

**UNIVAC<sup>®</sup>**

**UNISCOPE 300**

**VISUAL  
COMMUNICATIONS  
TERMINAL**

GENERAL DESCRIPTION

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UNISCOPE

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## 1. INTRODUCTION



The UNIVAC® UNISCOPE 300 is a visual communication terminal designed for those applications which require direct operator interaction with a centralized computer. Information generated by the operator is displayed on the UNISCOPE prior to transmission to the computer, so that the operator can make any required changes or edit where necessary. Data transmitted from the computer is displayed to the operator for interpretation and understanding.

Since the UNISCOPE 300 is not just a new product, but is primarily a new product concept, the justification of such a product concept will be briefly examined prior to a discussion of the actual product description and characteristics. The product concept embodied in the UNISCOPE 300 can best be developed by an analysis of the computer system evolution.

## **COMPUTER SYSTEM EVOLUTION**

### **BATCH PROCESSING SYSTEMS**

A device such as the UNIVAC UNISCOPE 300 had no traditional basis in the early stages of the computer technology. These batch processing systems required that all input data be manually collected over a period of time, and then be entered into the computer in a single batch. The computer would then generate a large volume of output data on a computer peripheral device such as a high speed printer. This batch output would then be manually edited and distributed to the desired recipients. The organization of such a system had several disadvantages to the user. The major disadvantage was time: the time required to collect and prepare the data input in a form compatible to the computer; the time required to batch the input data for economical computer processing of large volumes; and the time required to manually edit and distribute the processed data to the requesting points in an organization.

### **REALTIME SYSTEMS**

The first major technological step in the computer system evolution, directed toward the elimination of the time factor, was the development of a realtime computer. A realtime computer does not require the batching of input data. A realtime computer can economically accept and process small amounts of data. The UNIVAC 490 system, introduced in 1961, was the first commercially available realtime computer. This computer system was also capable of direct data communication with remote points. Univac, therefore, provided the first realtime processing capability and also the means of eliminating the collection and distribution times by direct data communication with an organization's remote points. For the first time in the history of data processing, data generated many miles from an organization's computer facility could be immediately entered into the computer, and processed. The results could then immediately be sent back via data communications to the originating points.

### **KEYBOARD/PRINTER INPUT AND OUTPUT**

The original realtime computer systems used the keyboard/printer as the universal means of inputting data to the computer and recording the output data from the computer. Many of the applications automated by a real time computer system were dynamic applications with no requirement to preserve the output data once it had been interpreted by the human operator. The requirement to automate dynamic applications, increasingly more important in recent years, has necessitated the search for a substitute for the traditional keyboard/printer which, in addition to being slow, was not a very satisfactory man/machine interface.

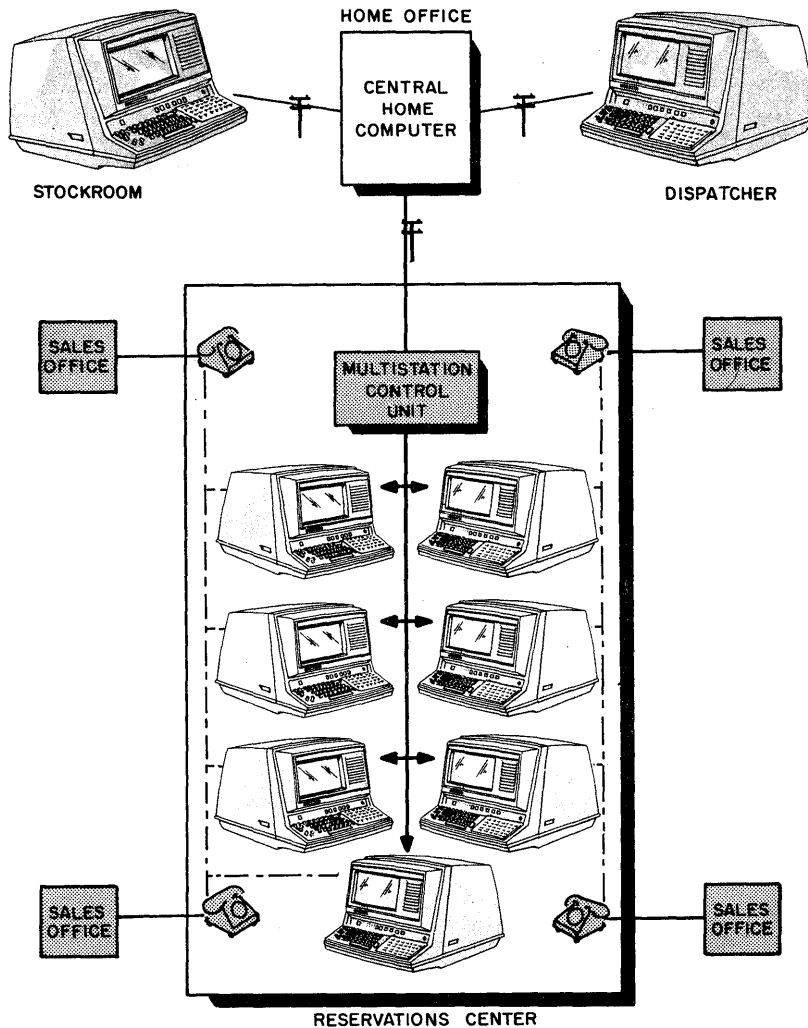


Figure 1-1. Network of Control Points within One Building Geographically remote from the Computer and Other Control Points

### NEED FOR A VISUAL DISPLAY

The logical substitute for the keyboard/printer is a visual display. It can be directed by the central computer at high speed, and coupled to the operator by means of the keyboard and display. It can also time share the communication facilities and keep line costs to a minimum. Univac, therefore, has developed the UNISCOPE 300 specifically to provide an efficient and effective means of implementing the rapidly growing number of dynamic applications and to provide an over-all reduction in total systems cost. The UNISCOPE 300, a visual communication terminal, is a member of Univac's Communication Terminal Product Line, specifically designed for computer controlled data communication.

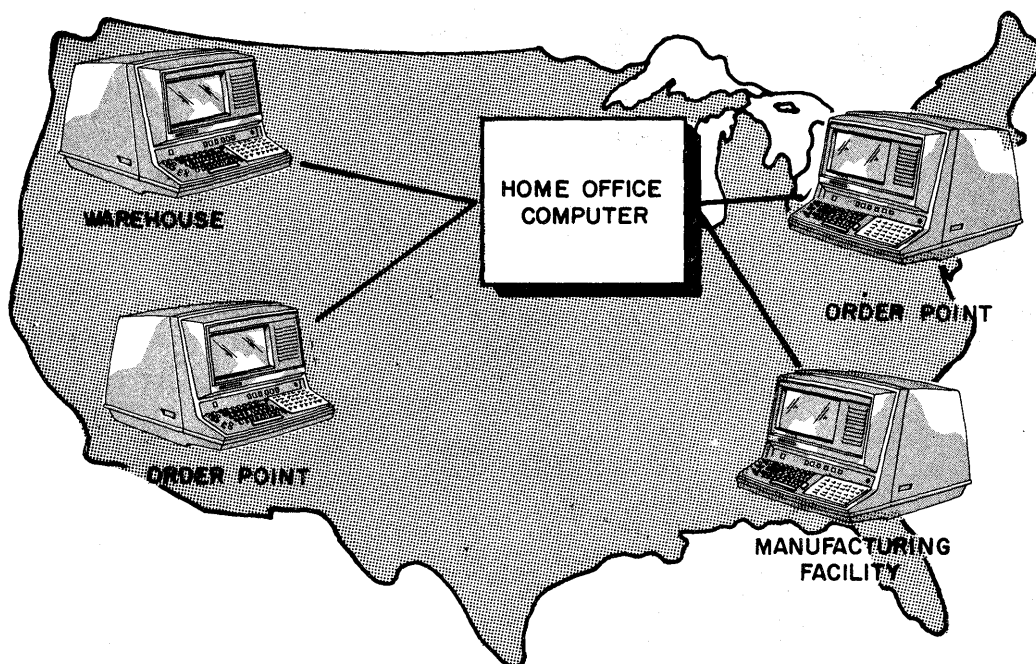


Figure 1-2. Network of Single Control Points Geographically Dispersed

## DYNAMIC APPLICATIONS FOR UNISCOPE

The applications for the UNISCOPE all imply necessity, speed, and human intervention. The feeling exists that operations and profits could be better if the quality and timeliness of the available information were better. These applications are dynamic.

