

NYRS

Turntable Indexing That Works

PTC Model 4+

Programmable Turntable Controller

Controller and Motor Assembly

P/N 03-250

4+



Installation and User Manual

New York Railway Supply (NYRS)

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Quick Start Guide

This one-page 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. **Perform a bench test.** Run the system on the bench, not attached to a turntable, so you understand the whole programming process first.
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, with no binding through a full 360° rotation.

WARNING — DO NOT ROTATE THE BRIDGE BY HAND WITH THE BRAKE ENGAGED.

If the motor is equipped with the optional electronic brake, enter Learn Mode before rotating the bridge manually. Learn Mode releases the brake. Forcing the bridge while the brake is engaged may damage the turntable, coupler, motor mount, or motor.

3. **Set the scale.** In Function Programming, set Scale (Function 8) to 0 for HO or 1 for O so the controller applies the correct motor current for your gauge.
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 ATR track-reversing connections, and the effects relay as shown in the wiring section.
6. **Program tracks.** Enter Learn Mode, point the head end at Track 1 and store it, store the Track 1 tail once (this sets the head-to-tail offset for every track), then store the head end of each remaining track. No indexing is required — the absolute encoder always knows the bridge position.
7. **Operate in RUN mode.** Select a track with '# <track> *' for head-end alignment or '# <track> #' for tail-end alignment. Use speed (F1) and momentum (F2) to suit your turntable.
8. **Fine-tune.** If a track is slightly off, re-enter Learn Mode and re-store just that track. There is no separate track-edit step.



The PTC Model 4+ front panel: power button, TRACK display, status LED, and keypad. (Shown: 3D-printed beta panel; production panels are black anodized aluminum.)

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 0.6. 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 stepper motor and bracket, a DC power supply, 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, and the optional 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 4+ uses the same integrated stepper/encoder motors as the PTC Model 5: a NEMA 17 (UIM4247CA) for HO and a NEMA 23 (UIM5756CA) for O. These motors have no backlash, so the PTC4's 300:1 planetary gearmotor and its 'always stops clockwise' behavior no longer apply and have been removed from this chapter.

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: the HO motor is a NEMA 17 frame with four tapped M3 holes on a 31 mm square pattern, and the O motor is a larger NEMA 23 frame with four Ø5 mm through-holes on a 47.14 mm square pattern. See Appendix A for full mounting-hole patterns and shaft dimensions, and the NYRS Motor Mounting Manual (www.nyrs.com) for step-by-step guidance.
- 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.

5.1 Checking Bridge Rotation

Enter Learn Mode (Section 6.2). In Learn Mode the motor releases and the bridge turns freely by hand. Rotate the bridge through a full revolution and watch for any of the following:

WARNING — DO NOT ROTATE THE BRIDGE BY HAND WITH THE BRAKE ENGAGED.

If your motor is equipped with the optional electronic brake, always enter Learn Mode before rotating the bridge manually. Learn Mode automatically releases the brake. Attempting to force the bridge while the brake is engaged may damage the turntable, coupler, motor mount, or motor.

- 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.

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.

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', then '# 1' to enter Learn Mode. The display shows 'Ln' and the status LED glows yellow. (At this prompt, '# 5' performs a factory reset instead; any other key returns an error.)
- 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.

Brake-equipped motors: The optional electronic brake is automatically released while the controller is in Learn Mode and re-engages when Learn Mode is exited.

Factory reset

To clear the stored track table and restore default settings, enter '# 0 0 #', then '9', then '# 5'. The HO/O Scale setting (Function 8) is preserved through the reset.

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 flashes red to confirm that the Track 1 head-end position is stored.

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.

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

Exit Learn Mode by entering '# 0 0 #'; the controller returns to normal RUN operation. No indexing step is required — the absolute encoder already knows the bridge position.

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.
- Set the Scale (Function 8) before programming — 0 for HO, 1 for O — so the motor current matches your gauge.

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 in RUN mode, the status LED lights red while the display shows the firmware version number (for example, 0.6). The LED then turns steady green and the display shows the current track number, indicating the controller is ready. There is no display-segment test and 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

- Until tracks are programmed, the controller will not move; the display shows 'nP' and the status LED flashes 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 start delay, stall sensitivity, and scale 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).
6	Motor Delay	0–2	Start delay (seconds) after a move command.
7	Stall Sensitivity	0–9	Encoder-based stall detection (new).
8	Scale	0–1	0 = HO, 1 = O. Sets motor work current for the gauge (new).
9	Program (Learn)	—	Start or adjust track programming.

