NYRS

Turntable Indexing That Works

PTC Model 4™

Programmable Turntable Controller

Controller and Motor Assembly

P/N 03-161

Installation Instructions

And

Users Manual

NYRS

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Quick Start Guide

This one-page checklist is intended to get you up and running quickly with a properly installed and programmed PTC Model 4 turntable controller. For full details, refer to the later sections of this manual.

1. **Perform bench test and indexing –** we highly recommend just running the system not attached to a turntable on the bench to make sure you understand the entire programming process first.
2. **Install the motor and bracket.** Mount the stepper motor using either the NYRS motor mount kit or a rigid, well-aligned custom mount. Ensure the motor shaft is square to the turntable shaft and that there is no binding through a full 360° rotation.
3. **Mount the controller.** Install the keypad/controller module in the fascia within reach of the turntable. Cut the panel opening to the dimensions shown in Appendix B and secure the module with the supplied hardware.
4. **Wire the system.** Connect the motor cable, power supply, optional ATR track reversing connections, accessory relay, and brake output as shown in the wiring diagram section.
5. **Enter Learn Mode and program tracks.** From RUN mode, enter '# 0 0 #' then function '9' to enter Learn Mode. Teach Track 1 (head end), then the remaining head-end tracks, then tail-end positions. Index track 1.
6. **Operate in RUN mode.** Power up normally. Select a track with '# <track> *' for head-end alignment or '# <track> #' for tail-end alignment. Use momentum and speed settings to suit your turntable.
7. **Fine-tune using Track Edit.** If a track is slightly misaligned after programming, rotate to that track, enter '# 0 0 #', then function '5' to nudge the position without reprogramming the entire table.

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. The controller uses a high-resolution stepper motor with 14,400 steps per revolution (0.025° per step), allowing accurate positioning even on smaller HO bridges.

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 6.1. Earlier firmware versions are similar in operation, but Version 6.1 includes refinements and bug fixes to momentum behavior and ATR timing. Refer to the Firmware Change Log section for specific details.

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 or brake output as well as the APR2 Automatic Power Router. See APR2 manual available 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.
- High-resolution stepper motor and optional NYRS motor mount kit.
- 12 VDC power supply (NYRS-supplied or equivalent) 12v 1.5amp.
- 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 three primary modes.

- LEARN Mode: Programming mode for teaching the controller the head and tail positions of each track.
- INDEX Mode: Special mode used to establish the reference position for Track 1 after programming or loss of reference.
- RUN Mode: Normal operating mode for selecting and indexing 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. The stepper motor we use has a 300:1 planetary gear system integrated into the motor housing. It is normal that this gearhead has some backlash. For this reason the motor will always stop in a clockwise direction. If the shorter distance to rotate is counter clockwise it will go past the stop point and reverse direction to stop in a clockwise direction to take up any backlash. It is important that locomotives come onto the bridge straight as to not push the bridge out of aligment. We recommend at least one engine length of straight track coming onto the bridge.

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.
- See Appendix A for the motor's mounting hole pattern and shaft dimensions.
- The PTC 4 stepper motor provides 14,400 steps per revolution. With this kind of resolution, 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 5 feet of the turntable if using the standard motor cable.
- Optional 3', 6', and 10' 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, draw lines that 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 using an appropriate saw. As you reach each corner, round the cut slightly rather than cutting past the corner into the mounting hole area.
- Debur 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. Check that the cable and PCB clearances behind the fascia are adequate; enlarge the opening slightly if needed, but avoid making it so large that the cover plate cannot fully conceal it.

4.3 Power Switch and Supply

The PTC does not include a built-in power switch. Instead, a harness and connector are provided so you can mount a separate on/off switch where it best fits your layout. A simple SPST toggle or rocker switch is sufficient. If you already have a master layout power switch, you can plug the PTC power supply into the same controlled outlet and short and short the two pins of the power switch connector together. In some cases when an entire layout is powered up at once there is so much electrical noise from switch machines and DCC systems that it can affect the PTC. In this case it is best to use the power switch. Be sure all wire splices are insulated.

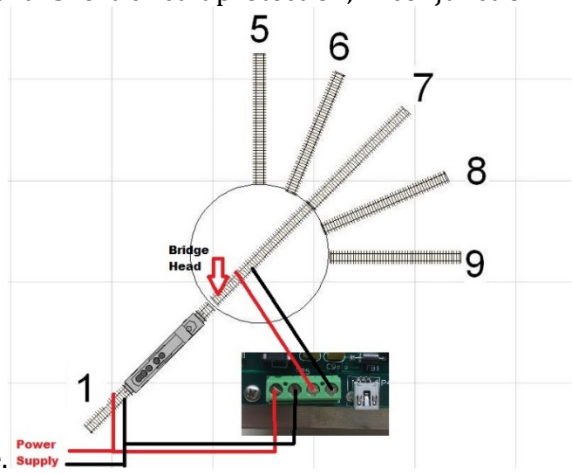
4.4 Track Reverser and ATR Wiring Overview

