CORNERSTONE®

N Built-Up Structure
130' TURNTABLE WITH DCC
933-2618

Thanks for purchasing this Cornerstone kit. All parts are styrene plastic, so use only compatible paint and glue to assemble and finish your model. PLEASE NOTE: These instructions are in two parts; the first covers layout installation, the second programming and operation. Please read all instructions and study the drawings carefully before beginning as some features of this model differ from earlier versions.

A key part of steam-era engine terminals, turntables are still used to turn locos and cars today, requiring less space than a wye or loop. A typical installation has three major parts; a below ground pit, approach and open-air or roundhouse storage tracks along the edge of the pit, and the bridge, equipped with rails and a drive system so it can be rotated through a full circle. Turntables evolved quickly as newer, longer and heavier motive power was introduced but most were of the deck-style with a deep pit supporting a continuous girder bridge. Powerful electric motors were used to turn the bridge, with electricity typically wired through a pivot mounted on an arch above the center of the bridge.

At bigger terminals, the turntable and roundhouse were in constant use. For safety, the actual controls were housed in a small operator's cabin at one end of the bridge; unlike your new model, turntables in the real world were aligned by eye and the end-mounted cabin provided a clear view of what was happening. Many also sported an old engine bell, rung to warn that the table was being turned.

In the days of steam, bigger engines were purpose-built for operating conditions found along one or two divisions, and locos were restricted to this set area. In many cases new terminals were built with turntables and roundhouses designed especially for the newest locos, but some roads opted to make-do, extending roundhouse stalls and bridge rails.

With the coming of diesels, the need for turntables began to decline. Although F units still had to be turned, road switchers and geeps could run fairly easily in either direction. Today, the number of turntables on active duty is declining, with some in use at major shops and engine terminals, as well as railroad museums.

Sized to fit a larger layout, this 130' (39.7m) table is typical of turntables installed on many roads from the 1900s on. Locos up to 9-3/4" (24.8cm) long fit easily on the bridge, so it can be used in any era. Typically found at newerend-point engine terminals, a complete scene can be modeled with the Three-Stall Modern Roundhouse (933-3260), Three-Stall Modern Roundhouse Addition (933-3261), Machine Shop (933-3264), 2-Stall Brick Diesel House (933-3266), Modern Coaling Tower (933-3262), Steel Water Tank (933-3817), Cinder Conveyor & Ash Pit (933-3816), and Sanding Towers & Drying House (933-3813), each sold separately.

Additional Cornerstone® Turntable Control Boxes (933-2320) are available should the design of your engine terminal require the turntable to be operated from more than one location. The optional Cornerstone® Turntable Advanced Control Module (933-2321) can also be added and provides additional control options including DCC control, serial UART inputs for control via an Arduino, Raspberry Pi or similar microcontroller, and allows the creation of custom control panels using buttons, numeric keypads or rotary switches for track selections. In addition, the ACM has outputs which can drive standard relay cards for automatic control of power to the selected turntable track.

See your local hobby shop, the current Walthers Model Railroad Reference Book or visit us online at walthers.com for additional ideas and accessories.

INSTALLATION ON YOUR LAYOUT

Your new turntable has been carefully assembled and tested to provide years of enjoyable operation. Please take a few minutes to look over the parts, read these instructions and study the drawings before starting.

The turntable package contains the pit, bridge assembly, control box with display, control box cable, mating plug for power connections, mounting screws and washers, bridge arch detail parts, mounting templates and instructions. The turntable control box connects directly to the pit via a plug-in modular cable. Optional additional control boxes and the Advanced Control Module connect to the control circuit in daisy-chain fashion with additional modular cables which are included with the add-on kits.

