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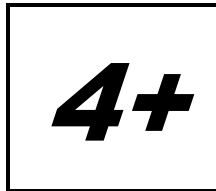
Turntable Indexing That Works

PTC Model 4+™

Programmable Turntable Controller

Controller and Motor Assembly

P/N 03-250



Firmware Version 1 | Rev 09/2026

Installation Instructions **And** **Users Manual**

NYRS

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Quick Start Guide

We are constantly trying to make our documentation better; always check for updates on the nyrs.com website.

This checklist gets you up and running with a properly installed and programmed PTC Model 4+ turntable controller. For full details, refer to the later sections of this manual.

- 1. Bench test first.** Run the system on the bench, not attached to a turntable, so you understand the programming process before final installation. When bench testing is complete, perform a factory reset before installing and programming the controller on the layout. This clears temporary bench positions so Track 1 head and Track 1 tail can be established correctly on the layout.
- 2. Install the motor and bracket.** Mount the stepper motor using the NYRS Motor Mount Kit or a rigid, well-aligned custom mount. Keep the motor shaft square to the turntable shaft.
- 3. Check free rotation.** Before programming, make sure the bridge turns freely through a full 360 degrees with no binding or sudden increase in drag. Section 5.1 describes the recommended loaded fish-scale test.
- 4. Mount the controller.** Install the keypad/controller module in the fascia within reach of the turntable. Cut the panel opening to the dimensions in Appendix B and secure the module with the supplied hardware.
- 5. Wire the system.** Connect the motor cable, power supply, optional DCC control input, optional ATR track-reversing connections, APR2 if used, and the effects relay as shown in the wiring section.
- 6. Reset before layout programming.** After installation and testing are complete, perform a factory reset (Section 8.13) and cycle power before programming the actual layout tracks. This erases all test positions so Track 1 head and tail are established from the installed turntable. Configure your settings and DCC after the reset.
- 7. Configure DCC,** if used. Function 8 assigns the two-digit base group used for DCC accessory addresses; see Section 8.10.
- 8. Program the tracks.** Enter Learn Mode, point the head end at Track 1 and store it, store the Track 1 tail once to establish the head-to-tail offset, then store the head end of each remaining track. No indexing is required.
- 9. Operate and fine-tune.** In RUN mode, select a track with '# <track> *' for head-end alignment or '# <track> #' for tail-end alignment. Adjust speed and momentum as desired. If a track is slightly out of alignment, re-enter Learn Mode and re-store only that track.

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The PTC Model 4+ front panel: power button, TRACK display, status LED, and keypad

1. Introduction

The NYRS PTC Model 4+ is a precision programmable turntable controller designed for model railroaders who want reliable, repeatable alignment of a turntable bridge to multiple lead and service tracks. Motion is handled by an integrated stepper motor with an absolute multi-turn encoder (12,800 counts per revolution, about 0.028° per count), so the controller always knows the bridge's position — even after power-off — and never needs indexing.

This manual describes how to install the motor and controller, perform a bench checkout, program head and tail positions for each track, operate the controller in normal service, adjust speed and momentum, use automatic track power reversing (ATR), and troubleshoot any errors that may occur.

1.1 Scope of This Manual

This document covers the PTC Model 4+ with firmware Version 1. Refer to the Firmware Change Log for version-specific details. Users upgrading from the original PTC Model 4 should see Appendix E for a concise summary of what changed.

1.2 Safety and Regulatory Notices

The PTC Model 4+ contains electronic assemblies soldered with lead-based solder. Avoid inhaling fumes if you solder or rework the internal boards, and wash your hands after handling internal components.

Follow all applicable electrical safety practices when wiring your layout, power supplies, and any mains-powered devices.

California Proposition 65 Warning: This product can expose you to chemicals including lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm.

2. System Overview

A complete PTC Model 4+ installation consists of the controller/keypad assembly, the scale-appropriate stepper motor and bracket, a DC power supply, optional DCC accessory control, optional ATR wiring for bridge track power, and any accessories tied to the effects relay, as well as the APR2 Automatic Power Router. See the APR2 manual at www.nyrs.com for more details.

2.1 Major Components

- PTC Model 4+ Controller Module with keypad, dual-digit display, and tri-color status LED.
- Integrated stepper motor with absolute encoder: NEMA 17 for N scale, NEMA 23 for HO scale, or NEMA 34 for O scale, with the corresponding NYRS motor mount kit.
- 24 V DC, 6 A power supply (NYRS-supplied or equivalent); 110/220 V, 50/60 Hz input.
- Optional track reversing (ATR) connection to bridge rails.
- Optional accessories: effects relay loads (lamps, sound modules, indicators), APR2.

2.2 Operating Modes

The PTC operates in two primary modes. (Index Mode is no longer used — the absolute encoder eliminates it.)

- **LEARN Mode:** programming mode for teaching the head and tail positions of each track. Individual tracks can be re-taught at any time without clearing the whole table.
- **RUN Mode:** normal operating mode for selecting and moving to programmed tracks.

3. Motor Installation

Proper motor installation is critical to accurate and repeatable turntable performance. Any misalignment, flex, or binding between the motor and the turntable bridge will show up as inconsistent track alignment. Take your time on this step — good mechanics make everything else easy.

It is good practice for locomotives to come onto the bridge straight so they do not push the bridge out of alignment. We recommend at least one engine length of straight track approaching the bridge.

Motor

The PTC4+ uses integrated absolute-encoder motors sized by scale: NEMA 17 for N, NEMA 23 for HO, and NEMA 34 for O. These motors have no backlash, so the PTC4's 300:1 planetary gearmotor and its 'always stops clockwise' behavior do not apply.

3.1 Using the NYRS Motor Mount Kit

If you are using the optional NYRS Motor Mount Kit, refer to the detailed instructions included with that kit. Install and test the motor mount before proceeding with the rest of this manual. The kit is designed to provide proper alignment and rigidity for most common turntable installations.

