NULL WEST // CHANNEL 77 // ARTIFACT MANUAL

REDLINE
// USE SIGNAL

NES LIGHTSYNTH + SIGNAL PROGRAMMING STUDIO

15	240	4	2
CHR TILES / PACKET	PATTERN BYTES	GENERATORS	CONTROLLERS

GLYPH

CLOUD

BLOCK

SIGNAL

IDENTIFICATION

REDLINE v0.5 / USE SIGNAL 0.3

MAPPER 0 // NROM // 32K PRG // 8K CHR-RAM // EMULATOR STRESS-TEST STABLE

USE SIGNAL.

NW-RL-077 // REV 2026.08.20

ARTIFACT INDEX // 00

REDLINE / USE SIGNAL

Formal artifact manual for the live NES lightsynth and its signal-programming bench.

USE SIGNAL

REDLINE is not a library of pictures. It is a live visual instrument. USE SIGNAL is not a development board. It is the bench where the transmission gets wounded on purpose. Edit the ROM. Watch the signal answer. Export what survives.

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IDENTIFICATION

This manual describes REDLINE v0.5 and USE SIGNAL Studio 0.3. Stock REDLINE is emulator stress-test stable under maximum-speed control abuse in the current field revision. The USE SIGNAL witness is a browser visualization, not an emulator.

FIELD MANUAL 00

Read This First

REDLINE is a two-controller NES visual-performance instrument built around live CHR-RAM synthesis. It continuously rewrites its own 8x8 graphics, places those graphics through the NES nametable system, moves color through attribute regions, and exposes the resulting field to direct performance control.

> **THE BASIC IDEA**
> Controller 1 shapes the field. Controller 2 controls energy, color, timing, mutation and freeze. The screen is generated continuously; the performer is steering a system, not selecting a playlist of scenes.

Operational Rules

- Use both controllers. REDLINE is intentionally divided into SHAPE and ENERGY hands.
- At performance speed, do not think in terms of “pictures.” Think in density, pressure, color memory, propagation and deformation.
- Palette changes and manual blasts can alter the entire field abruptly. Test projection intensity before a public set.
- RANDOM is a live palette state. Entering RANDOM rerolls it; leave and re-enter to ask for another result.
- If a custom REDLINE pressure curve causes top-edge tearing, vertical bounce or scroll displacement, reduce the jobs-per-packet value one step. That visible objection is the useful threshold.
- USE SIGNAL shows a plausible frozen witness frame. The exported NES bytes and real emulator/hardware output remain authoritative.

Signal Doctrine

> **THE BYTE IS THE TRUTH**
> Browser RGB is approximate. Literal NES palette values are not. A chosen $25 is $25 in the cartridge. A primitive is judged in the field, not alone in an editor. A setting that survives export and performance is part of the instrument.

SYSTEM 01

System Identity

PROPERTY	REDLINE V0.5
Format	iNES 1.0
Mapper	0 / NROM
PRG	32 KB
CHR-ROM	0 KB
CHR-RAM	8 KB writable pattern memory
Generators	GLYPH / CLOUD / BLOCK / SIGNAL
Core palette states	VOID VOLTAGE / DRANK SIGNAL / SLOWFLOOD COBALT / BRUISE ARC / RANDOM
Manual blasts	COBALT BLACKOUT / INVERSE VOLTAGE
Controllers	2
Maximum stock CHR work	15 complete tiles / 240 pattern bytes per packet
Nametable model	960-byte CPU shadow; live writes mirrored to both physical nametables

What REDLINE Is

REDLINE uses writable CHR-RAM rather than a fixed CHR-ROM library. Its generator banks are grammars: source forms from which the CPU continuously prepares new graphics. The resulting 2-bit tiles are transferred during vblank, while nametable and attribute updates determine where those forms appear and which subpalettes control larger color regions.

What REDLINE Is Not

It is not GHOST MASTER with more scenes. It does not depend on a catalog of prepared screens. The defining behavior is synthesis: shape vocabulary, placement, color geography, propagation and deformation remain live while the instrument is running.

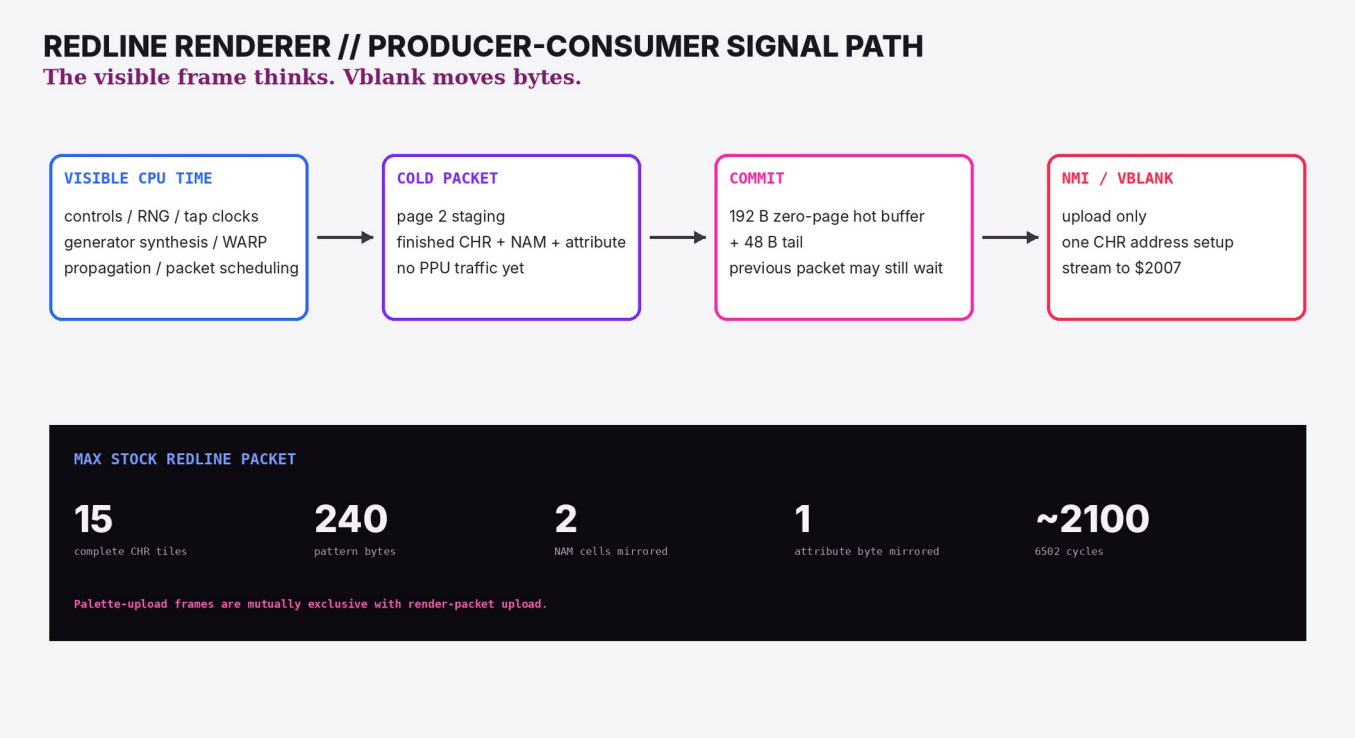

FIG. 01 // REDLINE producer-consumer renderer. Visible CPU time prepares; NMI uploads.