For DCC users, NYRS recommends using a dedicated DCC auto-reverser such as the PSX-AR, which combines auto-reversing functionality 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 the supply lines from your power source (conventional DC or DCC) to terminals A and B, and

connectthe bridge feeder wires to terminals C and D. At the Track 1 home position, A is connected to C and B to D. When the bridge rotates 90° from this reference, polarity reverses: B connects to C and A to D. At about 270° from home, polarity returns to the original orientation. See Appendix C for wiring diagram.
This section describes the electrical connections for the PTC's built-in track reversing (ATR) function. A graphical wiring diagram should be inserted here in the final manual to visually show the connections between terminals A, B, C, and D, the bridge rails, and the layout power source.

- 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 90° from home, connections reverse (B→C, A→D).
- At approximately 270° from home, connections return to the original polarity.
- For DCC operations, NYRS recommends using 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 Accessory and Brake Connectors

The controller provides an accessory connector that includes a 12 V output and an effects relay, as well as a dedicated brake output. See Appendix C for more information.

5. System Check-Out

Before committing to a permanent installation, verify basic operation on the workbench or with the turntable temporarily set in place. This will ensure that wiring, motor connections, and controller functions are correct before you start programming track locations.

5.1 Entering Index Mode

Index Mode is used during checkout and later to re-establish the reference position for Track 1. In Index Mode, the controller slowly rotates the bridge clockwise until you stop it.

- Ensure controller power is OFF.
- Press and hold the '*' key on the keypad.
- While holding '*', turn the controller power ON.
- The display will briefly show the firmware version, then two dashes ('--').
- Release the '*' key. The display will show 'Ad' (Advancing), and the bridge will begin rotating clockwise.
- The status LED will alternate red and yellow while indexing.

5.2 Observing Bridge Motion

Allow the bridge to make a full rotation while watching for any of the following:

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

If you see any of these issues, turn off power, correct the mechanical problem, and re-enter Index Mode to confirm the fix. If any of these issues are present the bridge will not index properly.

5.3 Single-Stepping in Index Mode

While in Index Mode, you can stop continuous motion and single-step the bridge to inspect specific areas:

- Press '*' once to stop continuous motion.
- Tap '*' repeatedly to advance one step at a time.
  The LED will alternate red and green with each step. – Because each step is only 0.025°, movement may be subtle on smaller bridges; step several times to confirm motion.
- Pressing and holding the ‘*’ key will back up the bridge a few degrees.

6. Programming the Turntable

Programming teaches the PTC the exact angular positions of every track, for both the head and tail ends of the bridge. Programming is typically done once after installation, and again only if major mechanical changes occur. It is best to program all tracks in a single session.

6.1 Planning Track Numbers

Before entering Learn Mode, decide how you want to number your tracks. Track 1 must be your primary lead track and will serve as the angular reference for ATR and indexing. For the remaining tracks, you can use any numbers from 2 to 99 in any pattern. Many users group numbers logically—for example:

- 1–3: Lead tracks.
- 11–15: Roundhouse stalls.
- 20–29: Outside storage tracks.
- 30–39: Additional service tracks.

Most users find it helpful to sketch a simple diagram of the turntable and write the chosen track numbers next to each track. Check off each track as you program it.

6.2 Head and Tail Ends

The PTC treats the two ends of the bridge independently so that it can compensate for minor offsets, non-concentric pits, or bridges that are not perfectly symmetric. You will first program all head-end positions, then program the corresponding tail-end positions. If one is careful you can actually program head and tail positions in one revolution but it is easy to lose track. Remember that you can't add or delete tracks once programming is complete without starting over. You can overwrite tracks during programming though if you think you made an error.

Choose one end of the bridge to be the head end. Often this is the end with the operator's shack or other visual cue. If both ends look identical, consider adding a small marker detail to identify the head end.

6.3 Entering Learn Mode

- Turn the controller ON and ensure it is in RUN (ready) mode.
- Enter '# 0 0 #' on the keypad. The display will show 'F-' (Function Prompt).
- Enter '9' to select the Program function.
- After a brief pause, the display will show 'P0', then select #1, this puts it in learn mode. See section 8.9 for some other options than normal learn mode. The display should now change to 'Ln' (Learn Mode). The status LED will glow yellow.
- At this point, any previous programming is cleared and you are ready to teach the controller new positions. Track locations must always be programmed starting with Track 1.

6.4 Programming Track 1 (Head End)

- Press and release '*'. The bridge will begin rotating clockwise at slow speed. The display will show 'Ad'.
- When the head end of the bridge is a few degrees short of your Track 1 lead, press '*' again to stop.
- Tap '*' repeatedly to single-step the bridge until the head end is precisely aligned with Track 1.

- When aligned, press '#'. The display will show '--', indicating it is ready for a track number.
- Press '1'.
- Press '*'. The status LED will flash red briefly to confirm that Track 1 head-end position has been stored.