Since the applications are so varied, cover so many industries, and include a myriad of functions, it is impossible to describe them in detail and also difficult to put them into categories. There are three categories, however, that will provide an adequate breakdown for examination of the broad ideas involved in applying the UNISCOPE 300. These categories are Information Retrieval, Direct Data Input, and Dialogue. If any particular installation were to be examined, it would probably be found that these categories overlap or that all three were being covered. **Applications for a visual communication terminal or cathode ray tube display will soon be universal.**

### INFORMATION RETRIEVAL

A corporation can benefit immensely by using UNISCOPE terminals in a computer communication system for information retrieval. Before the information can be retrieved, it must be streamlined, concise, and to the point. This means that the data gathering function will be standardized, selected input data will be reduced, and the controlling program will make the clearest presentation.

Applications where information retrieval can be gainfully used with respect to management problems, services, and file inquiry are as follows:



**Management Problems**

Presents up-to-the-minute picture of financial reports, competitive position, program milestones, inventory status, deliveries, product development.

**Services**

For use in banking, insurance, and information industries; to answer customers' requests, centralization of records, monitoring and simplifying work flow, and personnel deployment.

**File Inquiry**

Immediate presentation of retail credit or inventory status, medical case histories and references, library applications.

**DIRECT DATA INPUT**

Direct input of source data is finally becoming a reality after many years of unsatisfactory unit record manipulation. To a large degree, this is becoming possible because access to mass storage and computer power can be accomplished through multi-access communication systems. Key punching, with its slow production rate, is no longer the only choice; and the high error rate of the key punching technique may be substantially reduced with a UNISCOPE communication subsystem. The UNISCOPE operator can immediately proofread and verify his input statement after he completes it, and edit it completely before it is transmitted. Because of the direct interface with computer power, human errors are minimized by immediate computer validation. The ease of direct data input can provide:

**Simplified File Maintenance**

Updating a data base in real-time so that subsequent inquiries or running changes to accumulate records can be made immediately; effect rapid changes in book publishing; amplify hospital accounting and recording procedures.

**New Data Entry**

Ability to take new input data directly from the source, eliminating several entry steps thereby avoiding possibility of human errors; eliminate necessity for intermediate storage of bulky source material; eliminates need for expensive off-line data manipulating machines.

**DIALOGUE**

Dialogue is a combination of direct data input and information retrieval. Time, however, in the case of dialogue is a much more important factor because the effect of input on output is immediately required by the one who provides the input. Input action immediately effects the data base, produces a reaction, and modifies the output. Its use varies with the exact application, but basically dialogue provides immediate satisfactory answers to queries or it provides automatic solutions to presented problems. Practical examples of this can be found in the following areas:

**Simulation**

Provides real-time testing of scientific information, sales data, advertising effectiveness, budget information, operational efficiency.

**Inventory and Sales**

Gives immediate information to prevent both overselling and underselling of space, time, or material; up-to-the-second inventory records lets each transaction modify the data base; alternate solutions to customer problems can be given.

**Training, Education and Programming**

Allows efficient student self-testing; can act as scientific conversational programming terminal to construct, verify, and transmit code to the computer for execution or compilation.

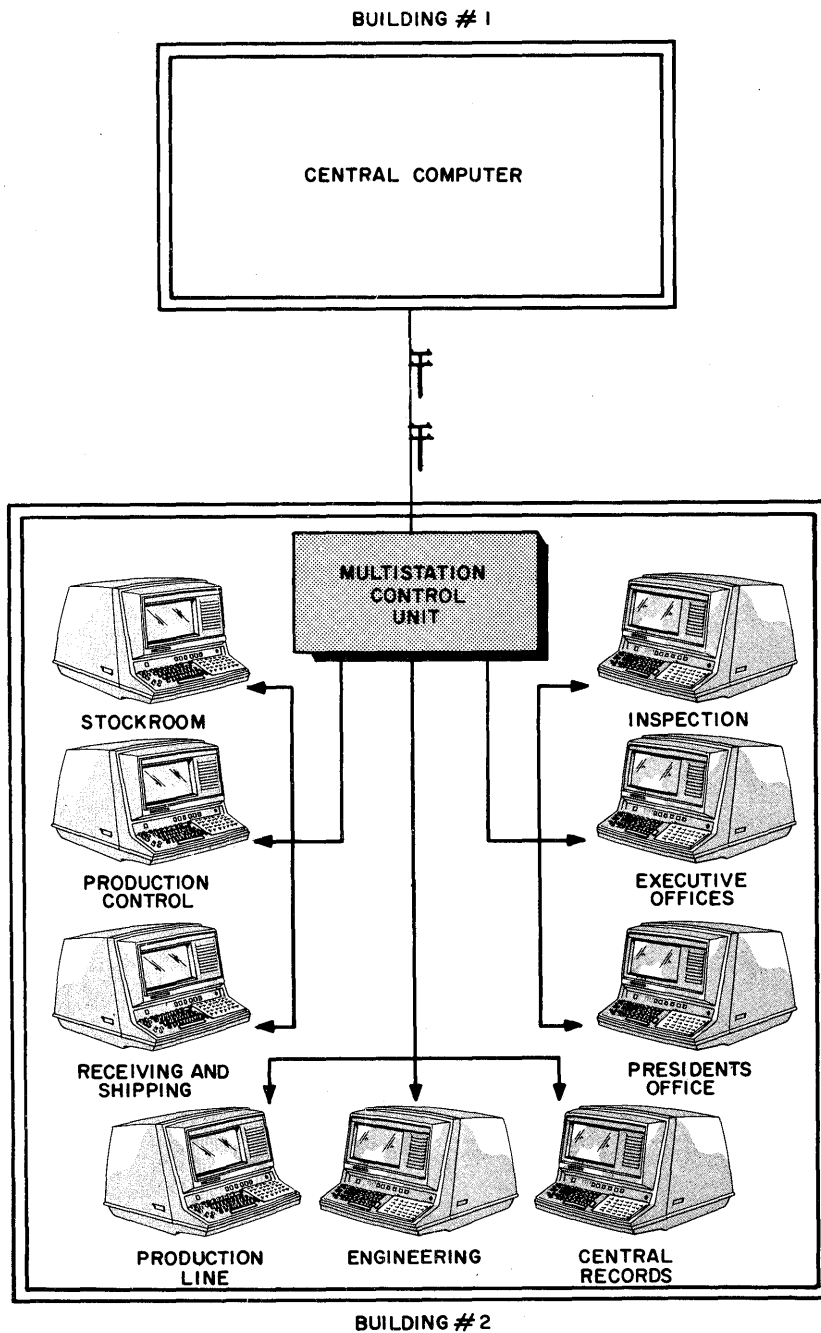


Figure 1-3. Network of Single Control Points within One Building

## 2. UNISCOPE FEATURES

The UNISCOPE visual communication terminal has been designed and produced to fulfill the market requirement for a general purpose alphanumeric display subsystem oriented towards minimizing systems cost. Using a cathode ray tube (CRT) display, the UNISCOPE presents many excellent features at no extra charge to keep communication costs, software costs, and maintenance at a minimum.