OPERATION 02

60-Second Quick Start

- Load REDLINE in an NES-compatible environment with both controllers mapped.
- Use Controller 1 SELECT to cycle GLYPH, CLOUD, BLOCK and SIGNAL until the field has the right structural language.
- Use Controller 2 LEFT / RIGHT to walk the core palette states. RANDOM rerolls when entered.
- Use Controller 2 UP / DOWN to establish synthesis speed. Stock maximum speed is a valid performance setting in the tested emulator revision.
- Use Controller 1 A / B to thicken or thin field density.
- Use Controller 1 START when you want one existing tile relationship to propagate outward through the field.
- Tap Controller 2 B twice to establish tempo. Subsequent beats reseed a propagation bloom and kick synthesis phase.
- Use Controller 2 SELECT to toggle WARP mutation: a color-safe row shear that deforms form without intentionally scrambling bitplane color.
- Use Controller 2 A for the manual blast. Completed blasts alternate COBALT BLACKOUT and INVERSE VOLTAGE.
- Use Controller 2 START to freeze / unfreeze the engine.

FIRST PERFORMANCE TEST

Choose SIGNAL, set a strong core palette, raise speed, add slow scroll, tap a tempo, trigger propagation, then toggle WARP. If that combination feels playable, the instrument is ready for deeper programming in USE SIGNAL.

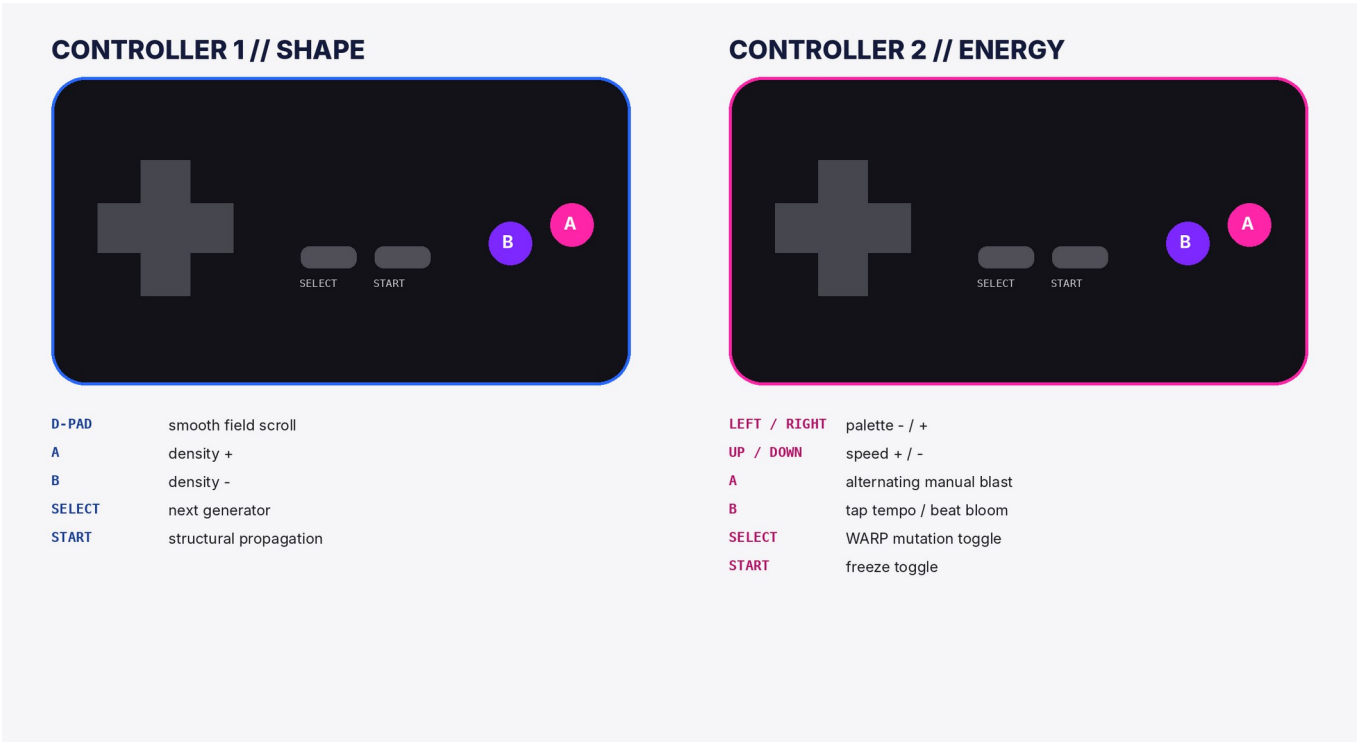

FIG. 02 // REDLINE control surface. SHAPE hand on Controller 1; ENERGY hand on Controller 2.

CONTROL 03

Controller 1 // SHAPE

CONTROL	FUNCTION	PERFORMANCE MEANING
D-pad	Smooth field scroll	Move the camera through the continuously maintained field. Movement occurs while held.
A	Density +	Increase the amount of signal allowed to exist. Higher density yields fuller visual fields.
B	Density -	Thin the field toward more negative space and sparse signal.
SELECT	Next generator	Cycle GLYPH → CLOUD → BLOCK → SIGNAL → GLYPH. Palette remains independent.
START	Structural propagation	Sample one tile already present and echo that relationship outward through the active 8×8 propagation trace.

Structural Propagation

START is not a random corruption switch. It creates relationship. The propagation engine samples an existing tile in the live nametable and reuses that tile through a defined 64-cell neighborhood order. Because those cells reference a common live tile identity, later CHR synthesis can transform the infected region together.

> **WHY IT WORKS**
> Propagation changes composition without inventing unrelated garbage. It redirects existing upload slots, so it remains inside the fixed REDLINE budget rather than adding extra PPU work.