3.2 Designing Your Own Motor Mount

If you are designing your own mount (for a scratch-built turntable or special installation), keep these guidelines in mind:

- Do not suspend the motor from the turntable shaft. The motor should be firmly supported by the pit, benchwork, or a rigid bracket — not by the bridge.
- The mount must be rigid. There should be no noticeable flex or twist when you apply moderate hand force to the motor.
- Maintain proper alignment. The motor shaft must remain coaxial with the turntable shaft to avoid binding.
- Use a common reference surface. The turntable and motor should be mounted to the same structural reference (pit, subroadbed, or a dedicated frame), rather than opposite sides of flexible benchwork.
- Motor mounting patterns differ by scale: N scale uses a NEMA 17 motor, HO scale uses a NEMA 23 motor, and O scale uses a NEMA 34 motor with bracket BRA-MM-NEMA34. See Appendix A and the NYRS Motor Mounting Manual (www.nyrs.com). Turntable shaft sizes vary; contact NYRS for the correct coupling for your installation.
- The high resolution of the encoder means even small mechanical errors can make alignment difficult. A well-built mount will pay off in years of smooth, reliable operation.

4. Controller Installation

The PTC controller/keypad module is designed for fascia mounting, where the operator has clear visibility of the display and easy access to the keypad. Choose a location that is both comfortable to reach and close enough to the turntable for the motor cable and wiring to reach.

4.1 Choosing a Location

- Mount within reach of the turntable using the standard motor cable; optional extension cables are available for longer runs.
- Treat the turntable like a cluster of turnouts — place it where the operator can easily see and reach it.
- Ensure sufficient clearance behind the fascia for the PCB, connectors, and cabling.

4.2 Fascia Cutout and Mounting

Use the controller cover plate as a template to mark the cutout on your fascia, or refer to Appendix B for detailed dimensions. Proceed as follows:

- Position the cover plate on the fascia, face down, and lightly trace the four mounting hole locations.
- Using a straightedge, connect the outer edges of the hole marks to define the rectangular cutout.
- Center-punch and drill the four mounting holes with a small pilot drill (about 1/16").
- Cut along the marked lines. As you reach each corner, round the cut slightly rather than cutting past the corner into the mounting-hole area.
- Deburr all edges carefully; burrs can scratch the anodized finish of the cover plate.
- Test-fit the cover plate over the cutout and adjust as needed. Do not oversize the hole so much that the plate cannot fully cover it.

- Mount the module using the supplied 4-40 self-tapping screws. Verify cable and PCB clearances behind the fascia.

4.3 Power Switch and Supply

The PTC 4+ has a built-in power switch — the push button on the front panel — which powers the controller on and off. The controller is powered from a 24 V DC, 6 A supply (110/220 V, 50/60 Hz input). When an entire layout is powered up at once, electrical noise from switch machines and DCC systems can be significant; the front-panel switch lets you power the turntable controller independently. Be sure all wire splices are insulated.

4.4 Track Reverser and ATR Wiring Overview

For DCC users, NYRS recommends a dedicated DCC auto-reverser such as the PSX-AR, which combines auto-reversing with circuit-breaker protection. The PTC's own ATR feature works well, but the added protection of a DCC reverser can help protect your wiring and boosters in the event of a major short.

The PTC's onboard track-reversing connections are labeled A, B, C, and D. Connect layout track power (conventional DC or DCC) to terminals A and B, and connect the bridge feeder wires to terminals C and D. At the Track 1 home position, A is connected to C and B to D. As the bridge turns, the PTC flips the reversing relay live from the encoder angle so polarity reverses exactly at the $\pm 90^\circ$ points relative to Track 1. See Appendix C for the wiring diagram.

- Connect layout track power (DC or DCC) to terminals A and B.
- Connect the two bridge rail feeders to terminals C and D.
- In the Track 1 home position, A is connected to C and B to D.
- At approximately $\pm 90^\circ$ from home, the connections reverse; at the next $\pm 90^\circ$ crossing they return.
- For DCC, NYRS recommends an external auto-reverser such as the PSX-AR for additional short-circuit protection, in conjunction with or instead of the PTC's ATR feature.

4.5 AUX Connector

The controller provides an AUX connector — the effects-relay output as dry (voltage-free) contacts, selectable normally-open or normally-closed via Function 3 and rated 30 V DC / 3 A. The physical shaft-brake output of earlier units is discontinued — the motor controller now provides braking internally. See Appendix C for the connector layout.

5. System Check-Out

Before committing to a permanent installation, verify basic operation on the workbench or with the turntable temporarily in place. This ensures wiring, motor connections, and controller functions are correct before you program track locations. After a bench test, perform the factory reset in Section 8.13 before initial programming on the layout; bench-test positions must not become the layout's Track 1 reference.

5.1 Checking Bridge Rotation

Enter Learn Mode (Section 6.2). In Learn Mode the motor releases and the bridge turns freely by hand. Before programming, check the turntable for smooth, free rotation under load. Place your heaviest

locomotive on the bridge. An inexpensive digital fish scale, available from Amazon for less than \$10, is useful for this test. Attach the scale near the end of the bridge and slowly pull the bridge through a complete 360° rotation while watching the reading. The force required should remain reasonably consistent throughout the rotation. A sudden increase in the reading indicates a stiff spot, binding, interference, or another mechanical problem that should be corrected before programming. Also watch for any of the following:

- Binding or stiff spots in the motion.
- Sudden jumps or catching.
- Unusual noises indicating misalignment.

If you see any of these issues, correct the mechanical problem before programming. Because the controller uses an absolute encoder, no indexing step is required at any point — the bridge position is always known.

Before programming layout tracks: After completing installation and all bench or layout testing, perform a factory reset (Section 8.13), then turn power OFF and ON. This clears stored test positions and restores the normal defaults. Begin programming with Track 1 head and tail on the actual layout; do not use positions saved during testing. Reapply your desired settings and DCC configuration after the reset.

6. Programming the Turntable

Programming teaches the PTC 4+ the exact angular position of every track. Thanks to the absolute encoder, you program the head end of each track plus a single head-to-tail offset once, and the controller derives every tail position automatically. Programming is normally done once after installation, and again only when major mechanical changes occur. If the controller was operated on the bench, restore factory settings before this initial layout programming. Track 1 head is the angular reference, and Track 1 tail establishes the head-to-tail offset used for every track.

