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SPECIFICATION

GIER ELECTRONICS

REFERENCES

GENERAL INFORMATION

	NAME	LOCATION	COUNTRY	APPLICATION	INSTALLATION
1.	Geodætisk Institut	Copenhagen	Denmark	Geodesy	December 1960
2.	Haldor Topsøe	Copenhagen	Denmark	Chemical Engineering	December 1961
3.	Atomenergikommissionens Forsøgsanlæg	Risø	Denmark	Nuclear Physics	February 1962
4.	A/S Regnecentralen	Århus	Denmark	Service Center and Training	April 1962
5.	A/S Regnecentralen	Copenhagen	Denmark	Numerical Analysis and Training	May 1962
6.	Hydro- og Aerodynamisk Laboratorium	Copenhagen	Denmark	Engineering and Ship Building	June 1962
7.	Københavns Universitet, Astronomisk Observatorium	Copenhagen	Denmark	Astronomy	August 1962
8.	Bassin d'Essais des Carènes	Paris	France	Ship Building	October 1962
9.	Norges tekniske Høgskole, Institutt for Reguleringsteknikk	Trondheim	Norway	Process Control	December 1962
10.	Norges tekniske Høgskole, SINTEF	Trondheim	Norway	Service Center and Training	February 1963
11.	OECD Halden Reactor Project, Institutt for Atomenergi	Halden	Norway	Nuclear Physics	April 1963
12.	Københavns Universitet, Matematisk Institut	Copenhagen	Denmark	Numerical Analysis and Training	May 1963
13.	A/S Regnecentralen	Copenhagen	Denmark	Service Center	July 1963
14.	Max-Planck-Institut für Kernphysik	Heidelberg	Germany	Nuclear Physics	October 1963

	NAME	LOCATION	COUNTRY	APPLICATION	INSTALLATION
15.	Burmeister & Wain A/S	Copenhagen	Denmark	Ship Building	October 1963
16.	A/S Regnecentralen	Aalborg	Denmark	Service Center	October 1963
17.	Uniwersytet Warszawski	Warsaw	Poland	Numerical Analysis and Training	January 1964
18.	Danmarks tekniske Højskole, Servolaboratoriet	Copenhagen	Denmark	Process Control and Training	April 1964
19.	A/S Scanips	Oslo	Norway	Service Center	October 1964
20.	Kungliga Lantmäteri-styrelsen	Stockholm	Sweden	Geodesy	October 1964
21.	Hamburger Sternwarte	Hamburg	Germany	Astronomy	November 1964
22.	Instytut Badan Jadrowych	Swierk	Poland	Nuclear Physics	January 1965
23.	Århus Universitet, Matematisk Institut	Århus	Denmark	Numerical Analysis and Training	May 1965
24.	Technische Universität Berlin, Lehrstuhl und Institut für Elektrotechnik	Berlin	Germany	Electro-Technical Computations	July 1965
25.	Københavns Universitet, Matematisk Institut	Copenhagen	Denmark	Numerical Analysis and Training	August 1965
26.	Ústav Jaderného Výzkumu	Řež	Czecho-slovakia	Nuclear Physics	September 1965
27.	Københavns Universitet, Niels Bohr Institutet	Copenhagen	Denmark	Nuclear Physics	October 1965
28.	Központi Statisztikai Hivatal	Budapest	Hungary	Statistics and Training	October 1965
29.	Gier Electronics GmbH	Hannover	Germany	Service Center	February 1966
30.	Haldor Topsøe	Copenhagen	Denmark	Chemical Engineering	April 1966
31.	Jydsk Telefon-Aktieselskab	Århus	Denmark	Administrative Data Processing	May 1966
32.	Slovenska Akademia Vied	Bratislava	Czecho-slovakia	Cybernetic Research	September 1966
33.	Chemocomplex	Pét	Hungary	Chemical Engineering	October 1966
34.	A/S Scanips	Oslo	Norway	Service Center	January 1967
35.	Ministry of Transportation	Sofia	Bulgaria	Optimalisation of Transportation	October 1967
36.	SPS A/S	Copenhagen	Denmark	Service Center	December 1967

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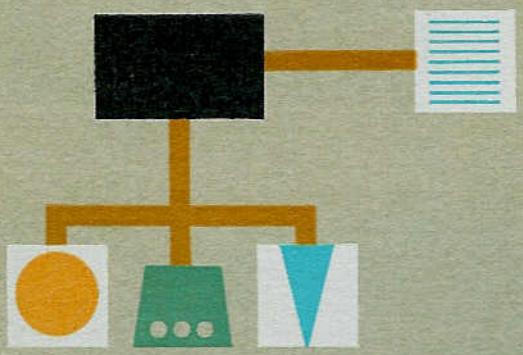
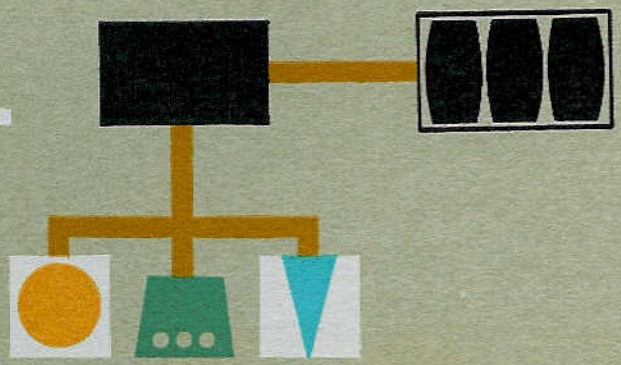
GIER
ELECTRONICS

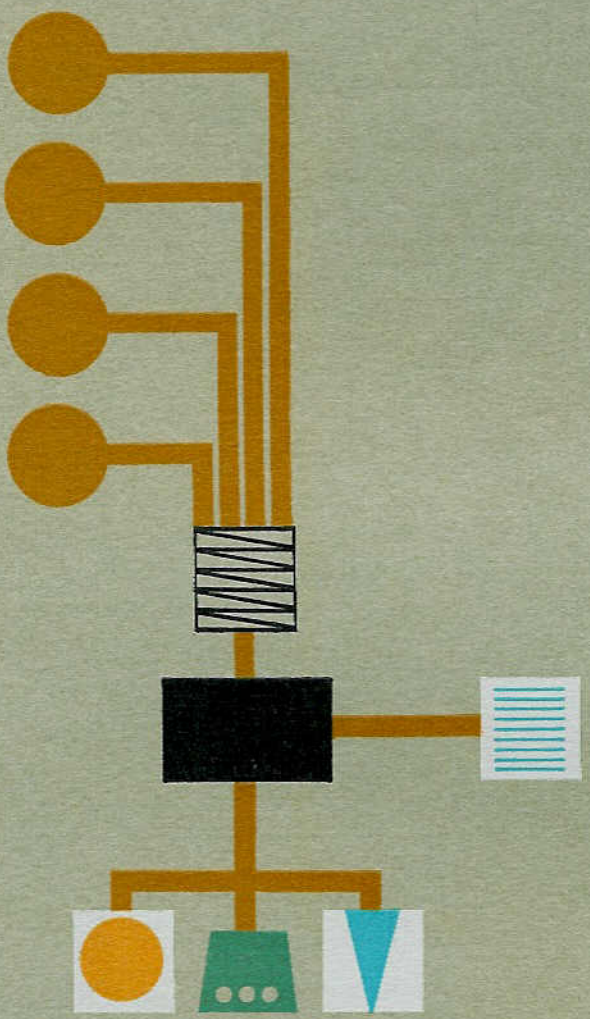
COMPUTER and CONVERTER CONFIGURATIONS

GIER-DISK



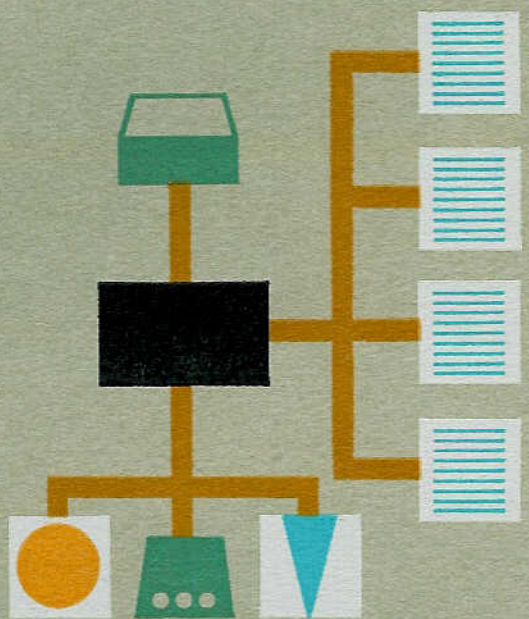


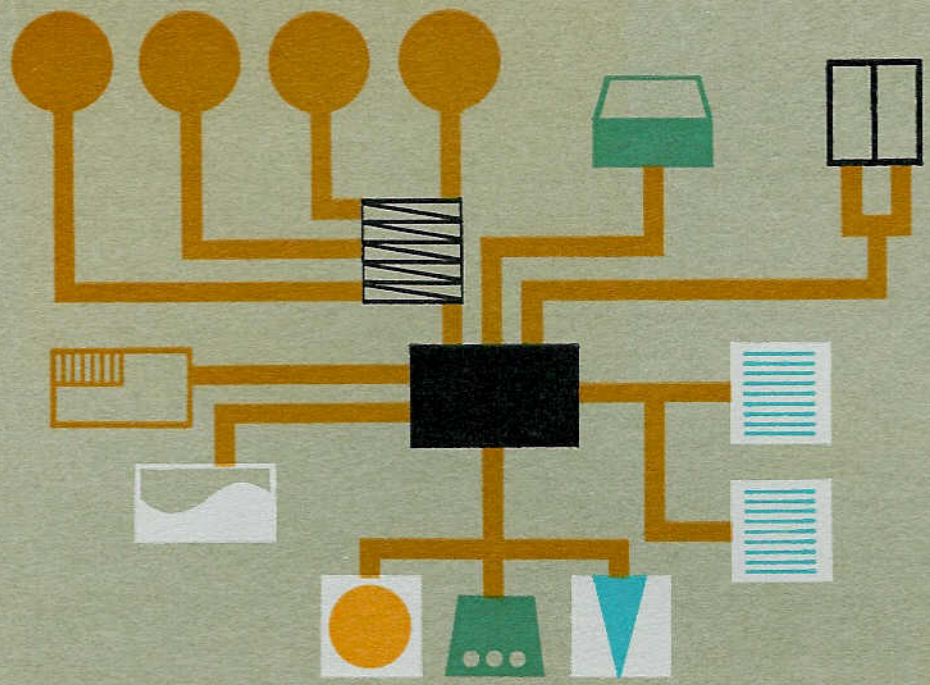
GIER Standard
with Three-Drum Unit



GIER-DISK
with Magnetic Tape

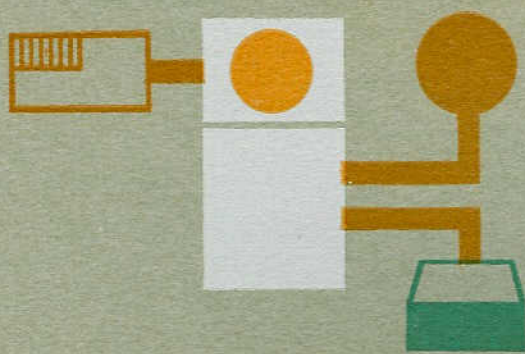
GIER-DISK
with Printer and Additional Disk Files