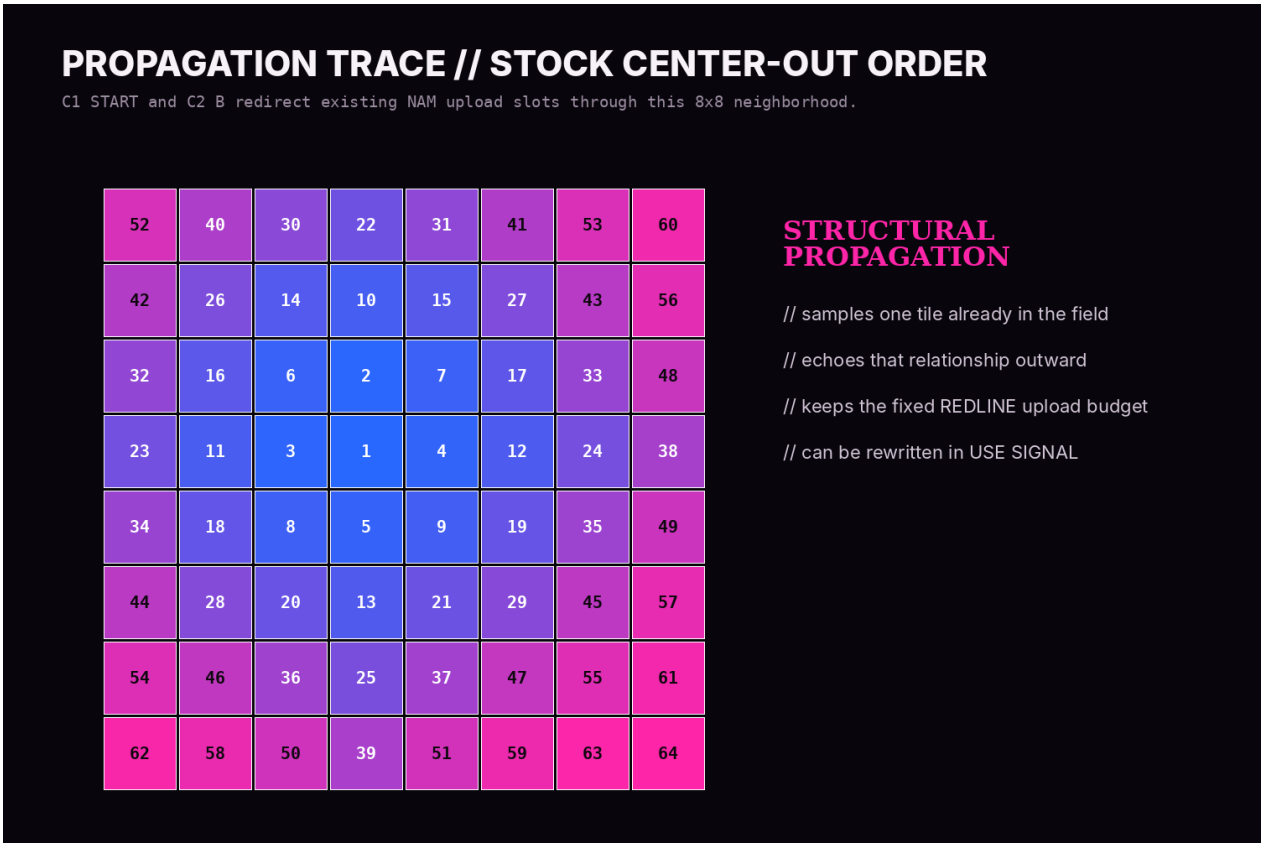

FIG. 03 // Stock center-out propagation trace. USE SIGNAL can rewrite this order.

CONTROL 04

Controller 2 // ENERGY

CONTROL	FUNCTION	PERFORMANCE MEANING
LEFT / RIGHT	Palette - / +	Walk the four curated worlds plus RANDOM. RANDOM rerolls every time it is entered.
UP / DOWN	Speed + / -	Change how frequently REDLINE prepares synthesis packets and, through the pressure curve, how much CHR work those packets can contain.
A	Manual blast	Apply an abrupt alternate full palette. Completed blasts alternate COBALT BLACKOUT and INVERSE VOLTAGE; repeated presses while active extend the same blast rather than rapid white/black alternation.
B	Tap tempo / beat bloom	Every physical tap launches a local structural bloom. Two valid taps establish beat period; subsequent beats reseed propagation and kick synthesis phase.
SELECT	WARP mutation toggle	Apply coherent row shear to both graphics bitplanes together. The form bends / tears while color relationships remain intentionally coherent.
START	Freeze toggle	Stop synthesis and field motion until toggled again.

Beat Is Structural, Not a Strobe

The automatic beat clock does not perform a whole-screen luminance flash. Its authority comes from structure: a fresh propagation bloom plus a synthesis-phase kick. Manual A remains the deliberate full-field color event.

> **ENERGY HAND**
>
> Use A when the room can take an abrupt color event. Use B when the music needs to move the structure. Use SELECT when the form needs to become unstable without turning into color soup.

SIGNAL 05

Generator Banks

Each generator bank contains sixteen 8×8, 2-bit source forms. REDLINE chooses from the active bank and synthesizes contiguous CHR runs from that vocabulary. The four banks are not scenes; they are different rules for what a tile is allowed to look like.