### **DESIGN USES DIGITAL CONCEPTS**

It is well worth noting that the UNISCOPE has been designed using digital concepts. This design provides three major advantages to the user. First, the incorporation of a digital scanning technique guarantees excellent linearity and consistent character spacing. Next, the characters are generated by a read only digital stroke generator which produces uniquely shaped characters that can be recognized at a glance. Also, since the UNIVAC field engineering force has extensive digital computer training, it is relatively simple for a field engineer to master the UNISCOPE visual communication terminal.

### **SYSTEMS DESIGNED TO REDUCE LINE COSTS**

UNIVAC's extensive systems experience plays an important role in the design philosophy of the UNISCOPE since the unit was developed to be an integral part of a UNIVAC computer communication system. One of Univac's major considerations in a large system is the line cost or telephone company facilities which may account for as much as one third of the total systems cost.

### **POLLING UTILIZES FULL LINE CAPACITY**

By keeping the number of telephone lines to a minimum, the line costs can be kept down. Also, by keeping the lines busy, more traffic can be transmitted per unit of time, and fewer lines will be required to handle the load. The UNISCOPE polling techniques aid these objectives and also allow single station units and multistation units to be mixed on one party line. These techniques keep traffic going in both directions simultaneously (full duplex) in order to keep the line efficiency at a maximum.

### **EFFICIENT MESSAGE INTERLEAVING**

In order to maintain two-way traffic on the telephone lines at all times, the UNISCOPE terminal will accept a break signal from the computer and will idle during the break time while the computer polls another UNISCOPE for input or output data. This procedure is called **message interleaving**. The original UNISCOPE that had its transmission broken will recognize a resume function from the computer to enable it to continue to receive its incoming message.

### **AUTOMATIC STRIPOUT OF NON-SIGNIFICANT SPACES**

Another technique for efficient transmission is also built into the UNISCOPE hardware. The transmission to and from the UNISCOPE does not contain any non-significant spaces. Non-significant spaces are automatically stripped out, and carriage return line feed signals are inserted while transmitting data to the computer from the display memory. The automatic insertion of carriage return line feed signals is significant because these characters need not occupy valuable data locations in the core memory.

**DUAL MODEM SERVES AS BACKUP AND INCREASES THROUGHPUT**

The dual modem (telephone line adapter) feature provides two system advantages. First, it serves as a backup in case trouble should develop on one of the telephone lines. Secondly, the dual modem can increase systems throughput because the multistation control unit can now handle simultaneous transmission and/or reception between the computer and two UNISCOPE terminals via two independent telephone lines.

**COMPONENTS OPERATE IN SEVERE ENVIRONMENTS**

The UNISCOPE subsystem, and all its components, will operate under severe environmental conditions. Temperature and humidity limits are termed by UNIVAC as Class C, or warehouse environment. No input power regulation is required, and the memory automatically compensates for changes in temperature, thus assuring a dependable UNIVAC computer communication system.

**DISPLAY UNITS SATISFY HUMAN REQUIREMENTS**

A complex subsystem such as the UNISCOPE, which actually extends man's cognition and permits him to interface directly with the power of the computer, had to be conceived and designed with the man in mind. The total computer communication system can operate efficiently only if the people within the system can function effectively. Univac made extensive human factors studies, evaluations, and experiments on the UNISCOPE and the man/machine interface by UNIVAC. The entire design effort has been directed towards fostering operator acceptance which will result in efficient, satisfactory system operation.

**COMFORTABLE TO OPERATE**

The UNISCOPE was designed to be a comfortable machine to operate in that it does not require awkward head movements or body positions. Once an operator positions himself at the keyboard, the viewing angle and the viewing distance to the display surface remains almost constant. In addition, the viewing perspective is well within the range of normal eye movement.

**NO EYE FATIGUE**

Characters are displayed on a nonglare screen. A character brightness control enables the operator to establish 70 to 100% of brightness, according to his own preference. No jittering or flickering can be perceived by the operator. Character size, spacing, aspect ratio, and so forth, have been optimized for maximum legibility and readability.

**ELECTRIC TYPEWRITER KEYBOARD**

The typewriter keyboard has been functionally designed to approximate the conventional electric typewriter, with its keyboard appearance, touch pressure, key travel, and slope characteristics. Typewriting speeds in excess of eighty words per minute can be accommodated by the keyboard. Because of its similarity to the standard typewriter, very little additional training is required to operate it.

**BALANCED KEY ASSIGNMENT**

The total UNISCOPE keyboard also includes the cursor controls, editing keys, and a group of function keys. The overall keyboard layout incorporates good right-left assignment balance to efficiently distribute the work load, and the key sets have been grouped for maximum ease in discrimination.

**COMPREHENSIVE AND FLEXIBLE STATION ARRANGEMENTS****SINGLE STATION**

The single station UNISCOPE is a self-contained communication terminal that operates independently of all other terminal equipment. The unit stores and displays 1,024 alphanumeric characters or special symbols. Data is entered from the phone line or from associated UNISCOPE keyboards. The single station UNISCOPE consists of a CRT display, keyboard, memory, and control logic. The unit is designed for synchronous transmission at speeds of 2,000 bits per second and higher. It interfaces a dataset (modem) such as the AT&T 201 through the Electronic Industries Association standard interfaces RS 232. In addition to operating individually on a private line, the single station unit may be connected to a multipoint party line and will respond to a poll code from the central computer. Character and message parity are checked on each incoming message and generated for each outgoing message. Erroneous blocks are retransmitted automatically upon request from the computer.

