 additional symbols to the character generator. One F0967-00 is required for each group of four (3527-00) or eight (3527-01) MSU terminals. Feature Number F0967-01 adds subsequent group of 35 symbols to the Character Generator. One F0967-01 is required for each group of four (3527-00) or eight (3527-01) MSU terminals. These features are used in conjunction with the Keyboard Expansion features F0967-02 and F0967-03 for the Single Station and Multi-Station UNISCOPE terminals (see 2.2.2.2).

2.5. INTERFACE

To provide compatibility with the communication facilities, specific communication equipment and terminal features are required for interface with either half duplex* or full duplex* switched or private line voice grade telephone networks. (See Figure 2–3.) The equipment requirements for the remote and central sites are described in the following paragraphs.

2.5.1. Remote Site

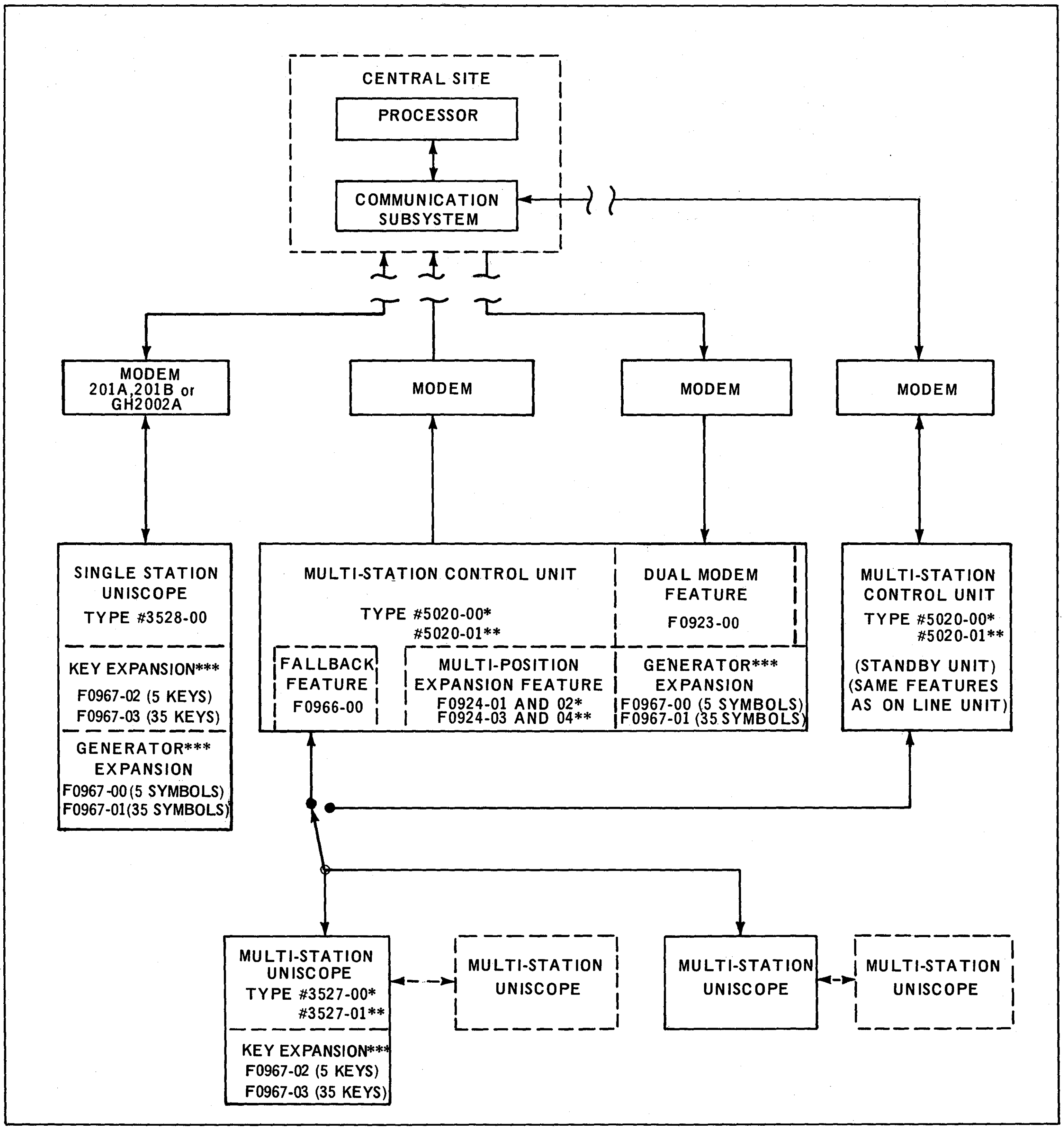
Remote Site equipment requirements are as follows:

- One or more Single Station UNISCOPE terminals; or one or more Multi-Station Control Units with up to 48 Multi-Station UNISCOPE terminals connected to each control unit.
- One or more modems as required by configuration options.

2.5.2. Central Site

Central Site installations utilizing a UNIVAC 418, UNIVAC 491, UNIVAC 492, UNIVAC 494, or UNIVAC 1108 Processor must have a Communication Terminal Modular Control (CTMC) Subsystem to interface with the UNISCOPE terminals. See "Communication Terminal Module Control Programmer/Operator Reference Manual," UP–7519 (current version). Installations utilizing a UNIVAC 9000 Series Processor require a Data Communication Subsystem (DCS). Both the CTMC and DCS conform to the accepted standard for serial data transmission (Electronic Industries Association Specification RS-232-B). The UNISCOPE terminal can interface with other installations using the accepted interface standard for serial data transmission.

**Half duplex describes a two-wire transmission facility permitting nonsimultaneous transmission of data in both directions. Full duplex, or simply duplex, describes a four-wire transmission facility permitting simultaneous two-way transmission of data (two wires for Input Messages and two wires for Output Messages). These definitions are in accord with "Proposed Revised USA Standard Vocabulary for Information Processing", Oct. 6, 1967.*



*4, 8, 12, 16, 20, or 24 terminals of 1024 characters each (see 2.4.3).

**8, 16, 24, 32, 40, or 48 terminals of 512 characters each (see 2.4.3).

***(see 2.2.2.2)

Figure 2–3. Interface

2.6. COMMUNICATIONS SEQUENCE

The exchange of data between the processor and remote terminals (SSU and MSU) is accomplished by a system of continuous interrogation (polling) by the processor and response by the UNISCOPE terminal. If no message is ready for transmission, the UNISCOPE terminal reacts to the poll with a No Traffic Message. Figure 2–4 illustrates the sequence of operation for a complete message. The initiation and control of traffic within the system is controlled exclusively by the processor. A description of data flow for Input and Output Messages follows:

Operator prepares query and presses TRANSMIT key	Input is ready and waiting for poll	Input is trans-mitted to processor	Data is processed and reply message is prepared	Output reply is ready and waiting for free telephone line	Output reply is transmitted to waiting UNISCOPE terminal	Transmission of text for extended (embedded) messages- (see 3.2.9)

Figure 2–4. Sequence of Operation

2.6.1. Data Flow For Input Messages

Input Messages (Figure 3–2) are composed on the CRT display by an operator using the keyboard. When the operator presses the TRANSMIT key, the keyboard is "locked" (that is disabled, not mechanically locked), and a traffic-ready condition in the SSU or MSCU is established. After a brief interval of time, the SSU or MSCU will be polled, which will cause the message to enter the traffic stream to the processor. Upon being polled, the SSU or MSCU assumes the transmit mode and generates a message in the following order:

(1) Transmits a heading composed of:

(a) three consecutive synchronization characters (SYN);

(b) a Start-Of-Message Character (SOM);

(c) two Remote Identifier (RID) characters identifying the transmitting SSU or MSCU;

(d) one Device Identifier (DID) character identifying the specific transmitting SSU or MSU terminal (the DID character for a SSU will always be an octal 40); and

(e) one function character which can provide acknowledgement status of a previous message. Each character, except SYN, is processed by the Input/Output logic and is transmitted with an odd parity.