6.5 Programming Additional Head-End Tracks

After Track 1 is stored, Learn Mode is ready for the next clockwise head-end track. Repeat the following steps for each additional head-end location:

- Press '*' to start the bridge moving clockwise again.
- Press '*' to stop when the bridge is near the next track.
- Tap '*' to single-step until the head end lines up with that track.
- Press '#', then enter the chosen track number (2–99).
- Press '*' to save that head-end position.
- Repeat for all remaining head-end tracks.

If you overshoot a position when single-stepping, press and hold '*' for about 3 seconds. The bridge will back up approximately 2 degrees. You can then step forward again to the exact alignment point.

6.6 Programming Tail-End Positions

Once all head-end positions are programmed, you will teach the tail-end locations. These are stored separately so the controller can account for any offset between the two ends of the bridge.

For each tail-end position:

- Press '*' to start the bridge rotating.
- Stop near the desired track when the tail end approaches it.
- Single-step with '*' until the tail end lines up exactly with the track.
- Press '#', then enter the track number.
- Press '#' again to store the tail-end position.

For example, to store the tail-end position for Track 1, you would use '# 1 #'. The display will then show '01.' (with a decimal point) to indicate a tail-end location.

Repeat this process for all tail-end tracks that correspond to head-end tracks you programmed earlier.

6.7 Completing Programming and Re-Indexing

After all head-end and tail-end positions are stored, exit Learn Mode by turning off the controller. To prepare the unit for normal operation, perform a final indexing to Track 1:

- With power OFF, press and hold '*'.
- Turn power ON while holding '*'. The controller enters Index Mode.
- Release '*'; the bridge will rotate and the display will show 'Ad'.
- When the head end of the bridge is close to Track 1, press '*' to stop.
- Single-step with '*' until the head end is exactly aligned with Track 1 (the display will show '01').
- Turn power OFF. The controller now knows where Track 1 is and is ready for normal RUN operation.

6.8 Programming Hints

Program all tracks you intend to use in one session.
If you make an erro during programming, simply turn the power off and start Learn Mode again; any settings from the incomplete Learn session are cleared.
Avoid removing the motor or bracket after programming. If you must, re-index to Track 1 and verify alignment.
If one track is slightly off after programming, use Track Edit (Function 5) instead of reprogramming all tracks.

7. Operating the PTC

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

7.1 Power-Up Self Test

When you turn the controller ON in RUN mode:

- The dual-digit display briefly shows '8.8.' (all segments on) as a display test.
- The status LED glows red momentarily, then steady green when ready.
- The bridge performs a short 'wag' motion—clockwise about 10°, then back—confirming motor output.

7.2 Selecting a Track

To move the bridge to a programmed location, enter the track code as follows:

- '# <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 *' — Move head end to Track 7.
- '# 4 3 #' — Move tail end to Track 43.

The display will show the requested track number; for tail-end positions the number is followed by a decimal point (for example, '43.'). The status LED flashes green while the bridge is moving. If momentum is enabled, the bridge will ramp up and down smoothly.

7.3 Emergency Stop and Pause (E0), Track Redirection

If you need to stop the bridge immediately, press any key while the bridge is moving. Motion will stop at once, momentum is ignored, and the controller enters a Pause state. The display shows 'E0' and the status LED is steady red.
To resume motion to the original destination, press '*'. To redirect the bridge to a different track, press '#', enter the new track number, and complete the entry with '*' (head) or '#' (tail).

7.4 Canceling a Track Selection

If you begin entering a track number and change your mind before starting movement, you can cancel as follows:

• Enter '# 0 0 *'.

The display returns to the current bridge position and the controller goes back to ready (RUN) mode.

7.5 Operating Hints

The controller will not operate (no movement) until tracks are programmed. In this case, the display shows 'Ln' going directly to learn mode and the status LED flashes yellow.

If you request a non-programmed track, the display briefly shows 'E3' and then returns to indicating the current position.

After a power-off, allow at least five seconds before turning the controller back on to ensure a clean reset.

Avoid turning power off while the controller is in Pause or during a move; if this happens, the controller may require re-indexing (E2).

8. Function Programming

Function Programming allows you to adjust speed, momentum, effects relay behavior, ATR, motor start delay, and perform track editing without reprogramming the entire table.

8.1 Accessing the Function Menu

From RUN mode (controller ready, no motion):

1. Enter '# 0 0 #'. The display shows 'F-' (Function Prompt).
2. Enter the function number you wish to adjust.
3. The display shows 'P' followed by the current stored value (for example, 'P6').
4. Press '*' to keep the existing value and exit, or '#' to change it.
5. If changing, the display shows 'P-'; enter the new value and press '*' to store it.