Function 5 (Track Edit) has been removed. To adjust a track, re-teach it in Learn Mode (Section 6.6). Any track can be redefined at any time.

8.3 Speed (Function 1)

Speed controls the maximum rotational rate of the bridge (0–9). The factory default is value 4 (approximately 1.8 RPM). Very large bridges may benefit from lower speeds. Approximate speeds by setting:

Value	RPM	Value	RPM
0	~0.83	5	~2.04
1	~1.07	6	~2.28
2	~1.31	7	~2.52
3	~1.55	8	~2.76
4	~1.79 (default)	9	~3.00

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 3 (≈ 500 ms) as the 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 — Normally Open (NO): contacts close when the motor is running.
- Value 1 — Normally Closed (NC): contacts open when the motor is running.

Use NO mode for an accessory that should be ON only while the bridge moves (for example, a 'Bridge Moving' indicator), or NC mode for an accessory active whenever the bridge is stopped. During power-up the relay is always NO until the system boots.

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 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 $\approx$ 1 second, 2 $\approx$ 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.

8.8 Stall Sensitivity (Function 7) — New

Function 7 sets how readily the controller flags a mechanical stall using encoder feedback (0–9; 0 = least sensitive, 9 = most sensitive). 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.

8.9 Scale (Function 8) — New

Function 8 sets the motor work current for your gauge. Enter 0 for HO (NEMA 17 motor, ≈ 1.7 A) or 1 for O (NEMA 23 motor, ≈ 2.8 A). The factory default is 0 (HO). Set the scale before programming and operating. The Scale setting is preserved through a factory reset.

8.10 Learn Mode Entry (Function 9)

Function 9 opens the programming menu. Press '# 1' to enter Learn Mode for programming (Section 6), or '# 5' to perform a factory reset (the Scale setting is preserved); any other key returns an error. Entering Learn Mode preserves existing track positions 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° increments) have been removed.

8.11 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'.
- Changes take effect on the next move; there is no need to power-cycle after adjusting a function.
- When experimenting with speed and momentum, start with low momentum values and work up until the motion feels right.

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:

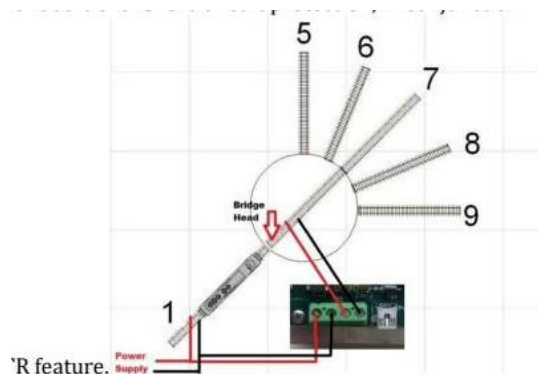
- When the head end is within $\pm 90^\circ$ of Track 1, one polarity is applied to the bridge rails.
- Beyond $\pm 90^\circ$, the polarity is automatically reversed.
- As the bridge continues around, the polarity toggles again at the next $\pm 90^\circ$ crossing.

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

The ATR wiring diagram below shows how to connect the A/B inputs and C/D outputs for both DC and DCC systems. Always use adequately sized wire and follow your booster or power-pack manufacturer's instructions.



Accessory and Brake Connectors

The PTC Model 4+ provides an accessory connector that includes a 12 V output and an effects output. The PTC Model 4+ also provides a dedicated brake output. See Appendix C for more information.

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 tri-color LED and the dual-digit display provide immediate feedback about operating mode and any conditions requiring attention.

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	A track position is being stored in memory.

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 flashing	Not programmed	Controller powered on but no tracks are programmed.

10.3 Display Codes

Display	Meaning
nP	Powered in RUN mode but not programmed. Enter Learn Mode and program tracks.
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).

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.
E6	Track ID '00' is not valid in Learn Mode.
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.