(2) If the Format Key feature (see 2.2.2.2 and Figure 2–3) is installed, the terminal transmits a Mode Identification (MID) character, identifying the plastic format keyboard overlay, as the first character of text. If the Format Key Feature is not installed, a predetermined code (hardware generated) occupies the MID character location in the Input Message.

(3) Transmits the display backwards beginning at the cursor (˥) location and continuing until an End-Of-Field (SOM/EOF) character (Δ) or "home" address coordinates (0000_8) is detected. All space characters from the last data character to the end of any line are dropped and a Carriage Return/Line Feed (CRF) character is inserted immediately following the last, or rightmost, data character on each line.

(4) Transmits the Cursor Function Character (Code 27) followed by two characters specifying the x and y coordinates of the SOM/EOF (Δ) character or home position.

(5) Transmits an End-Of-Message (EOM) character identifying the end of text.

(6) Transmits a Message Parity Character (MPC). The value of this character reflects a half-add check of all characters transmitted (except SYN) and is transmitted with even character parity. Message data character parity is always odd and MPC parity is always even. The eighth level of the MPC is used to ensure that the MPC will always be uniquely identifiable. If parity of either the data or the message is incorrect, the processor, under software control, will request a retransmission of the message.

(7) Transmits an End-Of-Transmission (EOT) character signifying the end of a complete message.

After transmission of the EOT character, the SSU or MSCU reverts to the "Look-for-SYN" mode (ready for next Output Message) from the central processor.

2.6.2. Data Flow For Output Messages

Output Messages (Figure 3–2) are received by the SSU or MSCU Input/Output (I/O) section in a bit-serial format. Each message is scrutinized for SYN characters to establish the character sampling intervals. Three consecutive SYN characters are required to achieve synchronization. When synchronization is achieved, the received data bits of the complete message are shifted in a bit-serial mode into Display Memory Data Registers in the I/O section of the SSU or MSCU, checked for correct parity, stored in Display Memory, and ultimately displayed.

2.6.2.1. Message Parity Check

Each complete character in the message is checked for correct parity (odd) as it is received. This examination starts with the SOM character and continues through to the EOM character. As each character is received, a variation of a half-add is made of its seven data bits, and the accumulated half-add sums are stored in the Message Parity Register (MPR). The processor provides an eight-bit Message Parity Chaiacter (MPC), which reflects the result of performing a half-add on the data bits in the Output Message. (The MPC has eight data bits, even parity, to distinguish it from the data characters.) A half-add of the incoming data characters, and the contents of the MPR must equal zero to indicate a correctly received message. If an error is detected by the I/O logic in the SSU or MSCU during the parity check of the message, the output to the CRT display is terminated, and an error signal is sent to the terminal display unit to light the FAULT indicator. In this case, that part of the Output Message already displayed remains on the SSU or MSU screen until the message is retransmitted by the processor.

2.6.2.2. Character Generation and Display

Two memories are used in developing a desired message upon the screen. The Control Memory merely stores the cursor screen location (see 2.2.1); the Display Memory stores the contents of the message or data which is to be displayed.

The message to be displayed on the SSU or MSU screen can start at any address location on the screen (see 2.2.1). Assume that the first character of the message is to be displayed at the upper left hand corner of the screen (screen location 0000_8). After the character has been checked for correct parity, and starting with the cursor position coordinates, the data is processed as follows:

(1) The cursor address 0000_8 is initially placed in Control Memory. A 1 bit (Cursor Bit) is stored in bit position 7 of Display Memory at address 0000_8. Only one Cursor Bit will be stored in Display Memory at one time.

(2) The cursor symbol (˥) is displayed on the screen at screen location 0000_8, corresponding to the address in Control Memory.

(3) After the first data character in the message has been checked for correct parity, it is stored in the seven low order bit positions of Display Memory at address location 0000_8 containing the Cursor Bit. Upon completion of storage the data character is displayed on the screen.

(4) The Cursor Bit moves to bit position 7 of the next higher address location in Display Memory (0001_8), the cursor symbol is displayed in screen location 0001_8, and the cursor address in Control Memory is increased by one to correspond with the new position of the Cursor Bit in Display Memory. This operation continues until all data on the line has been displayed.

After the data for the line has been displayed, the received Cursor Return code (CRF) causes the cursor to move to the first character position in the next lower line (0100_8). (The CRF code is similar to the carriage return and line feed operation on conventional typewriters.) If the number of characters sent to a UNISCOPE terminal is 65 for a given line of data, the UNISCOPE terminal supplies an automatic cursor return when it reaches the end of a display line (64 characters) and continues to display the data on the next line. If 65 characters are directed to a UNISCOPE terminal and the 65th character contains a CRF code, a second carriage return operation is performed causing a double space between lines of data. The first carriage return operation is an automatic function of the UNISCOPE terminal hardware and occurs after the 64th character on a line has been received. The second carriage return operation is caused by the 65th character (CRF code) in the line.

The Keyboard Unlock (KBU) code is normally the last information contained in the text portion of the Output Message. When this code is received the UNISCOPE terminal keyboard is unlocked, or enabled, thereby releasing the keyboard for construction of additional messages to the processor. (See KBU code 24, 3.1.2.)

2.7. MESSAGE ACKNOWLEDGMENT

Transmitted messages must all be acknowledged by the receiving station. This increases the effectiveness of system error control by preventing the loss of messages due to hardware, software, or telephone facility malfunctions.

The SSU or MSCU acknowledges a correctly received message (positive acknowledgments) by inserting an Acknowledge Bit in the function code transmitted in response to a subsequent processor poll. The operation sequence for a sample message acknowledgment is as follows:

- The SSU or MSCU sends function code 06 (POL; "Query" Message) to the processor (see 3.1.3).
- The processor replies by sending function code 07 ("OUT" Message), which is accepted and displayed by the SSU or MSU terminal. In addition to text, the OUT Message usually includes code 24 (KBU; "Keyboard Unlock" Message) immediately following the last text character in the message; this code unlocks, or enables, the UNISCOPE terminal keyboard. If the "Query" Message is not properly received by the processor (which would be indicated by an incorrect parity check), the processor replies with function code 05 (RET; "Request Retransmission" Message), and the keyboard remains locked.
- The processor transmits function code 06 (POL; "Request for Input" Message).
- The response to this POL from the SSU or MSCU hardware is ordinarily function code 16; a negative acknowledgement is expressed by the return of code 06.
- If the message is received from the processor with an error condition, the message being displayed on the CRT terminates at the character position in the message at which the incorrect parity was detected. In this case, the KBU code is not received, the keyboard remains locked, and the incomplete message remains on the screen. A negative acknowledgment in response to a subsequent Poll Message notifies the processor that the message was not received correctly. The processor, in turn, may retransmit the message, perform a diagnostic, or ignore the error and send the SSU or MSCU a KBU code to unlock the keyboard.

