

WANG

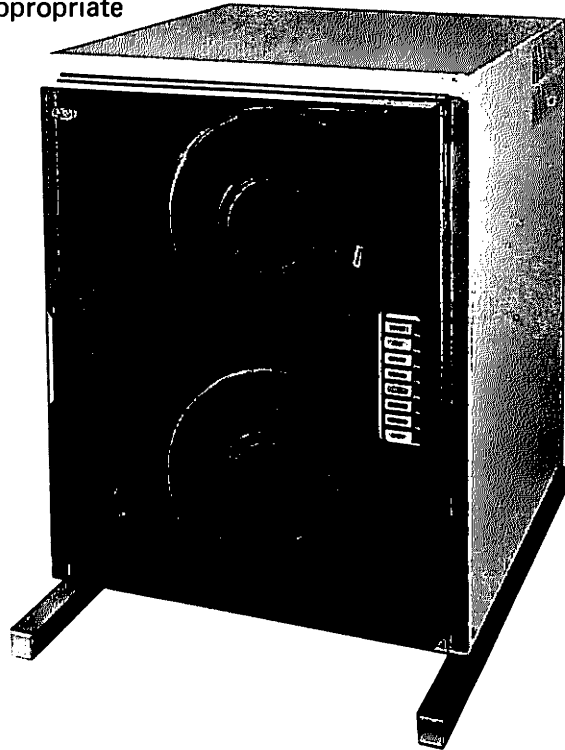
LABORATORIES, INC.

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DATA SHEET

The Model 2209 Nine-Track Tape Drive can read and write standard IBM compatible 1/2 in. (1.3 cm) x 2400 ft (732 m) tapes. Tapes written conform to the ANSI standard recording format for nine-track tapes and have a capacity of approximately 20 megabytes (20 million bytes). Tape records can be read in most nine-track formats with the appropriate data conversion routines. The Model 2209 can be used with any System 2200 so long as General I/O Statements are available. To operate Wang-supported utilities, 12K core is required.

The Model 2209 is a reel-to-reel tape drive which records at a single density of 800 bpi (bytes/in.) [315 b/cm] in the NRZI (non-return-to-zero, change-on-ones) mode. In the NRZI mode, one-bit is produced by each reversal of flux polarity; tape is fully saturated in each direction. To obviate tape breakage during start-up and slow-down of the tape transport, tension buffer arms are used. The unit contains a dual-gap read/write head providing the capability to do read-after-write checking during all write operations. A read-after-write permits immediate error checking when a record has been written.



MODEL 2209
NINE-TRACK TAPE DRIVE

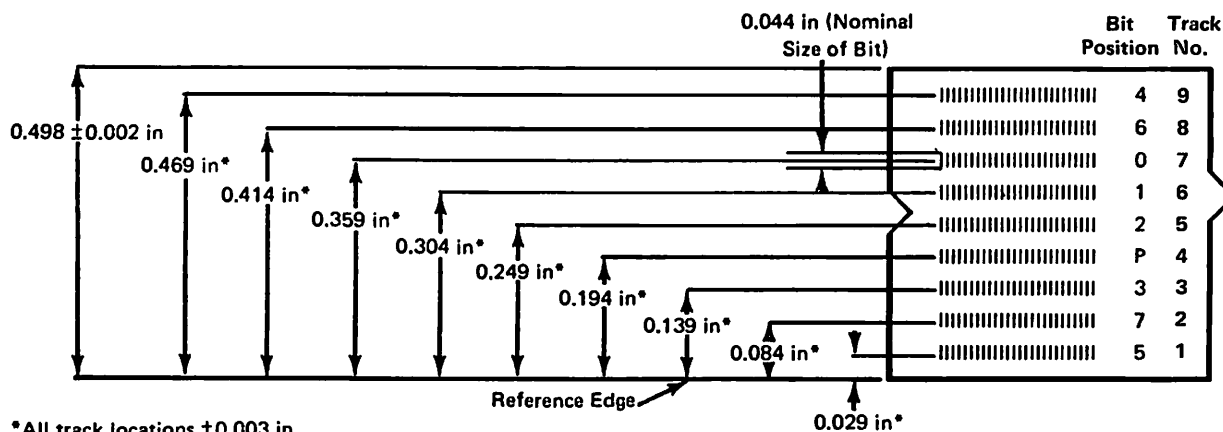


Figure 1. Recording Bits on Nine-Track Tape

Data bits, in each byte, are recorded across the tape as shown in Figure 1. Tracks are numbered from the reference edge of the tape from 1 to 9; bit position and place value are assigned in accordance with the ANSI standard (American National Standards Institute X3.22, 1973). This form is, in the main, IBM compatible. The

parity bit (P) for each data byte is written in track 4 whenever the byte contains an even number of one bits. For example, if the ASCII value for zero (00110000) is written, the parity bit is one; if the value for 1 (00110001) is written, the parity bit is zero.