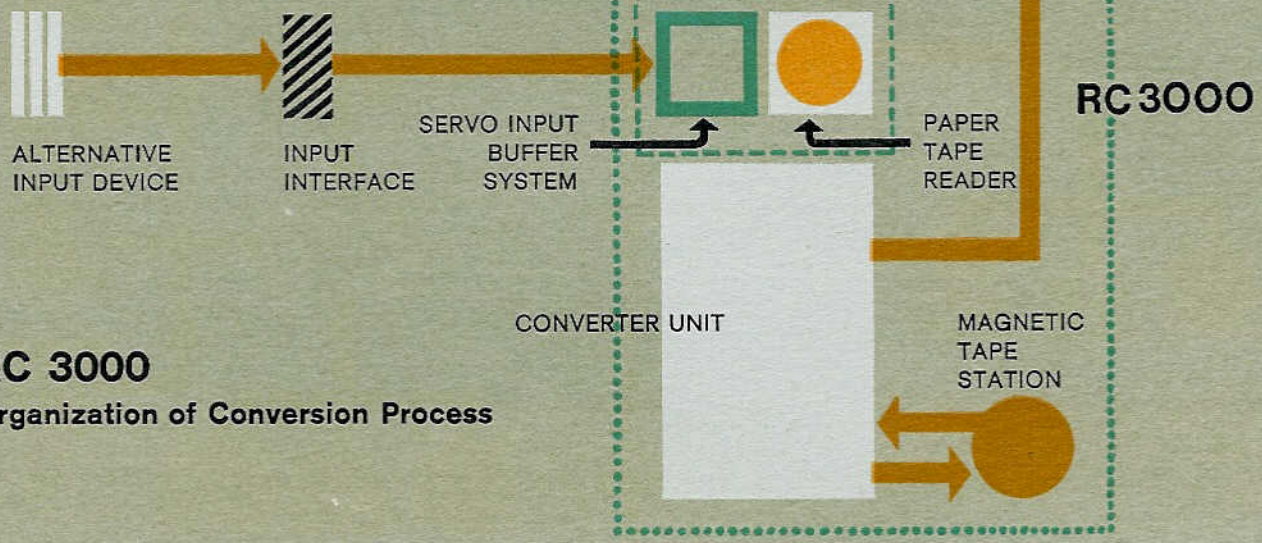




GIER SYSTEM – Typical Extension

RC 3000
Example of Off-Line Conversion



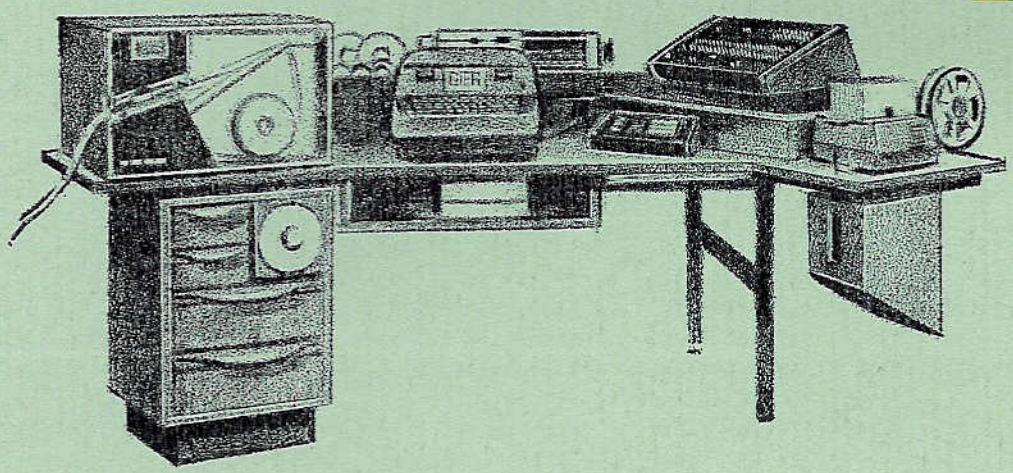


RC 3000
Organization of Conversion Process

SPECIFICATION

GIER ELECTRONICS

HARDWARE



GIER
CONSOLE

The desk-like Console, from which the GIER Computer can be operated by a single person, contains the Display and Auxiliary Display Panels, the Monitor Typewriter, the Paper Tape Punch, and the Paper Tape Reader (the last two items of equipment described in separate Specifications).

The Display Panel, which is provided with certain start and stop buttons, shows the contents of the various registers, indicates error conditions, and is used to operate the Computer manually.

The Auxiliary Display Panel contains the so-called HP button, a special interrupt control used to call the Administrator of the HELP System (see Specification), which includes an input program with symbolic addressing and a set of utility programs. When one presses the HP button, the program in progress is interrupted, whereupon the contents of the immediate access store and all relevant registers are transferred to secondary storage so that the situation before the interrupt can be restored later.

The on-line Monitor Typewriter is an electric typewriter used for input and output of limited quantities of data. Communication between the operator and HELP, for instance, is normally accomplished using the Monitor Typewriter. Input/output occurs at the rate of 8–12 char/sec.

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In addition, the off-line Perforator Typewriter, an electric typewriter equipped with an ALGOL keyboard, is available for producing typewritten documents and punched paper tapes for the input of programs and data to the Computer. As one types a program in GIER ALGOL for example, the information and data can be punched on 8-track paper tape at the same time. Since the Perforator Typewriter also reads paper tapes, copying of both documents and tapes is possible. Operation occurs at 8–12 char/sec.

CHARACTERISTICS

Size: width 230.0 cm, depth 111.0 cm, height 96.5 cm

Weight: 136 kg

Monitor Typewriter Speed: 8–12 char/sec (on-line)

Power: supplied from the Central Processor

Environment

cooling air: 120 m³/h from ambient
air temperature: 15–30° C
relative humidity: 40–70 %

These characteristics include the Paper Tape Reader, which is mounted on the Console.

SHIPPING SIZES AND WEIGHTS

The following contains information about the size and weight of certain items of equipment when packed for shipment. Weight indicates the gross weight, i.e. the unit plus packaging, and Size the external measurements of the packaging.

Console (without set of drawers)
Size:
width 230.0 cm, depth 108.0 cm, height 76.0 cm
Weight: 69 kg

Set of Drawers (for Console)
Size:
width 40.0 cm, depth 45.3 cm, height 59.0 cm
Weight: 20 kg

Display and Auxiliary Display Panels (in box)
Size:
width 72.0 cm, depth 59.5 cm, height 40.5 cm
Weight: 45 kg

Monitor Typewriter (in box)
Size:
width 86.0 cm, depth 74.5 cm, height 51.5 cm
Weight: 61 kg

Paper Tape Punch (in box)
Size:
width 73.0 cm, depth 35.0 cm, height 36.5 cm
Weight: 31 kg

Receptacle for Chads (for Punch)
Size:
width 20.9 cm, depth 25.0 cm, height 32.2 cm
Weight: 2.3 kg

Paper Tape Reader (in box)
Size:
width 80.0 cm, depth 55.0 cm, height 39.0 cm
Weight: 49 kg

Central Processor (on rack)
Size:
width 145.0 cm, depth 193.0 cm, height 70.0 cm
Weight: 298 kg
drum, metal back-plates, and micro-programming circuitry not included

Back-Plates (for Central Processor, five in box)
Size:
width 55.0 cm, depth 182.0 cm, height 17.5 cm
Weight: 66 kg

Printed Circuit Cards (three boxes)
Size:
width 62.0 cm, depth 53.0 cm, height 44.5 cm
Weight: 35 kg – 38 kg – 40 kg
maximum of 150 cards per box

Microprogramming Circuitry (in box)
Size:
width 48.0 cm, depth 18.5 cm, height 18.0 cm
Weight: 46 kg

Magnetic Drum (in box)
Size:
width 70.0 cm, depth 80.0 cm, height 83.0 cm
Weight: 92 kg

Line Printer (on rack in box)
Size:
width 150.0 cm, depth 193.0 cm, height 70.0 cm
Weight: 493 kg

Shipping information for other items of equipment will be provided in accordance with individual requirements.

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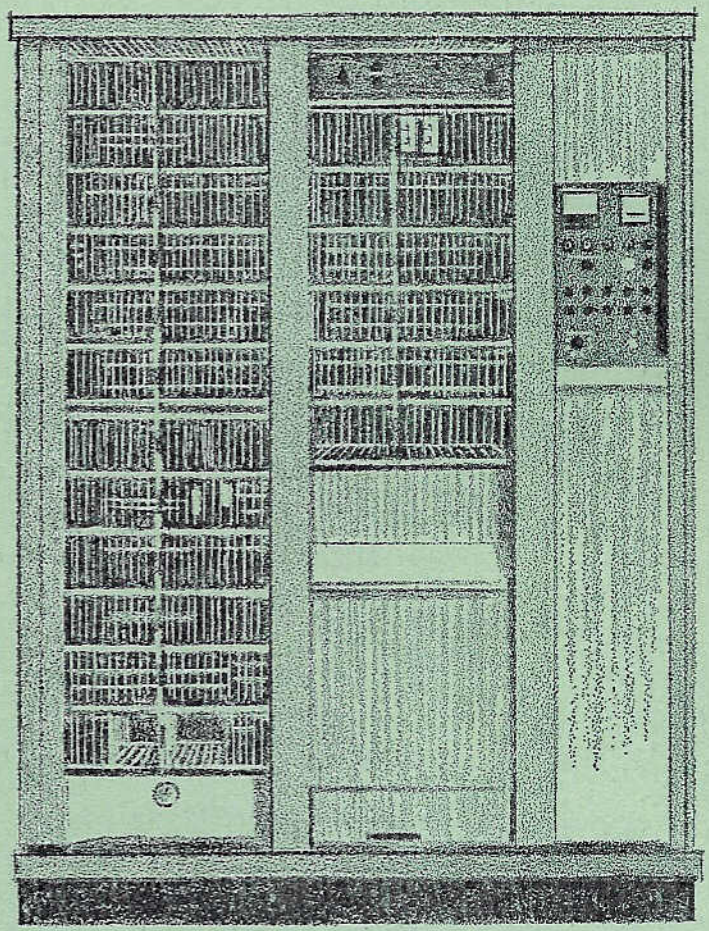
SPECIFICATION

GIER ELECTRONICS

HARDWARE



GIER COMPUTER

Central Processor

The GIER Computer is a compact, general purpose digital computer equipped with a highly effective ALGOL 60 compiler (see Specification) and a flexible operating system. The GIER Computer operates in the binary mode with a core store cycle time of 6.6 μs, 60 single-address instructions, and built-in floating-point arithmetic. Instruction execution times range from 29 μs to 267 μs. Word length is 42 bits, two of which are used as flag bits, each word being equivalent to 7 alphanumerical characters or 12 digits.

The Central Processor consists mainly of a number of control registers and an immediate access core store of 1024 words. The cabinet of the Central Processor houses storage devices, microprogramming circuitry, power supply, and the like.

Secondary Storage

The Drum Store, a magnetic drum of 320 40-word tracks or a total of 12,800 words, supplements the 1024-word immediate access store as a secondary random access store. Used in conjunction with the GIER Computer, the Drum Store provides storage capacity of almost 14,000 words.

Drum transfers, i.e. the copying of data from the immediate access store to the Drum Store or vice versa, take place simultaneously with other operations at a rate of 20 ms/track. Drum storage capacity is extendible by two drums to give a maximum capacity of 38,400 words.

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Normally the single drum is housed in the Central Processor cabinet, but if two or three drums are employed, all the drums are housed in a special cabinet called the Three-Drum Unit.

Alternatively, the Disk File (see Specification), a random access magnetic disk store with a capacity of 384,000 words, can be used with the GIER Computer as an auxiliary storage device to replace the Drum Store. Up to 4 Disk Files can be connected.

In addition, the Buffer Store (see Specification), an optional, high-speed, secondary store with a 4096-word core store, is available to supplement both immediate and random access stores and to accomodate magnetic tape transfers.

Data Channel

The general purpose, two-way, 42-bit Data Channel facilitates the connection of auxiliary devices, such as the Buffer Store, the Real-Time Clock, Hybrid Computer Linkage Equipment, and Magnetic Tape Stations (via Buffer Store). Data Channel transfers by blocks or by characters to and from the immediate access store take place at a rate of 15 μs/word (42 bits in parallel).

CHARACTERISTICS

CENTRAL PROCESSOR

Size: width 144.6 cm, depth 54.2 cm, height 192.7 cm

Weight: 436 kg

Core Store Cycle Time: 6.6 μs

Core Store Capacity: 1024 42-bit words, immediate access

Operation Times

addition:	22 μs	fixed-point	66 μs	floating-point	
multiplication:	155 μs	»	»	140 μs	»	»
division:	240 μs	»	»	190 μs	»	»
other:	2 μs		to	27 μs		

+ 27 μs for normal address modification

Power: 50 Hz; 3 x 380, 3 x 220 V
maximum power: 1400 kcal/h (1625 W)
maximum line current: 4 A at 3 x 380 V
fuses in mains connection: 6 A

Environment
cooling air: 600 m³/h from plenum
air temperature: 18–23° C
relative humidity: 40–70 %

THREE-DRUM UNIT

Size: width 162.8 cm, depth 41.0 cm, height 117.2 cm

Weight: 350 kg

Magnetic Drum Store Capacity: 12,800 42-bit words, random access
number of tracks: 320 of 40 words each
total number of drums: 3
maximum capacity: 3 x 12,800 = 38,400 words

Transfer Time: 20 ms/track

Power: 50 Hz, 3 x 380 V
maximum power: 557 kcal/h (648 W)
maximum line current: 2.5 A
fuses in mains connection: 6 A

Environment
cooling air: 250 m³/h from plenum, 215 m³/h from ambient
air temperature: 20–30° C
relative humidity: 30–75 %