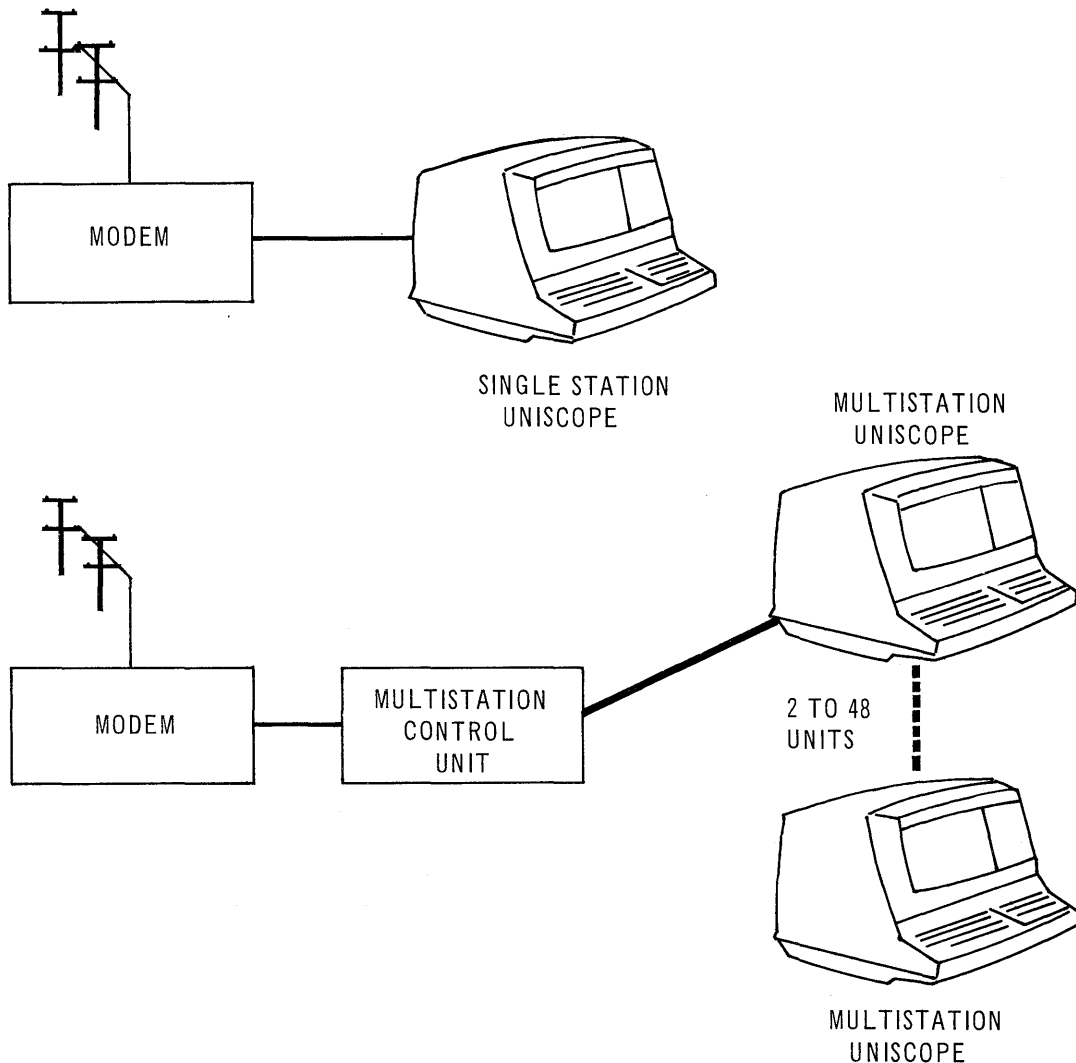


Figure 2-1. Two Basic Station Arrangements

**MULTISTATION**

The UNISCOPE multistation arrangement consists of a multistation control unit (MSCU) and multistation display units. The purpose of the multistation control unit is to provide a more economical alphanumeric display system when a number of UNISCOPE terminals are required. The control unit is of a modular nature and provides input-output message buffering, character generation, and control for 2 to 24 UNISCOPE terminals of 1,024 characters, each and for 2 to 48 UNISCOPE terminals of 512 characters, each.

This unique system permits operators at the UNISCOPE keyboard to type in inquiry or input messages, completely independent of each other. Each character entered by an operator is immediately displayed on the UNISCOPE and stored in the control unit memory. A completed message may be visually verified and edited and then transmitted to the computer. A subsequent acknowledgment or reply message may then, under computer program control, be received from the computer and displayed in place of, or, in addition to, the input message. The MSCU is also designed to operate as a remote device connected to a data set. The data set should be designed to operate at 2,000 bits per second or more and have an EIA RS 232 interface.

**SUMMARY OF TECHNICAL ADVANTAGES**

- Up to 48 UNISCOPE terminals can be operated per MSCU
- Completely self-contained single station UNISCOPE
- Random access computer core memory
- 1,024 character display capability
- Digital scan techniques used
- Stroke character generator
- Error checking and low overhead acknowledge scheme
- Up to 40 function keys with over 4,000 different meanings
- Seven standard editing functions
- Line insert and line delete (roll and scroll) capability
- Dual modem simultaneity
- Program controlled fall back
- Telephone line economy
  - Party line
  - Message segmentation
  - Non-significant space suppression
  - Full duplex operation
- Multistation UNISCOPE may be located 1,500 feet from the control unit

### 3. EQUIPMENT DESCRIPTION

#### SINGLE STATION UNISCOPE

The Single Station UNISCOPE is completely self-contained in one case. It interfaces with the operator on one side and with the telephone facility on the other. This unit will operate independent of any other UNISCOPE in the system. It consists basically of a display screen, memory, control, input/output section and a character generator.

#### DISPLAY SCREEN

The display screen is a cathode ray tube (CRT) with a viewing surface that is 10 inches wide and 5 inches high. A display format of 64 characters per line on 16 lines per display is provided, permitting a total of 1,024 characters. The display uses a digital scanning technique, as opposed to a TV scan, to provide excellent linearity. Spacing between characters is consistent from one end of the screen to the other, and the size and shape of each character does not change relative to its position on the screen. The character style maximizes legibility and readability. Each character is .150 x .113 inches and is readable from a distance of seven feet. The character brightness may be varied by the operator from 70% of brightness to full brightness.

The presentation is such that no flicker or jitter is perceptible to the operator. In order to accomplish this, each of the 1,024 characters is repainted on the display surface 60 times each second. To eliminate any interference with the 60 cycle power supply, the regeneration is synchronized with the power source.

TRANSACTION	LOAN ACCOUNT	RESERVE ACCOUNT
1216662 BALANCES	234134	16891
11363 PAYMENT	1156 4115-	231190 1885 18776
21763 PAYMENT	1141 4115-	2228231 1885 20661
31163 PAYMENT	1171 4115-	225257 1885 22546
41263 R. E. TAX		18043- 4503
41363 PAYMENT	1126 4115-	222268 1885 6388
41363	4594	222268 6388

SAMUEL S. BENSON  
1922 MADISON ROAD  
ANY TOWN, U.S.A.

LOAN NUMBER  
01-41740-4

Figure 3-1. An Example of a Banking Transaction Displayed on the UNISCOPE

### DISPLAY MEMORY

The display memory has a capacity of 1,024 seven bit characters. It is a computer core memory and therefore provides the same reliability, speed (7.2 microseconds per character), and random access that you will find in proven UNIVAC computer systems. The use of a core memory also simplifies control hardware, since timing restrictions are not required on the reading or writing of data. Because the display is regenerated from this memory, the traffic between the UNISCOPE and the computer will only be for the purpose of inputting or sending out new data. **The lines will not be burdened by refreshing directly from the processor memory.**

### CONTROL SECTION

The control section of the single station UNISCOPE directs all the UNISCOPE operations. It interprets all instructions and generates commands to the various other sections of the unit. In general, the control section sequences I/O operations, positions the cursor (position marker), addresses memory for painting characters, and handles block moves of data.

### INPUT/OUTPUT SECTION

The input/output section interfaces the communication facility or modem (data set). When a transmit order is given by the operator at the keyboard for information which was typed into the memory, this section takes the contents of the memory and serializes it to a string of bits suitable for data transmission. The I/O section will accept incoming messages from the modem, staticize them into displayable characters, and transfer them to memory.

### KEYBOARD

The keyboard is the operator's interface with the UNISCOPE and with the computer. From the keyboard the operator can control the UNISCOPE, can input data to the memory, and can request data from the computer. Each time a key is depressed, a unique code is sent to the keyboard control section which examines this code to see if it is data or a function. If it is data, it will be entered in the position indicated by the cursor. Functions generally cause block data moves or a repositioning of the cursor.



Figure 3-2. Overall View of UNISCOPE Keyboard



## MULTISTATION UNISCOPE

The Multistation UNISCOPE provides an economical way to expand the UNISCOPE subsystem. Each Multistation Control Unit (MSCU) can interface the communication facilities on one side and the multistation display units on the other. This arrangement allows one telephone line to serve up to 48 displays.

Each display unit, however, operates as if it were completely independent of all the other display units. This is accomplished with multiplexing circuitry in the MSCU which permits the entire contents of the memory to be continuously and automatically distributed to the UNISCOPE terminals.

The display format for the larger screen is 64 characters per line by 16 lines. The 512 character display is laid out in eight lines of 64 characters each.

## MEMORY

The memory in the MSCU can hold 24,576 characters for distribution to a maximum of 48 display units. The memory is modular in sets of 8,192 characters, and each 8,192 characters of memory can service either eight large capacity display units with 1,024 characters or 16 lower capacity terminal units that can display a maximum of 512 characters. The memory is a computer core memory, as in the case of the single station unit, and provides the same advantages as the single station Uniscope.

Additionally, the memory access time is reduced to 1.8 microseconds per character. On the basis of one or two displays, the benefit of a fast random access memory is hard to see, but with respect to the total system, the system response time is greatly enhanced.

## DISPLAY REGENERATION

Display regeneration is also controlled by the MSCU. The regeneration process is essentially the same as that described in the section on the single station unit, except that the regeneration in this case is accomplished with a faster memory transfer rate (1.8 microseconds) and a more sophisticated timing. These differences are required in order to maintain the flicker-free refreshing of the larger quantity of displays. Essentially, each character is repainted on the display screen at 60 cycles per second with up to eight continuous strokes per character.