What changed from the PTC4

Programming now works like the PTC5. Entering Learn Mode no longer clears the whole table — existing positions are preserved, and you can re-teach any single track at any time. You program each track's head end, and program the Track 1 tail just once to set the head-to-tail offset for all tracks. There is no separate Track-Edit function and no indexing step.

6.1 Planning Track Numbers

Track 1 must be your primary lead track; it serves as the angular reference for ATR and for the head-to-tail offset. The remaining tracks may use any numbers from 2 to 99 in any pattern. Many users group numbers logically — for example, 1–3 for lead tracks, 11–15 for roundhouse stalls, 20–29 for outside storage, and 30–39 for additional service tracks. Sketch your turntable, write the chosen numbers next to each track, and check them off as you program.

6.2 Entering Learn Mode

- Turn the controller ON and ensure it is in RUN (ready) mode.
- Enter '# 0 0 #'. The display shows 'F-' (Function Prompt).

- Enter '9'. The controller enters Learn Mode immediately. The display shows 'Ln' and the status LED glows steady yellow.
- In Learn Mode the motor releases and the bridge free-wheels, so you position it by hand. Existing track positions are preserved — you may re-teach a single track or teach the whole table.

Factory reset

Turn power OFF, hold keys 1 and 3, and turn power ON. Continue holding for approximately 1.5 seconds until the display shows 'rS'. Release both keys, then press '#' within 5 seconds to confirm. This clears the track table and restores normal controller and motor settings; the DCC base group is preserved.

6.3 Program Track 1 (Head End)

Choose one end of the bridge as the head end. It helps to mark this end — or model an operator's shack on it — so you can tell the two ends apart. Then:

1. By hand, point the head end of the bridge at Track 1.
2. Press '#', enter '1', then press '*'. The status LED gives two quick red flashes to confirm that the Track 1 head-end position is stored, then returns to steady yellow.

6.4 Program Track 1 (Tail End) — sets the offset for every track

Next, capture the head-to-tail offset by programming the tail end of Track 1:

1. By hand, rotate the bridge so the tail end points at Track 1.
2. Press '#', enter '1', then press '#'.

The controller stores the offset between the head and tail ends from this single move and applies it to every other track. You do not need to program the tail end of any other track. The controller also remembers that the bridge is parked at Track 1 tail, so Track 1 head may be selected immediately after leaving Learn Mode.

6.5 Program the Remaining Tracks

For each remaining track, point the head end of the bridge at the track and press '#', the track number, then '*'. Repeat for all tracks you intend to use.

Optional

If a particular track ever needs its own tail position, program it with '#', the track number, then '#'. This is rarely necessary — the Track 1 offset already covers the whole table.

6.6 Editing a Track

Editing works exactly like programming. Enter Learn Mode, position the bridge at the corrected location, and store it again ('#', track number, '*'). The new position overwrites the old one. There is no separate Track-Edit mode.

6.7 Finishing

To finish, press '*' by itself. You may also press '#', then '*'. Either sequence exits Learn Mode immediately and returns to normal RUN operation. The original '# 0 0 #' exit command is also retained.

The controller remembers the last taught track and end as its current position; no indexing step is required.

6.8 Programming Hints

- When teaching a table from empty, Track 1 must be stored first and must be a head-end position (error E5 appears if another track is stored first).
- Because positions are stored individually, a mistake on one track is fixed by re-teaching just that track — no need to reprogram the whole table.
- After storing Track 1 tail, verify both '# 0 1 *' (head) and '# 0 1 #' (tail). The bridge should move directly between the two ends without first visiting another track.

7. Operating the PTC 4+

Once programmed, normal operation is straightforward. The controller performs a brief self-test at power-up, then awaits track-selection commands.

7.1 Power-Up

When you turn the controller ON, the display first lights every segment and both decimal points as an LED test. Check that all segments are illuminated. The display then shows the firmware version number (for example, 0.8). The status LED turns steady green and the display shows the current track number when the controller is ready. There is no power-up 'wag' motion.

If the motor is not detected at power-up, the display shows 'E9' after the firmware version. Press any key to continue to RUN mode — the display and keypad remain usable, but the bridge will not move until the motor is connected.

7.2 Idle Jog (New)

When the controller is idle in RUN mode, you can nudge the bridge without issuing a track command: press '1' to jog the bridge counter-clockwise and '3' to jog it clockwise by a small fixed step (these keys are marked '<<' and '>>' above the keypad). The bridge holds the new position. Hold '1' or '3' for about three seconds and the bridge begins rotating continuously in that direction; press any key to stop it.

7.3 Selecting a Track

- '# <track> *' — align the head end of the bridge to the specified track.
- '# <track> #' — align the tail end of the bridge to the specified track.

Examples: '# 7 *' moves the head end to Track 7; '# 4 3 #' moves the tail end to Track 43. The display shows the requested track number; tail-end positions are followed by a decimal point (for example, '43.'). The status LED flashes green throughout the move. If momentum is enabled, the bridge ramps up and down smoothly.

7.4 Emergency Stop and Pause (E0), Track Redirection

To stop the bridge immediately, press any key while it is moving. Motion stops on the controller's deceleration ramp and the controller enters a Pause state. The display shows 'E0' and the status LED is steady red. To resume the original move, press '*'. To redirect the bridge, press '#', enter a new track

number, and finish with '*' (head) or '#' (tail). Returning to the track the move started from also works correctly.

7.5 Canceling a Track Selection

If you begin entering a track number and change your mind before movement starts, enter '# 0 0 *'. The display returns to the current bridge position and the controller goes back to ready (RUN) mode.

7.6 Operating Hints

- If no tracks are programmed, the controller enters Learn Mode automatically; the display shows 'Ln' and the status LED is steady yellow.
- If you request a non-programmed track, the display briefly shows 'E3' and then returns to the current position.
- Power-off is safe at any time. The encoder retains absolute position, so the controller never needs re-indexing.