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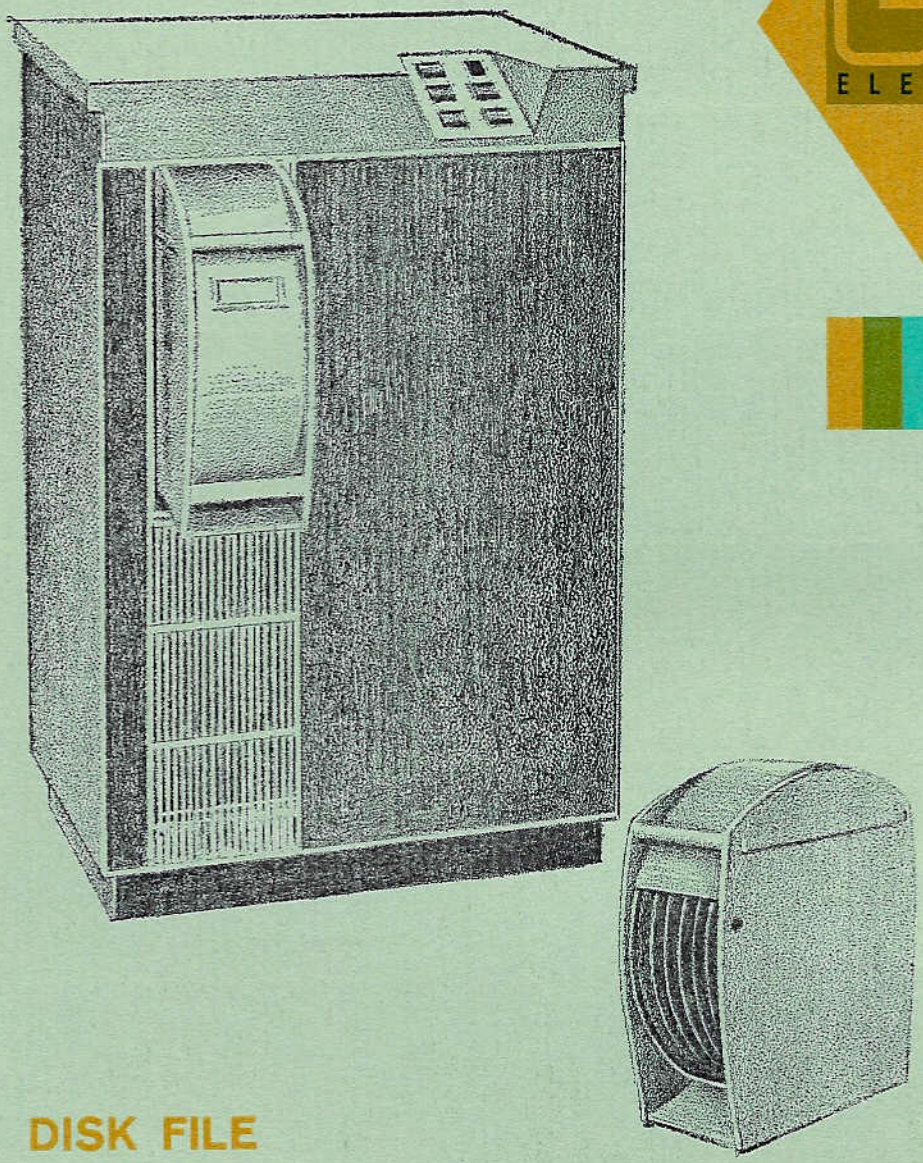
SPECIFICATION

GIER
ELECTRONICS

HARDWARE



DISK FILE

The Disk File is a high-speed, magnetic disk storage device supplementing the immediate access store in the Central Processor. By utilizing interchangeable Disk Kit units, the random access Disk File furnishes unlimited secondary storage capacity and fast access time, which along with balanced data packing provide maximum effectiveness in combination with the GIER Computer, to which a maximum of four Disk Files can be connected.

The removable Disk Kit, a modular package of six magnetic disks, is the basic unit of the Disk File, enabling direct, complete read/write interchangeability with the File. The efficient, self-encased Kits, which can be quickly inserted or removed for storing by the operator, protect the disks when not in use in the File and obviate maintenance adjustments and changes in control settings.

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The File itself, housed in a compact, free-standing unit to ease operation and maintenance, contains the Head Array, control circuitry, and the mechanical device that handles the Kit. When a Kit is inserted, the disks are automatically exposed to the Array; at the same time, the shaft for holding and revolving the disks is positioned.

Organization of data storage in the Disk File is in terms of blocks, surfaces, disks, and disk kit units: a block contains 40 42-bits words; there are 800 blocks per surface, 1600 blocks per disk, and 9600 blocks per unit. The data on the recording surface is accessed by a single read/write head through positioner motion.

CHARACTERISTICS

DISK KIT UNIT

Size: width 14.6 cm, depth 40.0 cm, height 41.1 cm

Weight: 5.5 kg

Number of Disks: 6

Number of Recording Surfaces: 12

DISK FILE

Size: width 68.3 cm, depth 80.6 cm, height 105.0 cm (less door panels)

Weight: 227 kg

Number of Movable Read/Write Heads
1 per disk surface
2 per disk
12 per complete unit

Magnetic Disk Store Capacity: 384,000 42-bit words, random access

block:		40 words or	1,680 bits
surface:	800 blocks or	32,000 words or	1,344,000 bits
disk:	1600 blocks or	64,000 words or	2,688,000 bits
disk kit unit:	9600 blocks or	384,000 words or	16,128,000 bits

Total Number of Disk Files: 4

Transfer Time: 3 ms/block

Positioning Time: 100 ms

Rotational Speed: 2400 rpm (nominal) or 25 ms/rev

Rotational Delay: 12.5 ms (average)

Power: 50 Hz, 3 x 380 V
maximum power: 860 kcal/h (1000 W)
maximum line current: 10 A
fuses in mains connection: 10 A

Environment
cooling air: 200 m³/h from ambient
air temperature: 18–25° C
relative humidity: 40–80 %

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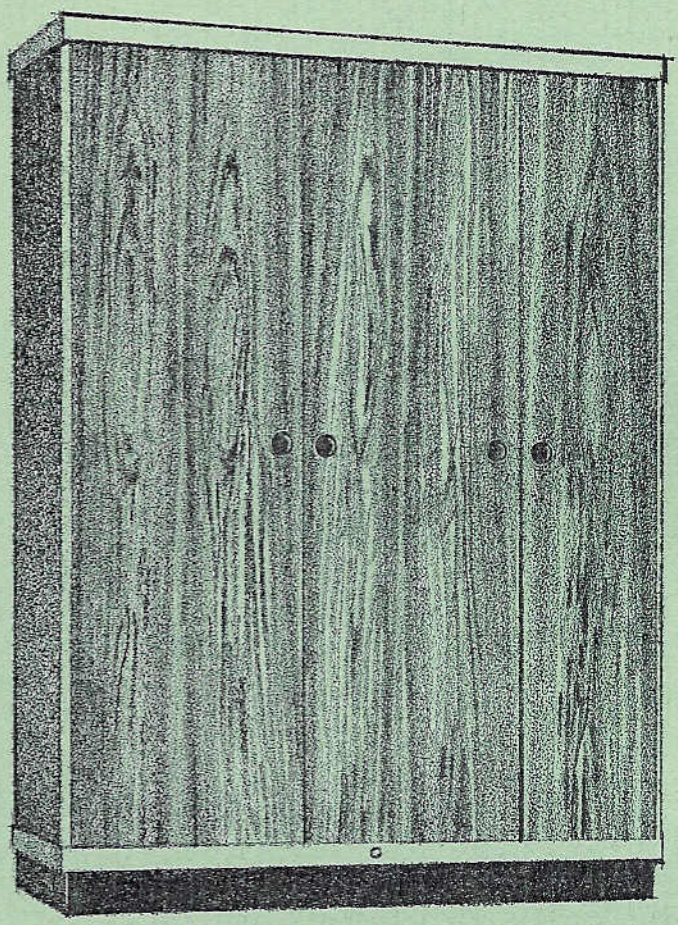

BUFFER STORE

The Buffer Store is an optional, high-speed, secondary storage device designed to supplement both immediate and random access storage and to accomodate magnetic tape transfers.

A buffer serves as an intermediary between two storage systems of varying access times and formats to compensate for the difference in rate of data flow. When used with the GIER Computer, the Buffer Store synchronizes the transmission of data between the immediate access store in the Central Processor and Magnetic Tape Stations or other peripheral devices.

The Buffer Store utilizes a core store of 4096 42-bits words and has transfer times of 7 μs/word for transfers to/from peripheral devices and 15 μs/word for transfers to/from the immediate access store. Transfers take place 42 bits in parallel at the same time as other computer operations. The cabinet housing the Buffer Store has the same size and appearance as the Central Processor cabinet and includes the power supply.

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Besides acting as an auxiliary storage device, the Buffer Store, which is connected to the Central Processor by means of the Data Channel, acts as a control unit for peripheral devices. Up to 4 simultaneously operating Magnetic Tape Stations can be connected by means of the Buffer Store.

Electronic adapters have been developed for the Control Data 9100 Tape Unit, the Facit 64 Carousel, and the Ampex TM-7 Tape Unit. The Magnetic Tape Adapters are mounted in the Buffer Store; there is one Adapter for each magnetic tape device or a maximum of four in the Buffer Store cabinet.

The Computer activates the peripherals via built-in circuits in the Buffer Store, and special interface circuitry for each peripheral connected can be included to suit the particular requirements of the various types of peripheral devices. In addition, this circuitry provides a register for collecting one word to permit word-by-word transfers, where the peripheral itself is only capable of character-by-character transfers.

CHARACTERISTICS

Size: width 144.6 cm, depth 54.2 cm, height 192.7 cm

Weight: 367 kg

Core Store Capacity: 4096 42-bit words

Transfer Times
to/from tape stations: 7 μs/word
to/from central processor: 15 μs/word

Number of Tape Stations: 4 (simultaneous operation)

Power: 50–60 Hz; 3 x 380, 3 x 220 V
maximum power: 581 kcal/h (675 W)
maximum line current: 1 A at 3 x 380 V
fuses in mains connection: 6 A

Environment
cooling air: 700 m^3/h from plenum
air temperature: 18–23° C
relative humidity: 40–70 %

These Characteristics apply to the Buffer Store with 4 Magnetic Tape Adapters.

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SPECIFICATION

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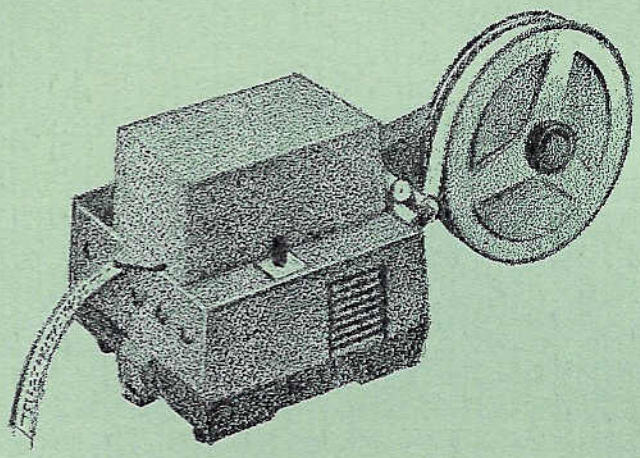
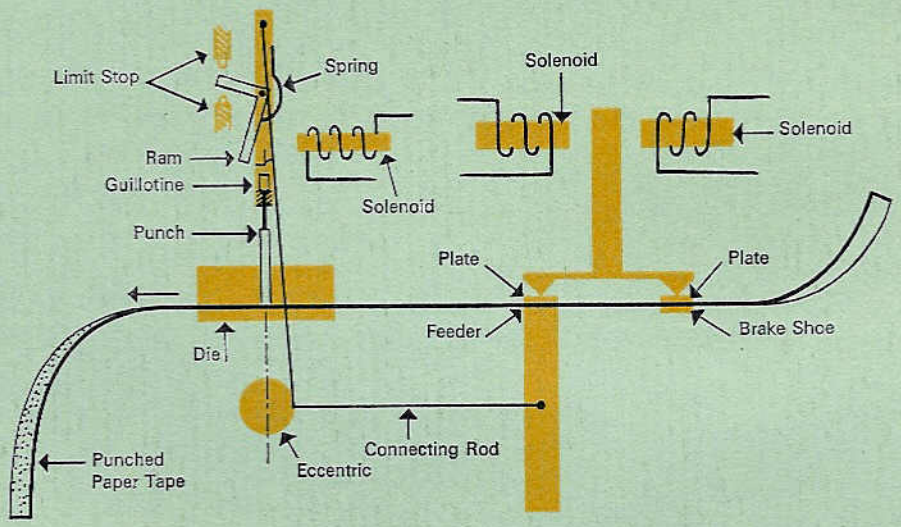
HARDWARE





PAPER TAPE PUNCH

The Paper Tape Punch, which is mounted on the Console, is used with the GIER Computer as an output device for results of limited volume, error reports, program tapes, and the like.

The Punch perforates data on 5/6/7/8-track paper tapes at a speed of 150 char/sec. The tape is available in 300 m rolls, equivalent to 120,000 characters or 13 minutes of continuous punching.

Punching is performed by a solenoid controlled punching mechanism, powered by the same motor that feeds the tape. It takes 0.3 sec to punch a character, unless the punch signal is received within 5 sec after the punching of the preceding character, in which case only 6.7 ms are required.

While the mechanical unit is mounted on the Console, the electronic unit containing the circuitry for the Punch is built into the Console itself. In addition, the Console is provided with a receptacle for chads, which is situated directly beneath the Punch.

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CHARACTERISTICS

Size: width 21.0 cm, depth 51.6 cm, height 21.8 cm

Weight: 16.5 kg

Punching Speed: 150 char/sec

Power: 50 Hz, 220 V (supplied from the Central Processor)
maximum power: 75 kcal/h (87 W)
maximum line current: 0.5 A
fuses in mains connection: 6 A

Environment
cooling air: 120 m³/h from ambient
air temperature: 15–30° C
relative humidity: 40–70 %

These characteristics apply to the mechanical unit only.