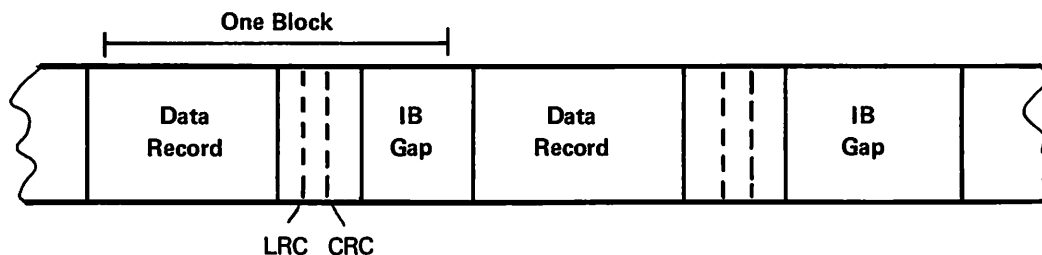


Figure 2. Recording Data Records in Blocks in the NRZI Mode

Data bytes are written as blocks (records) on tape, as directed by a system program. Blocks are separated on tape by an IBG (interblock gap), a length of erased tape nominally 0.75 in. (1.9 cm) long (see Figure 2). At the end of each block two check characters are written to be used for error-checking, the CRC (cyclic redundancy check) and the LRC (longitudinal redundancy check). Several blocks of data can be grouped together in a file; files are separated on tape by a Tape Mark or End-of-file (EOF) character. The EOF character, written by the Model 2209, is a special single-byte block; it follows a gap of approximately 3.75 in. (9.53 cm). The CRC and LRC are used to correct single-track errors on reading.

The Model 2209 has a tape-forward speed of 12.5 ips (in./sec) [32 cm/sec] during read or write operations and up to 150 ips (380 cm/sec) during rewind. Data transfer rate via \$GIO statements and the Model 2209 controller

is approximately 10 KBS (kilobytes/sec).

General I/O statements are used with the Model 2209 to provide I/O Control and BASIC statements for data conversion. \$GIO statements are used to support the Model 2209; using Wang supported utilities, records can be of variable length and can contain from 12 to 2,000 bytes. With a customized user-supplied routine, records up to 8,000 bytes long can be processed. Any data written in Wang ASCII character format can be easily read or written on the Model 2209; General I/O statements \$PACK and \$UNPACK can be used to convert other forms of data, such as internal and external decimal IBM 360 data formats. \$TRAN provides high-speed code conversion of alphanumeric data in any character-code format via look-up tables supplied in BASIC programs. Other numeric formats will require special conversion routines in BASIC.

NOTE:

General I/O statements, particularly \$GIO, must be used to operate the Model 2209; LOAD, SAVE, DATALOAD, DATASAVE statements cannot activate this unit.

The statements available to activate the Model 2209 consist of several forms of the \$GIO statement. Special formatting of data can be effected by \$PACK, \$UNPACK and \$TRAN.

The \$IF ON statement can be used to test the ready/busy status of the controller. General I/O statements provide the following features:

1. A flexible means of reading, writing, packing or unpacking variable length records via a specified alphanumeric array. All or part of the array can be referenced without regard to array-element boundaries.
2. A specified variable in a \$GIO tape-operation statement receives all error status information resulting from the execution of the operation; the variable can be examined under program control.
3. The following tape operations can be constructed with \$GIO statements:

READ	read next block on tape
WRITE	write next block on tape
WEOF	write an end-of-file (EOF)
BSR	backspace one block (record)
BSF	backspace one file
CLEAN	backspace tape over tape cleaner and reposition (backspace five times, forward space four times) to reread.
FSF	forward space one file.
FSR	forward space one record
REREAD	backspace one block and reread the block just read; correct for single track errors.
REWIND	rewind to load point (BOT)
WGAP	erase 3.5 in. of tape (to bypass a bad spot and 'write' a gap)
BSW	backspace one block (record) prior to writing.