The control unit also interrogates the total number of attached keyboards and stores the results that are input. As each character is received from the UNISCOPE keyboard, it is immediately written into the proper memory location and displayed on the respective Multistation UNISCOPE. The interrogation rate is high enough so that operator typing speed of 80 words per minute can be maintained without any loss of data.



## OPERATOR CONTROLS

As previously mentioned, the operator is an extremely important part of a computer communication system. Since the controls are the way by which the operator interfaces himself with the system, they too are an extremely important part of the system. An operator who is happy at the controls will be content with his system. This philosophy has consistently been kept in mind by Univac with respect to the operator controls of the UNISCOPE terminal.

The operator controls consist of an alphanumeric typewriter keyboard, cursor control keys, editing keys, and a few adjustments and indicators. To the right of these controls there is space for a bank of function keys.

## TYPEWRITER KEYBOARD

The typewriter keyboard very closely resembles the standard electric typewriter. It approximates as close as possible the key shape, key travel, and touch pressure that will be found with the electric typewriter. The slope of the keys has been designed to allow the operator to perform to the best of his ability while still being very comfortable. **An operator can type at various speeds, and even speeds in excess of 80 words per minute can be accommodated.** Because of the similarity to a typewriter, very little operator training is necessary.

The purpose of the keyboard is to compose messages that are destined for the computer. As the keys are depressed, the data will go simultaneously to the memory and to the display screen. It will remain there until the operator has had a chance to edit and verify the data before being transmitted at the operator's command.



Figure 3-4. Typewriter Portion of the Keyboard

## CURSOR

The cursor is a unique character that is displayed on the CRT at all times. The cursor indicates the location at which the next data character will be displayed. It also indicates the starting position from which data will be transmitted to the computer. Whenever the cursor is positioned over a displayable character, the two of them will blink automatically at a rate that can be preset between four cycles per second and ten cycles per second. The blinking prevents the operator from losing track of the cursor when it is positioned over a character. The cursor will advance one step for each character that is typed and can be positioned by the cursor control keys. The cursor control keys are nondestructive and do not effect the information in memory.

As the cursor moves to within eight positions of the end of any line, an audible alarm will momentarily sound and an indicator light which says "End of Line" will be lit. The indicator will remain lit as long as the cursor occupies one of the last eight character positions. Additionally, as the cursor enters the bottom line of the display, the alarm will sound and the "Last Line" indicator will be illuminated.



Figure 3-5. Cursor and Editing Controls

## CURSOR CONTROL KEYS

The operator will use the eight cursor control keys listed below when composing or editing messages on the display.

### Scan Forward —

This positioning key moves the cursor forward one space at a time, or at ten spaces per second when held down.

### Scan Backward —

This positioning key moves the cursor backward one space at a time, or at ten spaces per second if held down.

### Scan up —

This positioning key moves the cursor up one line at a time or at ten lines per second if held down.

**Return —**

The return key is similar to the carriage return on a typewriter, and positions the cursor to the first position of the next line.

**Space —**

The space bar is in the position normally occupied by the space bar on the standard keyboard and moves the cursor forward one space for each depression.

**Tab —**

This is a special cursor positioning key that moves the cursor forward until a special tab stop character is detected in the display memory. If a tab stop character is detected, the cursor will stop one character beyond it. If no tab stop character is found, the cursor will stop at the end of the display.

**Back Space —**

The back space key is similar to the back space key on a standard typewriter and moves the cursor backwards one space for each depression.

**EDITING KEYS**

The editing keys are used by the operator to correct or change data that has been input at the keyboard or received from the computer. The use of these keys is straightforward. Most functions are performed by pressing a single key in the lower case. Two functions are performed by pressing a single key in the upper case.

The five editing keys are described below:

**Character Erase —**

Depressing this key will erase the character in the cursor position and will enter a space in that position of the display.

**Erase to End of Line —**

Depressing this key will enter spaces in all character positions from and including the cursor position to the end of the line.

**Erase to End of Display —**

This key erases all the characters from and including the cursor position to the end of the display. Spaces will be inserted in all the erased positions.

**Scan Down —**

This positioning key moves the cursor down one line at a time, or at ten lines per second if held down.

Note: The repetition rate of ten spaces per second is actually adjustable from five to twenty-five spaces per second and may be preset anywhere in this range.

**Cursor to Home —**

This key repositions the cursor to the first character position on the display.

**Insert —**

When this key is depressed, all the characters to the right of and including the cursor position will shift one space to the right leaving a space at the cursor position. If the key is depressed in the lower case, only the characters in the line containing the cursor will shift to the right, and the last character on the line will be discarded. If the key is depressed in the upper case, then all the characters from the cursor position to the end of the display will be shifted to the right, and the last character of the display will be lost or discarded.

**Delete —**

Depression of this key will cause the deletion of the character in the cursor position, and all the characters to the right of the cursor will shift one character to the left. If it is depressed in the lower case, only the characters in the line containing the cursor will move to the left and a space will be inserted at the end of the line. If the keyboard is in the upper case, all the characters from the cursor to the end of the display will shift to the left, and a space will be inserted in the last character in the display.

**FUNCTION KEYS**

Special function keys add great flexibility to the UNISCOPE subsystem. The availability of these function keys saves typing time, reduces operator errors, and saves memory space. A maximum of forty function keys can be added to the UNISCOPE keyboard. The first five will be located above the numeric row of the typewriter keyboard. The rest of them are added to the right of the typewriter keyboard.

There is a plastic overlay which fits over the 35 function key positions. Each overlay is coded and activates a combination of seven switches as it is placed over the keys. The combination of seven switches will allow up to 122 different overlays to be used. Therefore, a different overlay can be used to differentiate applications, operators, stations, security, and so forth. With 122 possible overlays and 35 function keys, over 4,000 different functions can be represented. The overlay identification will be transmitted to the computer with every message so that the computer is always informed as to which overlay is on the keys. The character that will be displayed on the screen is etched on the key top, and the function of the key itself is written on the plastic overlay.



Figure 3-6. Thirty-five Function Keys with Removable Overlay

## CONTROLS AND INDICATORS

There are two data control keys located in the upper right hand corner of the keyboard. One is the message waiting switch which is used in conjunction with unsolicited messages. The other is the transmit key. This transmit key will cause data to be transferred to the computer, starting from the cursor position through the end of field character. The keyboard will be locked out from any further data entry until the message being transmitted is accepted by the computer.

There are six indicators which are located above the keyboard. Their functions are indicated below:

**Last Line —**

This indicator will light when the cursor is positioned anywhere in the last line of the display.

**End Line —**

This indicator will light when the cursor is in any of the last eight character positions in any line.

**Fault —**

This indicator lights whenever a parity error is detected in the message that is being received from the computer.

**Hi-Temp —**

This indicator lights to warn the operator that the internal temperature is exceeding the normal limit.

**Message Waiting —**

This indicator is lit whenever an unsolicited message is to be received from the computer.

**Wait —**

This indicator lights during the time that a message is being transmitted or received.

An audible alarm will sound to alert the operator to three possible conditions. A single beep is sounded when the cursor moves into the 57th character position of any line, and also when the cursor moves into the first character position of the last line. The alarm also sounds intermittently during the time that an unsolicited computer message is waiting. The alarm is turned off when the message waiting switch is depressed.

There are four display controls in the upper right hand portion of the keyboard. These controls are described below:

**On-Off —**

The on-off switch requires a key to operate. It applies power to the UNISCOPE terminal and puts it in an operating state.

**Focus —**

This control is used to focus the characters on the display screen.

**Louder —**

This control varies the volume of the audible alarm.

**Brighter —**

This control varies the intensity of the characters being displayed.