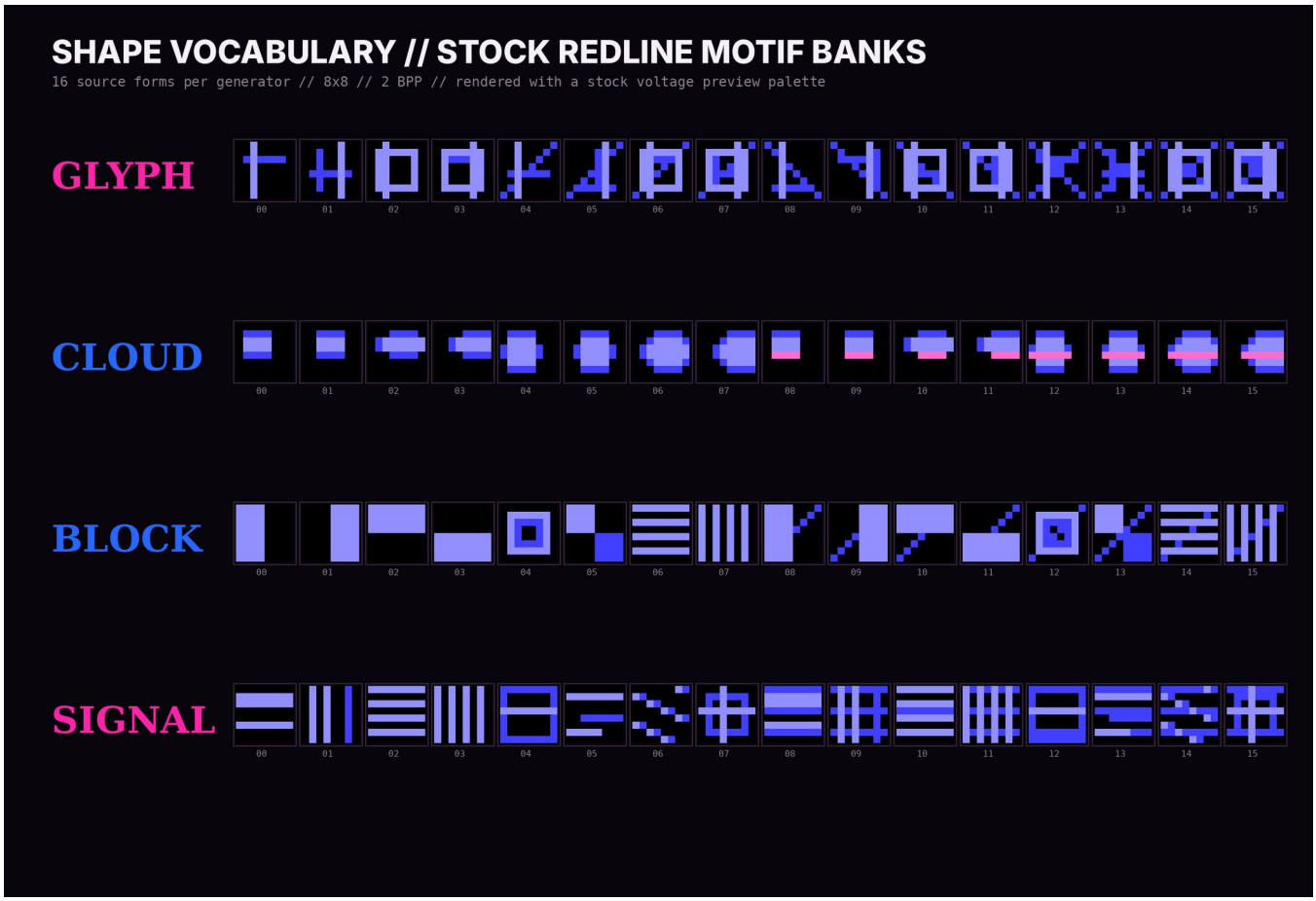

FIG. 04 // Stock REDLINE motif banks. USE SIGNAL can edit every source form directly.

GENERATOR	VISUAL GRAMMAR	USE WHEN
GLYPH	stems, crossbars, enclosures, diagonals, pseudo-writing	you want a field that reads like corrupted language, terminal marks or falling notation
CLOUD	coherent blobs, inner/outer mass, occasional bright seam	you want soft volume, weather, vapor or clustered organic motion
BLOCK	halves, frames, quadrants, bars, stripes, hard diagonals	you want large readable geometry and aggressive projector-scale composition
SIGNAL	scan bars, sync structures, grids, tracking fragments	you want broadcast damage, diagnostics, tracking failure and transmission logic

COLOR 06

Voltage // Color Memory

REDLINE separates generator choice from palette choice. Color is its own performance axis. Four stock core worlds are followed by a live RANDOM state; two additional palettes exist only as manual blasts.

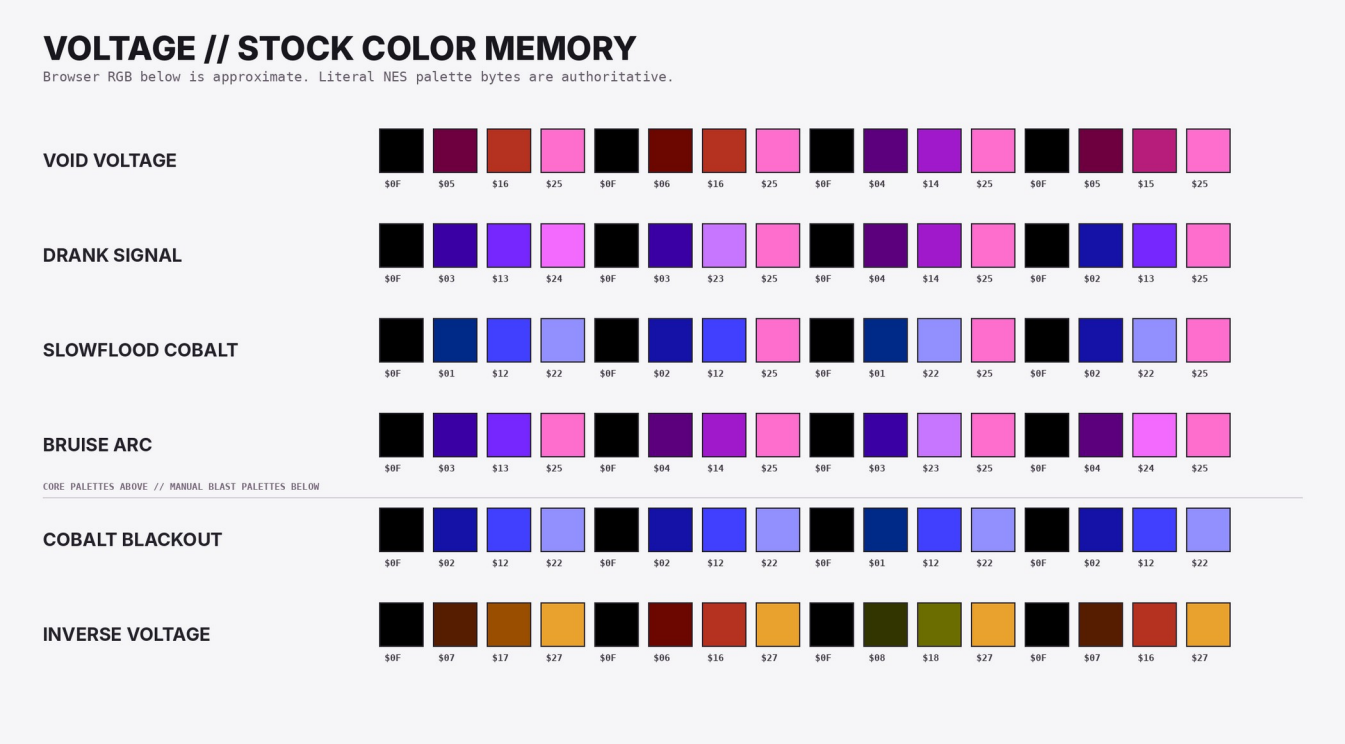

FIG. 05 // Stock REDLINE palette bytes. Browser color is approximate; bytes are literal.