3. CODES AND FORMATS

3.1. GENERAL

This section of the manual provides the code definitions and message formats for all transactions between the processor and the UNISCOPE terminals. These codes utilize a seven bit (plus parity bit) modified USASCII code. All messages consist of a header envelope, the text of the message, and a trailer envelope, as illustrated in Figure 3–1.

HEADER	TEXT	TRAILER

Figure 3–1. Simplified Message Format

The header envelope contains codes which are used for synchronization, and for identification of the UNISCOPE terminal and the type of message being transmitted. The trailer envelope contains codes for message parity and message termination. Some messages are used only for control and require no text. Each code described in this section is listed in Appendix B with its octal and hexadecimal representation.

The octal codes used in communications between the processor and the UNISCOPE terminals and between the UNISCOPE terminal keyboard and SSU or MSCU are grouped as follows:

- Message Control Codes
- Output Transaction Codes
- Input Transaction Codes
- Display Editing Codes
- Keyboard Editing Codes
- Keyboard Codes and Format Assignments

3.1.1. Message Control Codes

The message control codes listed in Table 3–1 are generated by the hardware; they are located in the header and trailer envelopes of the message and are used in controlling the communications between the processor and SSU and MSU terminals. Three consecutive Synchronization (SYN) characters and one Start-Of-Message (SOM) character are in the header envelope. One End-Of-Message (EOM) character and one End-Of-Transmission (EOT) character are in the trailer envelope. (See Typical Message, Figure 3–2.)

OCTAL CODE	CODE NAME	DESCRIPTION	
		PROCESSOR TO SSU OR MSCU	SSU OR MSCU TO PROCESSOR
26	SYN	Synchronizing	Synchronizing
01	SOM	Start-Of-Message	Start-Of-Message
02	EOM	End-Of-Message	End-Of-Message
03	EOT	End-Of-Transmission	End-Of-Transmission

Table 3–1. Message Control Codes

- SYN (26) Synchronization

  The SYN code is used to establish character sampling intervals. Each Input and Output Message must be preceded by at least three consecutive SYN characters.

- SOM (01) Start-Of-Message

  The SOM code alert the SSU, MSCU, or processor that a message is being transmitted. This code always precedes the address identifier.

- EOM (02) End-Of-Message

  This code indicates to the SSU, MSCU, or processor that the message has ended and the next character to be received is the Message Parity Character (MPC). The EOM code always follows the last text character in the message.

- EOT (03) End-Of-Transmission

  The EOT code serves notice to the SSU, MSCU, or processor that the transmission is ended and causes the communications modem to revert to an idle condition until the next SYN characters are received.

3.1.2. Output Transaction Codes

The output transaction codes listed in Table 3–2 occupy the function character location in the header envelope of the message transmitted from the processor to the SSU and MSCU's. These codes follow the Device Identifier (DID) character (SSU or MSU address) or General Identifier (GID) and identifies the type of transaction being transmitted (see Typical Message, Figure 3–2).

OCTAL CODE	CODE NAME	DESCRIPTION
04	SOM/**EOF**	End-Of-Field
05	RET	Request Retransmission
06	POL	Request For Input
07	OUT	Computer Output
10	CMW	Computer Message Waiting
11	OFF	Go Off Line
16	LFT	Drive Left Bank
17	RHT	Drive Right Bank
13	CRF	Cursor Return
14	BRK	Break For Segment
15	RES	Resume Transmission
20	BCD	Standby For Broadcast
21	SHL	Set High Memory Margin Limit
22	SLL	Set Low Memory Margin Limit
23	SNL	Set Normal Memory Margin Limit
24	KBU	Keyboard Unlock

NOTE: Some codes may have more than one use. See Table B–1.

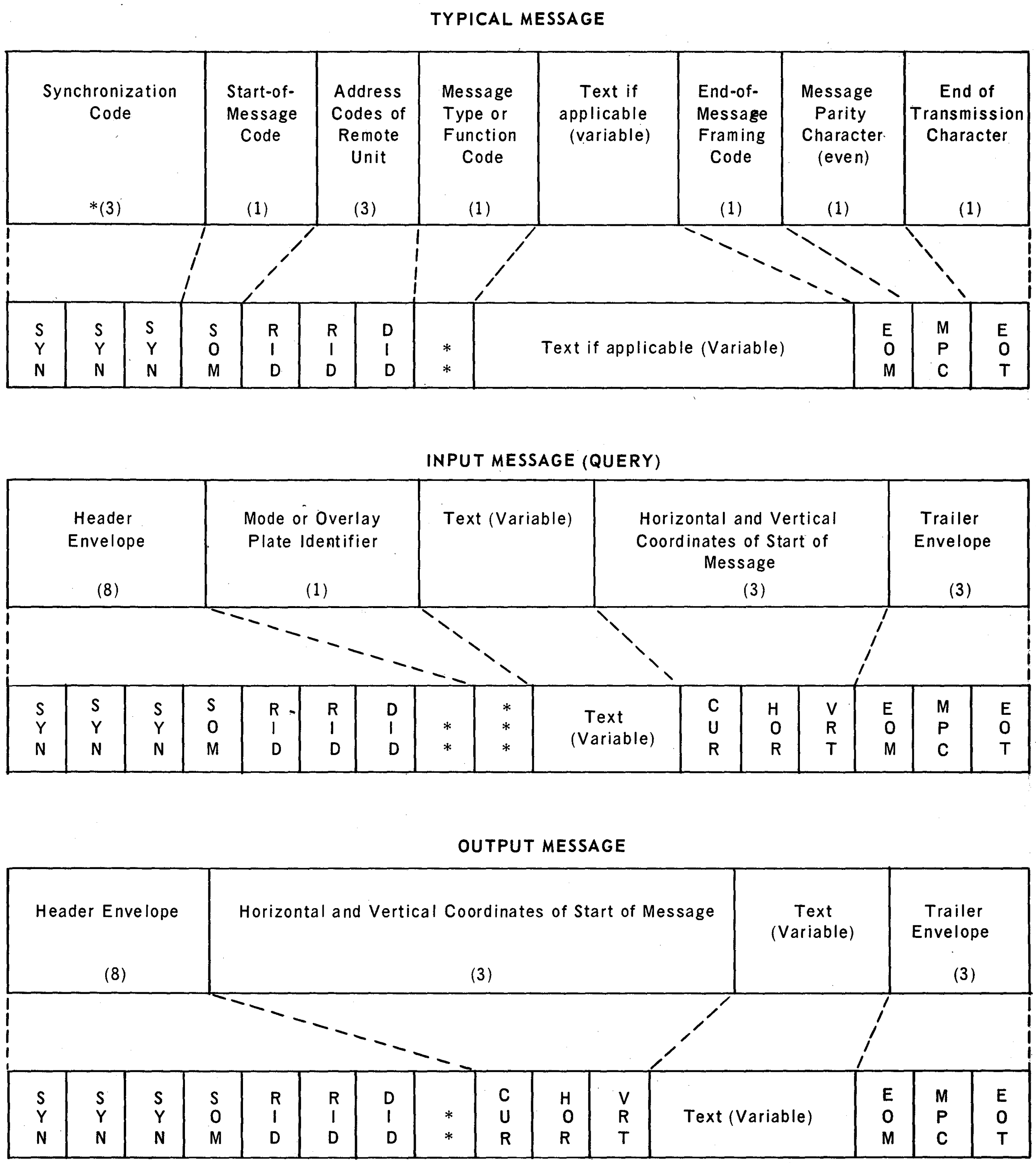
Table 3–2. Output Transaction Codes

- SOM/**EOF** (04) End-Of-Field

  When received in an Output Message, this code is processed as text and displayed on the SSU or MSU screen as a Δ. This symbol indicates the end of a displayed message. Several SOM/**EOF** codes may be contained within a given display, thereby allowing more than one message to be displayed on the SSU or MSU screen for one transmission period.

