

CONTROL DATA® 9920 CHANNEL SIMULATOR

CONTROL DATA
CORPORATION



DEC 8 1972

The CONTROL DATA® 9920 Channel Simulator is a suitcase-sized, programmable controller. This unit provides off-line simulation of Selector Channel I/O sequences which are used in factory checkout or on-site/on-call maintenance. Any selector channel sequence can be dynamically duplicated with continuous response checking.

Some multiplexer sequences also can be duplicated. The 9920 checks "bus in" for validity, with the ability to trap and examine up to three erroneous replies, and provides an optionally selectable halt-on-error function. Response timing checks are also selectable.

Using the manual keying facilities provided, the non-programmer can easily generate his own programs. A program can be recorded or played back in approximately 1 second. Two such programs (each of 128 words, but different in content) can be stored on a single magnetic card. The programs may be read back repeatedly or changed by the operator at will. More than one hundred diagnostic programs can be carried in a shirt pocket.

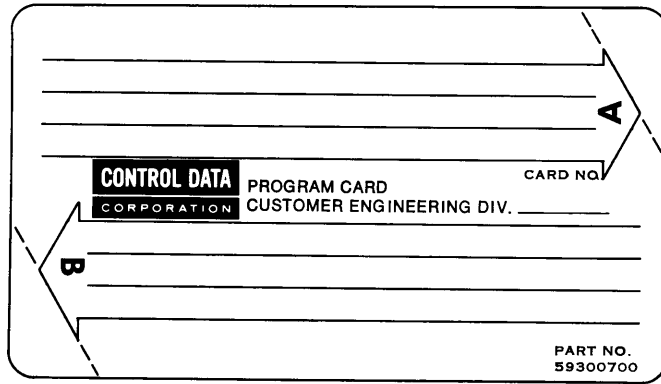
The 9920's memory consists of a 128-word by 10-bit, bipolar random-access MSI memory, with one-microsecond cycle time. Each 10-bit word in memory contains "odd parity" which is automatically generated and checked.

The 9920 is not limited by codes which may be peculiar to a particular control unit or device. This unit will exercise any external equipment which operates within IBM selector channel parameters. A single 9920 program instruction can manipulate several input/output lines, and many single instructions contain branch routines which are predicated on the specified response of the external device. The operator may trap and display any or all errors, and also may elect to "freeze" I/O conditions when a selected error type occurs. When the program has been written and loaded, only the START, CONTINUE, and HALT controls are required during program execution.

PROGRAM REPERTOIRE

Instruction Name	Instruction Mnemonic	Numerical Coding (EBCDIC)	Comments
Constants:			
Address Constant	ACN	000	
Command Constant	CCN	thru	
Status Constant	SCN		
Data Constant	DCN	OFF	
Selective Jump A	SJA	100	Reacts to switch setting A
System Reset	SYR	101	
Address from Switches	ADS	102	
Address from Memory	ADM	103	
Command Zeros & Clear	CZC	104	
Command from Memory & Input	CMI	105	Conditions Simulator for Read
Command from Memory & Output	CMO	106	Conditions Simulator for Write
Return Jump	RJP	107	Non-restrictive
Exit Status	EXS	108	
Pause until Request In	PRI	109	
Clear Select Out	CSL	10A	
Change Suppress Out	CSU	10B	
Program End	PGE	10C	
Selective Jump B	SJB	10D	Reacts to switch setting B
Jump on Status	JPS	10E	Reacts to 'status in'
Unconditional Skip	USK	10F	
Jump on Request	JPR	110	Reacts to 'request in'
Unused	---	111	
Pause Indefinite	PAI	112	Program hiatus
Repeat Indefinite	RPI	113	Transfers non-changing bytes indefinitely
Interface Disconnect	IDC	114	
Unused	---	115	
		thru	
		11F	
No-Operation	NOP	120	
Pause Definite	PAD	121	Bit 0=10 <i>usec</i> , Bit 1=100 <i>usec</i> ,
		thru	Bit 2=1 <i>msec</i> , Bit 3=10 <i>msec</i> ,
		13F	Bit 4=100 <i>msec</i> , 13F=.11111 <i>sec</i>
Repeat Definite	RPD	140	Values of 1 thru 63 and 256
		thru	available
		17F	
Direct Jump	DJP	180	Non-restrictive
		thru	
		1FF	

NOTE: Unless otherwise stated, all numeral references are in decimal notation.