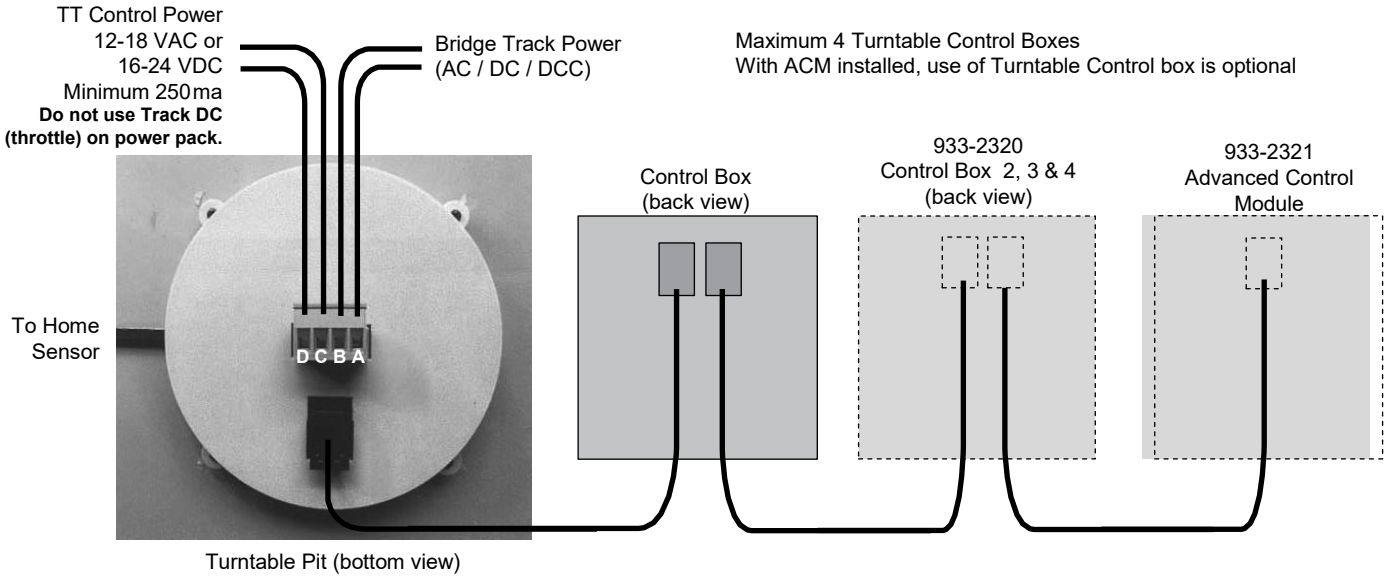
You will need to supply a suitable power supply for the turntable control circuits which meets the voltage requirements listed in the wiring diagram below. The turntable drive should be powered from its own power supply; we recommend the #933-2858 Cornerstone Turntable Power Supply. Alternately, a standard power pack, such as #942-4000 Walthers Power Pack, or power packs offered by MRC, Bachmann and Kato; meeting the power requirements listed below.

NOTE: Do not use DCC track power for the turntable control circuit, or Track DC (throttle) on power pack.

Bridge track power connections on terminals A & B are separate from the turntable control circuits and are connected to your layout track power (AC, DC, or DCC).

Check the control power supply output with a voltmeter before making any electrical connections. The control power must be within the range specified when the turntable is running. The control circuit will stop working and display an error (E8) if the control power is below the minimum requirement. Voltages above 18VAC or 24VDC may damage the control circuits.

TURNTABLE COMPONENT WIRING DIAGRAM



Turntable Pit (bottom view)

INSTALLING THE PIT

Your new turntable automatically reverses the bridge track polarity when turned. As a result, the unit has two electrically insulated areas where the track on the bridge is not powered. These are indicated on the underside of the lip by the “NO TRACK” lettering (also shown on the mounting template).

Working approach and storage tracks must be installed away from these areas – we suggest placing them at 90° to the approach tracks. You can however, add an unpowered display track at these points if desired.

The opening in the wall of the pit houses the optical sensor used as the “Home Position.” For the indexing to work properly, this area, along with the small gear teeth and ring rail molded in the bottom of the pit, must be clean and open at all times. If you plan to paint or weather the pit, mask off these areas before starting.

Before installing the pit, cover the center pivot hole with tape to keep out dust and debris. Make sure to adjust the pit height to be level with your trackbed to ensure level track transitions.

For best results your new turntable must be installed on a flat, level surface. Determine the location for your pit and use the enclosed template to cut the mounting hole in your benchwork. Allow at least 6" (15.2cm) of clearance below the pit. The home sensor is mounted next to a mounting boss; be sure to provide clearance in your benchwork for the sensor housing.

The locations of the preprogrammed tracks #1 and #2 are shown on the installation template. You may choose to use these locations for service tracks, but you are free to reprogram or delete them as desired.

