INTELLIGENT DIGITAL CASSETTE RECORDING SYSTEMS

- Off-line data reduction and nonvolatile storage
- RS232C compatible computer storage peripheral
- Real time process control system
- Portable/mobile data gathering
- Airborne recording computer
- Automatic systems testing

Memodyne CORPORATION
FEATURES:

Digital Cassette Recorder

- Reel driven, capstanless mechanism for gentle tape handling
- Rugged — designed to provide superior immunity to hostile environments
- High speed: Handles continuous data streams (Reads, writes, transmits and receives) at rates up to 9600 Baud
- Data Storage Capacity: Two tracks accessible on line, each capable of storing 238,000 bytes, formatted, on a standard cassette
- ANSI/ECMA-34 compatible in both encoding and formatting (Includes preamble, postamble, C.R.C., and up to 256 data characters per block) Writes and recognizes ANSI/ECMA tape marks
- Texas Instruments (TI.) compatible: Reads and writes cassettes compatible with Model 700 series terminals
- MEMODYNE CNRZ encoding compatible: Versions available to read all CNRZ-encoded tapes written on Memodyne incremental recorders
- N.C.R. compatible: Reads blocks sizes up to 511 bytes
- Auto error detection and retry capability

Computer

- Memodyne interrupt-driven firmware controls recorder and communication functions transparently in user programs
- 2.4576 MHz system clock
- 1K byte RAM, 2K optional
- 4K bytes of PROM
- Full 64K Z-80™ address space accessible via MEMOBUS™
- Accessory cards available for memory expansion within the M80 module: Model 406 8K static RAM board and Model 407 4K to 16K U.V.-EPROM board
- Four channel Integrating A/D Converter Card, Model 408, 12 bits plus sign

Front Panel Keypad

- Front panel keypad allows control of the M80 without a separate terminal and leaves serial ports completely open.
- M80 will accept and process keypad commands and user-generated RS232C data alternatively
- Two-level operation allows for simple control of recorder, while implementing the full M80 command repertoire
- Reliable bounce-free Hall-effect switches
- LED status indicators
- Internal selector switches for baud rate and serial communication format
**SPECIFICATIONS:**

Recording Media: Philips Certified Digital Cassette, 300 feet, ANSI/ECMA compatible

Recording Head: Read-While-Write, dual track

Recording Density: 800 bits per inch

Input/Output: RS232C and TTY current loop

Data Transfer Rates: 110, 150, 300, 600, 1200, 2400, 4800, and 9600 baud

Data Capacity: 250,000 bytes per track for total of 500,000 bytes — formatted

Data Format: Phase encoded or CNRZ

Block Size: Selectable up to 256 bytes per block

Interrecord Gap Length: 1.0 inches, nominal

Tape speeds: 19.2 inches per second — Read and Write; 100 inches per second — search and rewind

System Clock Rate: 2.4576 MHz

Error Rate: Soft errors, 1 in 10⁷ retried. Hard errors are cassette dependent

**Commands:**

Tape On, Tape Off, X On, X Off, Rewind, Load Forward, Set Erase, Write File Gap, Transmit Status, Set Baud Rate, Set Block Size, Select Track, Execute User Program

**Power Requirements:**

115 VAC ± 10% 50-60 Hz, 220 VAC optional.

Power consumption:

- Peak 80 watts max
- Average 50 watts

**Operating Temperature:**

0°C to +50°C

**Storage Temperature:**

-35°C to +70°C

**Relative Humidity:**

20 to 80%, no condensation

**MECHANICAL DIMENSIONS**

<table>
<thead>
<tr>
<th>Size</th>
<th>in 2000 case</th>
<th>H 6⅝” x W 10⅝” x D 12”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>in 2000 case</td>
<td>16.1 lbs</td>
</tr>
<tr>
<td></td>
<td>in 3000 case</td>
<td>18.6 lbs</td>
</tr>
</tbody>
</table>

MODEL M80 SHOWN WITH MODEL 403 INTERFACE CARD AND MODEL 402 CPU CARD
GENERAL DESCRIPTION:
The M80/2000FPC and M80/3000FPC Systems combine a patented high-speed digital cassette recorder with a general purpose Z-80 based computer to perform a wide variety of tasks. The systems can operate as intelligent digital cassette recorders handling continuous data streams at rates up to 9600 baud, as stand-alone computers with a full 64K-byte, Z-80 memory capacity residing on an M80 Spare Card or, by combining the two preceding functions, as intelligent recording peripherals.

They may be used as straightforward laboratory computing recording instruments under local control, or remote, slaved peripherals in distributed processing applications. The systems have full-duplex modern and terminal RS-232C and TTY current-loop serial I/O ports for easy interfacing. For maximum utility, the M80 recorder and communication functions operate under interrupt-driven control, enabling the systems to perform background tasks in support of the host computer or other peripherals on the bus. These tasks include transducer linearization routines, front-end data reduction and execution of external user programs.