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SPECIFICATION

GIER
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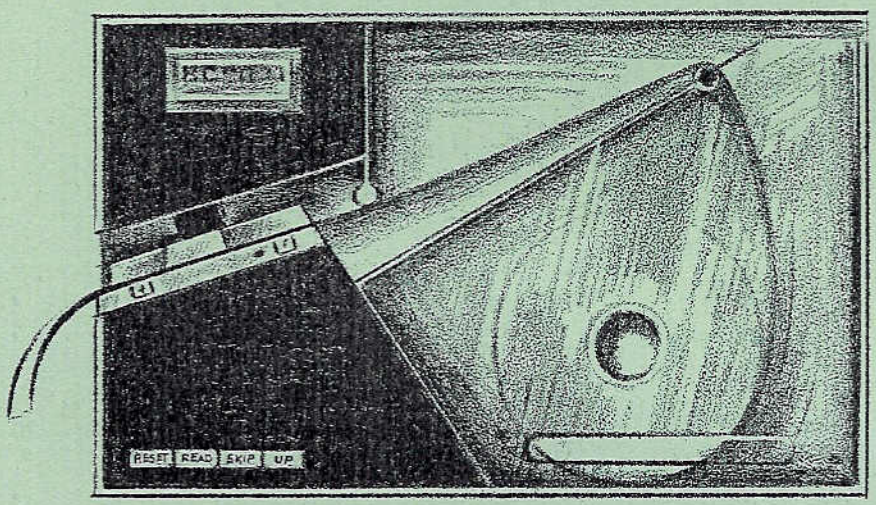
RESET | READ | SKIP | UP

HARDWARE



PAPER TAPE READER

The RC 2000 Paper Tape Reader reads at 2000 characters or 5 meters (ca. 16.5 feet) a second. Moving parts have been reduced to a minimum through the use of electronic functions, and uniform light intensity at the read head is automatically ensured. Free unwinding of tapes facilitates rapid loading – about 3 seconds – and eliminates feed difficulties and tape breakage.
The high-speed RC 2000 can be used on-line for input of data, programs, and the like to electronic computers or employed as a general purpose input device in conjunction with magnetic tape stations and/or other peripherals, e.g. in off-line data conversion with the RC 3000 Converter (see Specification). Besides being a fully transistorized, photo-electric reader, the RC 2000 incorporates the Servo Input Buffer System.

Normally RC 2000 accepts perforated paper tapes of the following types, punched in any suitable opaque medium:

Type	Number of Tracks	Nominal Width
One Inch	8 maximum	25.4 mm (1″)
Seven-Eighths Inch	7 maximum	22.2 mm (7/8″)
Olivetti (rectangular holes)	6	20.5 mm
Eleven-Sixteenths Inch	5	17.5 mm (11/16)″

Spliced tapes can also be read by RC 2000. Splicing is easily done with a special transparent, adhesive tape.

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Switching from one tape width to another takes only a second, turning the two tape width selector knobs on the front panel. A paper out control causes RC 2000 to stop at the physical end of tape; all further input to the Buffer is blocked, and the pressure lid, which holds the tape in place in the tape guide, springs up to facilitate reloading.

Servo Input Buffer System

The RC 2000 incorporates a servo input buffer system, whereby the number of unprocessed characters in a 256-word core store regulates the reading speed. By employing this core store as a buffer between RC 2000 and the computer or other processing device, it has been possible to let the tape be driven by a simple servo motor, thus eliminating abrupt starting and stopping and the resulting risk of tape breakage.

The Servo Input Buffer System can easily be adapted to control other input devices, such as a punched card reader or an optical reader.

CHARACTERISTICS

Size: width 52.0 cm, depth 46.3 cm, height 32.6 cm

Weight: 36 kg

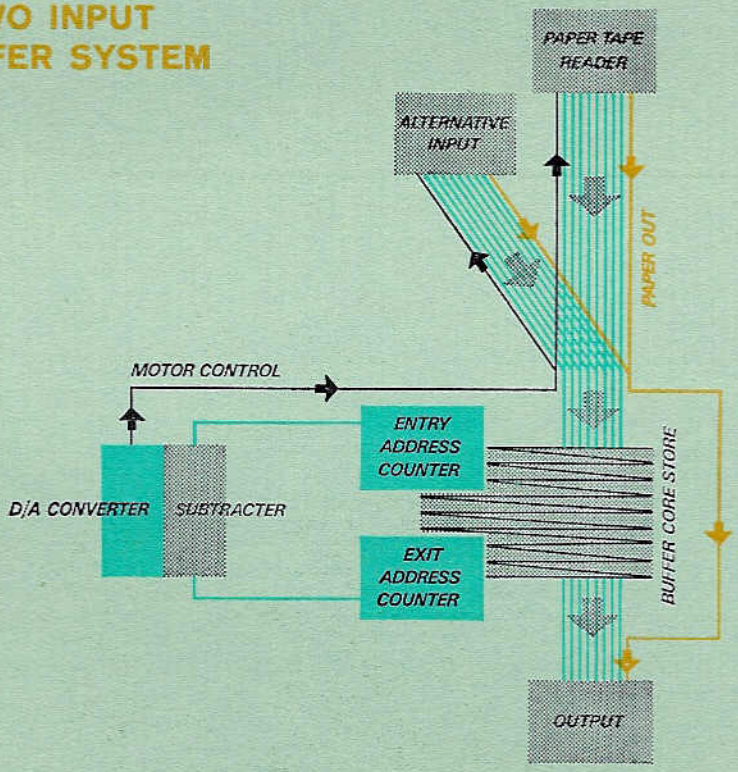
Reading Speed: 2000 char/sec

Tapes Accepted: widths equivalent to 5, 7, 8, and Olivetti 6 track tapes

Power: 50–60 Hz; 115, 127, 220 V
maximum power: 119 kcal/h (138 W)
maximum line current: 1 A at 220 V
fuses in mains connection: 6 A

Environment
cooling air: 120 m³/h from ambient
air temperature: 15–30° C
relative humidity: 40–70 %

SERVO INPUT BUFFER SYSTEM



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SPECIFICATION

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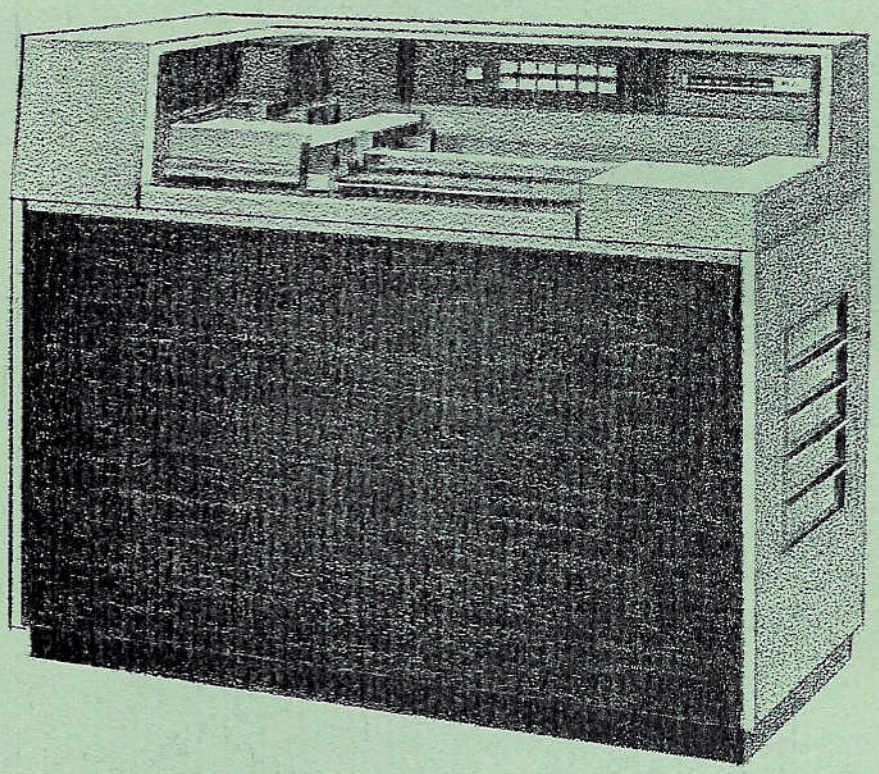
HARDWARE



PUNCHED CARD READER

For input of data on cards, the high-speed Punched Card Reader, which reads 1200 80-column or 1500 51-column cards a minute, is connected to the GIER Computer by means of the Servo Input Buffer System of the RC 2000 Paper Tape Reader (see Specification).

The Card Reader utilizes asynchronous, pneumatic card feed, photo-electric sensing, and column read. Card handling techniques assure reliability, operational efficiency, and extended card life, permitting even the reading of cards that have been bent or crumpled. To ensure accuracy, the read station employs a dual-read comparison check. In addition, a light/dark pre-read check is performed on each data channel, before the card is read. Reading by columns rather than by rows eliminates the need for large data storage and disassembly registers and frees the Computer of the necessity of rearranging the card word.

When cards in the feed tray reach the picker, they are separated by air injection; the cards are then removed in sequence by a rotating vacuum capstan for transportation past the station. If a card is not picked from the deck within a specified time, a fail-to-pick signal is sent to the Computer. From the read station the cards are turned on rollers and passed along to the stacking tray with original sequence and deck orientation maintained.

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Following the reading of the last column and without lessening the reading rate, the Computer determines in 1.5 ms whether a card is to be accepted or sent to the reject tray, thus enabling a limited amount of sorting. Depending on instructions from the Computer, the Card Reader can continue reading or stop.

The feed and stacking trays both vibrate to provide a constant force at the picker and the stacker regardless of deck length. The reject tray may be used for sorting or for storing rejected cards.

Housed in a compact, free-standing unit, the Punched Card Reader employs solid-state circuitry combined with pluggable modules and subassemblies. Front access to the logic chassis and power supply and the practical arrangement of the control panel provide operating and maintenance convenience.

CHARACTERISTICS

Size: width 144.7 cm, depth 83.0 cm, height 117.6 cm

Weight: 478 kg

Reading Speed
80 column: 1200 cards/min
51 column: 1500 cards/min

Card Tray Capacities
feed tray: 4000 cards
stacking tray: 4000 cards
reject tray: 240 cards

Power: 50 Hz (60 Hz available); 3 x 208 V or 3 x 380 V
maximum power: 2200 kcal/h (2519 W)
maximum line current: 10 A at 3 x 380 V
fuses in mains connection: 15 A

Environment
cooling air: 850 m³/h from ambient
air temperature: 17–25° C
relative humidity: 35–60 %

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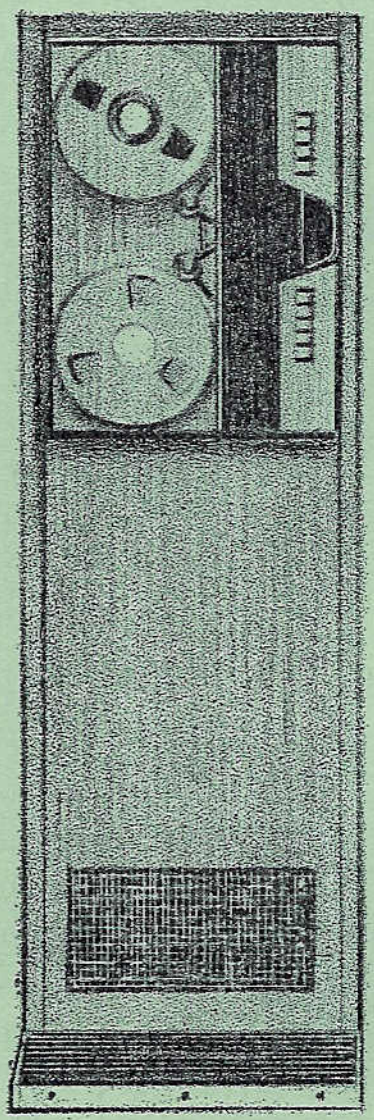

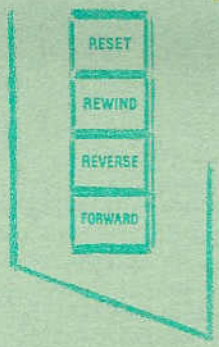

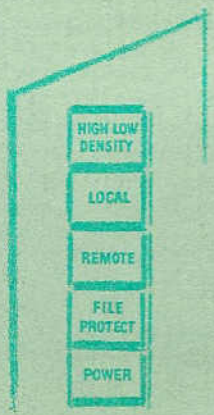

MAGNETIC TAPE STATION

The Magnetic Tape Station, which is used with the GIER Computer for storage and manipulation of data, is connected to the Central Processor by means of the Buffer Store (see Specification), the data channels in the Buffer Store enabling connection of up to four tape stations. Aside from this, the Magnetic Tape Station is an integral part of the RC 3000 Converter for off-line data conversion from selected input device to selected output device (see Specification).

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In the Magnetic Tape Station a single servo-driven capstan and a low-friction tape path are used for tape drive. No pinch rollers are used, and therefore there is no need for mechanical adjustments. The tape is held in contact with the capstan at all times by an even, low tension that is derived from vacuum buffer chambers, reducing tape wear and giving uniform, closely controlled performance.

The Magnetic Tape Station incorporates microprogrammed searching for and sensing of load-point and end-of-file marks. The combined read/write head permits read-after-write checking for parity and continuity. Writing on a reel of tape can be prevented by removing the plastic write-enable ring on the back of the reel. Greater recording reliability is assured by built-in tape cleaners.