If the turntable pit will be mounted on a wooden surface, drill out the areas for the mounting bosses as shown on the template with a 5/16" (8mm) bit. Secure the pit in place using the eight screws and washers — if the thickness of your wood surface is less than 1/2" (1.2cm), use additional washers (not included) for correct spacing — do not over tighten as this could cause the pit to warp.

If you are using foam for the surface of your layout, open the areas for the mounting bosses slightly and push the pit into place.

Make sure the pit is level, secure and properly supported before proceeding.

Please refer to the Turntable Components Wiring Diagram shown above.

Run wires (not included) from your power supplies to the power connector on the pit bottom cover as shown.

Your layout track power connects to terminals A and B at the right, the turntable control power connects to terminals C and D on the left. Double check the terminals are wired correctly before plugging the connector into the pit.

INSTALLING THE BRIDGE

Before starting, make sure the bridge rails are centered with about 1/16" (1.5mm) beyond each end of the bridge. Slide the rails into position if necessary. Remove the protective tape from the bridge post contacts and home sensor.

Gently clean the contacts on the bridge center post and wipers inside the pit as shown in the Maintenance & Trouble-shooting Section. Use a soft cotton swab and a good contact cleaner such as CRC 2-26 then wipe dry.

Be gentle when cleaning the wipers and avoid pushing them down. They should always be slightly raised in a flat row.

If adjustment is needed, gently lift the wiper/s upward until it aligns with the others.

Before installing the bridge, thoroughly vacuum the entire pit to remove all debris from the center pivot point, the ring rail and gear track.

The circular contact ring and wipers must be clean for consistent operation; inspect and clean these areas if needed any time the bridge is removed or installed.

Remove the tape you placed on the center pivot hole. Insert the center pivot on the bridge into this opening. Check that the bridge is fully seated and the drive gear engages the pit gear track. The arch presses in place as shown at the middle of the bridge – don't glue it down – leave it remov-able for track cleaning and mainte-nance. Note that the Operator's Cab is the "Head" and the opposite end is the "Tail" of the bridge.

INSTALLING THE CONTROL BOX

The control box can be used as-is, or flush-mounted on the surface or side of your layout.

For flush mounting, use the outline on the template and cut a hole at the mounting location. The control box may be mounted from either the front or back of the panel surface. Be sure to allow clearance for the control box mounting flange on the panel surface. The control box requires 1" (2.5 cm) clearance behind the panel with additional depth required for cable access at the connector location at the top center of the cutout.

Refer to the Turntable Component Wiring Diagram and plug one end of the supplied control cable to the connector on the bottom of the pit and the other to one of the connectors on back of the control box. Make certain the cable plugs are fully inserted and snap into place.

Up to four control boxes (#933-2320; each sold separately) can be installed and wired as shown for easy access and operation from multiple locations, for example on both sides and the end of a peninsula.

Additional control boxes as well as the optional ACM module may be added at any time and are automatically detected and configured by the turntable controller.

INITIAL CHECKOUT

Look over the command sequences shown on pages 6 & 7 if you have not already done so.

Check that all connections to the turntable power input terminals are correctly installed and the control box is properly connected.

You may now apply power, and after a short power-up scan, the control box display will be "- -" or flashing "E0." If the position error is displayed, push any key to cancel the error.

First, Reset the Home Position. The bridge will rotate clockwise until the Operator Cab end of the bridge is aligned with the Home Sensor. You will need to reset the home position any time the bridge is removed from the pit.

The turntable controller saves the bridge position on power down and restores it when powered up. If the bridge was moving when power was removed or any other event prevented a proper save, an E0 error will be displayed. The E0 error indicates a home position reset is needed to restore the service track location reference.

At this point, you can experiment with the turntable control functions listed on pages 6 & 7. Use the pre-programmed tracks 1 & 2 to become familiar with the turntable operation. You may delete or move these tracks to any other locations if needed.

You may wish to temporarily install a service track and use the manual rotation functions to learn how to position the bridge and program track locations.

Note that if you assign an existing track number to a new location, the old location is replaced with the new, so it is not necessary to delete a track number before moving it to a different location.

Note that when rotating the empty bridge to a new location, you can use the Track key to start the move, and the turntable controller will make the shortest move to the new track. However with a locomotive on the bridge, you usually want a particular end to move to the new track, and would use the Head or Tail keys to start the move.

