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LINOLEX

Romney
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The Summary Description Brochure

Part One: Introduction

The Linolex System is a complete desk-top data processing system for commercial, industrial and technical applications. In a single, low-cost package, it integrates hardware, firmware and peripheral capability.

The Linolex System may be used as a stand-alone unit or as a terminal with a larger computer. Storing both files and programs on high grade magnetic tape, it offers full data processing and file maintenance capabilities.

The System also features full programmability, proven circuitry, easy control and an extensive decimal and binary instruction set.

The basic control package includes a specially designed controller/processor, two tape cassette drives, a video display and a keyboard.

As a stand-alone processor, in a business environment, the Linolex System updates accounts receivable, writes invoices, and prepares payrolls. The sorting capability allows easy generation of reports, summaries, and distributions.

As a terminal, the System's mass storage capacity, and extensive processing facility, allow for both batch and conversational terminal modes. In the batch mode, stored data can be preprocessed and edited prior to transmission to a remote computer. Data retrieved from the remote computer can be translated, formatted, and stored for immediate observation by the operator or for later use in the Linolex System. In its conversational mode the System itself performs editing, verifying, and error checking.

A variety of peripheral devices may be attached to the Linolex System. Communications couplers and several types of printers are available.

A selection of software packages is provided with the System, including an off-line assembler, a simulator, and a number of utility routines. In addition, continuing software development at Linolex is producing applications programs of many types.

Controller-Processor

The specially designed Linolex controller/processor both processes data and controls other elements of the System, such as the tape drives and the display (See Figure 1).

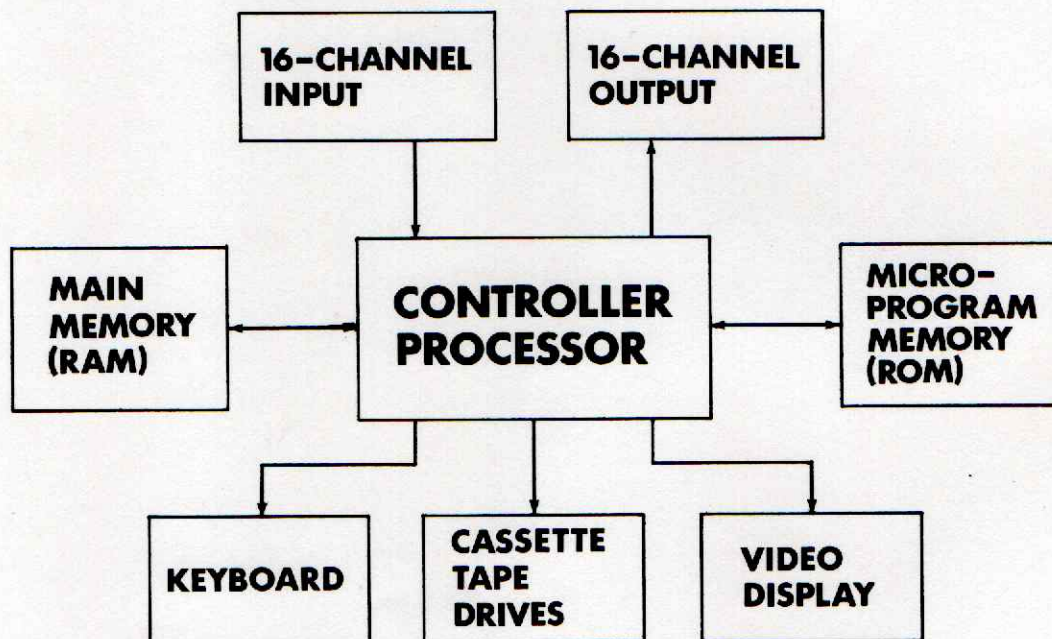


Figure 1

The Linolex System employs the latest "off-the-shelf" proven MSI and LSI circuits in its unique integrated design. This design concept creates advantages throughout the System.

For instance, the "peripheral" equipment is built into the System and serviced by a single controller/processor. Consequently there is no need for expensive peripheral controllers or duplicated power supplies and cabinets found in composite systems.

This integrated concept is also carried through in the circuits used. Many operations involving different sections of the System share a few high speed logic elements. Several types of storage banks hold data gathered for processing. This sharing of high speed logic proves more economical than using slower logic with many duplicated functions.

The integrated design also permits a single high speed microprogram to be used for both peripheral control and instruction interpretation. The latter use transforms a fast but simple computer into a data processor having a decimal/binary instruction set normally found only in the much larger machines.