An unexpected key at a prompt no longer produces an error — the controller simply re-displays the prompt and waits for a valid entry. (The PTC4's E1, E4, and E7 codes are therefore 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 'nP' and LED flashes yellow.	Controller is not programmed. Enter Learn Mode (Function 9) and program the track locations.
Display shows 'E2' and LED is steady red.	Motor stall. Remove any obstruction, verify the bridge turns freely, then power-cycle. If it recurs, lower the Stall Sensitivity (Function 7).
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

The PTC Model 4+ uses the same motors as the PTC Model 5. Two motors are available depending on scale.

A.1 HO Motor (NEMA 17, UIM4247CA)

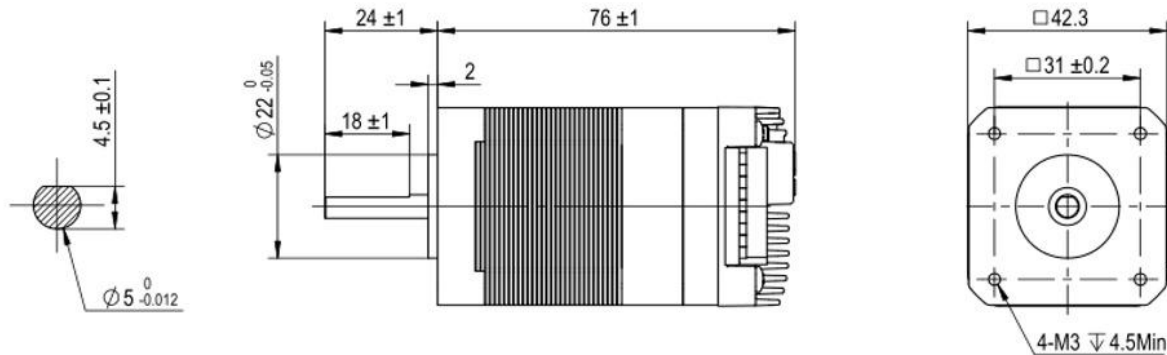


Figure A-1. HO motor (NEMA 17) mounting dimensions.

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 O Motor (NEMA 23, UIM5756CA)