8. Function Programming

Function Programming lets you adjust speed, momentum, effects-relay behavior, ATR, motor tuning, motor start delay, stall sensitivity, and the DCC accessory base group without reprogramming the track table.

8.1 Accessing the Function Menu

From RUN mode (controller ready, no motion): enter '# 0 0 #' to show 'F-', enter the function number, and the display shows 'P' followed by the current value. Press '*' to keep the value and exit, or '#' to change it — the display shows 'P-'; enter the new value and press '*' to store it.

8.2 Function List and Ranges

Fn	Name	Range	Description
1	Speed	0–9	Motor speed; 0 = slowest, 9 = fastest.
2	Momentum	0–9	Acceleration/deceleration; fixed ramp times (0 = shortest).
3	Effects Relay Mode	0–1	0 = normally open, 1 = normally closed.
4	ATR Enable	0–1	0 = standard ATR (default); 1 = reverse on motor run (see 8.6).
5	Motor Tuning	0–3	Adjusts motor smoothness; default 1. Power cycle required after a change (see 8.7).
6	Motor Delay	0–2	Start delay (seconds) after a move command.
7	Stall Sensitivity	0–9	Encoder-based stall detection (new).
8	DCC Address	00–99	Two-digit DCC accessory base group.
9	Program (Learn)	—	Press 9 to enter Learn Mode immediately.

Function 5 now selects Motor Tuning. To adjust a track position, re-teach it in Learn Mode (Section 6.6).

From RUN mode (controller ready, no motion): enter '# 0 0 #' to show 'F-', then enter the function number. For Functions 1-8, the display shows 'P' followed by the current value. Press '*' to keep the value and exit, or '#' to change it; the display shows 'P-', then enter the new value and press '*' to store it. Function 9 is different: pressing '9' enters Learn Mode immediately.

Speed controls the maximum rotational rate of the bridge (0–9), from approximately 0.50 to 2.50 RPM. The factory default is value 4 (approximately 1.39 RPM). Very large bridges may benefit from lower speeds. Approximate speeds by setting:

Value	RPM	Value	RPM
0	~0.50	5	~1.61
1	~0.72	6	~1.83
2	~0.94	7	~2.06
3	~1.17	8	~2.28
4	~1.39 (default)	9	~2.50

8.4 Momentum (Function 2)

Momentum controls how gradually the bridge accelerates and decelerates. Higher numbers produce longer ramps, simulating the inertia of a heavy prototype turntable. The 4+ uses fixed acceleration/deceleration ramp times of approximately 200, 300, 400, 500, 600, 750, 1000, 1500, 2000, and 3000 ms for values 0–9, with value 0 as the factory default. (This replaces the PTC4's speed-scaled momentum.)

8.5 Effects Relay Mode (Function 3)

The PTC includes an onboard relay for auxiliary effects such as lights, sound modules, or status indicators, available as dry contacts on the AUX connector (30 V DC / 3 A). Function 3 selects the relay sense relative to motor operation:

- Value 0 — disabled.
- Value 1 — Enabled.

Both contacts, NO and NC are available on the connector. The relay is activated when the motor is running.

8.6 ATR Enable (Function 4)

Function 4 selects the reversing-relay behavior:

- **Value 0 (default) — Standard ATR:** the PTC automatically reverses bridge-rail polarity as the head end passes $\pm 90^\circ$ from Track 1, flipping the reversing relay live from the encoder angle during the move.
- **Value 1 — Reverse on motor run:** the reversing relay is energized (polarity reversed) whenever the motor runs, rather than only at the $\pm 90^\circ$ points. This supports special applications such as a two-wire servo used for bridge locking. The Motor Delay (Function 6) also applies to this relay.

8.7 Motor Tuning (Function 5)

Motor Tuning adjusts the motor's operating characteristics and may improve how smoothly the bridge starts, moves, and stops. Results depend on the turntable's load and mechanical drag. If operation is satisfactory, leave this setting unchanged. Changing it requires a power cycle and preserves programmed track positions.

To change Motor Tuning, enter '# 0 0 #' from RUN mode, then press '5'. The display shows 'P' and the current setting. Press '*' to leave it unchanged, or press '#', enter a value from 0 through 3, and press '*' to save. The factory default is 1. After a change, the display shows 'Po' (power off) and the controller waits for a power cycle. Turn power OFF, then ON before operating. Changing Motor Tuning preserves programmed track positions.

8.8 Motor Delay (Function 6)

Motor Delay inserts a pause between the time a move is commanded and the moment the motor begins turning — useful when the effects relay or an external sound module needs a short startup time. Values: 0 = no delay (default), 1 ≈ 1 second, 2 ≈ 2 seconds. During the delay the command is accepted but the motor has not started, so the effects relay can trigger pre-move sound or lighting.

8.9 Stall Sensitivity (Function 7)

Function 7 sets how readily the controller flags a mechanical stall using encoder feedback (0–9; 0 = most sensitive, 9 = least sensitive; factory default = 2). On a stall, the bridge halts, the status LED goes steady red, and the display shows 'E2'. Clear the obstruction and power-cycle the controller to recover.

8.10 DCC Address

Function 8 sets a two-digit DCC accessory base group from 00 through 99. The accessory address is the base group followed by the two-digit track number: with base group 01, Track 1 is address 0101 (101), Track 2 is 0102, and Track 43 is 0143. Send Thrown to move the head end to that track and Closed to move the tail end. DCC commands use the same programmed positions, shortest-path motion, LED indications, brake sequencing, ATR, and stop handling as keypad commands. Duplicate command bursts are ignored after the first activation.

Reading the display while setting Function 8: From RUN mode, enter '# 0 0 #' and then '8'. The display uses both digits to show the current DCC base group (00–99); '--' means no group has been set with Function 8. This number may look like a track number, but it is the DCC base group, not the bridge position. Press '*' to leave it unchanged, or press '#', enter one or two digits, and press '*' to save. A single digit is saved with a leading zero (for example, 1 becomes 01). The status LED is amber while Function 8 is active. Once you return to RUN mode and the status LED is steady green, the display again shows the current track number.