8.2 Function List and Ranges

Function	Name	Range	Description
1	Speed	0–9	Motor speed; 0 = slowest, 9 = fastest.
2	Momentum	0–9	Acceleration/deceleration; 0 = off, 9 = longest ramp.
3	Effects Relay Mode	0–1	0 = relay normally open, 1 = normally closed.
4	ATR Enable	0–1	0 = ATR enabled, 1 = ATR disabled / toggle use.
5	Track Edit	00–99	Fine-tune currently selected track position.
6	Motor Delay	0–2	Start delay (seconds) after a move command.
9	Program (Learn Mode)	1	Start Learn Mode (clears and reprograms tracks).

8.3 Speed (Function 1)

Speed controls the maximum rotational rate of the bridge. Valid values are 0 through 9:

0 — Slowest (approximately 0.19 RPM).
9 — Fastest (approximately 1 RPM).

The factory default is set at 9 to speed up system testing, etc. For a good balance of speed and smoothness 7 or 8 is good. Very large bridges may benefit from lower speeds.

8.4 Momentum (Function 2)

Momentum controls how gradually the bridge accelerates and decelerates. Higher numbers produce longer ramp times, simulating the inertia of a heavy prototype turntable.

0 — No momentum. Bridge starts and stops abruptly.
1–9 — Increasing amounts of momentum, scaled to the selected speed.

Momentum is automatically scaled to the current speed setting so that long ramps remain practical even at higher speeds. Version 6.1 includes improved momentum behavior for more consistent stops, especially on shorter moves with high ramp lengths.

8.5 Effects Relay Mode (Function 3)

The PTC includes an onboard relay intended for auxiliary effects such as lights, sound modules, or status indicators. Function 3 selects whether the relay is normally open (NO) or normally closed (NC) with respect to motor operation:

- Value 0 — NO- Normally Open: relay contacts close when the motor is running.
- Value 1 — NC - Normally Closed: relay contacts open when the motor is running.

Use NO mode when you want an accessory to turn ON only while the bridge moves (for example, a 'Bridge Moving' indicator), or NC mode when you want an accessory active whenever the bridge is stopped. Note that during power up the relay will always be NO until the system is booted up.

8.6 ATR Enable and Toggle Use (Function 4)

Function 4 controls the Automatic Track Power Reversing behavior:

• Value 1 (default)— ATR enabled (standard mode). The PTC automatically reverses track polarity when the head end passes ±90° from Track 1.
• Value 0— ATR disabled / motor-on toggle mode. In this mode, the relay can be used as a motor-on signal for special applications (such as driving a two-wire servo), and polarity is automatically reversed by the PTC. Note that the delay function will also delay motor start for this relay as well.

8.7 Track Edit (Function 5)

Track Edit allows you to fine-tune an individual track alignment without reprogramming the entire table. Use this if a single track is slightly off after installation or trackwork changes.

- In RUN mode, move the bridge normally to the track to be adjusted.
- Enter '# 0 0 #'. The display shows 'F-'.
- Enter '5' for Track Edit.
- The controller enters a special adjustment mode for the currently selected track.
- Tap '*' to single-step the bridge forward.
- Hold '*' for about 3 seconds to move it backward a small amount.
- When the alignment is correct, press any key to store the new position and exit Track Edit.

  Note: Track 1 cannot be edited; attempting to do so will produce error E8. The Track 1 position defines the entire angular reference.

8.8 Motor Delay (Function 6)

Motor Delay inserts a pause between the time a track move is commanded and the moment the motor actually begins turning. This is especially useful when the effects relay or external sound modules need a short startup time.
Values:

• 0 — No delay (factory default).
• 1 — Approximately 1 second delay.
• 2 — Approximately 2 seconds delay.

During the delay period, the controller has accepted the command but has not yet started the motor. The effects relay and brake output can be used to trigger pre-move sound or lighting effects.

8.9 Learn Mode Entry (Function 9)

Function 9 places the PTC into Learn Mode and clears previously stored track locations. Learn Mode is required whenever the turntable is first installed, after mechanical changes, or when all track positions must be reprogrammed.
Selecting Function 9 from the Function Menu (# 0 0 # → 9) causes the display to show P0, indicating that Learn Mode preparation is active. The user must then select one of the Function 9 programming options shown in the Function 9 Options Table.
Programming Options (Function 9):

1	**Reprogram entire unit.**
2	Reprogram all less user options.
3	Custom CW
4	Custom OU
5	Single Step – 99 single step positions
6	30 degree increments (Version 5.8) and above.

These predefined patterns simulate complete track tables and are useful for verifying mechanical integrity, momentum behavior, ATR polarity changes, motor wiring, and indexing performance without manually teaching tracks.
Entering Learn Mode:
After selecting a Function 9 option and confirming with '*', the controller enters Learn Mode. The display changes from P0 to Ln, and the status LED glows yellow.
At this point:

- All previous track locations (and possibly user options) have been cleared depending on the chosen option.
- The controller is ready to begin teaching new head-end and tail-end locations.
- Track 1 must always be the first programmed track and must always be a head-end location.