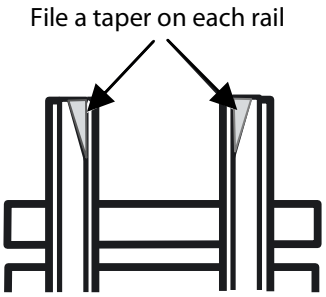
When you are familiar with the turntable operation, continue with the service track installations.

INSTALLING SERVICE TRACKS

With the pit in place, you can install storage and approach tracks. The indexing can be programmed for up to 99 locations so you can add tracks almost anywhere around the pit – but remember, don't install working tracks in the "NO TRACK" areas.

The bridge is equipped with Code 83 rail; if you're using another size, use Walthers Transition Tracks #948-897 for Code 100 or #948-898 for Code 70 (each sold separately).

For a smooth transition between the bridge and service tracks, you'll need to modify your rails by filing the inside ball of the rail at a slight angle for about 3/16" (4mm).



All service tracks must radially align with the bridge rails in a straight line with the track centerline aligned with the turntable center at the edge of the pit. You can use the bridge as a guide and sight along the rails to ensure a smooth transition from the bridge rails to the service tracks. Kinks in the rail alignment from the bridge to the service tracks will cause derailment problems as engines move on and off the turntable bridge.

For the rails to sit correctly on the lip of the pit, you must remove a few ties from the end of the track. The rails must end at the edge of the pit — leave a gap of about 1/16" (1.5mm) between the end of each service track and the bridge. Temporarily tape or pin the service tracks in place so you can make any adjustments after programming your stopping positions.

WIRING SERVICE TRACKS

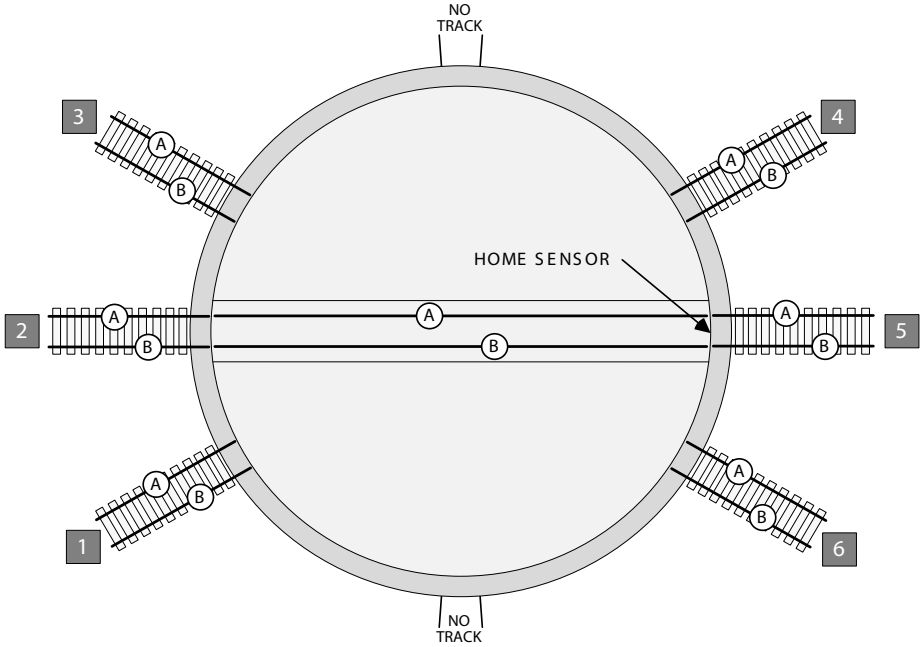
Track power to the turntable bridge is connected to terminals A & B on the pit power connector. When wiring track power to the turntable service tracks, proper polarity (or phasing) of the tracks must be observed to allow an engine to move on and off the turntable bridge.

Note that the NO TRACK zone divides the pit into two sections as shown in the accompanying diagram.

If you imagine standing on a service track looking at the pit, on the home sensor half of the pit (tracks 4, 5, & 6), the right rail is connected to terminal A, and the left to terminal B. On the opposite side (tracks 1, 2, & 3), A con-nects to the left rail and B to the right.