A permanently-stored microprogram combines elementary operations to form a comprehensive set of decimal and binary instructions (Table 1). A two-address format is used, with infinite level indirect addressing. The decimal and some of the logical instructions possess variable length fields. A novel form of indexing is used in which all locations in memory can serve as index registers. Furthermore, the increments by which the indices are advanced are individually variable under program control.

The basic word length is eight bits, but the decimal and some of the logical instructions can operate on variable length fields. The packed form is used for decimal arithmetic, leading to more efficient use of storage, both in main memory and on tape.

The controller/processor also uses the microprogram for the sequencing of all other System elements. In addition to simplifying the design this feature greatly reduces the programming effort required. For instance, the transfer of a block (128 characters) from a given location on tape to memory can be effected by a single instruction. Microprogram strings are used to control and check the cassette tape drives, to set up the video display, and to transfer information from the keyboard.

The processor contains several types of memory. For fast access, 32 hardware registers are used. The main memory is a random access semiconductor unit which contains 1024 character locations in the basic configuration, but is easily expandable to 4096 characters. Main memory access time is 480 nanoseconds. Microprogram is stored in a semiconductor read-only memory. This memory contains 2048 12-bit words and has an access time of 120 nanoseconds. Bipolar transistor integrated circuits (TTL) are used for all logic. All circuits included in the Linolex System have been well proven by general use.

Tape Drives

The basic System includes two digital cassette tape drives, a third being available as an option.

The cassettes conform to the Philips C-60 standard, but are constructed with finer bearings and surfaces to provide longer tape life. Certified, computer-grade magnetic tape is used in all Linolex cassettes.

Each cassette contains up to 300 feet of tape, capable of storing 1200 128-byte blocks. Tape speed during reading and writing operations is 10 inches per second, at a density of 800 bits per inch. Fast forward and rewind occur at 100 inches per second. Block searching can be accomplished during the high-speed modes.

Each block is identified by an accompanying block indicator. This method allows single blocks to be read or written at random without reading or disturbing any other blocks. Multiple-redundancy error protection is introduced by means of parity checks on each byte,

check sums for each block, and duplicate recording of each block. In the event of eight successive failures to read a given block correctly, the Linolex system halts and the operator is notified via the display screen.

Video Display

The video display provides communication from the System to the operator. It spells out system status as well as indicating the results of operations on data.

The display is a standard television monitor employing only solid-state circuitry and containing a 12-inch diagonal tube.

Normal television scanning is used to produce a bright flicker-free display. Each line contains 66 character positions, and up to 20 lines may be displayed.

As with the tape drives, the display is also sequenced by the central processor and its microprogram, so that minimal program control is required to cause characters to be displayed.

Character format is a 5-by-7 dot matrix and 64 characters, including "space," can be displayed.

Controls

The System contains no confusing banks of lights and switches found on most computers. Instead, messages from the System to the operator are displayed directly on the TV screen. The operator controls the System by means of a simple "start" button, a "stop" button and the keyboard.

When the "start" button is pressed, the System automatically loads the first block from the program tape into memory and starts executing instructions from that block. After starting, all other normal control is by means of the keyboard.

Keyboard

The keyboard uses solid-state switching concepts, thereby eliminating unreliable mechanical contacts. The keys are arranged in three separate areas, as shown in the illustration, Figure 2.

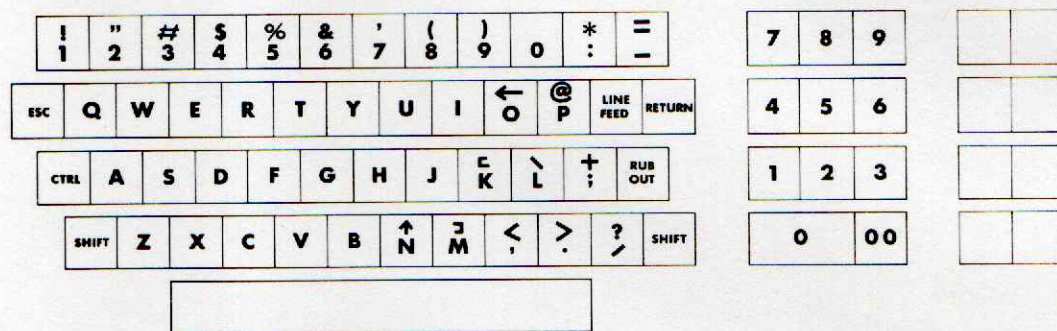


Figure 2. Keyboard layout

The first area is a standard communications keyboard, containing the alphabet, the ten digits, various arithmetic operations, and punctuation marks.