## 4. SPECIAL UNISCOPE FEATURES

### LINE INSERT AND DELETE

Line insert and line delete are two functions, built into the UNISCOPE hardware, which may be activated by function code from a computer. When the line insert function is given, all the lines below and including the line at which the cursor is placed move down one line, and the bottom line goes off the screen, or disappears. When the line delete function is given, the line where the cursor is positioned is erased; and all the lines below it move up one line, filling in the erased line and leaving the bottom line blank. Very interesting use of the UNISCOPE screen can be programmed from the computer through the use of these two functions. The complete rearrangement of data is known as a block move. This rearrangement permits the whole screen to be moved up or down without requiring any transmission from the computer.

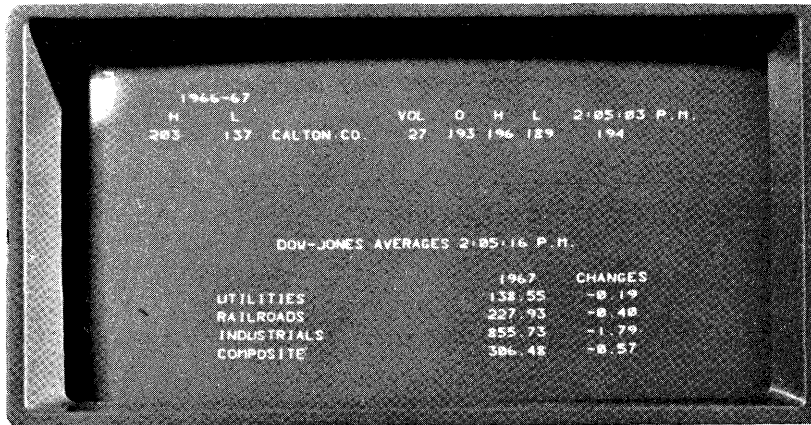
### ROLL AND SCROLL

Roll and scroll is a programming technique which uses the line insert and line delete functions mentioned above. As the program is operating, the data on the face of the screen appears to actually be rolling. If it is desired to roll the picture down, the line insert function is used. If a roll up is desired, the line delete function is used. If the computer performs an insert or delete function, it will insert a new line at the bottom or top of the screen, as the case may be. This feature could be used, for example, in a table look-up situation where the computer is scanning through a table, presenting it to you as an operator. By pushing the assigned function key, you can stop the rolling effect and then select the line item in which you are interested.

**SPLIT SCREEN**

Split screen operation lets you put a multiple number of messages on the screen at one time. The computer and the operator can exchange message segments instead of retransmitting the entire contents of the display. The only part to be transmitted will be that between the cursor position and an end of field symbol.

By using the split screen technique in conjunction with line insert and delete, multiple messages may be displayed on the screen at any one time, and any selected portion of it may be scrolled.



1966-67		VOL O H L				2:05:03 P.M.	
H	L	CALTON CO.	27	193	196	189	194

DOV-JONES AVERAGES 2:05:16 P.M.		
	1967	CHANGES
UTILITIES	138.55	-0.19
RAILROADS	227.93	-0.40
INDUSTRIALS	255.73	-1.79
COMPOSITE	386.42	-0.57

Figure 4-1. An Example of the Split Screen Operation Which Shows Two Separate Brokerage Transactions

### DUAL MODEM INTERFACE

An MSCU may be equipped with an optional feature known as a dual modem interface. This feature puts a second communications interface module in the MSCU. The MSCU with this feature will interface two modems and two separate telephone lines. This setup allows independent and concurrent communications over both lines, or one line can be reserved as a backup for the subsystem. When both modem interfaces are operating simultaneously, they may be used for simultaneous input or simultaneous output. In addition, one interface may be inputting and the other outputting, simultaneously.

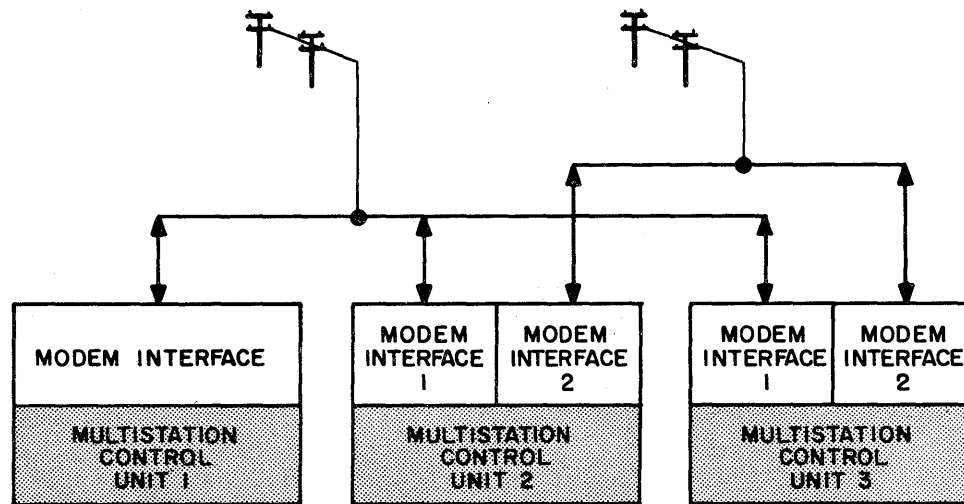


Figure 4-2. Two Multistation Control Units Equipped with Dual Modem Feature

**FALL BACK**

As an option, the MSCU may be equipped with a fall back feature. With this feature, two adjacent control units may be connected to the same set of UNISCOPE terminals, with one control unit switched onto the terminal sets, and the other unit switched off. Then in the event of an active control unit failure, the switching may be reversed to connect the terminal sets to the formerly inactive control unit. By this, "n" sets of displays may be supported by "n + 1" control units. With reversal of switches between, and including, the faulty control unit and the idle unit, a faulty control unit in any position may effectively be replaced by a standby unit in any position. The fall back feature is required in all control units in such an installation.

Fall back switching is accomplished by using three special function codes. The three function codes are "go off line," "drive left bank," and "drive right bank." Fall back can also be accomplished manually.

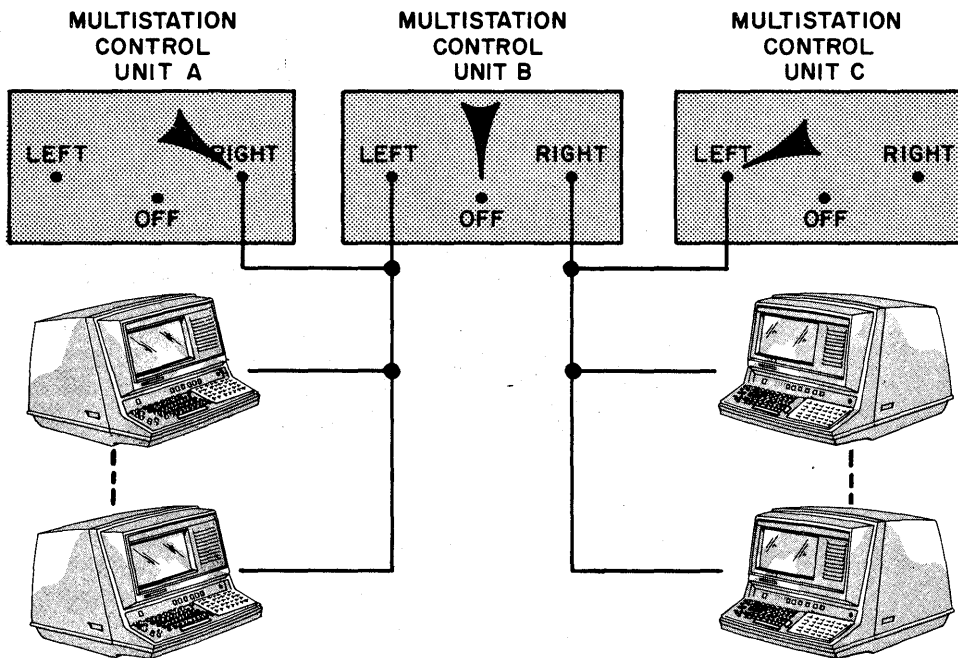


Figure 4-3. Fall Back Capability (MSCU B Is a Fall Back Control Unit Capable of Being Switched Manually or Under Program Control to Take Either Bank of UNISCOPE terminals)

**SELECTIVE DATA BLINKING**

Bracketing a character or group of characters with two unique, nondisplayable characters will cause the enclosed characters to blink. This is accomplished by decreasing the restoration rate of the bracketed characters. Selective data blinking can be activated as part of a computer message only, not by direct keyboard input. The two characters which provide this ability are the "Start Blink Marker" and "End Blink Marker."