FRONT PANEL KEYPAD CONTROL
Eight keys and four light emitting diode (LED) indicators all serving multiple functions, constitute the front panel control. The Model 411 keypad generates a unique vectored interrupt for each keystroke, interfacing with the M80 firmware, which is augmented to implement control operations. The multi-function keypad provides a total of 28 keystrokes, four of which select either RECORDER MODE or COMMAND MODE operation. The remaining 24 keystrokes initiate assorted system functions, depending on the mode of operation. See Table 1.

<table>
<thead>
<tr>
<th>KEY NAME</th>
<th>NO SHIFT</th>
<th>SHIFT</th>
<th>NO SHIFT</th>
<th>SHIFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>BACK</td>
<td>FILE REVERSE OR BLOCK REVERSE</td>
<td>SYSTEM RESET</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>REWIND</td>
<td>REWIND</td>
<td>CLEAR COMMAND BUFFER</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>WRITE</td>
<td>TAPE-ON (RECEIVE AND WRITE)</td>
<td>FINISH WRITING OR WRITE FILE GAP</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>READ</td>
<td>X-ON (READ AND TRANSMIT)</td>
<td>CLEAR DATA BUFFER</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>OFF</td>
<td>X-OFF, TAPE-OFF, AND HALT HIGH SPEED OPERATION</td>
<td>CLEAR (PREPARE FOR NEW COMMAND CODE)</td>
<td>RECORDER MODE</td>
<td></td>
</tr>
<tr>
<td>LF/FF</td>
<td>LOAD FORWARD OR FAST FORWARD</td>
<td>ERASE</td>
<td>EXECUTE</td>
<td></td>
</tr>
<tr>
<td>FWD</td>
<td>FILE FORWARD OR BLOCK FORWARD</td>
<td>COMMAND MODE</td>
<td>ENTER DATA</td>
<td></td>
</tr>
</tbody>
</table>

KEYSTROKE FUNCTION CHART

TABLE 1
APPENDIX A-11

M80 FUNCTIONAL BLOCK DIAGRAM

**RECORDER MODE**

The M80 powers up in the recorder mode, which gives the user direct control of tape motion and action. The keypad and indicator functions for the recorder control mode are illustrated in the first two columns of Table 1, and in Figure 1. Note that if the SHIFT key is held down, the other keys assume those functions represented in parentheses. (Figure 1)

Tape motion and Read and Write operations are most easily controlled in the RECORDER mode.

**COMMAND MODE**

A SHIFT-FORWARD keystroke enters the M80 system into the COMMAND MODE, which gives the user control of the computer itself and its related functions. The top row of keys become the 'hex-coded' data or parameter keys 8, 4, 2 and 1, with the LED above each key indicating DATA STATUS; thus the READ, WRITE, REWIND and BACK keys of Fig. 2 enter in 8, 4, 2 and 1, respectively, and the LED above each key lights to indicate the ON state of its assigned bit.

The bottom row of keys assume those functions written under the keypad diagram in Fig. 2. The SHIFT key is used only for two functions in conjunction with other keys; these and all other keyboard functions are illustrated in the last two columns of Table 1.
ORDERING INFORMATION:
When ordering an M80, we ask that you complete a questionnaire which details the firmware-selectable operation parameters; e.g., baud rate, block size, parity, etc. Although these parameters are all selectable via the keypad, it makes sense to have most of your requirements satisfied by custom firmware which Memodyne will prepare from your questionnaire. Separate forms are used for CNRZ and Phase-encoded formats.

Model M80/2000FPC  
Cassette Computer System in 2000 Portable Case  
Model M80/3000FPC  
Cassette Computer System in 3000 Desk Top Case  
Add suffix "R" for rack mounting  
NOTE 1. For either model add suffix "E" for 220V AC operation (EG: M80/3000FPCRE)  
NOTE 2. Phase encoding or CNRZ should be specified on Questionnaire

CAS-2H  
Certified Digital Cassette  
Recommended cassette is 300' long, has BEOT holes  
Model 360  
Bulk Eraser

OTHER ACCESSORIES AND OPTIONS
With such a versatile recording system many accessories and/or optional cards, etc. are available. Here is a brief list. If interested please notify our nearest representative or consult with the factory.

- Firmware listing – Cassette or paper  
- Firmware PROM Set  
- Source Program on Disk  
- Test tape – Phase Encoded  
- Test tape – CNRZ  
- Model 403 Card Modified for Transparent operations  
- Model 404 Phase Encoded Card  
- Model 405 CNRZ Card  
- Model 406 8K Static RAM Card  
- Model 407 4K to 16K U.V. EPROM Card  
- Model 408 4 channel, 12 Bit plus sign A/D Converter Card  
- Model 351 Rack Mounting ears for 3000 Case

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