The second area is a ten-key pad to allow rapid entry of numeric-only data.

The third area contains eight undesignated control keys. A plastic overlay is placed on the keyboard to designate the function of these keys in a specific program.

Input/Output Controls

A general input-output interface permits communication between the System and external devices such as the printer and telephone adapter. Up to 16 parallel, duplex, 8-bit channels can be maintained. Transmission rates above 1200 characters per second can be achieved.

The I/O channels permit users to modify or alter their basic configurations in almost limitless fashion -- relying on the controller/processor to integrate and handle the peripheral attachments.

Part Three: Software

In addition to a large amount of "wired-in" firmware, the Linolex System includes three types of software -- system, utility and applications.

To assist users in program development an assembler, a simulator and an editor are included. Maintenance of files, tape libraries and programs is simplified through utility routines.

Off-Line Assembler

The Off-Line Assembler is used to convert programs written in a symbolic source language into machine-language programs. The conversion is usually one-for-one; that is, the assembler produces one machine-language instruction for each symbolic-language instruction.

The assembler requires two passes. During the first pass, the source program is read and stored, and a symbol table is generated. During the second pass, an object program is created and a listing, if requested, is produced. A sophisticated set of pseudo-instructions is included as part of the Assembler.

The Off-Line Assembler is written in Fortran IV and is designed to operate on most computers with Fortran IV capability. The assembler can also be operated either in batch or conversational modes on Fortran IV equipped timesharing systems.

The System may be used as the terminal upon which a program to be assembled is composed. The source program is transmitted to the larger computer for assembly and the object program is returned to the System where it is stored on tape. The assembled program may be run immediately or may be saved for later use.

Simulator

The Linolex Simulator is designed to be operated in conjunction with the Off-Line Assembler. The Simulator gives a programmer the ability to test and correct his programs before committing them to the System. The same memory capacity and instruction set are contained within the Simulator as within the System itself.

In addition, the Simulator allows examination of the contents of any memory location, hardware register, or tape block. Display and memory maps can be produced at any point within the program under test. The design of the Simulator permits both inter-active time-sharing and batch mode operation.

Editor

The On-Line Editor is a keyboard-oriented system which allows both ASCII and hexadecimal symbol strings to be composed, altered, stored on tape, and recalled into the main memory text buffer. The contents of the text buffer are displayed on the screen along with an indication of the number of unfilled symbol spaces remaining in the text buffer. In the sequential tape mode, successive tape blocks are written or recalled for editing. An alternative mode allows the operator to designate the specific tape block for these operations. A printout of edited text is optional.

Terminal Emulators

These programs cause the Linolex System, when connected to other computing equipment, to emulate an appropriate terminal, while preserving the System's editing, storage, and processing capabilities.

Frequently repeated messages may be identified and transmitted by a single key depression. Likewise, terminal functions over and above those available on the terminal being emulated, (such as format control, and selective recording and playback), may be initiated by individual control codes or symbol strings.

ASCII Converter

When data or programs are transmitted to the Linolex System using ASCII symbols, as is the case when using a Teletype-oriented channel, it is not usually possible to obtain arbitrary eight bit codes. The ASCII converter allows general use of such channels by stripping the incoming characters of all but their lower four bits, packing these four-bit groups two per byte, and storing the resulting strings on tape.

Tape Library System

The Tape Library System allows the user to maintain an indexed library of program files on cassette tape. Features include the ability to add new files, replace or delete outdated files, and copy files onto another cassette.

If desired, programs may be stored in both source and object form. An index is kept on tape containing information about the placement of files and the usage of each block on tape.

Generalized Data Entry

The generalized data entry system permits rapid creation of a data entry system for the specific needs of each user. Formats for both cassette tape and display are specified by the user. In addition user selected error conditions will be flagged.

Test and Diagnostic Routines

These programs exercise different parts of the System and check that their operation is correct. Where feasible, the location and nature of a failure is indicated.

Subroutine Library

Linolex will continue to develop and make available to its customers a library of often used subroutines. Arithmetic, data processing, communications, and peripheral interface programs, among others, will be included.

Part Four: Applications

The Linolex System is job-oriented. By means of pre-programmed tapes, it will free the unsophisticated user from having to learn the special skills usually associated with the operation of data processing equipment.

Many of the programs will be self-teaching, in the sense that commands and alternatives will be displayed on the viewing screen in plain English.