**UNSOLICITED MESSAGE**

Most messages from the computer to a display unit are in response to operator inputs. Those that are not solicited are signalled to the operator by an audible alarm and a signal indicator. Under computer control, the actual message may be withheld until the operator signals readiness to accept it at his display; or it may be displayed unconditionally, overriding any other operation.

**SPACE SUPPRESSION AND AUTOMATIC  
INSERTION OF CARRIAGE RETURN LINE FEED**

A special transmission method is used to transmit data between the computer and UNISCOPE that helps to utilize the lines effectively and thereby reduce systems costs. The transmitted data contains no nonsignificant spaces, and the return symbol is immediately followed by character one of the following line.

When the transmit switch is depressed on the terminal keyboard, the significant data is transmitted, return symbols are automatically inserted, and the nonsignificant spaces are dropped.

The automatic insertion of the return symbol means that this symbol is not stored in the memory or shown on the screen. The memory locations which might have been filled with this symbol are therefore available for storing valuable data. The return key on the keyboard is merely a cursor control and does not effect the contents of the memory.

**DIAGNOSTIC MEMORY TEST FUNCTIONS**

By the use of the memory margin test function and proper data formats, the computer can load test patterns into the UNISCOPE memory, cause the memory to be operated at either low, high, or normal bias, and periodically transmit the contents of the memory to the computer for diagnostic analysis of the errors.

**BROADCAST/RECEIVE**

By means of the "Standby for Broadcast" function, it is possible for the computer to simultaneously transmit data to all stations on one party line.

**STANDBY AND INTERLEAVED MESSAGES**

Since normal system operation involves up to four times as much computer output as input, the display hardware allows the computer to interleave poll messages to another unit in the midst of long data messages addressed to a specific unit. This capability promotes rapid system response time.

**POLLING**

Polling hardware is a standard feature in the UNISCOPE, and when used in conjunction with the "break" hardware, the computer system can keep two-way traffic on a four-wire telephone line from two individual half duplex UNISCOPE terminals.

**ACKNOWLEDGE**

Messages are acknowledged by inserting the acknowledgment in the subsequent transmission from the device that received the message. Through the use of this technique, the system overhead is kept to a minimum and a faster response time may be obtained. If the terminal does not see a retransmit request, it knows that its message was received properly by the computer. If the terminal does not acknowledge in its subsequent input or "no traffic" message, the computer will automatically retransmit the last message. In this manner every input and output message is separately acknowledged and the possibility of lost or duplicate messages is eliminated.

## 5. OPERATION

### MESSAGES

Eleven possible types of messages using one of two basic message formats can be transmitted between the computer and the UNISCOPE. Typical messages will be composed of control characters, routing and addressing information, an error control character, functional codes, and actual text. The message composition must be put into a specific format in order to make the overall system as simple and efficient as possible.

#### Message Format

The message header, handled automatically by the UNISCOPE hardware, consists of eight characters and precedes the data portion of the message. Three of these eight characters are synchronizing characters which are used to put the transmitter and receiver in a condition such that they will understand each other. One code says the message is starting. A three-code address selects the remote unit that will be involved, and one code says what type of message it is.

The data portion can be formatted as input (query) or output (reply). The greatest portion of this data is text, or intelligence, or actual transaction information. However, other information is needed by the equipment. With the input message, the UNISCOPE sends function key overlay identification and the message starting position. With output messages, the computer sends cursor addressing information to position the message on the screen.

The UNISCOPE message trailer, handled automatically by the UNISCOPE hardware, consists of three characters. The trailer follows the data portion and terminates the message. The first character says the message is ending. The next character is the message parity character which is used by the receiver to see if the message was received without error. The last character in the trailer says that the transmission is finished.

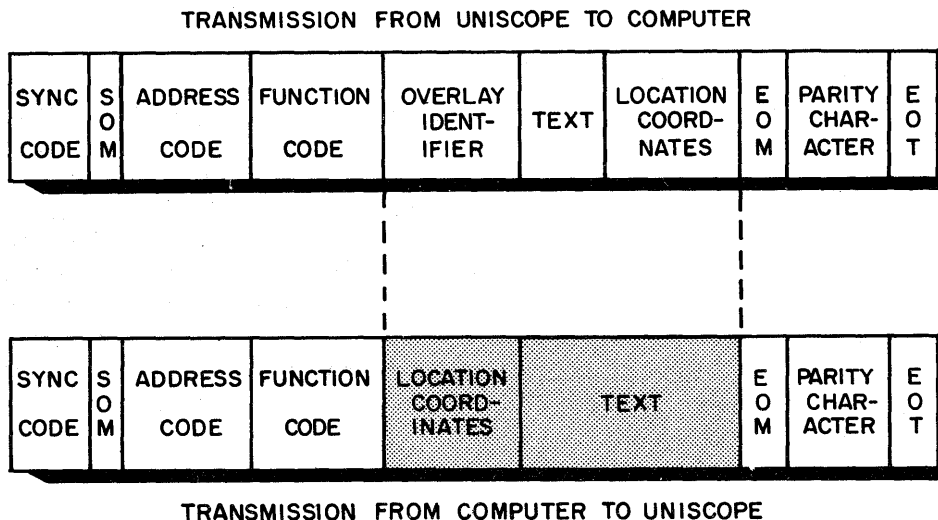


Figure 5-1. Message Formats

**Message Types**

The eleven types of messages that are sent back and forth between the UNISCOPE terminal and the computer are described as follows:

**1. Poll —**

This is a short output message which commands a given control unit to send data to the computer. In normal operation the poll contains a general device identifier which causes the multistation control unit to select one UNISCOPE from those who have data ready for transmission. There is no need for the computer to specify a particular UNISCOPE in a poll.

**2. Query —**

This is an input message which is transmitted to the computer in response to a poll. The transmission is essentially immediate and begins soon after the poll is received.

**3. No Traffic —**

This is a short input message in response to a poll. It is provided automatically by the control unit when the UNISCOPE has no data ready for transmission.

**4. Retransmission —**

This is a short output message from the computer. It is sent to a particular control unit in response to an input transmission in which the computer detected an error. The input message must pass both format and parity checks or it must be retransmitted.

**5. Reply —**

This is an output message from the computer addressed to a specific UNISCOPE. It is usually in reply to an original query. Some replies contain text and others do not. If the reply includes a unique unlock character, it will unlock the UNISCOPE keyboard which is locked when the transmit key is depressed.

**6. Computer Message Waiting —**

This is a short output message which alerts the UNISCOPE operator that the computer has a message waiting. This is an unsolicited message, not the normal reply to a query. The computer message alert allows the UNISCOPE operator to complete anything he may be doing before requesting the computer message.

**7. Unconditional Computer Message —**

This is an urgent output from the computer. It overrides anything that the operator may have on the screen in the area addressed by the message.

**8. Request Computer Message —**

This is a short input message. It is generated when the operator presses the "computer message waiting" button. Pressing this button sets up a condition within the control unit so that when a poll comes from the computer, the message is sent. The computer can interpret this message in one of two ways. If the "request computer message" is detected by the computer after the computer had sent a "message waiting" alert, it means that the operator is requesting the computer to send its message. In the second case, where the "request computer message" is received by the computer after the computer had sent an unsolicited message, it means that the operator is acknowledging that he has received and read the urgent message.