Example 1:

The following routine writes a record on a nine-track tape. The record is currently stored in memory in the first X bytes of the array A\$. The tape unit is selected with a SELECT TAPE statement; this becomes the default value for \$GIO since the address is not specified in the \$GIO statement; X is the number of bytes in the record.

```
10 DIM A$(30)20,B$(10) [dimensions the arrays]
20 DEFFN'1(X) [defines routine, no. of bytes]
30 PRINT "WRITE";X;"BYTE RECORD" [displays
  message]
40 SELECT TAPE 07B [selects unit]
50 $GIO WRITE (6CFA 4400 A206 8607,B$)A$(<1,X>
  [writes record]
60 RETURN
```

NOTE:

The notation <1,X> implies "write the record from array A\$ starting at the 1st byte, for X bytes". B\$ receives status and error information resulting from execution of the \$GIO statement.

Example 2:

The following routine rewinds a tape to the load point (BOT).

```
5 SELECT #1 07B
  [selects unit]
10 DIM B$10
  [dimensions variable]
20 DEFFN'5: PRINT "REWIND"
  [defines routine, displays message]
30 $GIO REWIND #1(6CF5 4400 8607,B$):RETURN
  [rewinds unit]
```

A set of standard utilities is provided to facilitate use of the Model 2209. These utilities are addressed principally to the use of the Model 2209 as an interchange medium between the Wang CPU and other computers, particularly the IBM 360. The utilities [for single files (data sets) on single reels (volumes)] include tape-to-disk, disk-to-tape, card reader-to-tape, and standard label processing. A dump-and-translate utility reads variable length blocks and outputs block size, untranslated hex image and translated alphanumeric image of the data.

DATA SHEET

SPECIFICATIONS

Tape Head
Dual Gap

Tape Drive Size:
Height 28 in. (71 cm)
Width 21 in. (54 cm)
Depth 28½ in. (72 cm)

Approximate Net Weight:
158 lb (71.6 kg)

Tape Drive Switches and Indicator:
Power, Load, On Line, Rewind, File Protect, Reverse, Forward, Reset

Site Size:
Height 30 in. (76 cm)
Width 23 in. (59 cm)
Depth — not less than 42 in. (107 cm) to accommodate opening door.

Accessories:
Tape unit cleaning pads

Equipment Required:
Any System 2200 which contains General I/O Statements; 12K core required to operate Wang-supported utilities.

Drive Type:
Reel-to-reel

Recording:
Tracks: 9
Format: ANSI X3.22-1973
Density: 800 bpi [315 b/cm]
Mode: NRZI

File Protection Device:
WRITE ENABLE ring

Interblock Gap:
0.75 in. (1.9 cm)

Tape Transport Buffer:
Tension arms

Tape Speed:
12.5 ips [32 cm/s];
150 ips [380 cm/s] (nominal) during rewind.

Data Transfer Rate:
10 KBS (kilobytes/sec)

SPECIFICATIONS (Continued)

Tape Specifications:
0.5 in. x 2400 feet [1.3 cm x 732 m]
full-width tested at 800 bpi (315 b/cm)
hubs compatible with IBM 2400 Series tape units.
Reel Size: Up to 10.5 in. (26.7 cm) diameter.

Cable Length:
(Drive to Controller): 12 ft (3.7 m)
(Drive to Power Source): 8 ft (2.4 m)

Power:
115 VAC ± 10%, 325 watts, 5 amp circuit breaker or 230 VAC ± 10%, 330 watts, 5 amp circuit breaker 50 to 60 Hz ± 1 Hz

Operating Environment:
Temperature: 60° to 90° F (16° to 32°C)
Relative Humidity: 40% to 60%, non-condensing

Non-operating Environment:
Temperature: -30° F to 140° F (-34°C to 60°C)
Relative Humidity: 15% to 95%, non-condensing.
Altitude: not above 20,000 feet (6000 m)

ORDERING SPECIFICATIONS

The Model 2209 Nine-Track Tape Drive must be a reel-to-reel unit fully compatible with the Wang System CPU and able to transfer data via the General I/O Statements. The drive must access tapes up to 10.5 in. in diameter compatible with IBM and ANSI nine-track standards, advance tapes at a rate of 12.5 ips (32 cm/s), and use a WRITE ENABLE ring when writing on tape. The drive must read and write tapes at a density of 800 bpi (315 b/cm) in the NRZI mode and transfer data at a rate of 10 KBS. IBG written must not be less than 0.75 in. (1.9 cm). The drive must have single capstan tension arms as a tape-transport buffer. The unit must contain a dual-gap read/write head in addition to an erase head and a tape cleaner. The dual-gap head must have the capability of doing a read-after-write for all write operations.

Standard Warranty Applies

Wang Laboratories reserves the right to change specifications without prior notice.



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