One Application: Accounts Receivable

An example that illustrates the scope of the System is its processing of accounts receivable. A flowchart illustrating this application is shown in Figure 3.

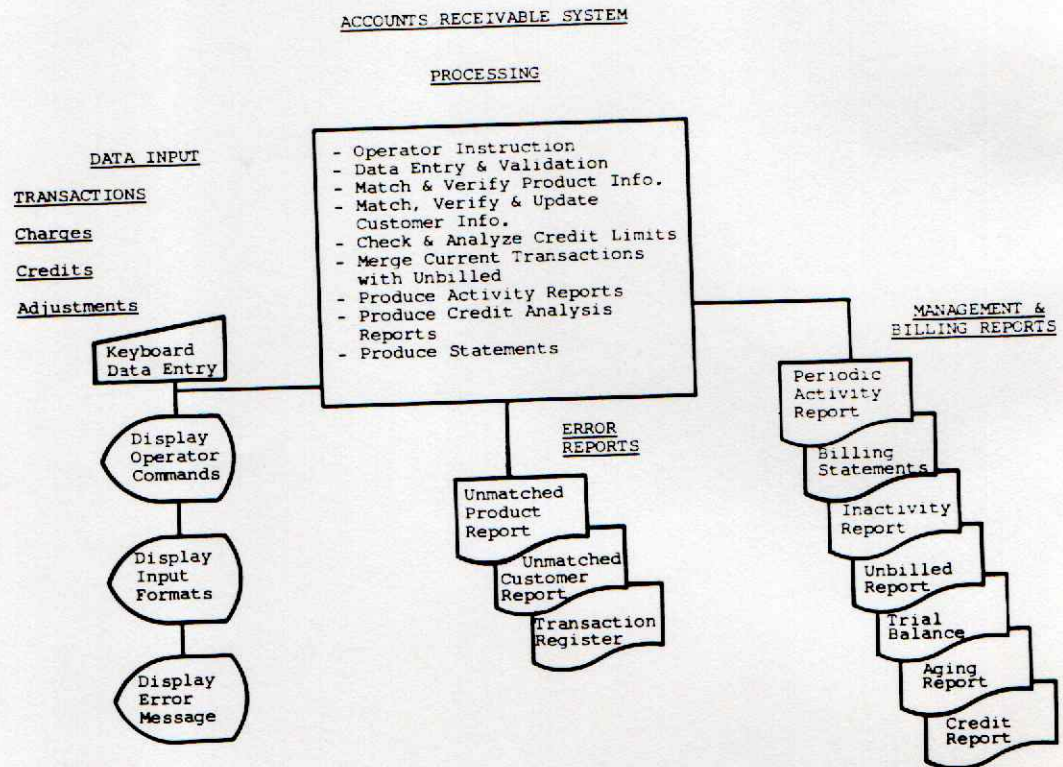
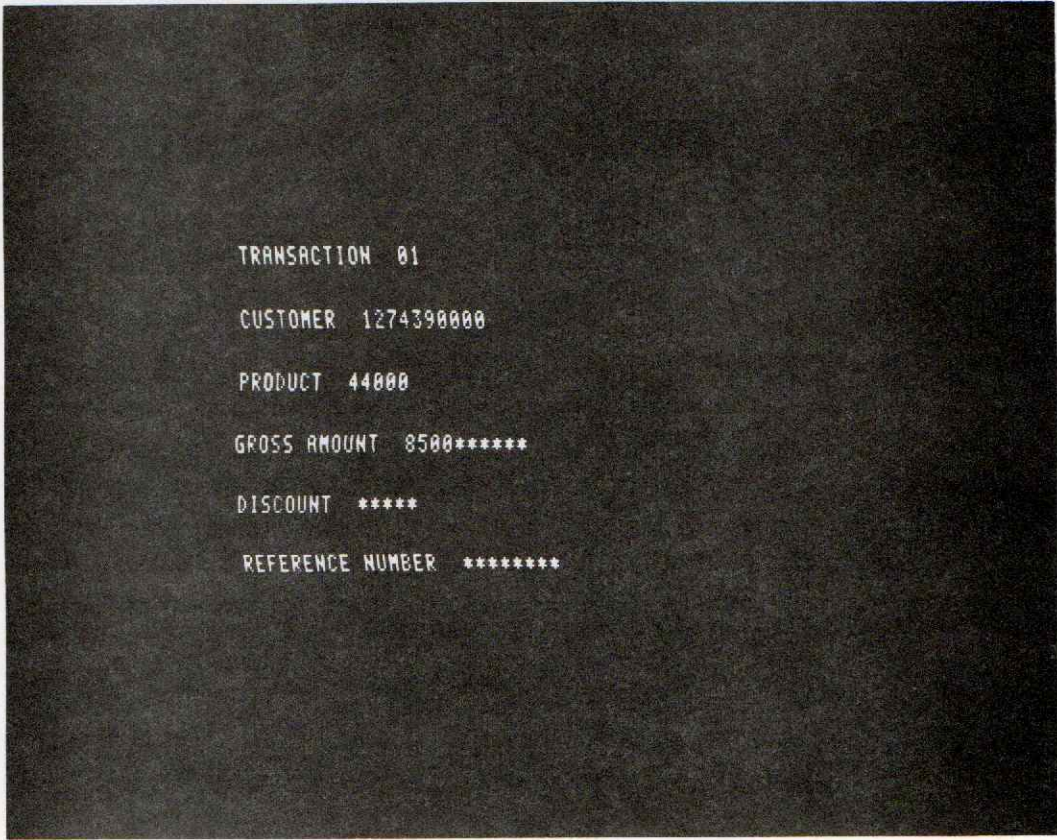