Core States

- VOID VOLTAGE — black-forward red / voltage / electric-pink field.
- DRANK SIGNAL — black, syrup-purple, ultraviolet and electric pink.
- SLOWFLOOD COBALT — black, cobalt and hard electric blue with $25 pink; no teal in the stock definition.
- BRUISE ARC — black, bruise purple, violent violet and $25 pink.
- RANDOM — generated live. Entering RANDOM requests a new palette; leave and re-enter to reroll.

Manual Blasts

- COBALT BLACKOUT — essentially black plus cobalt voltage.
- INVERSE VOLTAGE — warm orange / red complement on black. The background remains black; it is deliberately not a white flash.

> **$25**
>
> Every intentional electric pink in stock REDLINE is literal NES palette byte $25. USE SIGNAL preserves byte-level editing so color decisions remain explicit.

BEHAVIOR 07

Propagation / WARP / Beat

Propagation Changes Relationships

C1 START samples one live tile and distributes that identity through the active propagation trace. The stock trace is center-out. USE SIGNAL can replace the order with CENTER OUT, SPIRAL, SNAKE, DIAGONAL, EDGE IN, RANDOM or a rewritten custom trace.

WARP Changes Geometry

C2 SELECT does not add independent random noise to the two graphics bitplanes. It applies a coherent row displacement to both planes together. This makes the graphic appear dragged, sheared or torn while preserving the intended mapping between pixel value and palette slot.

Beat Changes Structure

C2 B has two jobs: register physical taps and drive the structural beat clock. Every tap has immediate visual authority through a local propagation bloom. A second valid tap establishes the period. Each subsequent beat reseeds the bloom and advances synthesis phase.

> **PERFORMANCE RULE**
>
> If an effect does not make you want to hit the button again, program it differently. REDLINE is an instrument. Stability is necessary; authority is the goal.

FIELD 08

Performance Practice

Build Pressure, Do Not Stack Noise

REDLINE is strongest when controls describe a coherent direction. Start with a generator and palette relationship, establish density and speed, then introduce motion and one destabilizing behavior. The renderer can tolerate aggressive combinations, but the audience still benefits from shape, contrast and change that can be read.

GESTURE	SUGGESTED OPERATION	RESULT
Slow transmission	SIGNAL + moderate density + slow horizontal scroll + DRANK SIGNAL	diagnostic field with enough negative space for tracking structures to read
Voltage bloom	BLOCK + high density + C1 START + COBALT BLACKOUT blast	large geometry spreads, then collapses into a hard cobalt event
Beat infection	GLYPH + medium speed + two C2 B taps + recurring beat bloom	pseudo-writing receives structural punctuation on the clock
Soft failure	CLOUD + slow speed + WARP + vertical scroll	vapor mass deforms without becoming random pixel soup
REDLINE	any strong generator + high speed + tuned density + beat + propagation	maximum live rewrite pressure; use the field rather than a static composition

Freeze as Composition

C2 START is useful not only as a pause but as a framing tool. Freeze a strong accidental state, use the room or music to carry the moment, then release synthesis. REDLINE does not require constant motion to remain alive.

> **ROOM TEST**
> Manual blasts, RANDOM palettes and high-density fields can create abrupt changes in perceived brightness. Validate the projection chain and room before a public performance.

ENGINE 09

REDLINE Renderer

REDLINE v0.5 exists because earlier builds proved a direct-NMI design could be driven into visible failure: top-edge tearing, vertical bounce and scroll displacement appeared when synthesis work and PPU transfer work were stacked inside vblank. v0.5 separates thinking from transport.

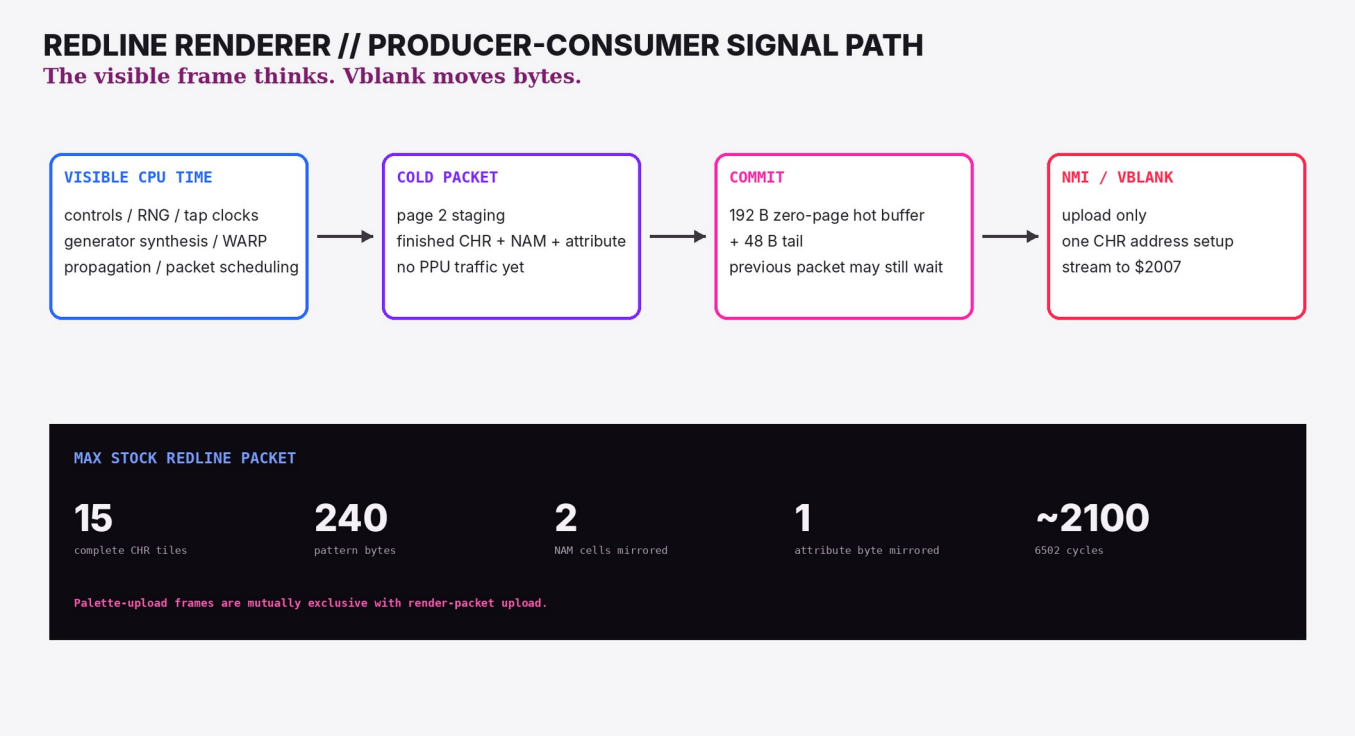

FIG. 06 // REDLINE renderer architecture and stock maximum packet.

