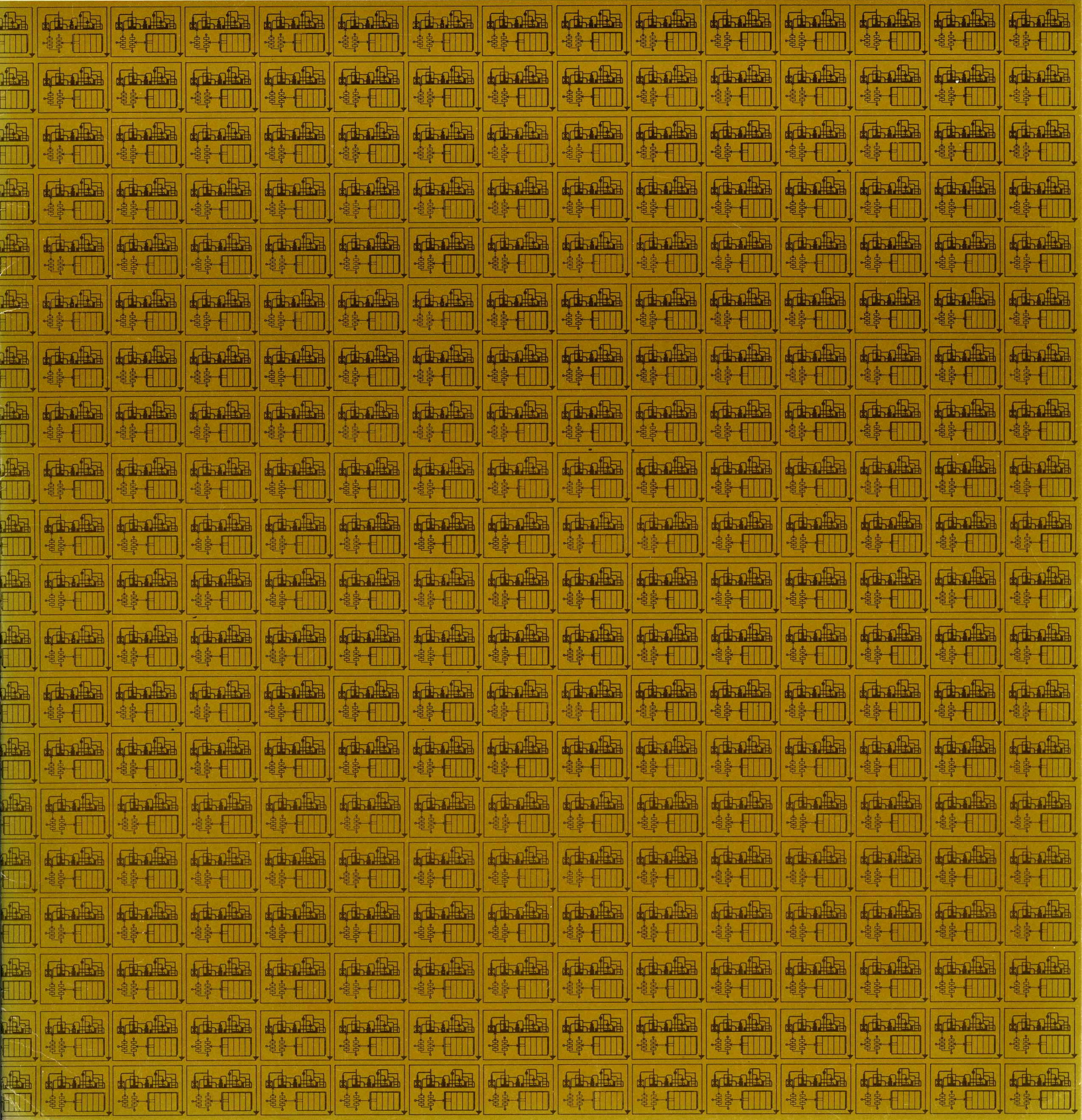


THE BUNKER-RAMO CORPORATION

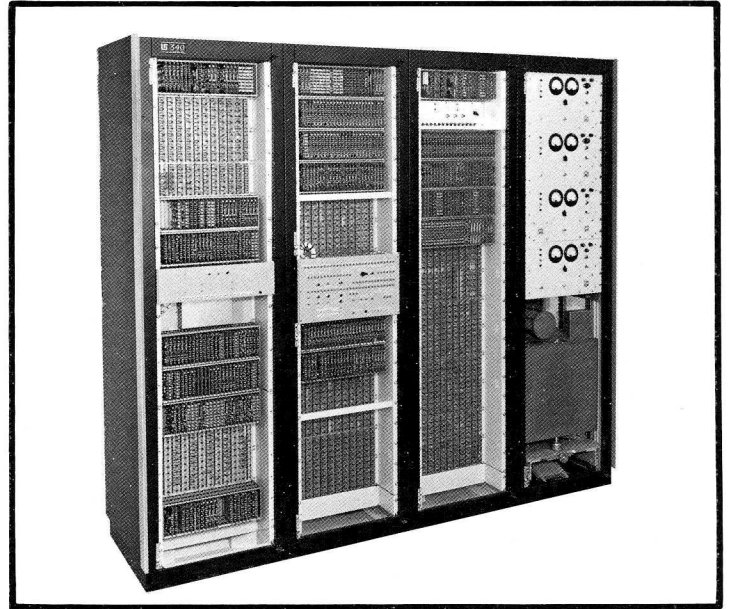
# L340

CONTROL COMPUTER SYSTEM



# 340 CONTROL CO

The 340 is a high performance control computer that combines advanced computer technology with the practical requirements of automatic control. The 340 employs core memory for high speed; for high volume, an auxiliary drum memory is used. As a result, the 340 is a **fast** and **versatile** machine, **flexible** in makeup and **field-expandable**. And like all Bunker-Ramo computers, the 340 is highly **reliable**. In short, the 340 provides exceptional computing capability at moderate cost.