8.11 Learn Mode Entry (Function 9)

Function 9 enters Learn Mode immediately; there is no 'P-' prompt and no additional '1' keystroke. The display shows 'Ln' immediately and the status LED is steady yellow. Existing track positions are preserved so you can re-teach a single track. Track 1 must always be the first track programmed on an empty table and must be a head-end position. The PTC4's canned track-table options (Custom CW/OU, 99 single-step positions, 30-degree increments) have been removed. Factory reset is a power-up key operation, described in Section 8.13.

8.12 Function Programming Hints

- A wrong function number simply re-displays 'F-'; entering '*' or '#' where a numeric value is expected (or an out-of-range value) shows 'E8'.
- Most function changes take effect on the next move. Motor Tuning (Function 5) requires a power cycle; the display shows 'Po' until power is turned off.
- When experimenting with speed and momentum, start with low momentum values and work up until the motion feels right.

8.13 Factory Reset and Firmware Update

Factory reset: Turn the controller OFF. Hold keys '1' and '3' while turning power ON, and continue holding both keys for approximately 1.5 seconds. When the display shows 'rS', release both keys. Press '#' within 5 seconds to confirm the reset. Pressing any other key, or failing to press '#' within 5 seconds, cancels the reset and continues with a normal startup. A confirmed reset clears the programmed track table, restores the controller's normal option defaults, and restores the required motor controller settings. The DCC base group is preserved. Use this reset after bench testing and before initial programming on the layout so Track 1 head and Track 1 tail are established from the actual installation.

Firmware update: Turn the controller OFF. Hold keys '4' and '6' while turning power ON, and continue holding both keys for approximately 3 seconds. When the display shows 'UP', release both keys. Press '#' within 5 seconds to confirm. Pressing any other key, or failing to press '#' within 5 seconds, cancels the update request and continues with a normal startup. After '#' is pressed, the controller enters the Atmel UART bootloader and is ready for firmware loading. Do not confirm firmware update unless a computer with Atmel FLIP is connected and ready. Once confirmed, the controller continues starting in the bootloader until FLIP completes programming and restores normal application startup.

9. Automatic Track Power Reversing (ATR)

Automatic Track Power Reversing eliminates the need for a split-ring rail or manual polarity switch to keep locomotive direction consistent as the bridge turns. When ATR is enabled, the PTC monitors the head-end angle relative to Track 1 and reverses bridge-rail polarity as needed, flipping the reversing relay live from the encoder angle so the change occurs exactly at the $\pm 90^\circ$ points.

9.1 Standard ATR Operation

In standard ATR mode (Function 4 = 0, the default), the controller treats Track 1 as the reference. The behavior is as though a split-ring commutator were used, with the 'splits' located 90° to either side of Track 1:

- When the head end is within $\pm 90^\circ$ of Track 1, one polarity is applied to the bridge rails.
- Beyond $\pm 90^\circ$, the polarity is automatically reversed.
- As the bridge continues around, the polarity toggles again at the next $\pm 90^\circ$ crossing.

9.2 Disabling ATR

If you prefer to use a separate DCC auto-reverser or other arrangement, simply do not connect any wires to the ATR connector. For DCC installations, NYRS recommends a dedicated auto-reverser such as the PSX-AR for added protection, although the internal system works fine; most boosters also provide short-circuit protection.

9.3 ATR Wiring Reference

Connect layout power to A/B and the bridge feeders to C/D, as shown by the labeled board terminals in Appendix C. This connection is the same for conventional DC or DCC. Always use adequately sized wire and follow your booster or power-pack manufacturer's instructions.

ATR wiring: layout power to A/B, bridge feeders to C/D; polarity reverses at $\pm 90^\circ$ from Track 1.

10. LED Status, Display, and Error Codes

The active-low tri-color LED and the dual-digit display provide immediate feedback about operating mode and any conditions requiring attention. Normal RUN idle is green only; Learn is yellow; errors and Pause are red.

10.1 LEARN Mode LED Patterns

Pattern	State	Description
Yellow steady	Ready	Controller in Learn Mode; bridge free-wheels by hand.
Red double-flash	Store	Two quick red flashes confirm the position was stored; LED then returns to yellow.

10.2 RUN Mode LED Patterns

Pattern	State	Description
Green steady	Ready	Normal power-on; ready for a move.
Green flashing	Move	Bridge is moving to a selected track.
Red steady	Pause / Stall	Paused after an emergency stop (E0), or halted on a stall (E2).
Yellow steady	Learn / Not programmed	Controller is in Learn Mode; an empty controller enters Learn automatically.

10.3 Display Codes

Display	Meaning
Ln	In Learn Mode, ready to record track positions.
--	Number-entry prompt (enter a track number or function value).
F-	Function prompt (enter a function number).
P-	Programming-value prompt (enter a value for the selected function).
rS	Factory-reset confirmation. Release keys 1 and 3, then press '#' within 5 seconds to perform the reset.
UP	Firmware-update confirmation. Release keys 4 and 6, then press '#' within 5 seconds to enter the firmware loader.
Po	Power cycle required after changing Motor Tuning. Turn power OFF, then ON.

10.4 Error Codes

Code	Description
E0	Emergency Stop / Pause. Press '*' to resume, or '#' to select a new track.
E2	Motor stall. The bridge halted on a stall (see Function 7); clear the obstruction and power-cycle.
E3	Requested track is not programmed.
E5	First programmed track must be Track 1.

Code	Description
E6	Track ID '00' is not valid when entered as '# 0 0 *' in Learn Mode. A lone '*' or '# #' exits Learn Mode without an error.
E7	Unsupported function number. The controller returns to the F- prompt.
E8	A '*' or '#' was entered where a numeric value was expected in Function Programming, or the value is out of range.
E9	Motor not detected at power-up. Press any key to continue to RUN mode; the display and keypad work, but the bridge will not move until the motor is connected.

At the function-number prompt, an unsupported function displays E7 and returns to 'F-'. A nonnumeric or out-of-range option value displays E8. The PTC4's E1 and E4 codes are not used.

11. Troubleshooting

The PTC Model 4+ provides both display codes and LED patterns to help diagnose setup or operational problems. Use the tables in Section 10 to interpret what you see. Below are common symptoms and actions.