- RET (05) Request Retransmission

  The RET code 05 is used in the processor Output Message whenever the program requires a retransmission of an incorrectly received Input Message.



* The number in parentheses is the number of characters required for the purpose indicated. The message is transmitted from left to right, the synchronization characters first, etc.

** Code varies depending on the direction of transmission (input or output)

*** Code varies depending on overlay plate used.

Figure 3–2. Typical, Input Message (Query), and Output Message Formats

- POL (06) Request-For-Input

  The POL code 06 is a request for input information from each SSU or MSCU, in turn, under processor control.

- OUT (07) Computer Output

  This code precedes the text data in an Output Message. It notifies the addressed SSU or MSCU to process the received text.

- CMW (10) Computer Message Waiting

  This code prepares the SSU or MSCU for two types of unsolicited messages, Conditional and Unconditional. The Conditional Unsolicited Message contains the CMW code without text to alert the operator of a forthcoming message. The Unconditional Unsolicited Message contains the CMW code followed by text and is forced on the display without operator intervention.

  When the Conditional Unsolicited Message is received at the UNISCOPE terminal, it lights the MESSAGE WAITING indicator and sounds an audible alarm. The operator may then, at his convenience, request the message by pressing the MESSAGE WAITING key. This action also extinguishes the MESSAGE WAITING indicator and silences the alarm.

  When the Unconditional Unsolicited Message is received, it is unconditionally displayed (forced) on the screen at the same time erasing any message which might have been displayed previously in the area addressed by the processor. It also lights the MESSAGE WAITING indicator and sounds the audible alarm. When the MESSAGE WAITING key is pressed, the indicator is returned off, the audible alarm is silenced, and a positive acknowledgment (W/Ack) is transmitted to the processor in the next polling cycle to verify that the message has been received. (See BRK code 14, 3.1.3.)

- OFF (11) Go Off Line

  This code is used to switch a defective MSCU with fallback feature into the offline or standby mode (see paragraph 2.4.1). This code is transmitted in association with the codes LFT (16) and RHT (17) described below.

- LFT (16) Drive Left Bank

  When received, this code switches a MSCU with the fallback feature into the "left bank" mode (see 2.4.1).

- RHT (17) Drive Right Bank

  When received, this code switches a MSCU with the fallback feature into the "right bank" mode (see 2.4.1).

- CRF (13) Cursor Return

  The CRF code is generated either by the processor or by depressing the cursor RETURN key on the UNISCOPE terminal keyboard. It causes the cursor to move to the first character position in the next lower line. When the cursor reaches the bottom line in the display, it will move to but not beyond the last character position coordinates (1777_8) (see 2.2.1). This operation is similar to the carriage return and line feed operation on conventional typewriters.

- BRK (14) Break For Segment

  This code is used when it is necessary to interrupt the transmission of a message to one SSU or MSU terminal so that a message can be transmitted to a different terminal on the same transmission line. When transmitted, this code causes the receiving SSU or MSU terminal to stop receiving, stop accumulating message parity, and revert to a standby mode until a subsequent Resume Transmission (RES) code is received (see RES 15 code in next paragraph). The next message contains an address for a SSU or MSU on the same transmission line, and a block of data. The newly addressed SSU or MSU receives this data while the originally addressed SSU or MSU awaits the RES code. (See Embedded Message, 3.2.9). This code may occur more than once in the same Output Message.

- RES (15) Resume Transmission

  This code is used in conjunction with the previously described BRK code. When received, this code returns the interrupted SSU or MSU to its original receive condition. As with the BRK code, the Resume code also may occur more than once in the same Output Message.

- BCD (20) Standby For Broadcast

  This code is used to alert an SSU or MSU that more than one SSU or MSCU will receive the processor message (broadcast type message). One by one as each SSU or MSCU is addressed, they are conditioned to receive the forthcoming message. Any number of SSU's or MSCU's on the transmission line can be addressed, but only one MSU per MSCU can be addressed.

- SHL (21) Set High Memory Margin Limit

  This code is a test function. Its purpose is to set the control voltages in Display Memory so that all memory cores will switch to and be maintained in the 1 state. While in this mode, the test program can perform test operations. These results aid in discovering potential readout failures in the Display Memory of the MSCU. The SSU is not affected by this code.

- SLL (22) Set Low Memory Margin Limit

  This code is a test function. Its purpose is to set the control voltages in Display Memory so that all memory cores will be switched to and maintained in the 0 state. As previously stated for the SHL code, it is an aid in discovering potential readout failures in the MSCU Display Memory. The SSU is not affected by this code.

■ SNL (23) Set Normal Memory Margin Limit

The purpose of this code is to return the control voltages in Display Memory of a MSCU to normal after transmitting the SHL and SLL codes. This code must be received by the MSCU prior to resuming normal operations.

■ KBU (24) Keyboard Unlock

The function of this code is to unlock the UNISCOPE terminal keyboard, which is locked when the TRANSMIT key is pressed, when a Query Message is transmitted to the processor, or when a Conditional or Unconditional Unsolicited Message has been received. The SSU keyboard can be unlocked manually by turning the Keylock Switch to OFF, depressing the MC (Master Clear) pushbutton at the rear of the SSU terminal, and returning the Keylock Switch to ON; the MSU keyboard can be unlocked by turning off and on the Keylock Switch at the upper right of the keyboard.

3.1.3. Input Transaction Codes

The input transaction codes listed in Table 3–3 occupy the function character location in the header envelope of the Input Message transmitted from the UNISCOPE terminals to the processor. These codes identify the type of transaction being transmitted and provide the acknowledgement as part of the response.

OCTAL CODE	CODE NAME	DESCRIPTION
04	SOM/EOF	Request Computer Message (WO/Ack)*
14	BRK	Request Computer Message (W/Ack)*
06	POL	No Traffic/Query (WO/Ack)
16	LFT	No Traffic/Query (W/Ack)*

NOTES: WO/Ack (Without Acknowledgment); W/Ack (With Acknowledgment).
Some codes may have more than one use. See Table B–1.

Table 3–3. Input Transaction Codes

■ SOM/EOF (04) Request Computer Message (WO/Ack)

This code is not displayed. It is originated by the operator at the UNISCOPE terminal keyboard when responding to a CMW code associated with the Conditional Unsolicited Message. As described in paragraph 3.1.2 the CMW code lights the MESSAGE WAITING indicator to notify the operator that a processor message is waiting. In response, the MESSAGE WAITING key is pressed, requesting the processor message. This action causes a SOM/EOF code (04) to be transmitted to the processor (without acknowledgment, WO/Ack) requesting the waiting message. Because this is a new request message and no message was previously received, no acknowledgment is required. When the 04 code is received by the processor, the processor will transmit the waiting message to the UNISCOPE terminal.