**FAST** Completes typical programs at a rate of over 70,000\* operations per second.

**VERSATILE** Standard features in the 340 include indirect addressing, relative transfer, and operation extension. Relative transfer is a hardware facility that automatically modifies address portions of instructions during drum/core block transfers; with the 340, *any* program can be transferred to and executed from *any* location in core memory. Operation extension is an instruction format that allows up to 320 interpretive instructions or subroutines to be executed without housekeeping, as though they were wired-in commands.

**FLEXIBLE** The range of core and drum memory sizes and the number of inputs and outputs available mean that the 340 can be tailored to the user's application.

**FIELD-EXPANDABLE** Core memory: to 32,768 words. Auxiliary drum memory: to 98,304 words. Input-output capacity: can be increased at will by addition of modular plug-in units.

**RELIABLE** Design is based on reliability proved in the field with successful control computer installations, installations that have logged over two million hours of on-line operation with total equipment uptime better than 99 percent.

\*Assumes 50% of 12-microsecond instructions, 35% of 6-microsecond instructions, and 15% of divides, multiplies, and shifts that average 40 microseconds. (The percentage of 6-microsecond instructions will be higher in many programs, since immediate addressing allows a substantial number of operands to be included in instructions, thus eliminating memory access.)

# COMPUTER SYSTEM

## CHARACTERISTICS

GENERALIZED OPERATION LIST	Operating Time, Microseconds	
	Direct Address	Immediate Address
Total of 114 basic operations. (Breakdown shown in parentheses in listings below.) Over 700 variations of basic operations are used.		
Register Transfer (28)	6	—
Load (9)	12	6
Add, Subtract, Decrement Index (8)	12	6
Branch (15)	6	—
Extract, Merge, Exclusive Or (5)	12	6
Store (10)	12	—
Compare (4)	12	—
Program Control, Input, Output (8)	12, 18, 24	—
Multiply (n multiplier bits) (1)	$14 + 2n$	$6 + 2n$
Divide (n quotient bits) (1)	$18 + 2n$	$12 + 2n$
Shift (n places) (16)	$8 + 2n$	—
Search (4)	$6 + 6/\text{word}$	—
Compare Tables (4)	$6 + 12/\text{word}$	—
Typical Operation Extension Instructions		
Floating Point Load	12	—
Floating Point Store	12	—
Floating Point Add	400 average	—
Floating Point Subtract	400 average	—
Floating Point Branch	6	—
Floating Point Multiply	250 average	—
Floating Point Divide	250 average	—

## SPECIFICATIONS

**CORE MEMORY**—4,096 to 16,384 words, in blocks of 4,096 words. Additional switchable blocks of 4,096 words to a total of 32,768 words.

**DRUM MEMORY**—8,192 to 98,304 words, in blocks of 4,096 words.

**DISK MEMORY**—400,000 words.

**DATA WORDS**—28 bits, including sign (plus one parity bit on all memory operations).

**INSTRUCTION FORMAT**—Two fields: a 14-bit operation field and a 14-bit operand field.

**ADDRESSING**—Sequential single-address. Direct, indirect, and immediate (operand) addressing.

**NUMBER SYSTEM**—2's complement binary.

**OPERATION**—Arithmetic, control, and core memory circuits: Parallel. Magnetic drum memory circuits: Serial.

**CLOCK FREQUENCY**—Arithmetic, control, and core memory circuits: 478 kc. Magnetic drum memory circuits: 239 kc.

**REGISTERS**—Six major arithmetic unit registers. Three index registers. Additional registers are included for communicating with peripheral equipment.

**ENVIRONMENTAL CONDITIONS**—Designed for operation from 55 to 110°F. Normal power consumption 8 KVA.

**CABINETS**—Assembled in four (or more, as required for each installation) vertical rack-and-panel cabinets bolted together to form a convenient package. Each cabinet is 84 inches high, 23 inches wide, and 24 inches deep. Rugged industrial construction is used throughout.

**SOFTWARE**—An integrated software system especially designed for process control programming includes FORTRAN II, utility package, assembler, compiler, and complete library of subroutines.

**INPUT/OUTPUT SUBSYSTEMS**—The 340 control computer system includes a complete range of peripheral input/output equipment. The system can accommodate over 1000 analog inputs, over 100 analog outputs, and over 3500 digital (contact-closure) inputs and outputs.

**PRIORITY INTERRUPT**—A priority interrupt subsystem distinguishes automatically between 28 levels of priority.

The 340 design is based on experience, the unparalleled experience of the company that has designed and installed more control computer systems than anybody else in the field: The Bunker-Ramo Corporation. This experience is your assurance of control system performance and reliability. For further information concerning Bunker-Ramo computer systems for specific industrial control problems, write to the address listed on back cover of this brochure.

FOR ADDITIONAL INFORMATION, OR FOR THE ADDRESS OF YOUR NEAREST BUNKER-RAMO OFFICE, CONTACT:

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