Symptom	Possible cause / action
Display shows 'Ln' and LED is steady yellow.	Controller is in Learn Mode. If the table is empty, this happens automatically; program Track 1 head first.
Display shows 'E2' and LED is steady red.	Motor stall. Remove any obstruction, verify the bridge turns freely, then power-cycle. If it recurs, increase the Function 7 value (higher values are less sensitive).
Display shows 'E9' at power-up.	Motor not detected. Press any key to reach RUN mode, then check the motor cable and connector; the bridge will not move until the motor is connected.
Bridge does not move when a track is selected.	Check the power supply and motor cable/CAN connection, and make sure the controller is not in Learn Mode or paused (E0).
Bridge stops short or overshoots a track.	Verify mechanical alignment and smooth rotation, then re-teach that track in Learn Mode (Section 6.6).
Shorts when leaving certain tracks.	Check ATR wiring, track gapping, and any DCC auto-reverser. Ensure rails are gapped correctly at the turntable entrance. A track near 90° or 270° may need its own polarity attention.

Appendix A — Motor Dimensions

Motor selection by scale:

N/HO scale — NEMA 17 motor.

HO/Sn3/On3 — NEMA 23 motor, (If you are turning brass Bigboys in HO you might want this motor).

O scale — NEMA 34 motor with BRA-MM-NEMA34 motor mount.

Turntable shaft sizes vary by manufacturer and model. Contact NYRS for the correct coupling for your installation.

A.1 N/HO Scale Motor (NEMA 17, UIM4247CA)

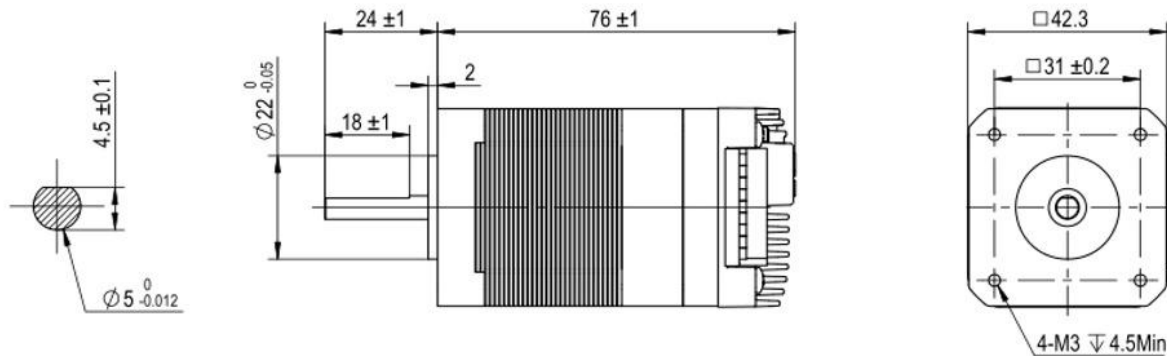


Figure A-1. N scale motor (NEMA 17) mounting dimensions.

Dimension	Value
Frame	42.3 mm square (NEMA 17)
Mounting holes	4 × M3, 31 mm square pattern, 4.5 mm min. depth
Pilot boss	Ø22 mm (0 / -0.05)
Shaft	Ø5 mm (0 / -0.012), 4.5 mm flat (D-cut)
Overall length	76 mm (±1)

A.2 HO/S/On3 Scale Motor (NEMA 23, UIM5756CA)

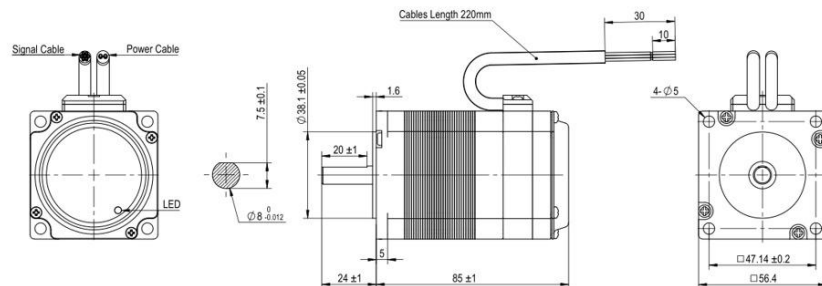


Figure A-2. HO scale motor (NEMA 23) mounting dimensions.

Dimension	Value
Frame	56.4 mm square (NEMA 23)
Mounting holes	4 × Ø5 mm through-holes, 47.14 mm square pattern

Dimension	Value
Pilot boss	Ø38.1 mm (± 0.05)
Shaft	Ø8 mm (0 / -0.012), 7.5 mm flat (D-cut)
Overall length	85 mm (± 1)
Cables	Signal and power, 220 mm; status LED on rear

A.3 O Scale Motor (NEMA 34)