The connections to the bridge rails are automatically reversed when the bridge rotates through the NO TRACK zone to maintain this polarity relationship. Thus the bridge rails match the service tracks at both ends regardless of the orientation of the bridge.

If you are using DCC control, wire the turntable bridge track and all service tracks to the output of the same power booster.



You may wish to include switches in the service track power feeders to allow power to be removed on all but the service track aligned with the bridge. This is handy to silence a roundhouse full of sound decoder equipped locomotives for example.

The optional Advanced Control Module (933-2321) has digital logic outputs which can be used to drive relays in the service track circuits to provide this function automatically.

OPTIONAL ACCESSORIES

Turntable Control Box (933-2320)

If the design of your engine terminal requires operation of the turntable from more than one location, up to three additional control boxes may be added. You may add additional control boxes at any time, and they will be automatically configured for proper operation.

Advanced Control Module (933-2321)

The ACM module is a circuit card which can be built into custom control panels and offers alternate methods of turntable control including 1) DCC control using stationary decoder protocols 2) Numeric keypad 3) Button per track 4) Rotary selector switch 5) Control box Emulation 6) Serial Rx/Tx UART port.

Additional digital outputs are also available for connecting a remote dual digit display and controlling track power relays to selectively power service tracks automatically. See the ACM documentation for further information on these features.

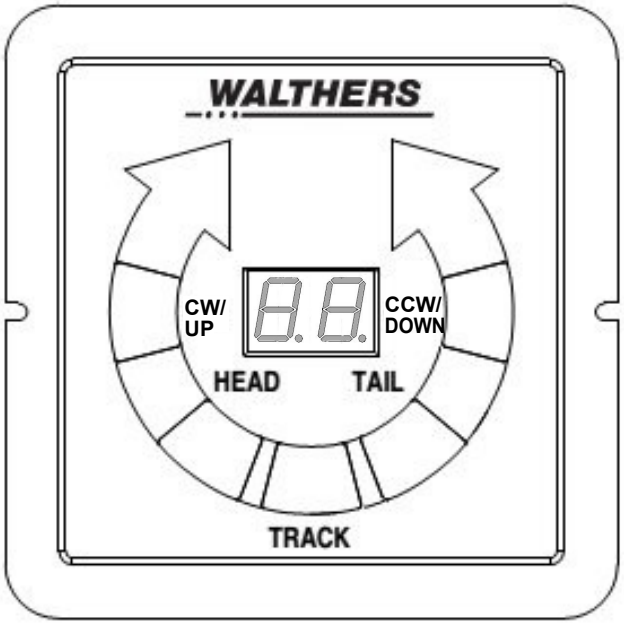
FINAL ASSEMBLY

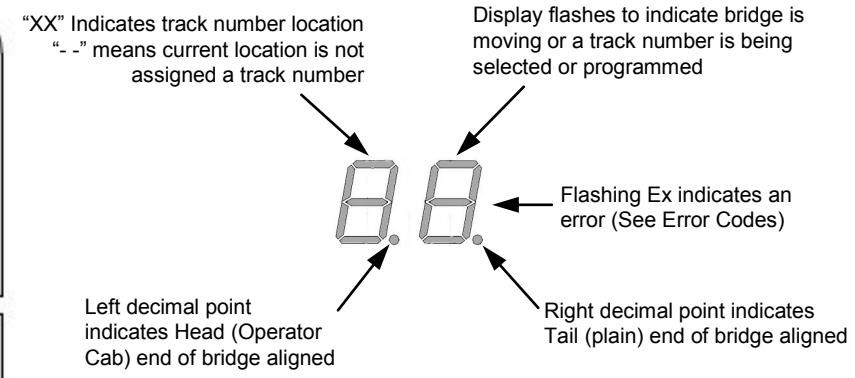
Once you're satisfied with the operation of the bridge, check the alignment with all approach and storage tracks, making sure their rails rest directly on the lip of the turntable pit. You may wish to glue these to the pit, and/or spike the track in place at the first tie on the benchwork.

Please note that before doing any scenery work, such as painting or adding ballast and ground cover near by, remove the bridge from the pit and tape over the center pivot. Before putting the bridge back in the center pivot, carefully and completely vacuum the pit and the surrounding area.