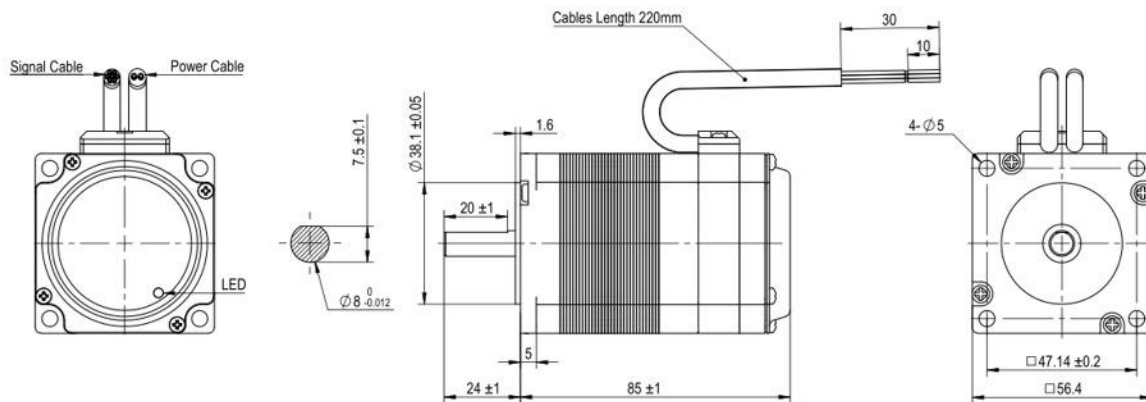


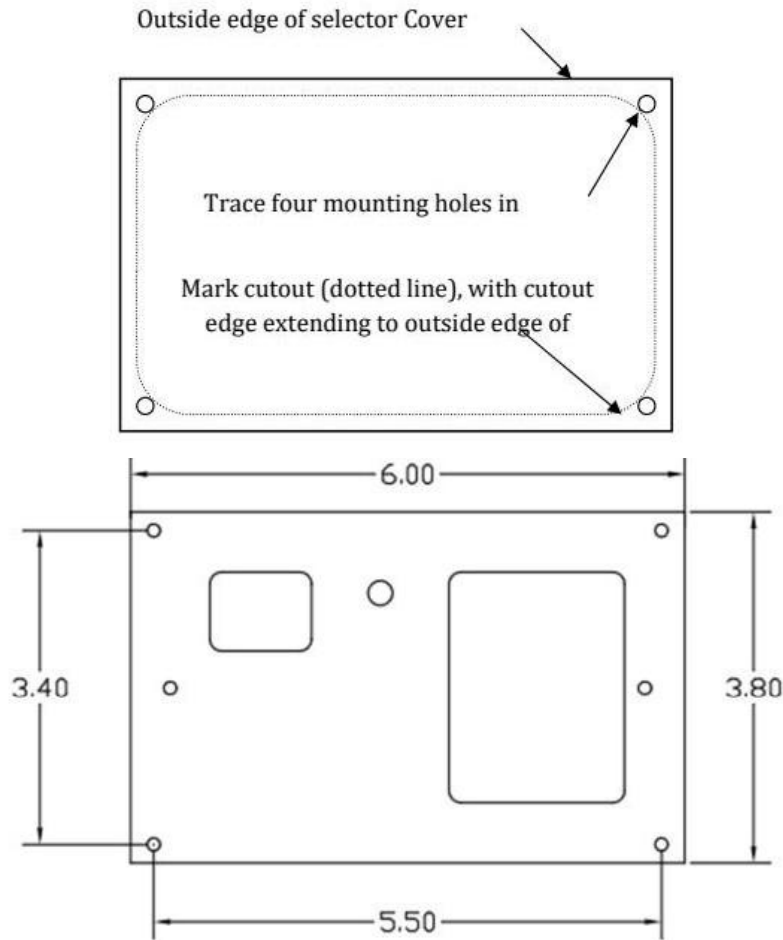
Figure A-2. O motor (NEMA 23) mounting dimensions.

Dimension	Value
Frame	56.4 mm square (NEMA 23)
Mounting holes	4 × Ø5 mm through-holes, 47.14 mm square pattern
Pilot boss	Ø38.1 mm (±0.05)
Shaft	Ø8 mm (0 / -0.012), 7.5 mm flat (D-cut)

Dimension	Value
Overall length	85 mm (± 1)
Cables	Signal and power, 220 mm; status LED on rear

Appendix B — Panel Dimensions

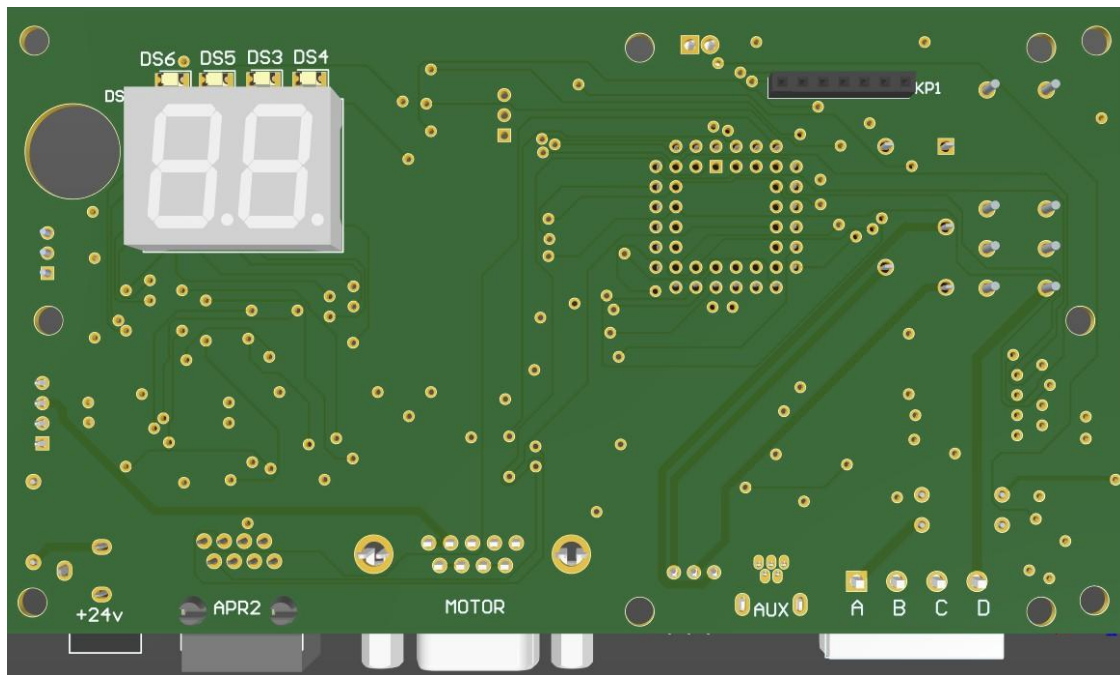
Use the cover plate as a template, or the dimensions below, to mark the fascia cutout. Trace the four mounting holes in the corners; mark the cutout (dotted line) so its edge extends to the outside edge of the selector cover.



