CS617 Chapter 09

Chapter 09 | MREVAL: Explore the Native Math Library

Edition r003 | Owner-witnessed emulator learning guide | PB-2000C
Scope: MREVAL is a **separate exploratory ROM**, not the reusable library itself.

What MREVAL is for

MREVAL lets you investigate the real resident Casio math behavior without first writing an entire assembly driver. It connects the 23 `MATH_*` library services to B9 number parsing, a VT (Virtual Terminal) example browser, an editor and a historical tape. There are **26 demonstration commands** because `comp`, `sign`, and `cordic` come from other origins, not because three more original resident services were discovered.

The workflow on screen

1. Cold boot the owner-accepted MREVAL image. The launcher exposes **`[eval]`**, **`[lib1]`**, **`[lib2]`**; the fourth function-key slot is unused.
2. Browse an immutable example sheet. It contains **24 rows of 80 characters**; **13 populated** rows and **11 blank** rows.
3. Choose a populated line with **EXE** or **`:c`**. This **copies the expression to the normal editor without executing**.
4. Execute separately from `[eval]`. Results and diagnostics use the application tape.
5. **Q** exits a library document back to the launcher. **BRK** is a recovery path. `:t` prints a viewer document using the integrated serial transport.

Why does selection not auto-run?

An exploratory notebook should let you inspect/edit an example before executing it. This separates the choice of an experiment from its actual invocation; it also helps avoid unexpected tape entries. Blank rows are deliberately inert; `:e` cannot erase immutable ROM examples. The owner has witnessed these behaviors in bounded emulator cases.

When you enter VT (Virtual Terminal)

VT does not display a separate welcome or mode announcement. Choosing `[lib1]` or `[lib2]` immediately opens a scrollable VT view of the corresponding example document. From the `[eval]` editor, **F1** opens the historical tape in VT. The editor itself is **not** a VT session.

In the viewer, the calculator LCD shows only a four-line window onto a larger document. Use **UP/DOWN** to choose lines, **LEFT/RIGHT** to see more columns, `t` to return to the top and `b` to reach the bottom. Type `:` to see the VT command prompt; `:t` sends the current document through the configured serial interface.

In library views, **EXE** or `:c` copies a selected example to the editor without executing. In the tape view, the same controls **recall** a selected tape entry. **Q** exits the viewer. **MENU** returns to the launcher; **BRK** follows the warm-recovery path. See **VT - Virtual Terminal User's Guide** for the complete quick reference and splash mockups.

The complete example catalog

Row	Library 1	Library 2
1	`acs(0.5)`	`inc(7)`
2	`add(12,5)`	`lgt(100)`
3	`asn(0.5)`	`log(2)`
4	`atn(1)`	`mul(6,7)`
5	`b2bcd(123)`	`pi()`
6	`cmp(1,2)`	`power(2,3)`
7	`cnvr(123)`	`rnd12(12.345)`
8	`comp(1,2)`	`sign(-12.5)`
9	`cordic(1)`	`sin(30)`
10	`cos(60)`	`sq(7)`
11	`div(8,2)`	`sqr(9)`
12	`exp(1)`	`sub(12,5)`
13	`fix(7.5)`	`tan(45)`

All remaining rows 14-24 are blank in both documents. Successful library selection is **not** an independent numerical reference oracle.

Try these guided explorations

A. The difference between naming and representation. Compare `sq(7)` with `sqr(9)`. Square and square-root are different native calls. Do not infer a global round-trip law from one fixture.

B. Angles are part of the machine state. Try `sin(30)` and `cos(60)` in the explorer. Its application establishes DEG for these example paths; a new assembly consumer must not assume firmware defaults.

C. Similar logarithms are not interchangeable. `log(2)` is a natural logarithm; `lgt(100)` is common logarithm.

D. Compare native flags with derived output. `cmp(1,2)` exercises a native comparison path. `comp(1,2)` is an application adapter that maps the flags into a displayed signed comparison value. They are not two resident comparison algorithms.

E. Table data is not a numerical solver. `cordic(21)` selected the last valid historical record and was owner-observed to display `4.34e-01`. `cordic(22)` produced `Error: Numeric range`. These support indexed lookup behavior, not a CORDIC computation.

F. Safety is layered. `div(8,0)` is rejected with `Error: Unsafe math domain` by MREVAL preflight; it does not establish how a raw `MATH_DIV` service handles zero.

Diagnostics and their status

Code	Displayed message	Interpretation
01	`Error: Syntax`	Owner-witnessed named error path
02	`Error: Unknown function`	Owner-witnessed named error path
03	`Error: Wrong argument count`	Owner-witnessed named error path
04	`Error: Invalid number`	Owner-witnessed named error path
05	`Error: Numeric range`	Owner-witnessed named error path
06	`Error: Number too long`	Owner-witnessed named error path
07	`Error: Invalid native B9`	Message in source; independent owner trigger NOT WITNESSED
08	`Error: Invalid packed BCD`	Message in source; independent owner trigger NOT WITNESSED
09	`Error: Unsafe math domain`	Owner-witnessed named error path
10	`Error: Input/STR contract`	Message in source; independent owner trigger NOT WITNESSED

Exact witnessed examples: `xyz(1)` (02), `div(8,0)` (09), `pi(1)` (03), `pi()x` (01), `add(12,xyz)` (04), a 24-digit numeric token (06), and `cordic(22)` (05). Do not call the remaining 07/08/10 runtime-tested from this session.

Tape and viewer care

The historical tape is in the application-owned UA14 workspace and has recall and erase-confirmation paths. The source-backed VT integration is designed to preserve it during library browsing; owner observations cover selected tape/editor paths and a repeated library-entry sequence. Exact 1,968-byte RS232C wire-framing and all tape permutations are **not** independently qualified. Distinguish a readable saved report from byte-perfect serial transport proof.

Known limitations and maintenance notes

- The currently accepted MREVAL binary may display a trailing `DEG` suffix; this is disclosed, not silently modified.
- `:v` behavior remains a known UI cleanup candidate.
- C-ROM-assisted RS232C is a firmware dependency, not a promise of portability to all language cards or AI-1000.
- MREVAL error handling and friendly input syntax are *application features*, not native service contracts.
- No new hardware witness, complete caller-state clobber map or full-domain numerical accuracy follows from the explorer results.

Reading map and sources

- Chapter WHAT r007
- MREVAL r004 requirements
- Evidence and gap review
- **Companions: Native MathROM Field Guide**, **Native MathROM: 23 Function Contracts**, and **VT - Virtual Terminal User's Guide**.

Praeteritum ad futurum servamus.