Notes:

- Use Function 9 only when intentional full or partial reprogramming is required.
- If Function 9 is entered accidentally, just hit '*' and it will be cancelled.
- The PTC must be reindexed to Track 1 after completing Learn Mode.
- Track Edit (Function 5) may be used afterward for fine alignment adjustments.
- Option 2 can be useful if an option such as reversing relay option is set for toggle on motor run. If there is a servo being used as a brake you would program one position using option 1. Set user function 4 = 0, and then use programming option 2. This way the brake would be de-energized during programming movements.

8.10 Function Programming Hints

- If you enter an invalid function number, the display briefly shows error 'E7'.
  • If you enter an out-of-range value for a function, the display shows 'E8'.
  • Changes take effect on the next move; there is no need to power-cycle after adjusting functions.
  • When experimenting with speed and momentum, start with low momentum values and work up until you find a combination that feels right.

9. Automatic Track Power Reversing (ATR)

The Automatic Track Power Reversing feature 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 polarity when necessary.

9.1 Standard ATR Operation

In standard ATR mode (Function 4 set to 0), the controller treats Track 1 as the reference. As the head end rotates away from Track 1, ATR behaves 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 ±90° of Track 1, one polarity is applied to the bridge rails.
When beyond ±90°, the polarity is automatically reversed.
As the bridge continues around, the polarity toggles again at the next ±90° crossing.

Version 6.1 includes refined timing for this transition to better handle backlash and ensure that polarity changes occur consistently at the correct angle.

9.2 Disabling ATR

If you prefer to use a separate DCC auto-reverser or other arrangement simply don't connect any wires to the 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 will have short circuit protection.

9.3 ATR Wiring Reference

The ATR wiring diagram (see Appendix C) 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.

10. LED Status Patterns

The tri-color LED on the controller provides immediate feedback about the operating mode and any conditions requiring attention. The meaning of some patterns differs between RUN and LEARN modes.

10.1 LEARN Mode LED Patterns

Pattern	State	Description
Yellow steady	Ready	Controller in Learn Mode and ready to move.
Yellow flashing	Ad	Bridge advancing continuously during Learn movement.
Red / Green alternating	Single step	Each press of '*' causes one step; LED toggles between red and green.
Red double-flash	Store	Controller is storing the new track position in memory.

10.2 RUN Mode LED Patterns

Pattern	State	Description
Green steady	Ready	Normal power-on, controller ready for a move.
Green flashing	Move	Bridge is moving to a selected track.
Red steady	Pause	Controller paused after an emergency stop (E0).
Red / Yellow alternating	Index	Index Mode bridge movement in progress.
Yellow flashing	Not programmed	Controller powered on but no tracks are programmed.
Red double-flash	Re-index needed	Controller has lost position reference and must be indexed to Track 1.

10.3 Mode Definition Summary (Display Codes)

Display	Meaning
nP	Controller powered in RUN mode but not programmed. Enter Learn Mode and program tracks.
Ln	Controller in Learn Mode and ready to record track positions.
Ad	Bridge advancing in Learn or Index mode.
--	Number entry prompt (enter track number or function value).
F-	Function prompt (enter function number).
P-	Programming value prompt (enter value for selected function).

10.4 Error Definition Summary (Display Codes)

Error Code	Description
E0	Emergency Stop / Pause mode. Press '*' to resume the move or '#' to select a new track.
E1	Invalid key; a number was expected.
E2	Indexing required. The controller has lost reference and must be indexed to Track 1.
E3	Requested track is not programmed.
E4	Invalid key; '#' expected to start an entry.
E5	First programmed track must be Track 1.
E6	Track ID '00' is reserved.
E7	Invalid function code (wrong function number at F-).
E8	Invalid programming value (out of range or inappropriate for function).