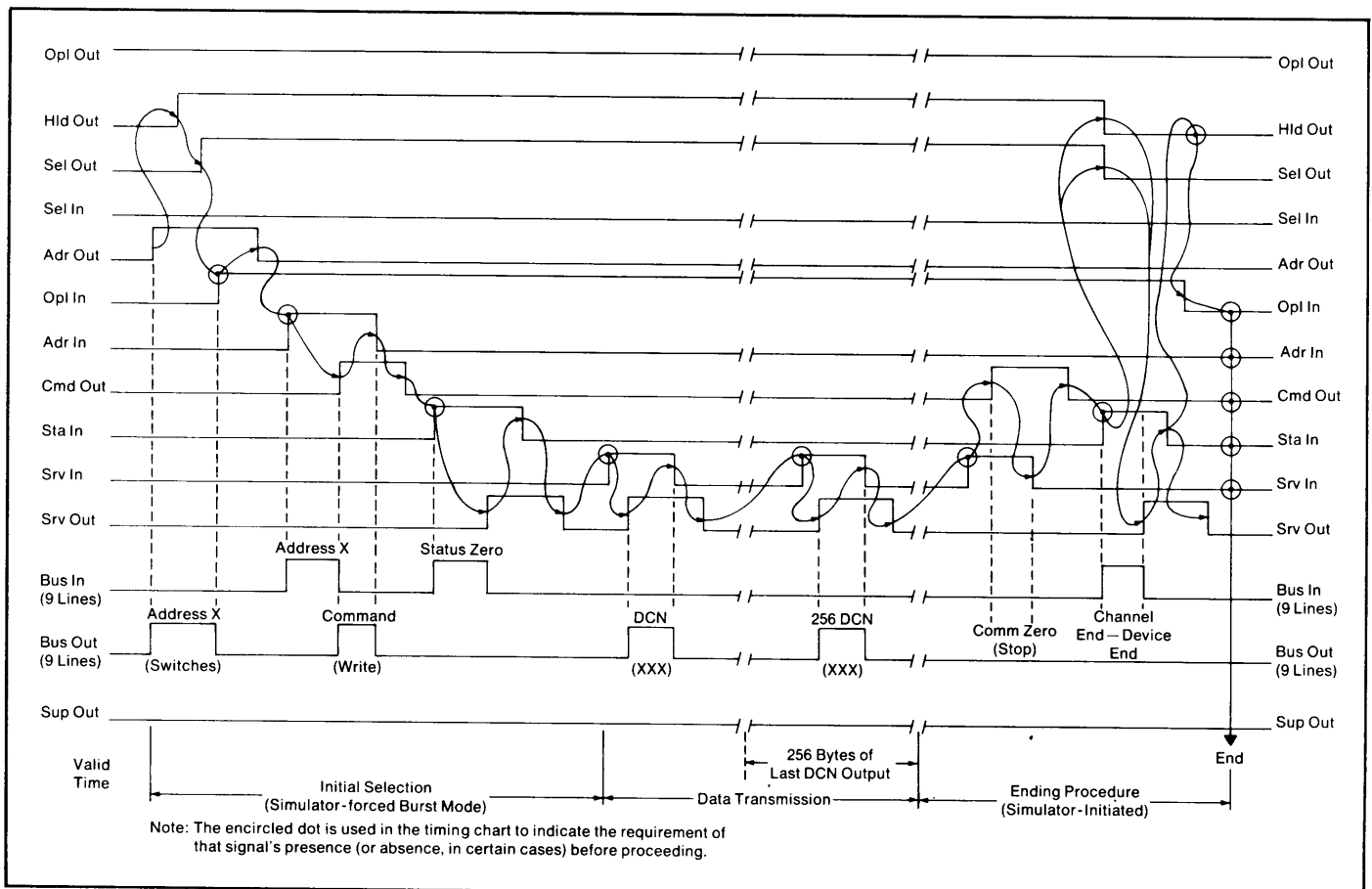


MAGNETIC OXIDE PROGRAM CARD

Sample Program and Associated Timing Diagram

Program Address (EBCDIC)	Instruction Mnemonic	Numerical Coding (EBCDIC)	Comments
000	ADS	102	The sample program at left requires only 12 memory locations to cause the sequence of events to occur as illustrated in the timing diagram below. These events include: Initial selection, with comparisons of address and status, and a write command output; a write data transmission of 257 bytes; ending procedure with status check. The sample program shown here is in simplest terms, and represents only one of many possible variations which the program repertoire makes possible.
001	CMO	106	
002	CCN	XXX	
003	SCN	000	
004	EXS	108	
005	DCN	XXX	
006	RPD	140	
007	CZC	104	
008	CSL	10A	
009	SCN	00C	
00A	EXS	108	
00B	PGE	10C	

XXX=Constant required by particular device



Physical Features

- Hand-portable: Fits under airplane seat, weighs only 30 lbs.
- Rugged: Watertight aluminum case protects unit during uncrated air baggage shipment.
- Attractive: Colors and styling suitable for any environment.
- Complete: Each unit includes I/O cables, terminators, power cord, program card set, and Customer Engineer Manual.

Environmental Features

- Temperature: Can withstand temperature extremes encountered in auto trunks and air baggage compartments in on-call and Tech Support maintenance situations.
- Humidity: 0 to 90% (non-condensing).

Performance Characteristics

- Memory Cycle Time: 1 *usec*.
- Data Transfer Rates:* 2 MHz (500 *nsec* per byte) of continuous single-value stream.
500 KHz (2 *usec* per byte) of continuously changing data.

*Exclusive of externally-induced transmission delays.

- Memory: Random Access bipolar MSI; 10 bits by 128 words.
- Memory Input: Magnetic oxide card; manual switches.
- Magnetic Oxide Card Reader/Writer: 4-channel; 1 second read/write time.

- Magnetic Oxide Card: 2 full 128-word programs with protect feature.
- Program Repertoire: 24-instruction, including:
 - Selective Jump
 - Non-restrictive Direct Jump
 - Non-restrictive Return Jump
 - Repeat Definite Number of Bytes
 - Repeat Indefinite Number of Bytes
 - Pause — for operator intervention
 - Programmed variable-time no-ops
 - I/O Constants — Address, Status, Command, Data — with comparison
- Response timing and content checks, with 3 error traps.

Maintenance Features

- Self-checking: Monitored tape program input, memory cycles.
- Reversible I/O cards with built-in terminators.
- Sweep write, sweep read.
- Only 4 adjustments: Can be performed with ordinary voltmeter.
- Signal Monitor: Switch, indicator, and test point for test indications and oscilloscope synchronization.
- Oscilloscope synchronization on address compare.
- Variable automatic program re-start for 'deep-end' program situations.