- BRK (14) Request Computer Message (W/Ack)

  This code is transmitted to the processor to acknowledge receipt of an Unconditional Unsolicited Message (code 10). Following receipt of an Unconditional Unsolicited Message, the MESSAGE WAITING key is depressed. This causes the MESSAGE WAITING indicator to go out, silences the audible alarm, and prepares a 14 code for transmission to the processor when the next POL code is received.

  The code 14 is derived from code 04 (**SOM**/EOF) by insertion of a 1 bit in bit position 3. The processor interprets this code as the start of message, positive acknowledgment of the Unconditional Unsolicited Message, and termination of the input message.

- POL (06) No Traffic/Query (WO/Ack)

  This code is transmitted to the processor in response to a Request For Input Message.

  When the SSU or MSCU is polled by the processor and (1) no Input Message is waiting to be transmitted to the processor and (2) no message was received previously, the 06 code is sent to the processor indicating No Traffic (WO/Ack). If an SSU or MSCU has a message waiting and no acknowledgment for a previously received message is required, this code accompanied by text is transmitted and designated "Query (WO/Ack)". The processor differentiates between the two code designations by the presence or absence of text in the message.

- LFT (16) No Traffic/Query (W/Ack)

  This code acknowledges receipt of an Output Message (W/Ack, With Acknowledgment) and is transmitted in response to a subsequent Request For Input Message.

  When this message is received by a SSU or MSCU and (1) no message is waiting to be transmitted to the processor and (2) a previously received message requires acknowledgment, the SSU or MSCU hardware automatically inserts a 1 bit in bit position 3 of the POL code (06) to form the 16 code, which is designated "No Traffic (W/Ack)".

  If an SSU or MSCU has a message waiting for transmission to the processor and a message was received previously, the 16 code, accompanied by text, is transmitted and is designated "Query (W/Ack)". The processor is able to differentiate between the two code designations by the presence or absence of text in the message.

3.1.4. Display Editing Codes

The display editing codes listed in Table 3–4 are used by the processor for controlling the SSU or MSU display of a new Output Message or for editing portions of previous Output Messages. A description of each display editing code follows:

OCTAL CODE	CODE NAME	DESCRIPTION
12	ERD	Erase to End Of Display
27	CUR	Cursor Position
30	INL	Insert Line
31	SBF	Start Blink Field
35	EBF	End Blink Field
32	ERL	Erase To End Of Line
33	TAB	Tab Stop Set
34	DEL	Delete Line

NOTE: Some codes may have more than one use. See Table B–1.

Table 3–4. Display Editing Codes

- ERD (12) Erase To End Of Display

  This code is used by the processor to edit (update) a portion of a previously transmitted Output Message. It causes all characters beginning with the one at the cursor position and ending at the end of the display to be erased. The corresponding location in Display Memory will be filled with space codes. A new line of data can now be transmitted to replace the erased portion of the display.

- CUR (27) Cursor Position

  In Output Messages, this code is associated with the horizontal and vertical coordinate characters; they occupy the first three character positions in the text portion of the message. The group of three characters (CUR, HOR, and VERT) provides the first displayable character of text on the SSU or MSU screen (see Output Message, Figure 3–2). These characters can also be transmitted within the text portion of the Output Message for positioning the data at various coordinates on the viewing screen.

- INL (30) Insert Line

  The INL code is used by the processor to change (update) a portion of a previously transmitted Output Message. It causes the entire contents of the bottom line in a SSU or MSU display to be erased (corresponding location in Display Memory will be filled with space codes) and the line occupied by the cursor and all succeeding lines are moved down one line. The first line in the display can now be filled with additional data.

When transmitted in an Output Message, this code should be followed by at least two NULL characters. This provides time for the UNISCOPE terminal to complete the Insert Line operation before processing the new data in the edited portion of the display.

- SBF (31) Start Blink Field

This code is inserted in the text portion of the Output Message and precedes the data which is tagged for the operator's attention. It causes the displayable characters within this field to blink on and off in unison approximately once each second. The tagged field is bracketed with the SBF (31) and EBF (35) codes. The EBF (End Blink Field) is described below.

- EBF (35) End Blink Field

The EBF code is inserted in the text portion of the Output Message at the end of each tagged display field. This code is always used in association with the SBF (31) code previously described.

- ERL (32) Erase To End Of Line

This code is used by the processor to change (update) a line of data or a portion of a line of data in a previously transmitted Output Message. This code causes all characters from and including the cursor to the end of the line to be erased. The corresponding location in Display Memory will be filled with space codes. Only the line containing the cursor will be affected.

- TAB (33) Tab Stop Set

The operation of this code is similar to the Tab operation on a conventional typewriter except in this case the tab stop is determined by the processor. When received in an Output Message, this code provides a stop position for the cursor when the TAB key on the UNISCOPE terminal keyboard is pressed.

- DEL (34) Delete Line

The DEL code is used by the processor to change (update) a portion of a previously transmitted Output Message. It causes the erasure of all characters in the line occupied by the cursor and all lines below the affected line to move up one line; the cursor remains in its original location. The address locations in Display Memory are filled with space codes. This makes more space for data available to the processor.

3.1.5. Keyboard Editing Codes

The keyboard editing codes listed in Table 3–5 are generated within the SSU and MSU terminals; they are used only to compose and edit the message displayed on the SSU or MSU screen prior to transmission to the processor (see Figure 2–2 and Table 3–6). These codes perform editing functions similar to the display editing codes, described in 3.1.4, associated with Output Messages.

OCTAL CODE	CODE NAME	DESCRIPTION
06	POL	Horizontal Tab
07	OUT	Insert Character In Display
11	OFF	Delete Character In Display
12	ERD	Erase To End Of Display
14	BRK	Scan Up
15	RES	Scan Down
16	LFT	Scan Left
17	RHT	Scan Right
27	CUR	Insert Character In Line
31	SBF	Delete Character In Line
32	ERL	Erase To End Of Line
33	TAB	Home Cursor

NOTE: Some codes may have more than one use. See Table B–1.

Table 3–5. Keyboard Editing Codes

- POL (06) Horizontal Tab

  When the TAB key is pressed, this code causes the cursor to advance to the next tab stop location, plus one. The tab stop code is transmitted by the processor and stored in the memory of the SSU or MSU terminal. If no tab stop has been previously transmitted, the cursor advances to the end of the display (coordinates 1777_8). (Refer to 3.1.4 for description of Tab Stop Set code 33.)

- OUT (07) Insert Character In Display

  This code is used to insert a character in a message being composed on the SSU or MSU display. When the uppercase (unmarked key) and IN DISPL/INSERT/IN LINE keys are depressed simultaneously, all characters beginning with the one at the cursor position and ending at the end of the display shift right one space. A space is inserted at the cursor location, a space is stored in the corresponding address in Display Memory, and the character located in the last position (1777_8) of the display is discarded.

■ OFF (11) Delete Character In Display

The OFF (11) code is used to delete a character in a message being composed on the SSU or MSU display. When the uppercase (unmarked key) and IN DISPL/DELETE/ IN LINE keys are depressed simultaneously, the character under the cursor is erased and all characters from this position to the end of the display shift left one character position to occupy the space of the deleted character.

■ ERD (12) Erase To End Of Display

This code is used to change or delete a portion of the message being composed on the SSU or MSU display. When pressed, the erase to end of display key causes all characters beginning with the one at the cursor location and ending at the end of the display, to be erased (converted to spaces).