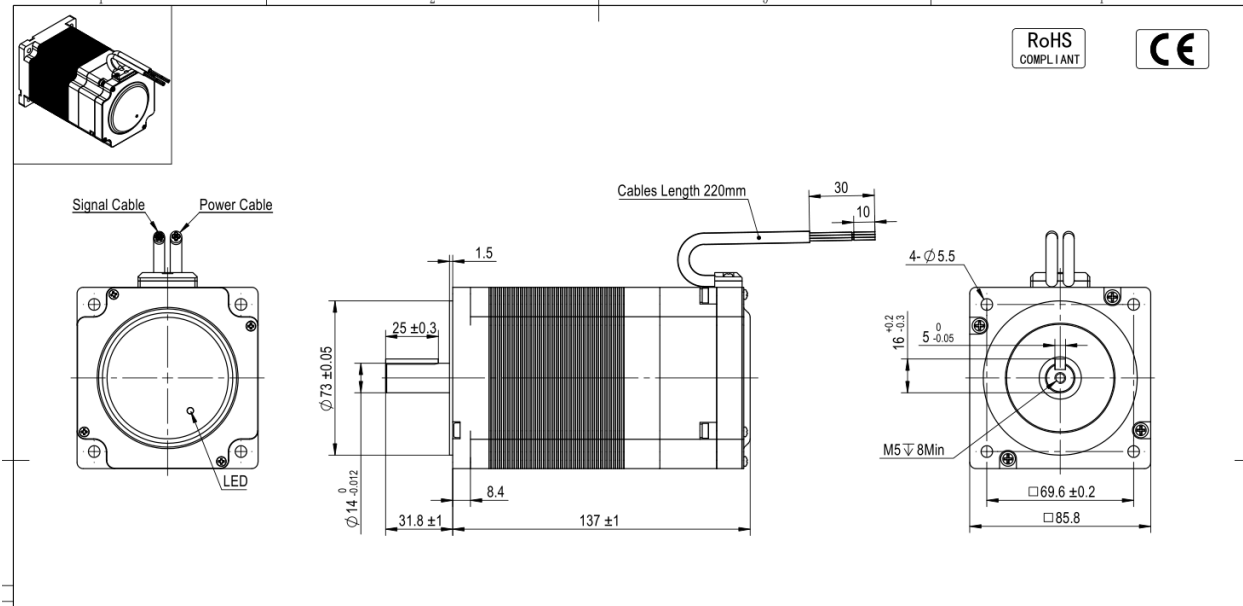


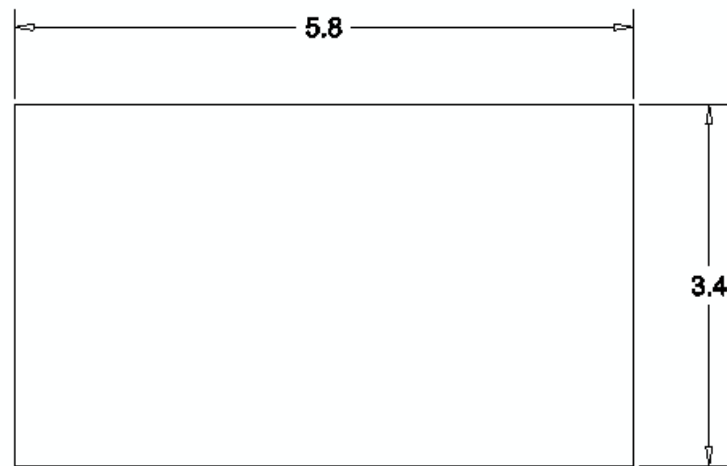
Figure A-3. O scale motor (NEMA 34) mounting dimensions.

Dimension	Value
Frame	85.8 mm square (NEMA 34)
Mounting holes	4 × Ø5.5 mm through-holes, 69.6 mm square pattern (±0.2 mm)
Pilot boss	Ø73 mm (±0.05)
Shaft	Ø14 mm, 5 mm flat
Shaft extension	25 mm (±0.3)
Overall length	137 mm (±1)
Cables	Signal and power, 220 mm; status LED on rear

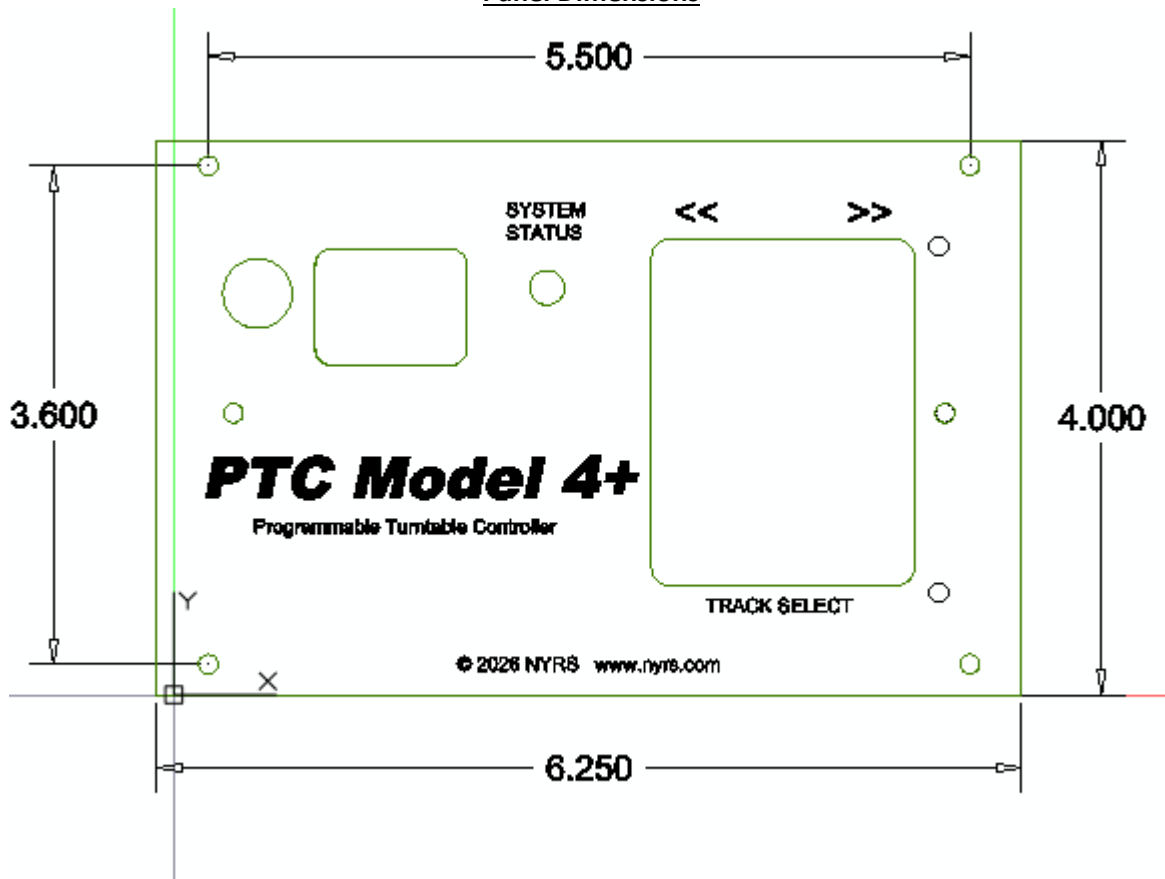
Appendix B — Panel Dimensions

Use the cover plate as a template, or the dimensions below, to mark the fascia cutout. Trace the four mounting holes in the corners; mark the cutout and then use front panel as template for drilling holes.