The magnetic tape used has seven tracks, is one-half inch wide, and is internationally compatible. Tape length is 800 meters (2450 feet), which corresponds to 5.8 or 16.3 million characters in low or high density. Block length is variable (see Magnetic Tape Utilization table on separate Specification).

CHARACTERISTICS

Size: width 57.2 cm, depth 57.0 cm, height 179.9 cm

Weight: 166 kg

Tape Speed: 36 inches/sec

Recording Density
200 char/inch (low density) and 556 char/inch (high density)
800 char/inch to be made available

Transfer Times:
7200 char/sec at 200 char/inch
20000 char/sec at 556 char/inch
28800 char/sec at 800 char/inch

Tape Length: 800 m (2450 feet) equivalent to
5.8 million characters at 200 char/inch
16.3 million characters at 556 char/inch

Interblock Gap: ¾ inch

Rewind Speed: 180 inches/sec
800 m can be rewound in about 3 minutes.
During rewinding the tape is not removed from the vacuum chambers.

Start Times
from start of tape until reading begins: 12 ms
from start of tape until writing begins: 14 ms

Power: 50–60 Hz; 220 V and 3 x 220 V
maximum power: 731 kcal/h (850 W)
maximum line current: 4 A at 220 V
fuses in mains connection: 6 A

Environment
cooling air: 300 m³/h from ambient
air temperature: 16–32° C
relative humidity: 40–70 %

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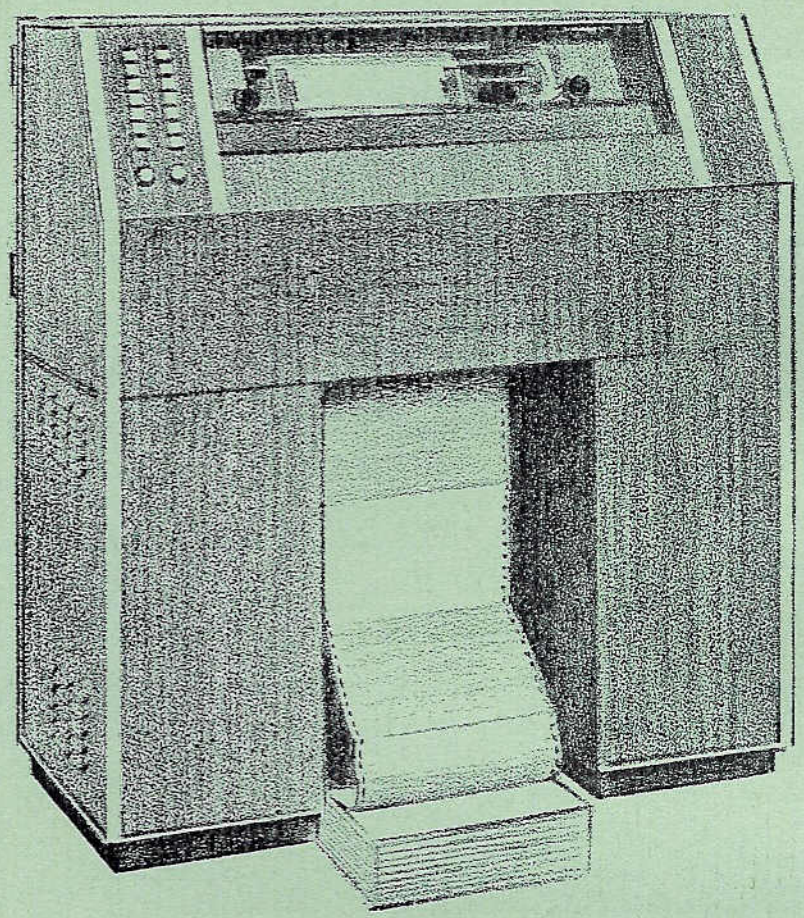

LINE PRINTER

As an output device with both on-line and off-line applications, the Line Printer is connected by means of the Line Printer Adapter to the GIER Computer and is also used in conjunction with the RC 3000 Converter (see Specification). The standard model has a speed of 667 lines/min with 160 print positions and a print density of 10 char/inch horizontally and 6/8 lines/inch vertically. Other models are available.

The Line Printer has a single-line buffer that accepts character-by-character output from the Computer and composes it into lines. Since the buffer is scanned during printing, it is unable to accept further output, but as soon as all the characters have been printed, the buffer is released. As the characters on the print barrel are arranged in order of greatest frequency, the buffer is released on the average in less than half a revolution, so that the paper can be advanced and the printing of the next line begun before the next revolution. The single-line buffer has a tabulation facility.

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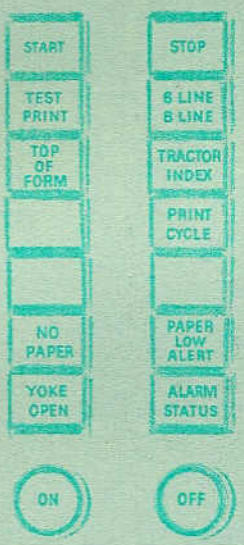
The Line Printer has a character set of 64 characters consisting of the decimal digits, the alphabet (capital letters), and certain special symbols. With a few exceptions, the relationship between numerical values and typographical symbols is the same as for the off-line Perforator Typewriter (see Table of Codes); moreover, this code may be easily altered by changing a code disk in the Line Printer. Other character sets are available.

The vertical format is controlled by a special 8-track paper tape. Paper is skipped at a speed of 27.5 inches (70 cm) a second, and an optional high-speed paper feed facility (75 inches/sec) is available.



0 1 2 3 4 5 6 7 8 9

A B C D E F G H I J

K L M N O P Q R S T

U Ü V W X Z Y Æ Ø Å

_ | [> < ^ ˇ] ( )

× = : ; , ₁₀ + − / %

& * '

CHARACTERISTICS

Size: width 124.4 cm, depth 77.0 cm, height 138.5 cm

Weight: 482 kg

Printing Speed: 667 lines/min maximum

Print Positions: 160

Print Density: 10 char/inch horizontally; 6/8 lines/inch vertically

Paper Skip Speed: 70 cm or 24.5 inches/sec

Power: 50 Hz, 220 V
maximum power: 808 kcal/h (940 W)
maximum line current: 6 A
fuses in mains connection: 10 A

Environment
cooling air: 120 m³/h from ambient
air temperature: 18–25° C
relative humidity: 40–70 %

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SPECIFICATION

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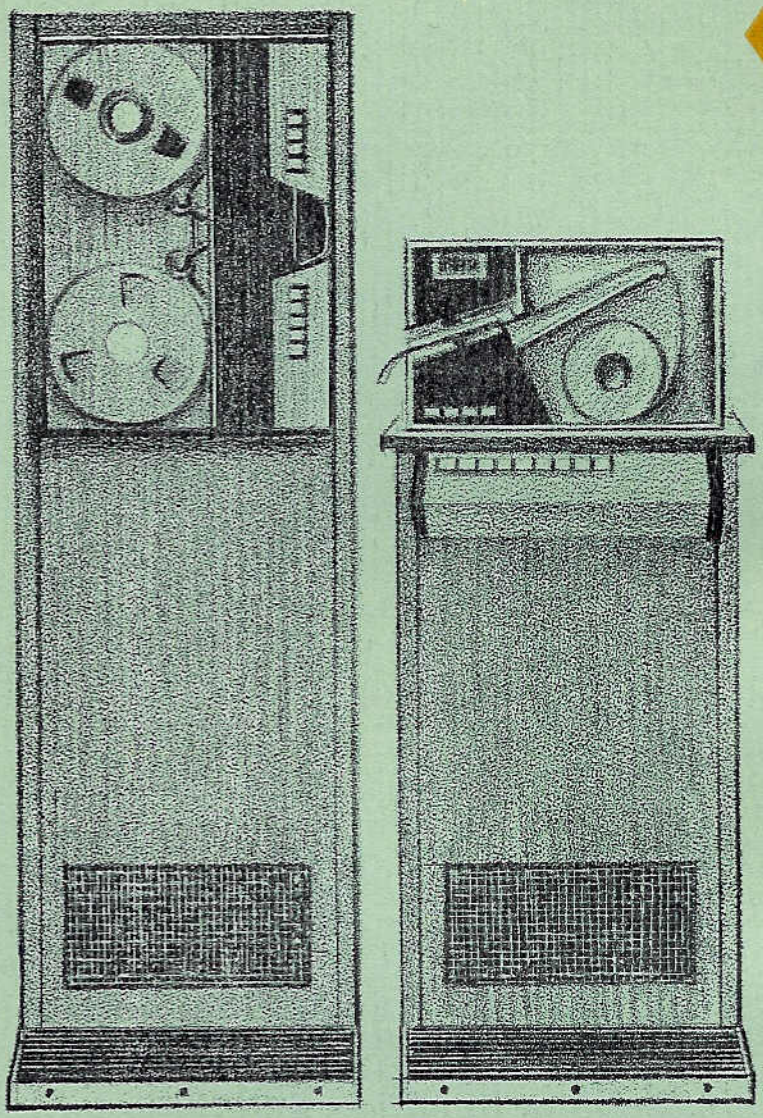
HARDWARE



CONVERTER

The RC 3000 Converter for multi-directional, off-line data conversion provides better utilization of both computer and peripherals by enabling exclusive use of magnetic tape as a high-speed input/output medium for the computer. Conversion modes include: paper tape or alternative input to magnetic tape, magnetic tape to optional output device, and paper tape or alternative input to optional output device.

The RC 3000 consists of the Converter Unit, the RC 2000 Paper Tape Reader, which is mounted on top of the former, and the Magnetic Tape Station, with provision for connection of Line Printer, Punched Card Reader, or any peripheral device that can be conditioned to inpart/receive data in the form of 8-bit characters. Through the use of electronic functions, the number of moving parts has been minimized, and the comprehensive use of solid-state circuitry further ensures reliability. The Converter is compact, neat in appearance, and easy to operate and maintain.

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The Converter Unit contains a core store of 1024 8-bit words and has a cycle time of 7 μs. Parity checking, which is performed throughout the conversion process, includes transfers in the core store, transfers to and from magnetic tape, and input from paper tape or alternative device. A catalog, which is read in to the store before each run, provides universal code conversion; the remainder of the store is used to buffer blocks of data during conversion.

The length of the catalog varies according to the number of bits in the input character, but has a maximum length of 512 words. Functions in the catalog allow: conversion to any 7-bit character, catalog shift, deletion, and end of block (with or without stop). Each block is buffered in the portion of the core store not occupied by the catalog. Block length depends on the size of the catalog, is variable through programming, and may range from 1 to 1024 characters. Data format is optional, and standard American printer formats are catered for.

The Paper Tape Reader and the Magnetic Tape Station are described fully in separate Specifications.

CHARACTERISTICS

Size: width 58.9 cm, depth 62.0 cm, height 140.9 cm

Weight: 121 kg

Converter Unit Core Store
- cycle time: 7 μs
- capacity: 1024 8-bit words

Paper Tape Reader
- speed: 2000 char/sec
- tapes accepted: widths equivalent to 5, 7, 8, and Olivetti 6 tracks tapes
- servo input buffer
  - number of unprocessed characters regulates reading speed
  - adaptable to alternative input device

Magnetic Tape Station
- tape speed: 36 inches/sec
- tapes used: 7-track, ½ inch, internationally compatible
- recording densities: 200 and 556 char/inch
- transfer time: 20,000 char/sec at 556 char/inch
- transfers: binary or BCD characters
- error detection: read-after-write check for parity and continuity

Power: 50 Hz, 220 V
- maximum power: 334 kcal/h (388 W)
- maximum line current: 2 A
- fuses in mains connection: 6 A

Environment
- cooling air: 280 m³/h from ambient
- air temperature: 18–25° C
- relative humidity: 40–70 %

These Characteristics apply to the Converter Unit with the Paper Tape Reader. Complete Characteristics for the Paper Tape Reader and the Magnetic Tape Station are contained in separate Specifications.