■ BRK (14) Scan UP

When the ↑ key is pressed, this code causes the cursor to move up to the next higher line or lines, depending on how long the key is held depressed. The cursor will move up approximately ten lines per second if the ↑ key is held depressed.

■ RES (15) Scan Down

When the ↓ key is pressed, the RES (15) code causes the cursor to move down to the next lower line or lines, depending on how long the key is held depressed. The cursor will move down approximately ten lines per second if the ↓ key is held depressed.

■ LFT (16) Scan Left

When the ← key is pressed momentarily, this code causes the cursor to move left one character position. If the ← key is held depressed the cursor will move approximately ten character positions per second.

■ RHT (17) Scan Right

When the → key is pressed momentarily, this code causes the cursor to move right one character position. If the → key is held depressed, the cursor will move approximately ten character positions per second.

■ CUR (27) Insert Character In Line

The CUR (27) code is used to shift the characters on a line to provide space for an additional character to be inserted at the cursor position. When the INSERT/IN LINE key is pressed, it causes all characters from the cursor location to the right end of that line to shift right one space. A space is inserted at the cursor location, a space code is stored in the associated address in Display Memory, and the last character in the line is discarded.

- SBF (31) Delete Character In Line

  The SBF (31) code is used to delete a character in a message being composed on the SSU or MSU display. When the DELETE/IN LINE key is pressed, (1) it causes the character under the cursor to be erased (a space code is stored in the correlated address in Display Memory), (2) all characters from the cursor to the end of the line move left one character position, and (3) a space is inserted in the last character position on the line.

- ERL (32) Erase To End Of Line

  When the ERASE TO END OF LINE key is pressed, this code causes all characters from and including the cursor location to the end of the line to be erased, and space codes to be stored in the corresponding addresses in Display Memory.

- TAB (33) Home Cursor

  When the CURSOR TO HOME key is pressed, this code causes the cursor to move to the home position (screen coordinates 0000_8).

3.1.6. Keyboard Code and Format Assignments

The complete keyboard is composed of a slightly modified alphanumeric keyboard, an optional group of forty format keys, and a group of editing and cursor keys. (See Figure 2–2.) Labels denoting the function assignment of each format key (in the group of thirty-five keys) are above the keys on a plastic overlay, which may be changed. The plastic overlay associated with the group of thirty-five format keys activates a combination of seven switches. These switches provide a special overlay identifier code (MID) which is transmitted with each message from the UNISCOPE terminal (see Figure 3–2). Table 3–6 illustrates the keyboard codes and format label assignments associated with the display characters.

3.2. MESSAGE ENVELOPES AND FORMATS

All messages transmitted between the central processor and UNISCOPE terminals comprise a header envelope (eight characters) immediately preceding the text, and a trailer envelope (three characters) immediately following the text. (See Figure 3–2.) The characters are composed of a modified seven-bit USASCII code. (The Message Parity Character, MPC, utilizes an eight-bit character to distinguish it from the control characters in the message.) Some messages are used only for control and do not require any text.

The header and trailer envelopes for all messages transmitted between the processor and the UNISCOPE terminals consist of a special group of standard codes. These codes include three Synchronization (SYN) characters, one Start-Of-Message (SOM) character, two Remote Identifier (RID) characters, one Device Identifier (DID) character, one function code character, one End-Of-Message (EOM) character, one Message Parity Character (MPC), and one End-Of-Transmission (EOT) character. (These codes are listed in Table 3–1 and described in 3.1.1 through 3.1.4.)

KEY	OCTAL WITH PARITY	HEXA-DECIMAL WITH PARITY
MSG WTG	004	04
TAB	206	86
INSERT IN DSPY	007	07
DEL IN DSPY	211	89
ERASE END DSPY	212	8A
RETURN	013	0B
CURSOR ↑	214	8C
CURSOR ↓	015	0D
CURSOR ←	016	0E
CURSOR →	217	8F
INSERT IN LINE	227	97
DEL IN LINE	031	19
ERASE END LINE	032	1A
CURSOR TO HOME	233	9B
CHAR ERASE	040	20
!	241	A1
"	242	A2
#	043	A3
$	244	A4
%	045	25
&	046	26
'	247	A7
(	250	A8
)	051	29
*	052	2A
+	253	AB
,	054	2C
–	255	AD
.	265	AE
/	057	2F
0	260	B0
1	061	31
2	062	32
3	263	B3

KEY	OCTAL WITH PARITY	HEXA-DECIMAL WITH PARITY
4	064	34
5	265	B5
6	266	B6
7	067	37
8	070	38
9	271	B9
:	272	BA
;	073	3B
<	274	BC
=	075	3D
>	076	3E
?	277	BF
⌼	100	40
A	301	C1
B	302	C2
C	103	43
D	304	C4
E	105	45
F	106	46
G	307	C7
H	310	C8
I	111	49
J	112	4A
K	313	CB
L	114	4C
M	315	CD
N	316	CE
O	117	4F
P	320	D0
Q	121	51
R	122	52
S	323	D3
T	124	54
U	325	D5
V	326	D6
W	127	57
X	130	58
Y	331	D9
Z	332	DA
[	133	5B
Δ	334	DC
]	135	5D
‡	136	5E
▭	337	DF
↓	340	E0
╳	141	61
≤	142	62
≥	343	E3
Ɏ	144	64
¥	345	E5

KEY	OCTAL WITH PARITY	HEXA-DECIMAL WITH PARITY
∠	346	E6
√	147	67
◇	150	68
Σ	351	E9
↙	352	EA
≡	153	6B
λ	354	EC
↑	155	6D
⊡	156	6E
⊻	357	EF
⊏	160	70
⊽	361	F1
–	362	F2
^	163	F3
∀	364	F4
⊦	165	75
⍒	166	76
↖	367	F7
::	370	F8
π	171	79
⋈	172	7A
÷	373	FB
∴	174	7C
≠	375	FD
¢	376	FE
↯	177	7F

Table 3–6. Keyboard Codes and Format Label Assignments

The messages listed below are transmitted between the processor and UNISCOPE terminals:

- Poll Message
- Query Message
- No Traffic Message
- Retransmission Message
- Reply Message
- Computer Message Waiting Message
- Request Computer Message
- Unconditional Unsolicited Message
- Embedded Message
- Queued Output Message
- Go Off Line, Drive Right Bank, Drive Left Bank Messages
- Test Memory At High Margin, Test Memory At Low Margin, Set Memory To Normal Messages

The formats for each of the above listed messages are given in Table 3–7 and described in 3.2.1 through 3.2.12.

3.2.1. Poll Message

The Poll Message (request for information) is a short Output Message which enables a waiting SSU or MSCU to send data under control of the processor. (See message (1), Table 3–7). Ordinarily, the Poll Message addressing a MSCU contains a General Device Identifier (GID) which causes the MSCU to select one UNISCOPE terminal from those that have data ready for transmission. A MSCU may have as many as 48 MSU's attached and only one message waiting to be transmitted. The GID code allows the Poll Message to be addressed to the MSCU only once, instead of to each of the forty-eight MSU units individually. If more than one MSU has a message ready for transmission, the messages are stacked and transmitted in the order of completion (first in, first out).