9. Break —

This is not a message as such, but is a special provision which permits the computer to break into a long output reply to one UNISCOPE terminal for the purpose of sending a poll or brief output message to another UNISCOPE. The address of the polled unit must be different from that of the unit receiving the interrupted message. Any output can be broken any number of times, but each output block must be completed before a new one is started.

10. Fall Back —

There are three short output messages applicable to multistation control units that are equipped with the fall back feature. The three output messages are "Go off line," "Drive right bank," and "Drive left bank." With these commands the MSCU can be directed to go off line, and the UNISCOPE that it had been servicing may be backed up by an adjoining MSCU.

11. Memory Test —

There are three short output messages that enable the computer to test the MSCU memory. These three messages: are test memory at high margin, test memory at low margin, and set memory to normal.

2 <sup>3</sup>	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1		
2 <sup>4</sup>	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1		
2 <sup>5</sup>	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1		
2 <sup>6</sup>	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1		
2 <sup>2</sup>	2 <sup>1</sup>	2 <sup>0</sup>																
0	0	0				CHAR. ERASE	(	∅	8	▣	H	P	X	↓	◇	⊞	::	
0	0	1		DEL. IN DSPY		DEL. IN LINE	!	)	1	9	A	I	Q	Y	Y	Σ	⊕	π
0	1	0		ERASE END DSPY		ERASE END LINE	"	*	2	:	B	J	R	Z	≤	↙	-	⊗
0	1	1		CR		HOME CURSOR	#	+	3	;	C	K	S	[	≥	≡	∧	÷
1	0	0	MSG WTG	SCAN UP			\$	,	4	<	D	L	T	Δ	Y	λ	∇	::
1	0	1		SCAN DOWN			%	-	5	=	E	M	U	J	¥	↑	h	†
1	1	0	TAB	SCAN LEFT			&	.	6	>	F	N	V	≠	≠	⊞	⊞	⊞
1	1	1	INSERT IN DSPY	SCAN RHT	INSERT IN LINE		'	/	7	?	G	O	W	□	√	∇	↖	↗

Figure 5-2. Character Code Assignments

## ERROR CONTROL

The error control consists of character parity, message parity, and acknowledgment of messages. Odd character parity is generated for each character leaving the UNISCOPE memory. Parity is also generated for the control characters SOM and EOM. These same characters are also given a character parity check on input. Message parity is accomplished by performing a half-add operation on each individual character. The result is accumulated from SOM through EOM. Then in the case of transmission, the message parity character (MPC) is tacked on to the end of the message. When receiving, the accumulated MPC is compared against the one that was sent with the message. The message parity character has even character parity, and so, it is unique and cannot be mistaken for a function code.

If either the character parity or message parity is incorrect, the computer will either ask for a retransmission from the UNISCOPE or retransmit to the UNISCOPE depending upon the direction of data flow. When the error is detected at the UNISCOPE, the UNISCOPE will not accept any more data. The fault indicator will go on, and the partial message will remain on the screen until the entire message is retransmitted from the computer.

All transmitted messages must be acknowledged by the receiving station. This adds security to the system and eliminates the possible loss of messages due to malfunctions.

UNISCOPE terminals acknowledge a computer message by inserting an acknowledge bit in the function code transmitted in response to a subsequent computer poll. The two possible replies to the subsequent poll are "no traffic" or "an input message." The computer will acknowledge a message sent to it by the transmission of a normal poll or by transmitting the next output message.

If the computer does not get an acknowledge bit, it will retransmit its last output message. If the computer does not get a good message from a UNISCOPE, it will respond with a retransmit request.

## OPERATOR ENTRY OF DATA

The operator may enter data into the UNISCOPE memory through the typewriter keyboard and the function keys. In most cases the function keys will be used to notify the computer as to the type of entry under way. This makes it easier for the computer to handle the flow of traffic because it must scrutinize only one character instead of a coded phrase or a whole sentence. It is easier for the operator, because it requires less typing, will produce less mistakes, and also will result in less corrections. The amount of typing will vary, of course, depending upon the transaction. Most likely it will be as concise as possible.

Variable data such as name, address, quantity, and exceptions might be the general type of data involved. The operator will use the cursor control and the tab function to facilitate operations and to aid in message construction. The editing keys will be used to make corrections or to update records.

The transaction between the UNISCOPE and the computer is controlled by the operator with the exception of the forced unsolicited message. No transmission from a UNISCOPE will take place unless the operator has depressed the transmit button. Use of the special features, such as splitting the screen for more than one message or scrolling a portion of the screen, are also initiated by the operator through the use of selected function keys.

**TRANSMIT**

When the transmit key is depressed, it initiates data flow from the UNISCOPE to the computer. Common terms for this action are send data, input messages, or transmissions. Any portion of the data that is displayed on the screen can be sent to the computer. The desired portion must merely be bracketed with the cursor and an EOF character. This screen splitting or message segmentation may be used many ways and must be supported by adequate programming. When a message has been transmitted, all further entry from the keyboard will be prevented until the computer accepts the message as valid.

Transmission from the UNISCOPE will start when the UNISCOPE receives the poll. In the multistation arrangement, the MSCU will pick up the transmit request from any one of 48 UNISCOPE terminals. It will hold this request until it is polled. Any other transmit request from that same bank of UNISCOPE terminals will be ignored until the present message is accepted by the computer. Where the dual modem is included, two messages can be handled simultaneously.

The message type and format could be one of the eleven discussed earlier in this section.

**RECEIVE**

Data flow from the computer to the UNISCOPE is called receive data, output message, or reception. The output message is one of three types—an answer to a query, a request to send an unsolicited message, or a forced unsolicited message.

A forced unsolicited message will override whatever the operator is doing and will fill the memory and the screen with the important message. An audible alarm will go off and the computer "message waiting" indicator will go on. The alarm and indicator will be turned off by the operator when he depresses the "message wait" switch. This action on the part of the operator acknowledges his receipt of the message.

When the computer requests to send an unsolicited message, only the alarm will go off and the indicator will light. No data will be forced onto the screen. This allows the operator to clear up the transaction in which he is involved, and when he depresses the "message wait" switch, the computer will send the operator the unsolicited message. When the switch is depressed, the light will go out and the audible alarm will cease.

Any message that is received by the UNISCOPE will include a cursor address, and the data will appear on the screen starting at this address. The formats for these three types of messages were discussed earlier in this section.

## APPENDIX A. GENERAL SPECIFICATIONS

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### DISPLAY

Capacity	1,024 or 512 Characters
Viewing Area	10" Wide x 5" High
Format	64 Characters per Line x 8 or 16 Lines
Character Size	.150" High x .113" Wide
Refresh Rate	60 Cycles per Second
Scan Method	Digital
Character Set	56, 61, or 96 Symbols
Character Generation	Closed Stroke, Maximum 8 per Character

---

### KEYBOARD

Basic Alphanumeric Typewriter  
 8 Cursor Control Keys  
 5 (7 Functions) Editing Keys  
 0, 5, or 40 Function Keys  
 122 Possible Function Key Overlays  
 (Over 4,000 Functions are Possible)

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### MEMORY

Single Station	1,024 Magnetic Cores 7.2 Microseconds Cycle Time
Multistation	8,192, 16,384, or 24,576 Magnetic Cores 1.8 Microseconds Cycle Time
Code	7 Bit Modified ASCII

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### SUBSYSTEM SIZE

Single Station	1 : 1,024 Characters
Multistation	2—24 : 1,024 Characters 2—48 : 512 Characters

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### INTERFACE

Communication (Telephone) Line,  
 AT&T 201 Data Set or Equivalent,  
 2,000 Bits per Second or Higher

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### POWER

120 Volts + 10%  
 - 15%  
 Single Phase  
 60 Cycles per Second  $\pm$  .5 Cycle

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### SIZE

MSCU	36" x 24" x 64"
Display	25" Wide 17" High 24" Deep

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