Typical Conversion Modes

PAPER TAPE to PUNCHED CARDS OPTICAL READER to MAGNETIC TAPE
PAPER TAPE or PUNCHED CARDS to LINE PRINTER or to MAGNETIC TAPE
MAGNETIC TAPE to LINE PRINTER or to PLOTTER

Selected Conversion Speeds

Paper Tape to Magnetic Tape: 2000 char/sec
Punched Cards to Magnetic Tape: 1200 – 1500 cards/min
Magnetic Tape to Line Printer: ca. 10 lines/sec
Punched Cards to Line Printer: 1200 – 1500 cards/min
Paper Tape to Line Printer: ca. 10 lines/sec

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SPECIFICATION

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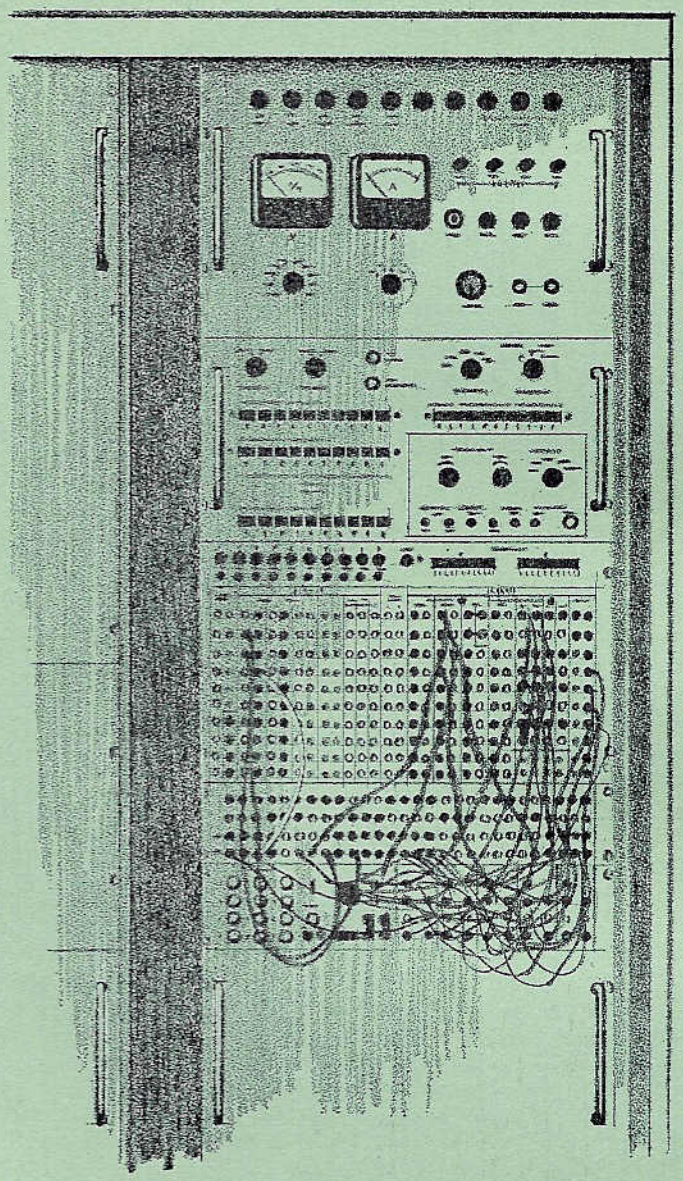
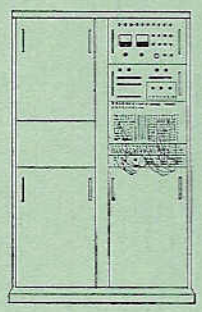
ELECTRONICS

HARDWARE





HYBRID COMPUTER LINKAGE EQUIPMENT

Research involving the application of digital computers to process control may be carried on effectively with a hybrid computer system, in which the process is simulated by an analog computer. The GIER System can accordingly be extended by the addition of Hybrid Computer Linkage Equipment to provide a means of communication between the GIER Computer and analog computers or other types of analog voltage systems.

The main purpose of the Hybrid Computer Linkage Equipment is to convert from analog voltages to digital numbers and vice versa. In addition, the Equipment is provided with a number of input and output channels, e.g. for digital potentiometers and on/off parameters.

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The GIER Computer can be provided with an interrupt unit, so that a signal to one of the interrupt channels immediately initiates a special program. The interrupt channels may be given different priorities by means of a programmed masking register.

Although the requirements of individual users differ greatly, GIER Electronics Hybrid Computer Linkage Equipment can be adapted to almost every conceivable application.

CHARACTERISTICS

Communication between the GIER Computer and the Equipment takes place on a digital basis. The IL instruction transfers data to the accumulator in the computer, while the US instruction transfers data from the accumulator. One instruction transfers 10 or 20 bits.

35 Analog Input Channels These are connected to an analog/digital converter by means of a transistor multiplexer.

Input Range:	+ 10 V to – 10 V and/or + 100 V to – 100 V, single ended
Input Resistance:	5 kΩ and/or 50 kΩ or 10 MΩ with optional input amplifier
Conversion Time:	60 μs
Accuracy:	± 0.1% of full scale, long term

12 Analog Output Channels The analog outputs are generated by digital/analog converters driven by 10-bit buffer registers.

Output Range:	± 5 V (no load)
Output Resistance:	2.5 kΩ ± 0.1 %
Settling Time:	2 μs

10 Digital Inputs These are provided with buffer elements (10-bit registers) for temporary data storage between reading operations.

80 Digital Outputs These are provided with buffer elements arranged in 8 10-bit registers for storage of data between writing operations.

1 Control Register This 10-bit register is a digital output channel normally used for functional control purposes, such as controlling the operation modes of an analog computer. As a programming facility, the register is designed to permit the contents to be read into the computer again and data to be loaded into the control register using part of the accumulator as a masking register.

2 10-Bit Registers that can be connected by means of a switch either as a buffer register for 10 digital inputs or as a control register.

Options The equipment may be provided with a number of inputs or outputs, analog or digital, different from those mentioned above. The buffer registers may be expanded to 20 bits. The cabinet that houses the equipment may be placed at a distance greater than 5 m from the computer by incorporating a set of cable-drivers and -receivers.

The Interrupt Unit

The interrupt unit containing 12 interrupt channels is housed in the central processor cabinet.
Interrupt calls are stored until the response program can be carried out.
As a programming facility, interrupt calls may be blocked by means of a 10-bit masking register.
When an interrupt call passes the mask, it causes a jump from the program in progress to a subroutine that corresponds to the interrupt channel number.
After the response routine is completed, the main program continues as if nothing had happened.
Concurrent interrupt calls are processed in a fixed, built-in order.

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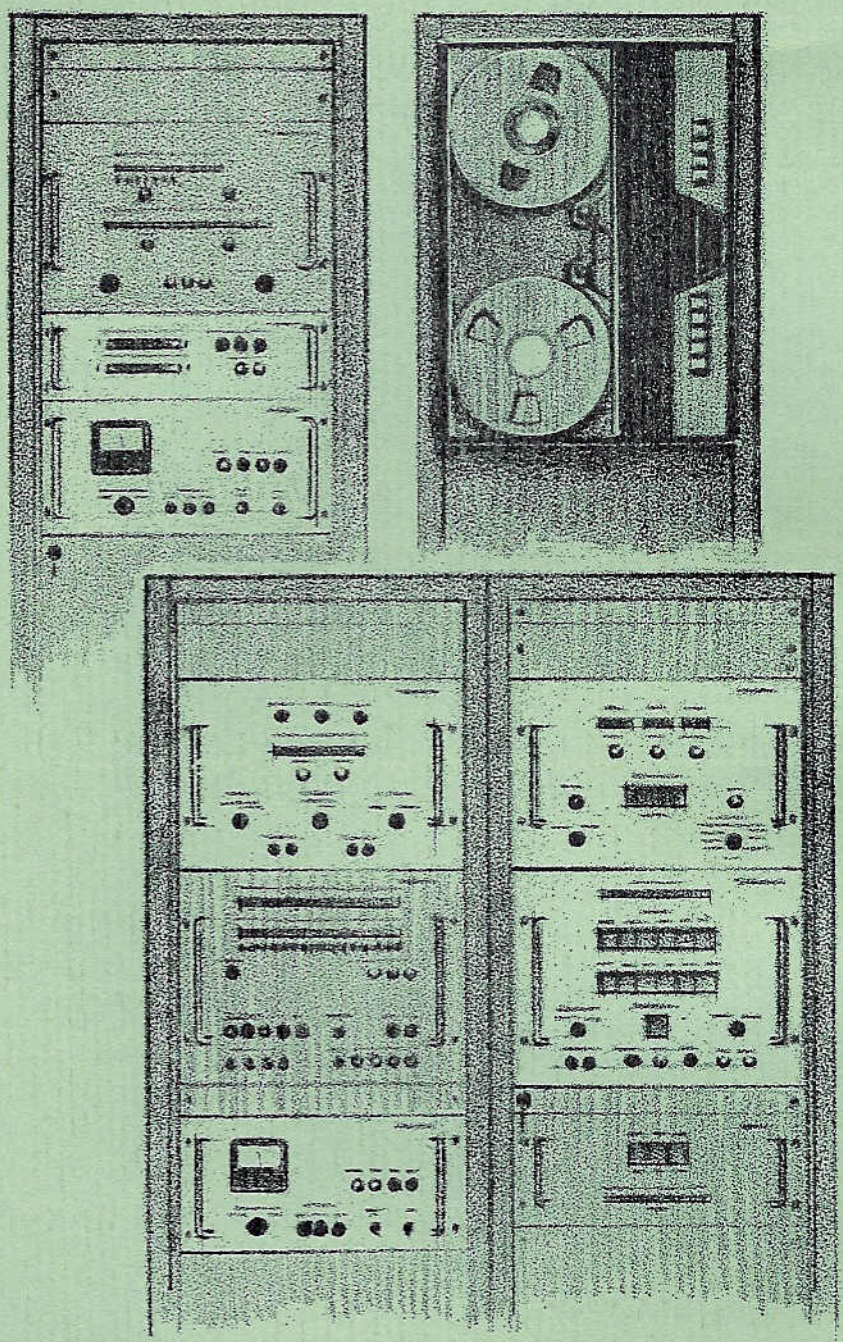

DATA LOGGING SYSTEM

The RC Data Logging System for high-speed acquistion, handling, and recording of data enables off-line collection of analog and digital data with recording on magnetic tape in standard computer format.
Analog input voltages are converted to digital numbers and recorded along with digital input data and time records from a digital clock. The analog inputs are divided into a fast-scan group with a scanning speed of 10,000 ch/sec and a slow-scan group with a scanning speed of 20 ch/sec. The average scanning speed including time between scans is 500 ch/sec maximum.

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The System accepts a maximum of 500 input channels. A scan program may consist of several or all channels from one, two, or all three of the following groups: fast-scan, slow-scan, or digital scan.
The data recorded on magnetic tape may be processed in the GIER Computer using the same tape station used for logging. The computer can read or write on magnetic tape in a character-by-character manner using the same core store used during logging.
The System is composed of a number of system modules from the RC Data Logging Modules Series. The Modules are mechanically independent units constructed for 19-inch standard racks.
The circuits used are from the RC Logic Modules Series 500 and 1000, constructed from professional components and designed to meet the need for high reliability and effective noise immunity.
The System is furnished with the following built-in, automatic checking facilities: high temperature, power drop-out, parity (throughout the system including core store), over-range of input signal, and error in analog to digital conversion (special check voltage).

CHARACTERISTICS

Analog Inputs

Fast-Scan Group	ranges:	+ 10 V to – 10 V or + 1 V to – 1 V, single ended inputs
	input resistance:	2.5 kΩ or 10 MΩ
	scanning speed:	10,000 ch/sec, peak 500 ch/sec, maximum average
	accuracy:	± 0.1% of full scale, long term
	program:	set from control panel
Slow-Scan Group	ranges:	+ 25 mV to – 25 V and + 5 V to – 5 V
	input resistance:	1 MΩ minimum floating differential input terminals
	common mode noise rejection:	100 dB
	scanning speed:	20 ch/sec
	accuracy:	± 0.1% of full scale, long term
	program:	group of consecutive channels
Digital Inputs	scanning speed:	10,000 ch/sec, peak 500 ch/sec, maximum average
	bits/channel:	10
Control	complete scan repetition rate from 0.01 sec to 4 hours facilities for a number of manual operations available automatic stop of scanning at selected time	
Output	magnetic tape, 20,000 ch/sec, recorded in internationally compatible format in blocks of a maximum of 511 characters record of time at beginning and end of each scan channel number and measured value recorded decimal display of time in hours, minutes, and seconds	

The data logger cabinet may be placed at a distance from the computer.
Computer programs for testing the buffer and the tape station and for print-out of collected data are available.

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SPECIFICATION

GIER ELECTRONICS

SOFTWARE

GIER ALGOL COMPILER

<basic symbol> ::= <letter> | <digit> | <logical value> | <delimiter>

<letter> ::= a | b | c | d | e | f | g | h | i | j | k | l | m | n | o | p | q | r | s | t | u | v | w | x | y | z
A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z

<digit> ::= 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

<logical value> ::= true | false

<delimiter> ::= + | − | × | / | : | ↑
< | ≤ | = | ≥ | > | ≠
= | => | ∨ | ∧ | -,
go to | if | then | else | for | do
, | . | 10 | : | ; | := | _ | step | until | while | comment
(|) | [|] | ≮ | ≯ | begin | end
own | Boolean | integer | real | array | switch | procedure
string | label | value

abs
arctan
char
cos
drum place
entier
exp
from drum
gier
gierdrum
gierproc
inchar
inone
input
kbon
ln
lyn
outchar
outclear
outcopy
outcr
output
outsp
outsum
outtext
pack
setchar
sign
sin
split
sqrt
todrum
typechar
typein
write
writechar
writecopy
writecr
writetext

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Adhering faithfully to ALGOL 60, the unusually capable GIER ALGOL Compiler is an outstanding aspect of the GIER Computer and reflects the advanced techniques developed by our associate compiler group.

ALGOL 60 (**algo**rithmic **l**anguage) is an international programming language, i.e. a language that can be translated by means of an electronic computer into the language of the computer itself, the so-called machine code. Programming in ALGOL has several advantages over programming in machine code.