Suggested Cutout



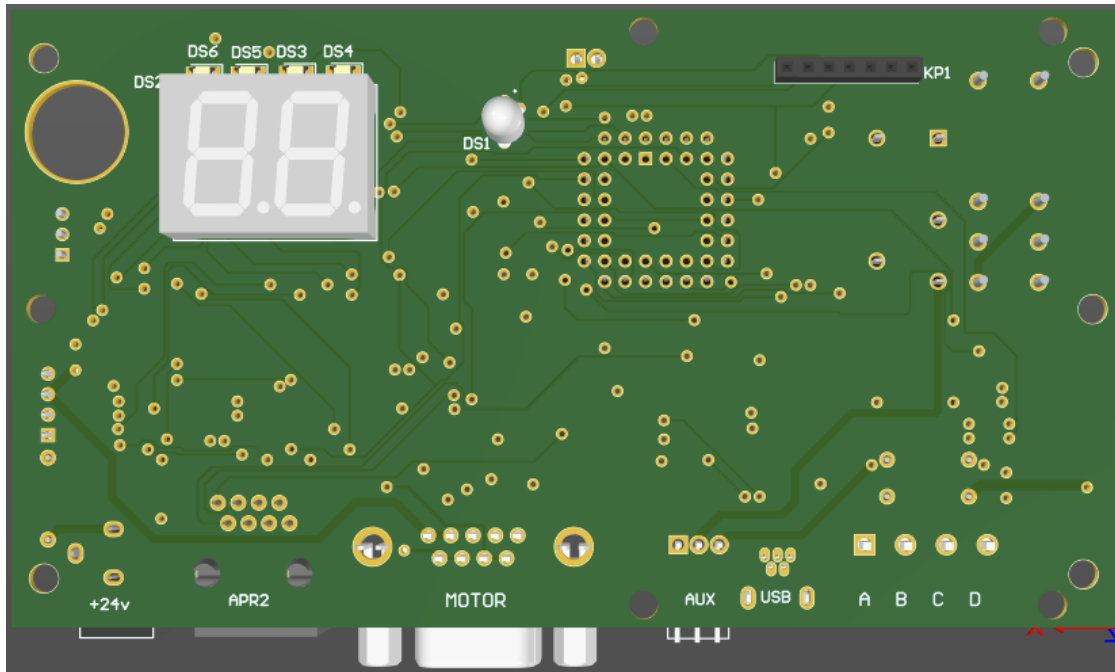
Panel Dimensions



Panel cutout and mounting-hole dimensions (inches).

Appendix C — Wiring Connections

Board Connectors



PTC Model 4+ board connectors.

The board connections, left to right along the lower edge, are: **+24v** (24 V power input), **APR2** (Automatic Power Router), **MOTOR** (motor cable), **AUX** (accessory / effects relay), and the **A B C D** track-reversing terminals. KP1 is the keypad header.

AUX Connector

The AUX connector provides the effects-relay output as dry (voltage-free) contacts, selectable normally-open or normally-closed via Function 3. Contact rating: 30 V DC, 3 A. Use it to switch external accessories such as lamps, sound modules, or indicators.

Appendix D — Firmware Change Log

Release Version 1

Released DCC accessory control, absolute-encoder motors, factory reset and firmware-update power-up chords, display test, idle jog, internal braking, stall detection, and corrected LED behavior. Function 9 now enters Learn directly with no entry flash; lone * and #* exit Learn; the firmware-update hold is approximately 3 seconds.

Appendix E — For Existing PTC4 Users: What Changed

This appendix is a quick reference for operators already familiar with the PTC Model 4. Track-selection keystrokes are unchanged ('# <track> *' for the head end, '# <track> #' for the tail); most differences follow from one change — the 4+ uses an absolute encoder, so it always knows the bridge position and never needs indexing.

Biggest change — programming now works like the PTC5

- Entering Learn Mode no longer clears the table. Existing positions are preserved, and you can re-teach any single track at any time.
- Program each track's head end. Program the Track 1 tail once to set the head-to-tail offset for every track — no per-track tail programming.
- In Learn Mode the motor releases and you position the bridge by hand.
- No separate Track-Edit function (old F5) — re-teach the track instead.
- To erase the whole table, turn power OFF, hold keys '1' and '3', and turn power ON. Continue holding both keys for approximately 1.5 seconds until the display shows 'rS'. Release both keys, then press '#' within 5 seconds to confirm. This also restores the controller options and required motor controller settings; the DCC base group is preserved. Any other key, or no '#' within 5 seconds, cancels the reset.

No more indexing

- The power-on-with-'*' index procedure, the post-Learn re-index step, and 'E2 = indexing required' are all gone.
- Power-off is safe at any time; the encoder retains absolute position.

New

- Idle jog: keys 1 (CCW) and 3 (CW) nudge the bridge when idle in RUN mode.
- Function 7 — Stall Sensitivity (0–9): encoder-based stall detection; a stall halts the bridge, LED steady red, display 'E2'; power-cycle to recover.
- Function 8 — DCC Address (00–99): sets the two-digit accessory base group.

Removed

- Old Track Edit — re-teach track positions in Learn Mode. Function 5 now selects Motor Tuning.
- Function 9 canned track tables (Custom CW/OU, 99 single-step, 30° increments).

- The physical shaft-brake output (the motor controller now brakes internally).
- The power-up 'wag' self-test (replaced by a full display-segment and decimal-point test).

Changed

- Function 1 (Speed) ranges from approximately 0.50 to 2.50 RPM across values 0–9; the default is value 4 (approximately 1.39 RPM).
- Function 2 (Momentum) now uses fixed ramp times rather than being speed-scaled.
- 'E2' now means motor stall (was 'indexing required').
- ATR flips the reversing relay live during the move, at the $\pm 90^\circ$ points.
- The green status LED flashes throughout a move.

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