(1) COMPUTER POLLS FOR INPUT		(2) OPERATOR TRANSMITS DATA OR QUERY		(3) REMOTE TRANSMITS NO TRAFFIC		(4) COMPUTER REQUESTS RETRANSMISSION	(5) COMPUTER TRANSMITS DATA OR REPLY
GENERAL POLL	SPECIFIC POLL	WO/ACK	W/ACK	WO/ACK	W/ACK		
SYN		SYN		SYN		SYN	SYN
SYN		SYN		SYN		SYN	SYN
SYN		SYN		SYN		SYN	SYN
SOM		SOM		SOM		SOM	SOM
RID		RID		RID		RID	RID
RID		RID		RID		RID	RID
GID DID		DID		DID		DID	DID
POL		POL LFT		POL LFT		RET	OUT
EOM		↑		EOM		EOM	CUR
MPC				MPC		MPC	HOR
EOT or SOM		TEXT		EOT		EOT	VRT
							↑
							TEXT
		↓					
		CUR					
		HOR					
		VRT					↓
		EOM					EOM
		MPC					MPC
		EOT					EOT or SOM

Table 3-7. Formats For Messages Transmitted Between the Processor and UNISCOPE Terminals (Sheet 1 of 3)

(6) COMPUTER SENDS CONDITIONAL MESSAGE REQUEST	(7) OPERATOR REQUESTS CONDITIONAL MESSAGE		(8) COMPUTER SENDS UNCONDITIONAL MESSAGE	(9) COMPUTER SEGMENTS OUTPUT WITH A POLL
	WO/ACK	W/ACK		
SYN	SYN		SYN	SYN
SYN	SYN		SYN	SYN
SYN	SYN		SYN	SYN
SOM	SOM		SOM	SOM
RID	RID		RID	RID
RID	RID		RID	RID
DID	DID		DID	DID
CMW	SOM/EOF	BRK	CMW	OUT
EOM		MID(if used)	CUR	CUR
MPC		EOM	HOR	HOR
EOT		MPC	VRT	VRT
		EOT	↑	↑
				TEXT
				↓
			TEXT	BRK
				SOM
				RID
				RID
				DID
			↓	POL
			EOM	EOM
			MPC	MPC
			EOT or SOM	RES
				CUR
				HOR
				VRT
				↑
				TEXT
				↓
				EOM
				MPC
				EOT or SOM

Table 3–7. Formats For Messages Transmitted Between the Processor and UNISCOPE Terminals (Sheet 2 of 3)

(10a) FALL BACK COMMAND "GO OFF LINE"	(10b) FALL BACK COMMAND "DRIVE RIGHT BANK"	(10c) FALL BACK COMMAND "DRIVE LEFT BANK"	(11a) TEST MEMORY AT HIGH MARGIN LIMIT	(11b) TEST MEMORY AT LOW MARGIN LIMIT	(11c) TEST MEMORY TO NORMAL MARGIN
SYN	SYN	SYN	SYN	SYN	SYN
SYN	SYN	SYN	SYN	SYN	SYN
SYN	SYN	SYN	SYN	SYN	SYN
SOM	SOM	SOM	SOM	SOM	SOM
RID	RID	RID	RID	RID	RID
RID	RID	RID	RID	RID	RID
GID	GID	GID	DID	DID	DID
OFF	RHT	LFT	SHL	SLL	SNL
EOM	EOM	EOM	EOM	EOM	EOM
MPE	MPC	MPC	MPC	MPC	MPC
EOT	EOT	EOT	EOT	EOT	EOT

Table 3–7. Formats For Messages Transmitted Between the Processor and UNISCOPE Terminals (Sheet 3 of 3)

When the waiting SSU or MSCU on the communications line receives the Poll Message, it is then enabled to transmit the message to the processor.

When the processor repeatedly receives incorrect messages and suspects a SSU, MSU, or associated MSCU of being defective, it assumes the Test Mode, and the Device Identifier in the Poll Message does become active and the processor addresses the specific SSU or MSU (DID instead of GID). Receiving this code commands the addressed SSU or MSCU to transmit the contents of memory locations starting at the cursor position and ending at the delta character (Start-of-Message) or the beginning of the display, whichever occurs first (see 3.2.12).

3.2.2. Query Message

The Query Message (message (2), Table 3–7) is an Input Message transmitted by a SSU or MSCU when it desires a communication from the processor. When the waiting SSU or MSCU receives a Poll Message from the processor it promptly begins transmitting a Query Message.

3.2.3. No Traffic Message

The No Traffic Message (Input Message) is an automatic function performed by the UNISCOPE hardware. It notifies the processor that the polled SSU or MSCU has no message waiting for transmission (message (3), Table 3–7). It may also include an acknowledgment code (see 2.7) for a previously received message.

3.2.4. Retransmission Message

The Retransmission Message (message (4), Table 3–7) is a short Output Message transmitted to a specific SSU or MSU terminal. It requests the addressed terminal to retransmit the message contained in Display Memory. The Retransmission Message is sent by the processor in response to consequence of detection of error in a previous input message.

3.2.5. Reply Message

The Reply Message (Output Message) is usually transmitted in response to an original Query Message from a UNISCOPE terminal and, depending on the type of reply, may or may not contain text. (See message (5), Table 3–7.) Reply Messages usually contain the Keyboard Unlock (KBU) code which, if properly received at the SSU or MSU terminal, unlocks the UNISCOPE terminal keyboard, which was locked when the TRANSMIT key was pressed.

3.2.6. Computer Message Waiting Message

At the addressed terminal, the Computer Message Waiting Message lights the MESSAGE WAITING indicator and sounds the audible alarm to signify that the processor has a message to transmit. (See message (6), Table 3–7.) This message is a Conditional Unsolicited Message (see 3.1.2), not a normal reply to a Query Message.

3.2.7. Request Computer Message

The Request Computer Message (message (7), Table 3–7) is generated at the SSU or MSU terminal whenever the MESSAGE WAITING key is pressed. The message is transmitted to the processor when the terminal receives the next Poll Message. The Request Computer Message does not include the overlay identifier character, MID.

When received at the processor, the Request Computer Message has one of two distinct meanings.

(1) If this message is received after the processor has alerted the SSU or MSCU, the processor understands that the waiting message is requested.

(2) If this Message is received after the processor has sent an Unconditional Unsolicited Message, the processor understands that the operator is acknowledging receipt of the urgent message.

3.2.8. Unconditional Unsolicited Message

The Unconditional Unsolicited Message is a urgent Output Message from the processor. (See message (8), Table 3–7.) When this message is received by the addressed SSU or MSU terminal, the message is forced on screen, overwriting anything in the area addressed.

3.2.9. Embedded Message (Break)

The Embedded Message (message (9), Table 3–7) permits the processor to interrupt a long Output Message to a specific SSU or MSU for the purpose of sending a Poll Message or brief Output Message to a different SSU or MSU terminal on the same transmission line. This makes it possible for many Output Messages to be transmitted in a given period of time, utilizing the communications facilities to their fullest capacity. An Output Message to a specific UNISCOPE terminal can be interrupted any number of times, but each interruption must contain Break Code (see 3.1.2) and must be completed by a Resume Code (see 3.1.2) before an interrupt is again initiated. In other words, an interruption can not itself be interrupted.

3.2.10. Go Off Line, Drive Right Bank, Drive Left Bank Messages

The purposes of these three short Output Messages (10a, 10b, 10c; Table 3–7) are indicated clearly by their titles. They control the operation of those MSCU's which have the Fallback feature. With these commands, any addressed MSCU using the Fallback feature (see 2.4.1) can be directed to go off line, and the UNISCOPE terminals that it had been servicing may be switched to the standby MSCU. (Only a Remote Identifier (RID) code is required in the address portion of the Output Message using these codes.)