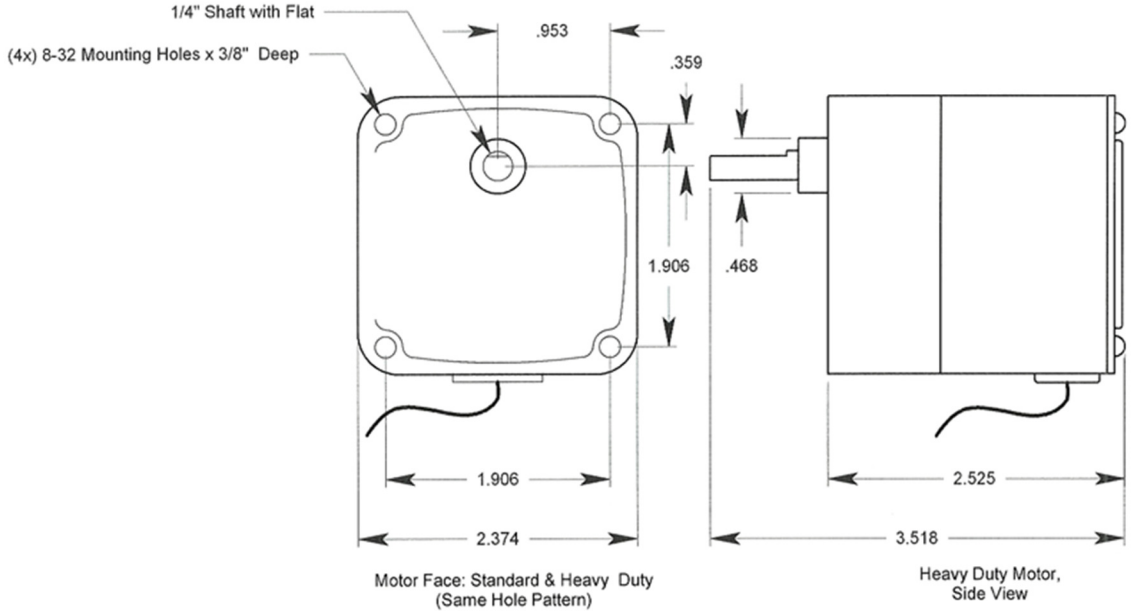
12. Troubleshooting

The PTC Model 4 provides both display codes and LED patterns to help diagnose setup or operational problems. Use the tables in the LED and error code sections to interpret what you see. Below are some 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 all track locations.
Display shows 'E2' after power-up.	Controller does not know bridge position. Enter Index Mode and align the head end to Track 1.
Bridge does not move when track is selected.	Check power supply, motor connector, and make sure controller is not in Learn Mode or paused (E0).
Bridge stops short or overshoots track location.	Verify mechanical alignment, ensure bridge moves smoothly, and consider reprogramming that track by using Track Edit.
Frequency of shorts when leaving certain tracks.	Check ATR wiring, track gapping, and DCC auto-reverser setup. Ensure rails are gapped correctly at the turntable entrance. If the track is exactly at or near 90 or 270 degrees you may need to change the polarity of the track itself.

13. Appendix A – Motor Dimensions

This appendix is reserved for a dimensioned drawing of the PTC Model 4 motor, including mounting hole pattern, shaft diameter, keying, and overall length. Insert your latest mechanical drawing or PDF export here.

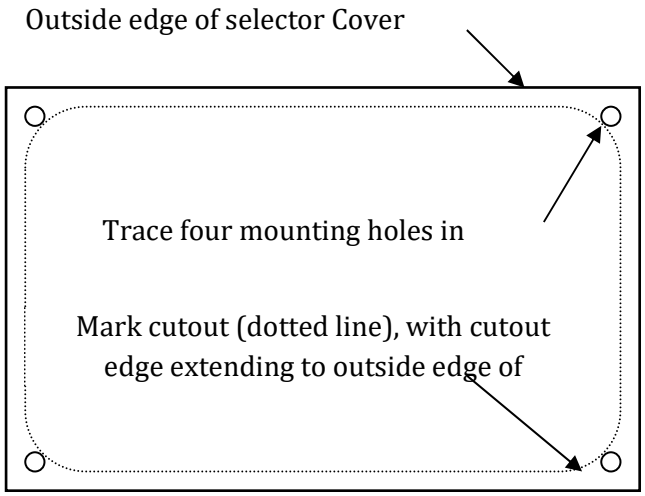


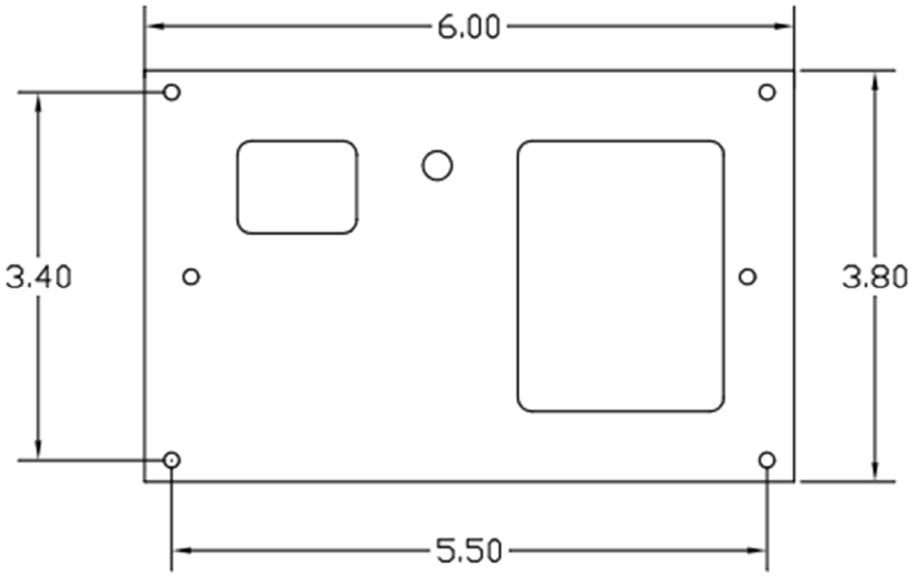
PTC Model III Motor Dimensions
Heavy Duty Models. Not to Scale.