After reinstalling the bridge, you must reset the home position as shown in the operating instructions.

TURNTABLE CONTROL BOX QUICK REFERENCE GUIDE





CW/ UP: Initiates clockwise bridge rotation / Increment number

CCW/ DOWN: Initiates counter-clockwise bridge rotation / Decrement number

HEAD: Selects / Programs Operator Cab end of bridge

TAIL: Selects / Programs Plain end of bridge

TRACK: Start Track Selection / Initiate shortest move

HINTS AND TIPS

- Do not use DCC track power for the turntable control circuit, or Track DC (throttle) on power pack.
- The factory programmed tracks are provided solely for turntable checkout and test. You may use them for service tracks, but are free to delete or modify them as you wish.
- Service tracks are programmed once using either end of bridge. The other end is saved automatically.
- When the bridge is rotating, pushing any button will stop the bridge at the current location.
- You may assign a track number to the home position if desired.
- You may assign multiple track numbers to the same bridge position.
- There is no requirement to sequentially number service tracks.
- When the bridge is stopped aligned with the NO TRACK zone, the bridge tracks are not powered.
- When resetting the home position, if the sensor end of the bridge is more than 1/2 a revolution from the home sensor, use the CCW button and rotate the bridge to a position just counter-clockwise from the sensor, then perform the reset. This will shorten the time to required to complete the reset.
- If you wish to add a new track between two existing tracks with sequential numbers, and renumber the tracks after the added track, first move to the highest track that needs to be renumbered and program it with the new higher number. Work your way back to the added location, moving to each track in turn with the old number, then programming the new number. This way the only track location you need to manually add is the new track.

PROGRAMMING AND OPERATION

The following tables list the key sequences required to operate the turntable.

Press the keys in the sequence shown on the left side of the table starting at the top. Note that certain functions require the key to be held until the display reacts, indicating you can proceed to the next step.

If you make an error during a key sequence, just stop and allow the command to time out (about 7-8 seconds), then start over.

Additional information is provided in the comments to the right of each control function table.

MOVE TO TRACK NUMBER

TRACK	*Switches to entry mode, Display flashes*
UP / DOWN	*Increment/Decrement to desired track number*
HEAD or TAIL or TRACK	*Defines bridge end to align. Initiates motion.* *Head/Tail aligns selected bridge end to track.* *Track alings closest end to track*

- Command timeout is approximately 7-8 seconds. If a pause longer than the timeout occurs during a keystroke sequence, the command is automatically cancelled and display reverts to normal readout.
- When equipped with multiple control boxes, keystrokes may be entered from any box.
- Only programmed track numbers will appear in list.
- Controller automatically determines direction of rotation to complete move.
- While rotating, pushing any button will immediately stop the bridge.
- Select track 0 to reset bridge home position.

TURN

HEAD or TAIL	*Either button reverses bridge orientation at current location*

- Controller determines direction of rotation based on programmed alignment.
- Works from any bridge position, programmed or not.
- While rotating, pushing any button will immediately stop the bridge.

MANUAL CONTROL

CW or CCW	*Initiates bridge roation in selected direction*

- Push and release direction key to jog bridge in selected direction.
- If key is held for longer than 3⁄4 second, bridge will continue to next programmed track when released.
- Display updates after button release to display next stop. If more than one track number is assigned to the next location, the lowest number is displayed.
- While rotating, pushing any button will immediately stop the bridge.
- When stopped, the display will indicate “- -” if location is not programmed.

PROGRAM CURRENT LOCATION

TRACK	*Switches to entry mode, Display flashes*
TRACK	*Push and hold until display flash rate doubles indicating Program Mode.*
UP / DOWN	*Increment/Decrement to desired track number*
HEAD or TAIL	*Push and hold until display flashing stops*

- Use Manual Control to rotate bridge to desired location. Any bridge location can be programmed to any number (1-99) at any time.
- Track locations may be programmed using either end of bridge. Opposite end of bridge is automatically stored so it is unnecessary to program both ends.
- Reusing a current number overwrites previous stored location.
- Programming a new track number has no effect on existing track numbers.
- More than one track number may be assigned to the same bridge location.
- There are no restrictions on how close programmed tracks are to adjacenttracks, and tracks may overlap if desired.
- Head and Tail may refer to either end of bridge. Default locations use operator’s cab as head end.