Producer / Consumer

- Visible CPU time handles controller parsing, tap / beat clocks, scrolling arithmetic, RNG, generator synthesis, WARP math, propagation planning and packet scheduling.
- A cold packet is prepared in page 2 while the previous committed packet may still be waiting for NMI.
- Commit copies the first 192 CHR bytes into the zero-page hot buffer at $40-$FF and stages a 48-byte tail for the final three tiles.
- CHR destinations are contiguous runs. NMI sets the PPU address once, then streams the run through $2007.
- Palette-upload frames are mutually exclusive with render-packet upload. A blast or palette walk therefore does not stack sixteen palette writes on top of REDLINE traffic.

ENGINE 09B

Stock REDLINE Curve

SPEED STEP	CHR TILES / PACKET	PATTERN BYTES
0	1	16
1	1	16
2	2	32
3	3	48
4	4	64
5	6	96
6	9	144
7	12	192
8	15	240

STATIC MAXIMUM

Worst-case stock packet at speed step 8 is estimated at approximately 2,100 NMOS 6502 cycles including NMI entry / exit: 15 CHR tiles, up to two mirrored NAM cells, one mirrored attribute byte and scroll restoration. The current field revision has survived emulator abuse at this setting.

STUDIO 10

USE SIGNAL

USE SIGNAL is the formal programming bench for REDLINE. It patches the compatible .NES directly; it is not a separate renderer and it does not replace emulator / hardware testing. Its purpose is to make palette, primitive, propagation and pressure work immediate enough that visual identity can be programmed by eye.

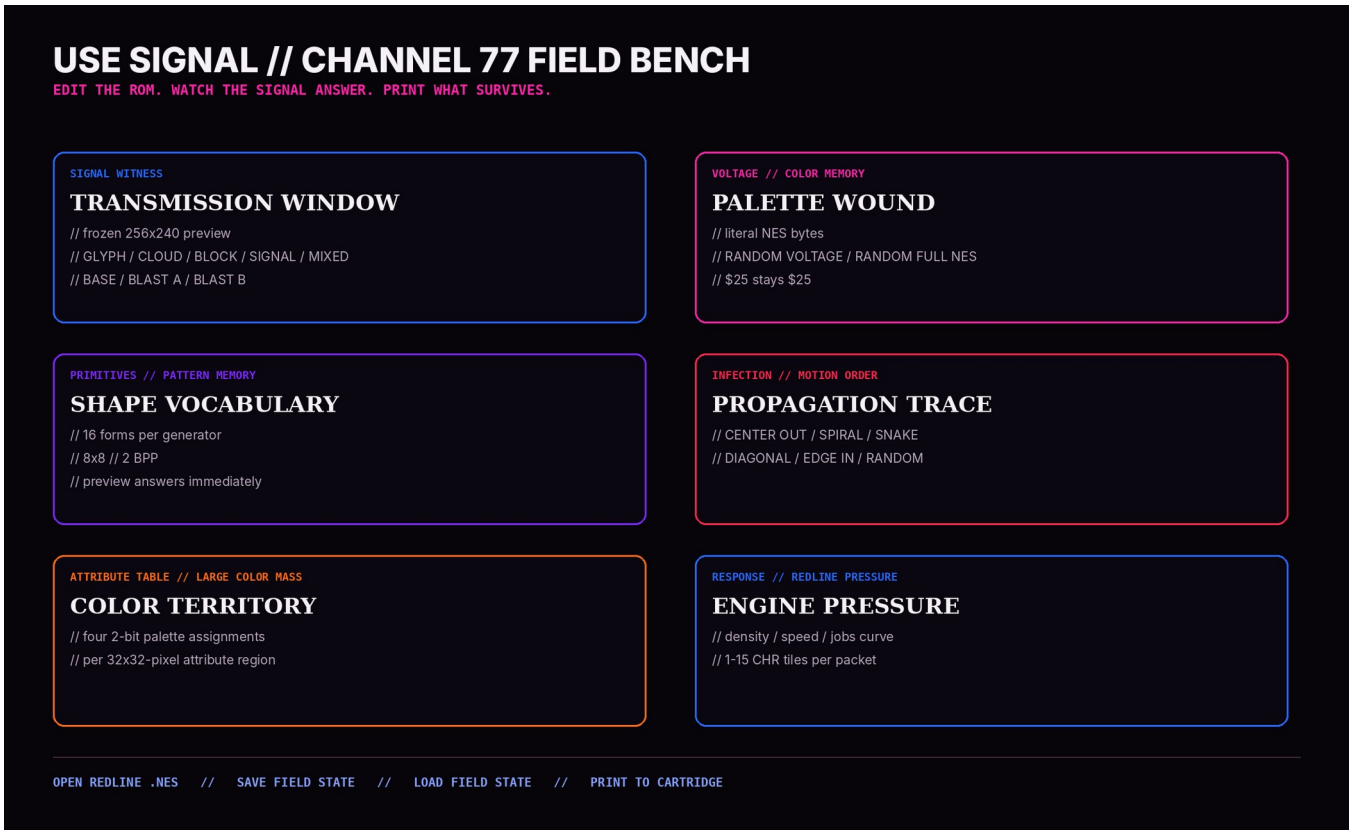

FIG. 07 // USE SIGNAL Studio 0.3 artifact map.

Core Actions

ACTION	MEANING
OPEN REDLINE .NES	Load a compatible REDLINE v0.5 cartridge layout for direct patching.
RESTORE REDLINE	Return the bench to the embedded stock REDLINE baseline.
SAVE FIELD STATE	Export Studio settings as JSON: palettes, curves, attributes, propagation and motif banks.
LOAD FIELD STATE	Apply a compatible USE SIGNAL settings JSON to the active ROM.
PRINT TO CARTRIDGE	Export the currently patched .NES file.