Figure 3. Accounts Receivable System.

Following the format displayed on the screen, (Fig. 4), the operator enters pertinent receivables information through the keyboard, sight verifying as she progresses. If during this data entry stage, invalid information, such as wrong transaction codes or customer numbers, are entered, an audible signal is generated and the nature of the error is indicated on the display tube.

When data entry is completed, the System operates on its own to sort the input/update master files, and produce the necessary invoices and related reports. Detail and summary reports of all types -- ranging from statements to statistical trend analyses -- can be produced as by-products of the accounts receivable updating.



```
TRANSACTION 01  
CUSTOMER 1274390000  
PRODUCT 44000  
GROSS AMOUNT 8500*****  
DISCOUNT *****  
REFERENCE NUMBER *****
```

Figure 4. Accounts Receivable Display.

Range of Applications

- Business

- Accounts receivable
- Accounts payable
- Payroll
- General ledger
- Sales analysis
- Order processing
- Inventory control
- Automatic typing
- Report generation
- Data entry and verification

- Scientific

- Programmable calculator
- Formula translation
- Data reduction
- Instrumentation and measurement
- Technical proposal generation
- Program development

- Educational

- Programmed instruction
- Individual testing
- Classroom assignments
- Transcript preparation
- Library "look-up"

- Process control

- Programmed controller
- Monitor and display
- Data reduction and recording
- Operator training
- Central monitor station

- Institutional

- Fund analysis
- Trend recording and reporting
- Financial reporting
- Stock transaction reporting
- Portfolio analysis
- Brokerage back office accounting

Part Five: Specification Summary

- Processor Specifications:

Word length:	Variable in groups of 8 bits
Main Memory	Semiconductor RAM
	1024 - 4096 bytes
	480 nansec. access time
Instructions:	52
Control:	Microprogram
Microprogram Memory:	Semiconductor ROM
	2048 12-bit words
	240 nanosec cycle time
Hardware Registers:	32
Processor Logic:	TTL

- Tape Storage Specifications:

No. Drives:	2 (3 optional)
Type:	Digital cassette
Record Form:	Block
Record Length:	128 8-bit bytes
No. Rec./Cassette:	1200
Reading Speed:	10 inches per second
Rewind Speed:	100 inches per second
Recording Density:	800 bits per inch
Data Protection:	Character parity, block checksums, and duplicate, sequential recording of blocks

- Video Display Specifications:

Character Font:	64 ASCII
Character Size:	5-by-7 dot matrix
No. of characters/line:	66
No. of lines:	20

- Keyboard Specifications:

Type:	Solid state
Number of Keys:	69
Layout:	"ASR-33" plus 10-key data entry plus 8 special functions

- Input/Output Channel Specifications:

No. of Channels:	16
Channel Type:	8-bit, parallel, duplex
Capacity:	1200 + characters per sec.

- Hard Copy Output: Several options available

- Communications Coupler: Optional

- Physical Specifications:

Main Unit:	Height,	- 18"
	Width,	- 18"
	Depth,	- 12"
	Weight,	- 48 lbs

Keyboard:	Height,	- 3"
	Width,	- 18"
	Depth,	- 8½"
	Weight,	- 5 lbs

Power:	120 Watts @ 110 Volts, AC
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