DELETE TRACK

TRACK	*Switches to entry mode, Display flashes*
TRACK	*Push and hold until display flash rate doubles indicating Program Mode.*
UP / DOWN	*Increment/Decrement to desired track number*
TRACK	*Push and hold until display flashing stops*

- It is not necessary to rotate the bridge to a track number you wish to delete.
- It is not necessary to delete a track definition before reusing the number for a different location.
- Display will read “- -” after deletion if no other number refers to the same location, otherwise the lowest number assigned to the location will be displayed.

RESET HOME POSITION	
TRACK	*Switches to entry mode, Display flashes*
UP / DOWN	*Increment/Decrement to track number 00*
HEAD or TAIL or TRACK	*Initates CW rotation from current location until zero position (Home) sensor is located.*

- Rotates the bridge to the Home Sensor location and resets the track location reference position.
- E0 error indicates Home Position needs to be reset.
- Rotation to home sensor position is always clockwise regardless of starting location.
- If the home sensor is not detected after a complete rotation, error E1 is displayed.
- The home location may be assigned a track number if desired.
- If a track number has been assigned to the home location, using the assigned number for movement does not reset the bridge location reference.

FASCIA DISPLAY BRIGHTNESS	
	Remove power to Fascia box
CW / CCW	*Reapply power and hold CW or CCW until bx display appears*
UP / DOWN	*Increment/Decrement to desired display intensity*
TRACK	*Push to save setting*

- Display intensity can be adjusted from b9 (brightest) to b1 (dimmest).
- Display intensity setting is locally stored and will be retained on any turntable.
- On systems using multiple Control Boxes, each is set individually.
- Pushing Head or Tail cancels the setting and reverts to prior intensity.

CLEAR MEMORY/FACTORY DEFAULT RESET	
	Remove power to turntable, wait 10 seconds after display is off.
HEAD + TAIL	*Simultaneously hold both buttons and reapply power.*
UP / DOWN	*Increment/Decrement to required D-Code*
TRACK	*Push and hold until display flashing stops, and the double bars light*

- All existing programmed locations are erased after a factory reset.
- A reset to home position is required after a factory reset.
- Hold down Head+Tail buttons while the display is “scrolling” until the D-Code comes up.
- D-Code for this model is d1. When flashing stops, display will indicate “--” showing that the D-Code is programmed
- Command will automatically cancel if no change is made within 7 seconds
- Default location for track 1 is created 10° clockwise from home sensor reference.
- Default location for track 2 is created 10° counterclockwise from home sensor reference.

ERROR CODES		
E0	*Position Reference*	*Reset Home Position is required*
E1	*Home Sensor Not Found*	
E2	*Communication Error*	
E3	*Bridge Not Responding*	
E4	*Configuration Error*	
E5	*Configuration Error*	*Fascia Control Box/ ACM error*
E6	*Pit Not Responding*	*Fascia Control Box error*
E7	*Internal Memory Error*	
E8	*Low Supply Voltage*	*Supply voltage below minimum*
E9	*Invalid Track Number*	*ACM only error*

- Home reference location could not be restored on power up
- Home sensor may be blocked, bad pit LED, bad bridge sensor
- Bridge wiper intermittent, bad control cable
- Bridge is not installed, bad bridge wipers
- Internal configuration info bad, factory reset may clear
- More than 4 control devices connected
- Pit controller not running, bad control box cable
- Internal ROM memory bad, fatal error
- 12-18 VAC / 16-24 VDC required for turntable operation; do not use DC throttle connection for power
- Track number is not defined

E0 Position Error can be cleared by pushing any key. Service track locations will not be correct until a reset of the home position is done. Other errors will clear automatically when the cause is corrected.

MAINTENANCE

As operation can be affected by dust, you may wish to cover your model with a plastic sheet or similar lightweight cover between operating sessions. Always cover the turntable pit when working on nearby scenery to prevent plaster dust, scenery foam or static grass from contaminating the pit area.

Zero Position: Make sure this area and the pit edge is always clean and free of dust.