3.2.11. Test Memory at High Margin, Test Memory at Low Margin, Set Memory to Normal Messages

These three short Output Messages (11a, 11b, and 11c; Table 3–7) permit the processor to test the memory of a specific MSU. (This code does not affect the SSU.) These messages are used in conjunction with Output Transaction Codes 21(SHL), 22(SLL) and 23(SNL); see 3.1.2.

3.2.12. Queued Output Message

Greater efficiency in the use of the output circuit can often be gained by queuing messages (transmitting Output Messages one immediately following the other). This can be accomplished by replacing the End-Of-Transmission (EOT) character of the first message with a Start-Of-Message (SOM) character and following it with the address characters of the second message.

SYN	SYN	SYN	SOM	RID	RID	DID	OUT	TEXT	EOM	MPC	SOM	RID	RID	DID	OUT	TEXT	EOM	MPC	SOM

In this way, the resynchronization time required to establish communications with a SSU or MSU is eliminated and the three synchronization characters which normally precede a message are omitted. (See SYN code 26, 3.1.)

The only restriction applying to this operation is that the addressed units must be on the same party line.

4. TIMING

4.1. TRANSMISSION RATES

The UNISCOPE 300 Visual Communications Terminal can use any of the following modems as an interface to normal communication lines:

- Bell System 201A and 201B (or equivalent)
- Standard Radio & Telefon AB GH-2002A and GH-2002B (or equivalent)

The Bell System 201A Modem (or equivalent) is required for switched telephone networks; its maximum rate of transmission is 2000 bits per second (bps). The Bell System 201B Modem (or equivalent) is required for private line use; its maximum rate of transmission is 2400 bps. (A modified version of the 201B is capable of transmitting at 4800 bps.)

The Standard Radio & Telefon AB GH-2002A Modem, appropriate for European applications, is required for switched telephone networks; the GH-2002B is required for private line (four-wire) use. Both of these modems can transmit at 1200 bps.

Turnaround time for the Bell System 201A Modem is approximately 150 milliseconds with half duplex (two-wire) lines; however, in a best-case situation, where short two-wire lines without echo suppressors are employed, this time can be reduced to approximately 8.5 milliseconds (strapping option). Turnaround time for the 201B Modem is approximately 8.5 milliseconds with full duplex (four-wire) lines. Turnaround time for the Standard Radio & Telefon AB GH-2002A Modem can be set for either 200 milliseconds or 400 milliseconds (strapping option). Two turnarounds are required for a UNISCOPE transaction (input or output transaction/acknowledgment cycle).

For every 100 miles of transmission line between terminals, line propagation time increases both transmission time and acknowledgment time by approximately 1 millisecond and will not exceed 30 milliseconds in worst-case routing.

4.2. RESPONSE TIME

Response time is the time interval between the issuance of a message from the UNISCOPE terminals to the processor, and the receipt of an acknowledgment or response. Because message length is variable and the number of UNISCOPE terminals in the system is not fixed, the response time for a message cannot be known with accuracy.

To a limited extent, message control can be performed by ‘‘embedding’’. The embedding method divides all messages into two groups according to size. When a short message arrives, it is given priority over the long message; when a short message arrives while a long message is being received, it is temporarily suspended in order to transmit the entire short message. (See Embedded Message, 3.2.9.)

APPENDIX A. UNISCOPE TERMINAL FUNCTIONS AND VISUAL RESPONSES

This appendix describes the functions and visual responses of the UNISCOPE 300 Visual Communications Terminal. Table A–1 presents the input and output functions and the visual responses.

IF THE UNISCOPE TERMINAL . . .	THE RESULT IS . . .
Receives notification of a Computer Message Waiting (Conditional Unsolicited Message)	MESSAGE WAITING indicator lights and audible alarm sounds until MESSAGE WAITING key is pressed. When MESSAGE WAITING key is pressed, message is displayed on screen.
Receives Unconditional Unsolicited Message	Message is displayed on screen. MESSAGE WAITING indicator lights and audible alarm sounds until MESSAGE WAITING key is pressed. When MESSAGE WAITING key is pressed, a positive acknowledgment is sent to the processor.
FAULT indicator lights	Parity error has been detected in message received from processor.
TRANSMIT key is pressed	Information displayed on screen, between the cursor and SOM, is transmitted to the processor and the keyboard is locked (disabled).
WAIT indicator lights	Message is being received or transmitted.

APPENDIX B. COMMUNICATION FUNCTION CODES

The Communication Function Codes used between (1) the Processor and UNISCOPE terminals and (2) UNISCOPE terminal keyboard and SSU or MSCU are shown in Table B-1. Each code is listed with its octal and hexadecimal representation (with parity) and, depending on direction of transmission, its function within the system.

OCTAL WITH PARITY	HEXA-DECIMAL WITH PARITY	CODE NAME	PROCESSOR TO SSU OR MSCU	SSU OR MSCU TO PROCESSOR	KEYBOARD TO SSU OR MSCU
001	01	SOM	Start Of Message	Start Of Message	UA
002	02	EOM	End Of Message	End Of Message	Start Of Message
203	83	EOT	End Of Transmission	End Of Transmission	UA
004	04	SOM/EOF	End Of Field	Request Computer Message (WO/Ack)	Request Computer Message
205	85	RET	Request Retransmission	UA	UA
206	86	POL	Request for Input	No Traffic/Query (WO/Ack)	Horizontal Tab
007	07	OUT	Computer Output	UA	Insert Character in Display*
010	08	CMW	Computer Message Waiting	UA	UA
211	89	OFF	Go Off Line	UA	Delete Character in Display**
212	8A	ERD	Erase To End Of Display	UA	Erase To End Of Display
013	0B	CRF	Cursor Return	Cursor Return	Cursor Return
214	8C	BRK	Break For Segment	Request Computer Message (W/Ack)	Scan Up
015	0D	RES	Resume Transmission	UA	Scan Down
016	0E	LFT	Drive Left Bank	No Traffic/Query (W/Ack)	Scan Left
217	8F	RHT	Drive Right Bank	UA	Scan Right
020	10	BDC	Standby For Broadcast	UA	UA
221	91	SHL	Set High Memory Margin Limit	UA	UA
222	92	SLL	Set Low Memory Margin Limit	UA	UA
023	13	SNL	Set Normal Memory Margin Limit	UA	UA
224	94	KBU	Keyboard Unlock	UA	UA
025	15		UA	UA	UA
026	16	SYN	Synchronizing	Synchronizing	UA
227	97	CUR	Cursor Position	Cursor Position	Insert Character In Line*
230	98	INL	Insert Line	UA	UA
031	19	SBF	Start Blink Field	Start Blink Field	Delete Character In Line**
032	1A	ERL	Erase To End Of Line	UA	Erase To End Of Line
233	9B	TAB	Tab Stop Set	Tab Stop Set	Home Cursor
034	1C	DEL	Delete Line	UA	UA
235	9D	EBF	End Blink Field	End Blink Field	UA
236	8E		UA	UA	UA
037	1F		UA	UA	UA

*Upper and lower case, from same key
**Upper and lower case, from same key

WO/Ack = Without Acknowledgment
W/Ack = With Acknowledgment
UA = Unassigned

Table B-1. Communication Function Codes

UNIVAC

SPERRY RAND