1. ALGOL is problem-oriented – programming is therefore easier and less time-consuming, especially as regards the corrections that usually have to be made during preparation and revision of programs.
2. An ALGOL program is an English-language description as well as a program; thus it can be directly understood by others including non-programmers.
3. Since ALGOL 60 is independent of the computer, ALGOL programs may be employed in electronic computers of various types and makes.

ALGOL has been constructed with the description of numerical and logical processes in mind; thus an ALGOL program consists of a number of statements and expressions describing both the calculations and the sequence in which they are to be executed.

The procedure, a special ALGOL concept that consists of a program-independent algorithm, has proved extremely useful, and forms the basis of the GIER System Library (see Specification). Examples of such library procedures are matrix arithmetic, the solution of linear equations, least squares, approximation of data, integration, and special functions.

The GIER ALGOL Compiler accepts the entire ALGOL 60 language except **own array.** Programming possibilities are very extensive, a large variety of input and output procedures in included, and ample provision has been made for using machine code.

ALGOL programs for the GIER Computer are punched on 8-track paper tape, which is then translated by means of the GIER ALGOL Compiler. During compilation – performed at a speed equivalent to the generation of about 2300 machine instructions per minute – the program is tested for errors in syntax, and relevant error messages are output on the Monitor Typewriter. The object programs generated by the Compiler are almost as effective as "hand-made" programs, due in part to the Compiler's dynamic, fully automatic administration of the immediate access and secondary stores.

If a syntactical error is detected during translation, the Compiler does not stop; after informing the operator of the error, the erroneous instruction is erased from the program, after which the Compiler continues to check for further errors. One test run may therefore often suffice to find all syntactical errors in a program.

Compilation time is exceptionally fast: from 4 to 180 seconds per program. The Compiler occupies about 6000 words of the secondary store, according to mode of use; a special transient edition for compilation of very large programs, however, is available. This two-phase version occupies only 2680 words of the drum store, the second phase being read in from paper tape during compilation.

The new, forthcoming version of the GIER ALGOL Compiler, GIER ALGOL IV, is expected to include certain extensions of the ALGOL language and facilities for handling magnetic tape and using disk files.

Not only does the GIER ALGOL Compiler facilitate the writing of programs, but within the abundant storage space provided by the Disk File and with the specially adapted service routines furnished by the GIER System Library, up-dating of programs can be carried out without recourse to paper tape. Programs can accordingly be compiled from any specified area of the Disk File, while compiled programs can be stored in other selected areas ready for use, so that paper tape copies of such programs are only needed for documentation and similar purposes.

Attention is called to the table entitled Selected Execution Times in GIER ALGOL, which appears on a separate Specification.

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SPECIFICATION

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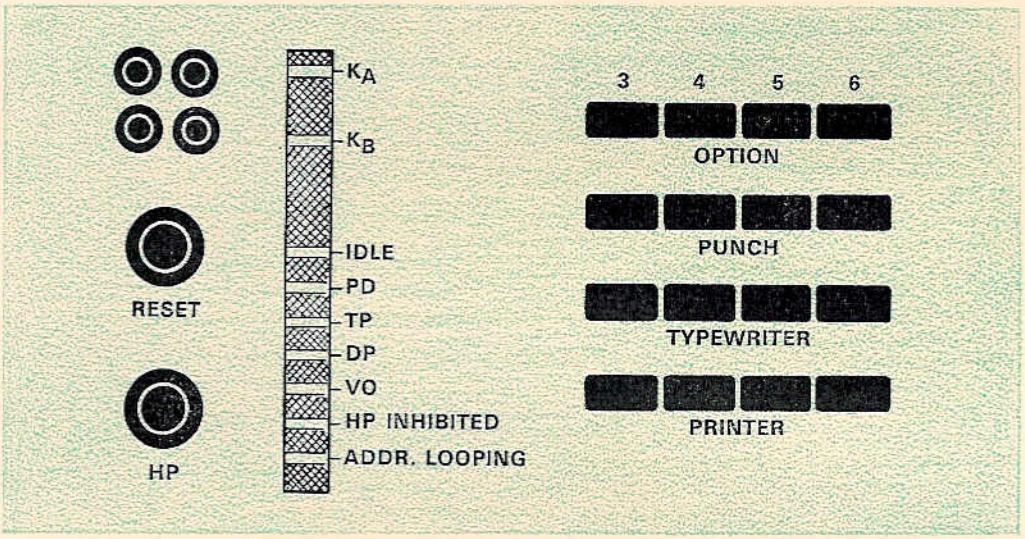
SOFTWARE



HELP ADMINISTRATIVE SYSTEM

HELP is an administrative system designed for the GIER Computer to promote the testing and running of programs. Besides a central administration program, monitored by typewriter input, and a number of subroutines, the System has an interrupt facility: by pressing the so-called HP button the program in progress is interrupted and the contents of the immediate access store and appropriate registers are transferred to secondary storage.

While the SLIP Input Program, the largest and most important of the subroutines, is described in a separate Specification, the chief aspects of the central administration program and some of the utility subroutines, such as those used for normal output, storage dumps, initializing, comparison of storage sections, and tracing programs during a run, are outlined here.

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HP Button and HELP Administrator

Since the immediate access store is rather small, the System is designed to occupy only 10 cells of the former during a program run; on the other hand, it is obvious that during an interrupt the System must be able to use a much larger part of the immediate access store and yet restore its contents before the run is continued.

At present this is accomplished by reserving the last 26 tracks of the drum store for an "image" of the immediate access store during the interrupt. Since the System proper occupies the first 58 tracks of the drum, the total storage available to the programmer consists of the 1024 cells of the immediate access store and about three-fourths of the 320 drum tracks.

Since writing is inhibited on the first 32 of the 58 reserved tracks, it is impossible to destroy the basic part of the HELP System during a normal run.

One may call for an interrupt at any stage of a run. Pressing the HP Button causes the contents of the registers and the immediate access store to be stored in the image on the last 26 tracks of the drum and control to be transferred to the HELP Administrator, which waits for typewriter input describing what action is required. One can now activate any of the HELP subroutines or make corrections in the stored program.

When the desired operation has been completed, one must type an end signal, thereby causing the immediate access store and the registers to be restored from the image and control to be transferred to the point in the program where the interrupt was called for.

HELP Utility Subroutines

The subroutines described here may be devided into three groups according to use before, during, or after a run.

Before a run one may use a subroutine to initialize the entire computer. After input of the program, this can be copied to an unused part of the secondary store for later comparisons or for restoring the initial situation, should something go wrong during the run.

During a run one may use tracer subroutines to follow the program's activities, for example to make reports when jumps are performed or when the contents of selected registers or cells change value. One may also cause storage dumps to be made every time a selected instruction is executed. In addition, HELP includes subroutines for the standard output of texts and numbers.

After a run one may use subroutines for dumps of any part of the store, for comparison of the program before and after the run, and for output of the corrected program in condensed form suitable for fast input.

If additional facilities are desired, it is easy to extend the HELP System to include new subroutines, either in addition to or instead of some of the standard routines.

If maximum available storage is required on the other hand, the HELP System can be confined by sacrificing some of the facilities to 26 + 39 drum tracks (needed to keep the interrupt facility, the Administrator, and the SLIP input routine intact) instead of 26 + 58 tracks.

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S P E C I F I C A T I O N

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SLIP INPUT PROGRAM

b	<declaration>	: core store block head (b alone dummy)
b	i=<predefined address>	: core store block head
b	k=<predefined address>	: drum block head
c	<integer>	
d	<name>=<predef. address>, ...:	definition of serial address and/or label (d superfluous)
e		: termination of block
e	<predefined address>	: termination of input
f		: floating-point numbers
h	<HELP routine name>	: call of HELP routine
l		: input via tape
m		: fixed-point numbers
n		: cancel automatic relative addressing
r		: establish automatic relative addressing
s		: input via typewriter
t		: text
u	<predefined address>	: definition of exit address
x		: dump table of labels
x	<predefined address>	: dump table of labels
z		: restore table of labels
z	<predefined address>	: restore table of labels

All other underlined letters (expect g) have the same effect as s.

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SLIP (**S**ymbolic **L**anguage **I**nput **P**rogram) is a symbolic loader program incorporated as a subroutine in HELP and always called via the HELP Administrator. Thus the basic programming language used with the GIER Computer is called the SLIP language, i.e. the language accepted by the SLIP input routine.

SLIP reads instructions, strings of text, and three types of numbers, viz. fixed-point numbers, floating-point numbers, and integers, which can be packed with a maximum of four integers per cell. Input may include comments [in square brackets for instance] which are ignored by SLIP.

SLIP permits symbolic addressing, an important advantage meaning that the address constant and the increment of an instruction may be symbolic names, the values of which are defined through the use of the names as labels elsewhere in the program. Although the class of names available is restricted, the SLIP language has a block structure much like ALGOL with regard to the use and scope of such names:

1. names must be declared in a block head before use and may be used within the block, the head of which contains the declaration, viz. that they are local to that block;
2. if a name is declared in each of several blocks within one another, the name may have different values on each block level.

In designing SLIP special consideration has been taken for ease in using symbolic names in connection with relative addressing.

During input an extensive syntactical check is made: whenever an error is found, an appropriate message is typed out, after which SLIP continues to read in the program, skipping the remainder of the erroneous material or numbers. This means:

1. all syntactical errors can frequently be detected in one run;
2. if there are only one or two minor errors in a program, they can be corrected at once by means of HELP;
3. a test run can be completed despite these errors.

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SPECIFICATION

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GIER SYSTEM LIBRARY

SOFTWARE

0. **General Information**
0.0 General
0.1 Techniques
0.2 Programming
0.3 Organization

1. **Service Routines**
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1.1 Executive
1.2 Hardware Test
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2. **Basic Data Processing**
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6.3 Mechanics, Mechanical and Civil Engineering
6.4 Electrical Science and Engineering

7. **Business Applications**
7.0 General
7.1 Payroll
7.2 Sales Statistics
7.3 Banks

The GIER System Library is a centralized information service for GIER System users, providing information about existing publications, such as descriptions and tapes of programs and subroutines, books, reports, and surveys, and forwarding these to the user on request.

It is important that computer users have easy access to **library routines,** i.e. programs or subroutines that perform frequently recurring jobs. The advantages of applying library routines are:

1. that library routines exist in finished and tested form – the user is spared the task of programming and related debugging;
2. that library routines are intended to be as optimal as possible as regards program length, running time, and accuracy – they are programmed by specialists.

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The library routine is prepared either as a **program** for solving a whole problem or as a **subroutine** to be incorporated in a program to perform a certain part of the processes of that program.

The GIER System Library includes programs and subroutines written in SLIP and programs and procedures written in ALGOL.

All literature and relevant program tapes in the GIER System Library are classified according to the decimal system illustrated here. While General Information, as its name implies, covers publications and books of general interest, Service Routines comprises the actual programs and their descriptions relevant to any GIER System installation. Apart from the GIER ALGOL Compiler, there is the HELP System, incorporating the symbolic loader program SLIP and numerous other debugging aids; among other useful programs are those for testing hardware and a flexible program for introducing corrections into copies of paper tapes.

The Basic Data Processing groups include procedures and subroutines for sorting and those catering for specialized input and output requirements. The remaining five subject groups cover differing applications of the GIER System to a wide variety of problems, such as mathematics, mathematical statistics, operational research, highway and railway planning, and optical design.

Periodically the GIER System Library publishes a complete, revised **Index** of all publications and five-line **Abstracts** of each publication, arranged according to the classification system, thereby making it possible for the GIER System user to be informed promptly of the existence of a particular publication, so that he may order it if he wishes.