File: mot2_pat.vlm
Rev: 9/16/96

15. Appendix B – Panel Dimensions

This appendix is reserved for the fascia panel cutout dimensions, including corner radii, mounting hole spacing, and bezel size. Insert your mechanical drawing or template here for accurate panel machining.

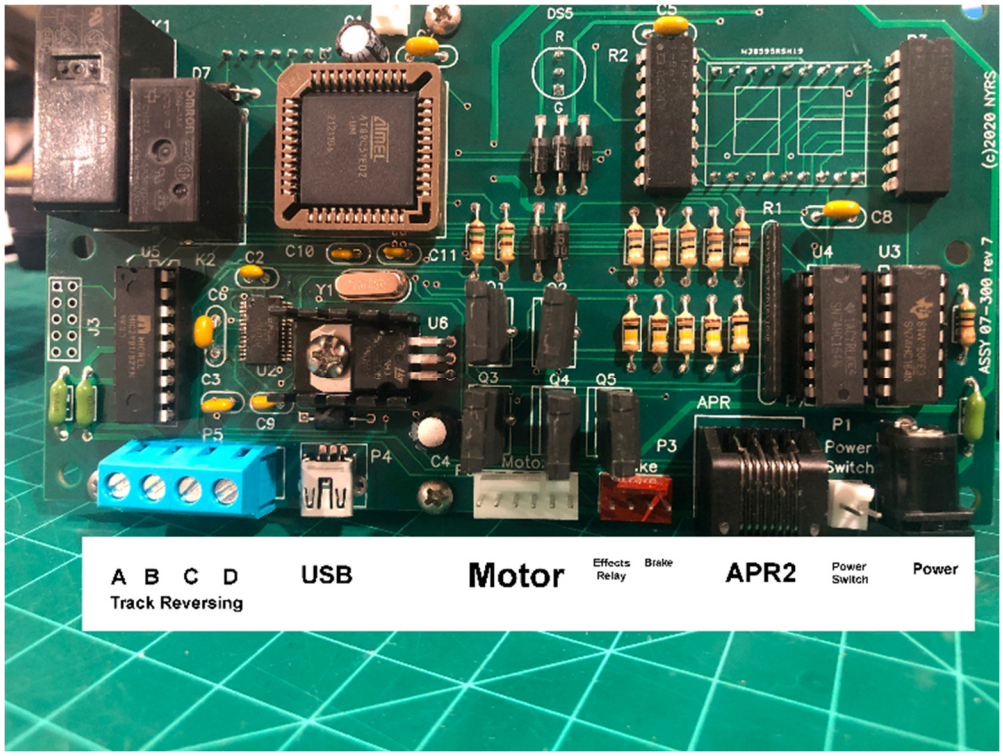


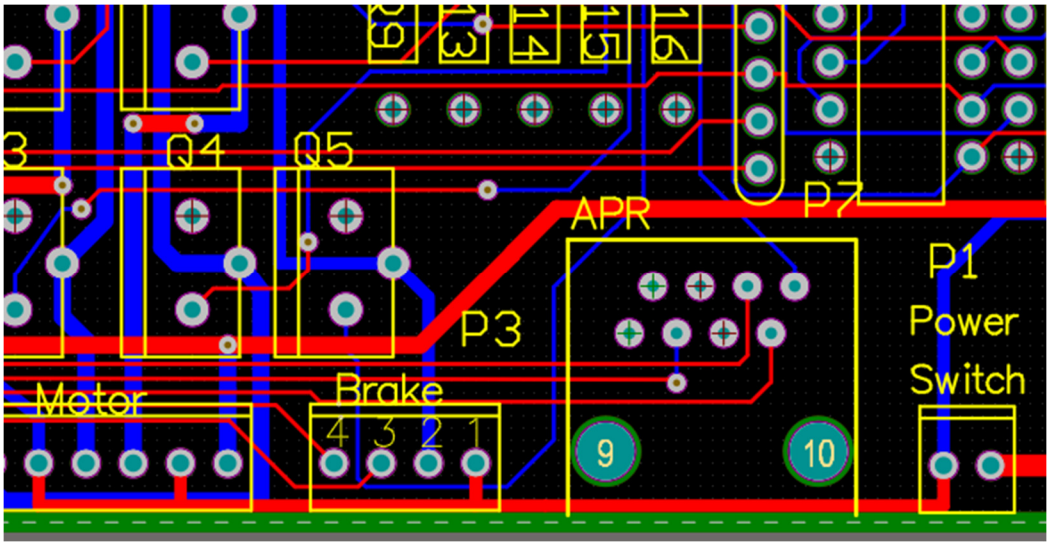


16. Appendix C – Wiring Connections

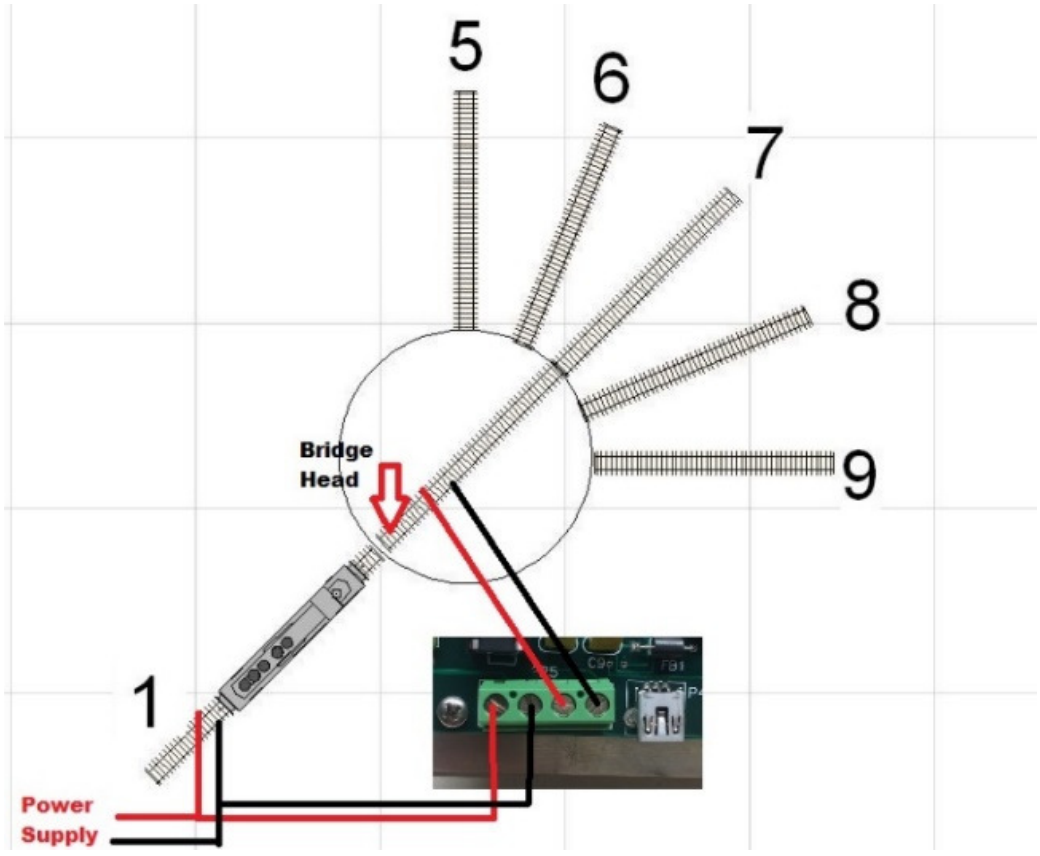
Accessory and Brake Connector Pinout

Pins	Function	Description
3–4	Effects Relay Contacts	Normally Open or Normally Closed (selectable in user options). Used for triggering external accessories.
1–2	Brake Connector	Originally designed for a shaft brake (no longer available). The 12 V line may still be used to power an accessory.
1	12 V Brake Output	Provides 12 V for shaft brake or accessory (up to 0.5 A).
2	Switched Return	Pulls to ground when the motor is running.




Q4
Q5
APR
P7
P1
Power
Switch
P3
Motor
Brake
4 3 2 1
9
10

ATR wiring


5
6
7
8
9
Bridge
Head
1
Power
Supply

Appendix D – Firmware Change Log

Version 6.2 — Fixed Issue

- Programming Reverse Move – Corrected issue that randomly appears when backing up during programming. (affected v 6.1 only)

Version 6.1 — Added Features

- Optimized non-volatile memory access to speed up programming.