Panel cutout and mounting-hole dimensions (inches).

Appendix C — Wiring Connections

Board Connectors



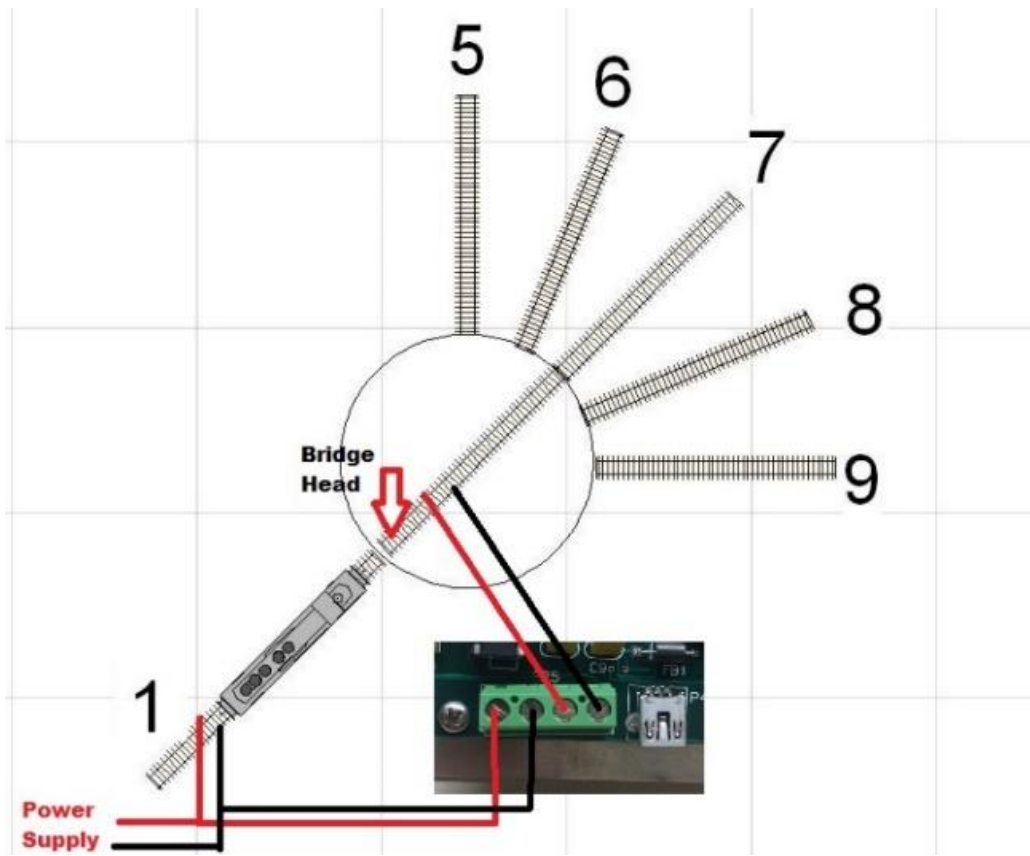
PTC Model 4+ board connectors.

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.

ATR Wiring



ATR wiring reference (see Section 9).

Appendix D — Firmware Change Log

Beta

Firmware is at beta Version 0.5. Initial Release

Version 0.6

- Added support for motors equipped with the optional electronic brake. The brake is automatically released in Learn Mode so the bridge can be positioned by hand.
- General firmware improvements and bug fixes.
- HO/O scale and motor-current selection (Function 8).

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, use the factory reset: '# 0 0 #', '9', '# 5' (the HO/O scale is preserved).

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 — Scale (0 = HO, 1 = O): sets the motor work current for your gauge.

Removed

- Function 5 (Track Edit) — re-teach instead.
- 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.

Changed

- Function 1 (Speed) re-ranged; default is value 4 (≈ 1.8 RPM), range approximately 0.83–3 RPM across 0–9.
- 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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