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SELECTED EXECUTION TIMES IN GIER ALGOL

ALGORITHMIC ENTITY	EXAMPLE	EXECUTION TIME (ms)
Addition	a + b	0.12
Multiplication	a × b	0.18
Division	a / b	0.21
Square	a ↑ 2	0.18
Cube	a ↑ 3	0.4
Power, Integer Exponent	a ↑ i	
abs (exponent) = 1		3.8
10		5.5
100		8.0
1 000		10.0
10 000		12.0
100 000		14.0
1 000 000		16.0
Power, Real Exponent	a ↑ r	12.0
Subscripted Variable		
1 subscript	A[i]	0.9
2 subscripts	B[i, j]	1.2
3 subscripts	C[i, j, k]	1.5
Step Until Element, Constant Step and Simple Upper Limit, Each Loop	**step** 1 **until** n	0.6
Block with Simple Variables	**begin real** a; **end**	1.4
Block with Array Declaration	**begin array** a [1:10]; **end**	3.0
Reference to Formal Parameter Called by Name		
Actual Parameter:		
simple		0.4
expression		3.2
array identifier		0.0
switch identifier		0.0
procedure identifier		0.0
Call of Declared Procedure		
Having an Empty Procedure Body		
no parameter	P;	3.8
1 parameter	Q(a);	4.7
2 parameters	R(a, b);	5.2
3 parameters	S(a, b, c);	5.3
Call of Standard Procedure		
abs	abs(x)	0.17
arctan	arctan(x)	6.5
cos	cos(x)	6.0
exp	exp(x)	5.8
ln	ln(x)	5.6
sign	sign(x)	3.2
sin	sin(x)	5.8
sqrt	sqt(x)	6.2

Correlation of Bits with Integers and Decimal Digits

Magnetic Tape Utilization

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CORRELATION OF BITS WITH INTEGERS AND DECIMAL DIGITS

Number of Bits	Maximum Unsigned Integer	Maximum Number of Decimal Digits
1	1	0
2	3	
3	7	
4	15	1
5	31	
6	63	
7	127	2
8	255	
9	511	
10	1 023	3
11	2 047	
12	4 095	
13	8 191	
14	16 383	4
15	32 767	
16	65 535	
17	131 071	5
18	262 143	
19	524 287	
20	1 048 575	6
21	2 097 151	
22	4 194 303	
23	8 388 607	
24	16 777 215	7
25	33 554 431	
26	67 108 863	
27	134 217 727	8
28	268 435 455	
29	536 870 911	
30	1 073 741 823	9
31	2 147 483 647	
32	4 294 967 295	
33	8 589 934 591	
34	17 179 869 183	10
35	34 359 738 367	
36	68 719 476 735	
37	137 438 953 471	11
38	274 877 906 943	
39	549 755 813 887	
40	1 099 511 627 775	12
41	2 199 023 255 551	
42	4 398 046 511 103	

MAGNETIC TAPE UTILIZATION

Characters/ Block	Blocks/ Reel	Characters/ Reel	Utilization %
10	37 501	375 010	2
20	36 643	732 860	5
30	35 823	1 074 690	7
40	35 039	1 401 560	9
50	34 289	1 714 450	11
60	33 570	2 014 200	13
70	32 880	2 301 600	14
80	32 219	2 577 520	16
90	31 583	2 842 470	18
100	30 973	3 097 300	19
200	25 953	5 190 600	32
300	22 333	6 699 900	42
400	19 600	7 840 000	49
500	17 462	8 731 000	55
600	15 745	9 447 000	59
700	14 336	10 035 200	63
800	13 158	10 526 400	66
900	12 159	10 943 100	68
1 000	11 300	11 300 000	71
2 000	6 625	13 250 000	83
3 000	4 686	14 058 000	88
4 000	3 625	14 500 000	91
5 000	2 956	14 780 000	92
6 000	2 495	14 970 000	93
7 000	2 159	15 113 000	94
8 000	1 902	15 216 000	95
9 000	1 700	15 300 000	96
10 000	1 537	15 370 000	96
11 000	1 403	15 433 000	96
12 000	1 290	15 480 000	97
13 000	1 193	15 509 000	97
14 000	1 111	15 554 000	97
15 000	1 039	15 585 000	97
16 000	975	15 600 000	97
17 000	919	15 623 000	98
18 000	869	15 642 000	98
19 000	825	15 675 000	98
20 000	784	15 680 000	98
21 000	748	15 708 000	98
22 000	714	15 708 000	98
23 000	684	15 732 000	98
24 000	656	15 744 000	98
25 000	630	15 750 000	98
26 000	606	15 756 000	98
27 000	584	15 768 000	98
28 000	563	15 764 000	98

Length of Reel: 800 m or 16,012,800 characters
Inter-Block Gap: 417 characters
The longest block for a GIER Computer equipped with 1 Buffer is 4096 x 7 = 28,672 characters.

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TABLE OF CODES

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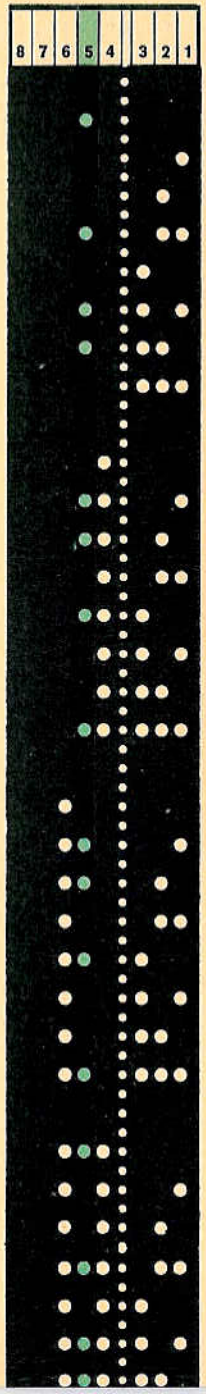
DECIMAL VALUE	INPUT/OUTPUT DEVICE						OCTAL VALUE
	OFF LINE TYPEWRITER	ON LINE TYPEWRITER	LINE PRINTER	OFF LINE TYPEWRITER	ON LINE TYPEWRITER	LINE PRINTER	
	LC			UC			
0	SP	SP	SP	SP	SP	SP	00
1	1	1	1	∨	∨	∨	01
2	2	2	2	×	×	×	02
3	3	3	3	/	/	/	03
4	4	4	4	=	=	=	04
5	5	5	5	;	;	;	05
6	6	6	6	[	[	[	06
7	7	7	7	]	]	]	07
8	8	8	8	(	(	(	10
9	9	9	9	)	)	)	11
10			SP			SP	12
11	STOP		SP	STOP		SP	13
12	END		Ü	END		Ü	14
13		å	Å		Å	Å	15
14	—	—	—	|	|	|	16
15			%			&	17
16	0	0	0	∧	∧	∧	20
17	<	<	<	>	>	>	21
18	s	s	S	S	S	S	22
19	t	t	T	T	T	T	23
20	u	u	U	U	U	U	24
21	v	v	V	V	V	V	25
22	w	w	W	W	W	W	26
23	x	x	X	X	X	X	27
24	y	y	Y	Y	Y	Y	30
25	z	z	Z	Z	Z	Z	31
26			SP			SP	32
27	,	,	,	10	10	10	33
28	CLEAR		SP	CLEAR		SP	34
29		RR	SP		RR	SP	35
30	TAB	TAB	TAB:	TAB	TAB	TAB:	36

PUNCHED TAPE CODE



Track 5 (marked in blue) forms the parity check, so that the number of holes in each row is always odd.

NOTES

General Control Characters

SP Space. Note that on the line printer several values have this same effect.

LC Lower Case

UC Upper Case

CR Carriage Return. The paper is spaced one line.

TAB Tabulation. The effect of this character on the line printer is different from that on the typewriters.

Special Punching Functions

AUX Aux(iliary) Function

PA Punch Address Function

AUX/PA Can only be punched in combination with other characters.

GIER ALGOL Control Characters

END End Code. Punched using **AUX** + **SP**. Prints as Ü.

CLEAR Clear Code. Punched using **AUX** + 0.

SUM Sum Code. Punched using **AUX** + A.

ON Punch On. Prints as * or '.

OFF Punch Off. Prints as **SP**.

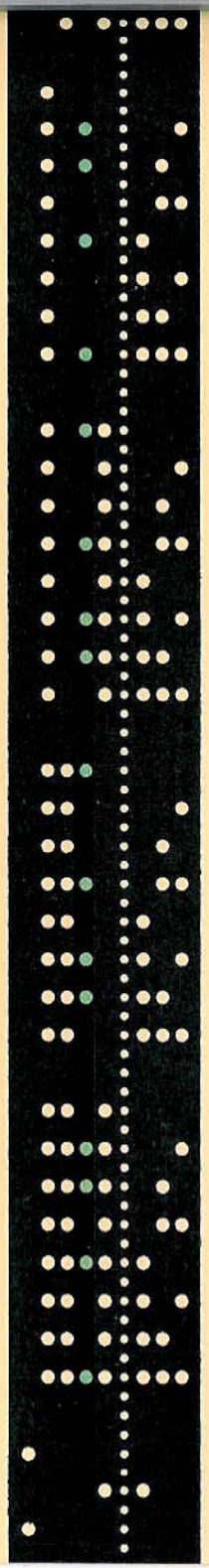
Line Printer Control Characters

CR Carriage Return. A line is printed and the paper is fed one line.

The **CR** character may be combined with one or more of the following values to provide printing with paper throw instead of single-line spacing, until a hole in an appropriate track of the format control tape is sensed:

+ 1 -> track 2
+ 2 -> track 4
+ 4 -> track 6

31	OFF		SP	OFF		SP	
32	—	—	—	+	+	+	
33	j	j	J	J	J	J	
34	k	k	K	K	K	K	
35	l	l	L	L	L	L	
36	m	m	M	M	M	M	
37	n	n	N	N	N	N	
38	o	o	O	O	O	O	
39	p	p	P	P	P	P	
40	q	q	Q	Q	Q	Q	
41	r	r	R	R	R	R	
42			SP			SP	
43	ø	ø	Ø	Ø	Ø	Ø	
44	ON		*	ON		:	
45			SP			SP	
46			SP			SP	
47			SP			SP	
48	æ	æ	Æ	Æ	Æ	Æ	
49	a	a	A	A	A	A	
50	b	b	B	B	B	B	
51	c	c	C	C	C	C	
52	d	d	D	D	D	D	
53	e	e	E	E	E	E	
54	f	f	F	F	F	F	
55	g	g	G	G	G	G	
56	h	h	H	H	H	H	
57	i	i	I	I	I	I	
58	LC	LC	LC	LC	LC	LC	
59	.	.	.	:	:	:	
60	UC	UC	UC	UC	UC	UC	
61	SUM		SP	SUM		SP	
62		BR	SP		BR	SP	
63	TF		SP	TF		SP	
64	CR	CR	CR	CR	CR	CR	
12	AUX			AUX			
64	PA			PA			



+ 8 -> track 8

The modification + 16 causes printing, but inhibits paper throw and line feeding. (This latter function may be modified on request to double line feeding).

Line Printer Control Characters can be punched using the **PA** function and if necessary, the **AUX** function to give the appropriate value between 65 and 80.

TAB: Tabulation Position follows. Twice the decimal value of the character following the **TAB:** character indicates the next printing position to be used.

On-Line Typewriter Control Characters

RR Red Ribbon. Punched using **AUX** + <.

BR Black Ribbon. Punched using **AUX** + B.

TAB Tabulation. The carriage is moved to the next tab stop.

Off-Line Typewriter Control Characters

ON Punch On

OFF Punch Off

TF Tape Feed. Can also be punched using **AUX** + C.

STOP The off-line typewriter stops.

TAB Tabulation. The carriage is moved to next tab stop.

Miscellaneous

Å Available on the on-line typewriter and the line printer. Punched using **AUX** + 1.

Ü Available on the line printer only. Punched using **AUX** + **SP** (same as **END**).

% & Available on the line printer only. Punched using **AUX** + 3.

— or | Does not advance the carriage on the typewriters, but occupies one printer position on the line printer.

All values between 0 and 127, i.e. any combination of holes in all eight tracks, can be punched with the on-line punch and read by the GIER Computer. The above-mentioned conventions for punching apply solely to the off-line typewriter, and this edition of the Table of Codes is revised in accordance with the conventions applicable to the Anelex Line Printer, Series 5.

100
14
100

SUMMARY

GIER Computer

compact, general purpose digital computer – ALGOL 60 compiler, flexible operating system – binary, parallel operation with 6.6 μs cycle time

60 single-address instructions – built-in floating-point arithmetic, automatic address modification, indexing

simultaneous drum/disk file and magnetic tape operations – buffered input/output, interrupt facility, open-ended design

central processor: immediate access core store of 1024 words – word length: 40 bits + 2 flag bits – instruction execution times from 29 μs to 267 μs

Secondary Storage

Type	Capacity	Transfer Time	Number
magnetic drum store, random access	320 tracks of 40 words = 12,800 words	20 ms/track	3
magnetic disk file, random access	9600 blocks of 40 words = 384,000 words	3 ms/block	4
buffer store	core store of 4096 words	7 and 15 μs/word	1

Peripherals

Type	Speed	Number
off-line perforator typewriter	8–12 char/sec	–
on-line monitor typewriter	8–12 char/sec	1
paper tape punch	150 char/sec	1
paper tape reader, photo-electric	2000 char/sec	2
punched card reader, pneumatic	1600 cards/min	1
magnetic tape station	28,800 char/sec*	4
line printer	667 lines/min	1
converter, off-line, multi-directional	2000 char/sec**	–
hybrid computer linkage equipment	60 μs***	–
data logging system	10,000 ch/sec****	–

* at 800 char/inch (36 inches/sec)
** conversion from paper tape to magnetic tape
*** conversion time – analog input channels
**** peak scanning speed – analog inputs, fast-scan group

Software

ALGOL 60 compiler (GIER ALGOL IV)

utility program system (HELP) with symbolic loader program (SLIP) and numerous other debugging aids

comprehensive information service (GIER System Library) with descriptions and tapes of programs and subroutines, books, reports, and surveys – literature and program tapes include: general information, service routines, basic data processing, mathematics, mathematical statistics, operational research, science and engineering, and business applications

Typical Installation Requirements*

area: 50 m² minimum

weight: 2600 kg (700 kg/m² floor load)

power: 9 kW maximum

air temperature: 18–23° C

relative humidity: 40–60 %

* based on central processor with 1 drum, console with basic peripherals, buffer store, 4 tape stations, card reader, and line printer

General

The GIER Computer is supplied with an operator's console and a ready-to-use package.

Extra options include connection of digital increment plotter, real-time clock, or MICR reader.

The price includes installation. The six months' warranty covers training, programming, and technical service, and in addition to this, extensive customer and maintenance service is available by contract.

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