- Refined ATR logic so polarity reverses while the motor is running. Polarity now changes only when the bridge actually passes through the ±90° points.
- Increased motor speed during programming and indexing.
- Improved momentum and deceleration profiles for smoother operation.

Version 6.1 — Fixed Issues

- **Track Reversing** Corrected polarity timing issues near the ±90° reversal points.
- **Momentum Fixed** scaling issues affecting long momentum profiles at high speeds.

Version 6.0 — Fixed Issues

- Resolved a defect allowing Track 1 to be edited using Track Edit. Track 1is reserved the reference track for all the rest of the tracks.

Version 5.9 — Added Features

- **ATR Enable Behavior Update** Setting ATR Enable = 0 no longer disables the reversing relay.
- **ATR Enable** = 0 now functions as a motor-on toggle, energizing the reversing relay while the motor runs. Supports 2-wire servos used for bridge locking, indexing hardware, or other auxiliary mechanisms.
- **Effects Relay Mode (Function 3)**
  Range: 0–1
  0 = Normally Open (NO)
  1 = Normally Closed (NC)

- **Motor Delay Option Added (Function 6)**
  Range: 0–2 seconds
  Adds a programmable delay before the motor begins moving.
  Delay affects both the effects relay and the polarity reversing relay.

Contact and Support

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