ARTIFACT POSITION

USE SIGNAL is not a development board. It is the bench where the transmission gets wounded on purpose. The signal should look like it came from somewhere it should not.

STUDIO 11

Transmission Window

The SIGNAL WITNESS is a 256×240 frozen browser visualization built from the actual motif bytes, palette bytes, density table and attribute assignments in the loaded ROM. Palette and primitive edits answer here immediately.

WITNESS CONTROL	FUNCTION
Generator	GLYPH / CLOUD / BLOCK / SIGNAL / MIXED.
State	BASE / BLAST A / BLAST B.
Core palette under witness	Choose the stock or edited core palette used when State = BASE.
Field density	Set the witness density independently for visual evaluation.
RESEED SIGNAL	Generate a different deterministic witness composition.

> **LOCK THE SEED**
> Keep the seed fixed while tuning color or primitives. A fixed witness makes before / after comparison meaningful. Reseed only when you want a different composition.

Witness Limit

The witness is intentionally not cycle-accurate NES emulation. It is a deterministic field preview. The ROM byte values, emulator output and eventual hardware / projection chain remain authoritative.

STUDIO 12

Palette Wound / Shape Vocabulary

Palette Wound

All six fixed 16-byte palette blocks can be edited directly against the full 64-entry NES palette grid. Select a slot, then choose or inject a byte. The browser color is an approximation; the hexadecimal value is the artifact.

- RANDOM VOLTAGE creates a constrained high-energy random palette for further editing.
- RANDOM FULL NES draws from the broader 6-bit NES palette range.
- $0D is blocked by default and may be deliberately unlocked in the interface.
- LIFT copies the active palette; GRAFT pastes the copied palette into another state.
- Changes answer immediately in SIGNAL WITNESS.

Shape Vocabulary

Each generator exposes sixteen source motifs. Every motif is an 8×8, 2-bit tile with pixel values 0–3. USE SIGNAL lets the operator paint those values directly, erase, invert and move among the sixteen forms while watching the field update.

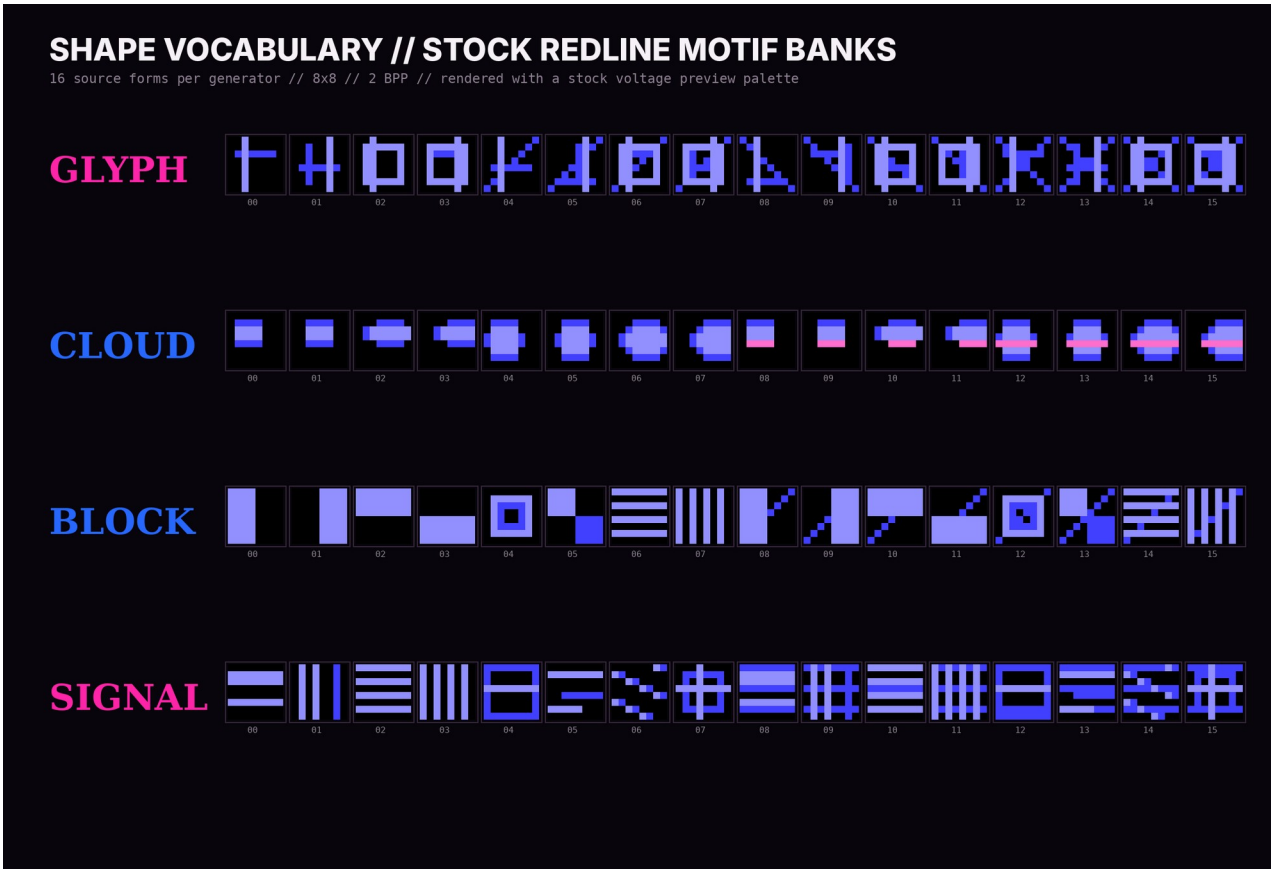

FIG. 08 // Stock source vocabulary. Editing the motifs changes what REDLINE can synthesize.

PROGRAM THE GRAMMAR

A primitive is not a logo. Its value is the behavior it produces when repeated, rewritten, propagated, warped and recolored across the field.

STUDIO 13

Propagation Trace / Color Territory / Engine Pressure

Propagation Trace

The propagation path is a 64-step order through an 8×8 neighborhood. C1 START and C2 B both use this structural engine. USE SIGNAL provides CENTER OUT, SPIRAL, SNAKE, DIAGONAL, EDGE IN and RANDOM, and can rewrite the trace into the ROM.

Color Territory

The NES attribute table assigns one of four subpalettes to 16×16 quadrants inside each 32×32-pixel attribute region. USE SIGNAL exposes eight attribute patterns so color can be programmed as geography rather than as isolated swatches.