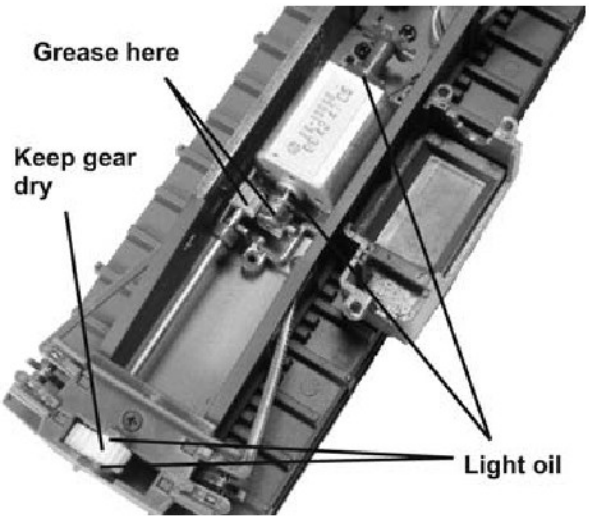
Use contact cleaner to clean the wipers and slip rings on the bottom of the bridge, should they get dirty.

Counting Wheel: If your table begins stopping out of alignment, the counting wheel may have become plugged with dust. Simply remove the bridge from the pit and blow any dust clear of the cogwheel.

Please note that any time the bridge is removed from the pit, you must reset the home position as shown in the operating instructions.

Lubrication: In normal use, the drive mechanism should only require servicing about once a year. Use plastic compatible lubricants made especially for hobby products —

Never use household oils or lubricants!



Apply a small drop of light oil for electric motors to the bearings; apply a light gear lubricant to the gear train as shown.

TROUBLESHOOTING

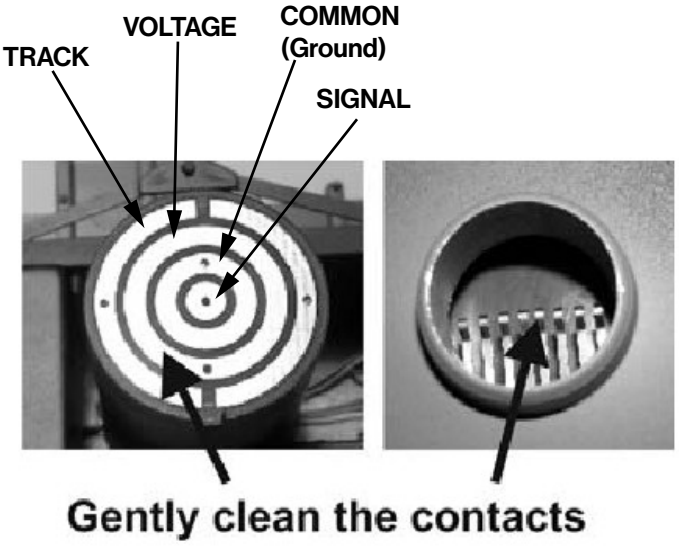
If error codes are displayed, check the Error Code section for additional information on the possible source of the error. Error codes will not appear during normal operation of the turntable.

If the bridge doesn't stop at a programmed position and won't move again (Error Codes E2/E3/E6), make sure there's good electrical contact between all wipers and the bridge center post. Remove the bridge and check all contact points as shown. Clean with a soft, cotton swab and a good contact cleaner - be gentle and avoid pushing the wipers down. They should always be slightly raised in a flat row. If adjustment is needed, gently lift the wiper/s upward until it aligns with the other. Replace the bridge and reset the home position as shown in the operating instructions.

If the Control Box display reads E2/E3/E6:

1) Check that the control cable plugs are seated firmly in both control box and the pit bottom cover.
2) Make sure there's good electrical contact between the eight contacts in the pit, and the center contact plate on the underside of the bridge. Clean with a soft, cotton swab and a good contact cleaner. Replace the bridge and reset the home position as shown in the operating instructions.

If the bridge consistently under or over rotates to the same programmed position and the bridge motor counting wheel is not obstructed, check the current code displayed when a factory reset is started. The display must be set at d1 for this model. Refer to the Clear Memory/Factory Default Reset instructions above. If the display is correct, allow the command to time out if you do not wish to erase the current set of programmed tracks.



If an E8 Low Voltage Error is displayed, especially when you attempt to move the bridge, the power supply is marginal and not capable of supplying sufficient current to operate the turntable control circuits. The turntable will not operate if the supply voltage is below the minimum values shown in the wiring diagram.