- QUIET FIELD — restrained palette territory.
- HARD BLOCKS — stronger regional separation.
- BREAK TERRITORY — more aggressive assignment patterns.

Engine Pressure

Three response curves are directly patchable: density, speed and REDLINE jobs-per-packet. The jobs curve is the dangerous one. REDLINE v0.5 supports 1–15 complete CHR tiles per packet; 15 equals 240 pattern bytes before NAM and attribute traffic.

> **DO NOT CONFUSE SPEED WITH REDLINE**
>
> Speed decides how often the instrument answers. The jobs curve decides how much CHR work can be packed into a prepared answer. The stock curves are already stress-tested together; custom curves should be validated in the same emulator / hardware path in which they will perform.

OUTPUT 14

Field State / Cartridge Export / Deployment

Save Field State

USE SIGNAL settings JSON is the portable programming state. It stores all directly patchable personality data: six fixed palettes, speed curve, density curve, attribute patterns, REDLINE jobs curve, propagation X/Y path and all four 256-byte motif banks.

Print to Cartridge

PRINT TO CARTRIDGE exports the active patched ROM. The Studio validates the REDLINE v0.5 NROM layout before editing: 32,784-byte iNES image, 32 KB PRG, CHR-RAM layout and expected REDLINE vectors.

Field Deployment

- Keep the stock REDLINE v0.5 ROM as a known-good reference cartridge.
- Name custom exports by personality or performance purpose rather than overwriting the baseline.
- Test a custom ROM in the same emulator / hardware path that will be used live.
- At maximum pressure, deliberately exercise scroll, START propagation, WARP, tap tempo, palette walk and manual blasts before relying on the build in a room.
- Keep the matching USE SIGNAL JSON next to any custom ROM worth preserving.

PRINT WHAT SURVIVES

The final test is not whether a setting looks good in the bench. The final test is whether it exports, boots, answers the controls and remains coherent under performance pressure.

RECOVERY 15

Troubleshooting

SYMPTOM	LIKELY MEANING	ACTION
Top edge tears / picture bounces at a custom pressure curve	The current packet budget is crossing the safe transfer window in that environment.	Reduce the high-end jobs-per-packet value one step and retest. Treat the previous stable value as the measured profile.
Palette looks different from USE SIGNAL witness	Browser RGB is approximate and the witness is not an emulator.	Trust the literal bytes, then judge in the target emulator / hardware / projector path.
RANDOM looks wrong	RANDOM is intentionally unconstrained compared with curated worlds.	Leave RANDOM and re-enter to reroll, or build a fixed palette in USE SIGNAL.
A manual blast is too aggressive	Blast palette is a full-field event.	Edit COBALT BLACKOUT / INVERSE VOLTAGE in Palette Wound, then preview BASE / BLAST A / BLAST B.
Propagation is visually dull	The path or source vocabulary does not create a readable relationship.	Change Propagation Trace or edit source motifs; preserve the fixed upload budget.
WARP looks weak	Source motif lacks horizontal structure or density is too sparse.	Try a stronger generator / density relationship before changing the engine.
Custom ROM refused by Studio	ROM is not the expected v0.5 REDLINE layout.	Open the stock REDLINE baseline or a cartridge exported from a compatible USE SIGNAL session.

> **RECOVERY RULE**
> If the signal becomes aesthetically bad but the machine remains stable, that is a programming problem, not an engine failure. Return to a known palette / generator, freeze if useful, then re-author the field.

APPENDIX A

Default Tables

Stock Response Curves

INDEX	0	1	2	3	4	5	6	7	8
Speed divisor	12	12	9	7	5	4	3	2	1
Density threshold	0	32	64	96	128	160	192	224	255
CHR jobs / packet	1	1	2	3	4	6	9	12	15

Stock Attribute Patterns

$00, $55, $AA, $FF, $33, $CC, $5A, $A5

Stock Palette Bytes

PALETTE	16 BYTES
VOID VOLTAGE	$0F $05 $16 $25 $0F $06 $16 $25 $0F $04 $14 $25 $0F $05 $15 $25
DRANK SIGNAL	$0F $03 $13 $24 $0F $03 $23 $25 $0F $04 $14 $25 $0F $02 $13 $25
SLOWFLOOD COBALT	$0F $01 $12 $22 $0F $02 $12 $25 $0F $01 $22 $25 $0F $02 $22 $25
BRUISE ARC	$0F $03 $13 $25 $0F $04 $14 $25 $0F $03 $23 $25 $0F $04 $24 $25
COBALT BLACKOUT	$0F $02 $12 $22 $0F $02 $12 $22 $0F $01 $12 $22 $0F $02 $12 $22
INVERSE VOLTAGE	$0F $07 $17 $27 $0F $06 $16 $27 $0F $08 $18 $27 $0F $07 $16 $27

Stock Propagation

64-cell center-out order across an 8×8 neighborhood. The path is stored as paired PropDX / PropDY tables and is directly rewritable in USE SIGNAL.

APPENDIX B

Terminology / Revision State

TERM	MEANING
CHR-RAM	Writable NES pattern memory. REDLINE synthesizes 8×8 graphics into this memory live.
NAM / nametable	The 32×30 tile layout that determines which tile identity appears at each screen cell.
Attribute	NES color-territory byte assigning one of four subpalettes to 16×16 quadrants inside a 32×32 region.
Motif	One of sixteen 8×8, 2-bit source forms in a generator bank.
Generator	GLYPH / CLOUD / BLOCK / SIGNAL source grammar.
Propagation	A structural relationship effect that echoes one live tile through a programmed neighborhood order.
WARP	Color-safe geometric row shear applied to both CHR bitplanes together.
Blast	Manual temporary full-palette event from Controller 2 A.
RANDOM	Live fifth core palette state generated when entered.
REDLINE	The v0.5 lightsynth instrument and the jobs-per-packet pressure model that drives its maximum live CHR rewrite rate.
USE SIGNAL	The Channel 77 / NULL WEST browser artifact used to program compatible REDLINE ROMs directly.
SIGNAL WITNESS	Deterministic frozen 256×240 browser preview built from active ROM data; not a cycle-accurate emulator.

Revision State

- Instrument name: REDLINE.
- Studio name: USE SIGNAL.
- Current instrument revision documented: REDLINE v0.5.
- Current studio revision documented: USE SIGNAL 0.3.
- Field status: stock REDLINE emulator stress-test stable under maximum-speed control abuse in the tested environment.
- Primary next work is signal programming and field/hardware deployment, not renderer repair.

FINAL DIRECTIVE

USE SIGNAL.