

Interlocks – 450 Series

45I-9C

Crane Interlock and Operating Mechanism

45I-10C

Connecting Interlock

These instructions are for 450 Series Interlocks, Models 45I-9C and 45I-10C, as used with TC/American Crane's 450 Series Patented Track rail.

An interlocking system consists of a least one crane with a Crane Interlock and Operating Mechanism and at least one spur rail with a Connecting Interlock. For some applications, the “connecting interlock” might be installed on a crane (i.e., see illustration on Page 6), and the “crane interlock” might be installed on a spur rail.

 **DANGER**

Lifting Operations

Installation of equipment such as TC/American Cranes and Monorails with Interlocks requires performance of overhead lifting operations. Proper lifting procedures involve training, skills and experience beyond the scope of this document. Workplace supervisors are responsible to assure that all persons under their supervision are properly trained, properly equipped, and are following safety practices appropriate for the lifting operation being employed.

 **DANGER**

Electrical Equipment Installation, Service and Maintenance

Persons performing installation, service or maintenance activities on, near, or with equipment that is electrically powered are exposed to electrical hazards that could result in serious injury or death if proper precautions are not followed. Before performing such work, disconnect the electrical power source for the system at the disconnect device and lock it out, following appropriate Lockout/Tagout (LOTO) procedures, to prevent electric power from being applied while work is being performed.

All persons must use safe work practices appropriate to the electrical system, and follow all workplace procedures and policies. This requires specific knowledge, equipment and training beyond the scope of this document. Workplace supervisors are responsible to assure that all persons under their supervision are properly trained, properly equipped, and are following appropriate safety practices.

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Interlocks

TC/American Crane offers several models of interlocks, for all sizes of our rail. Selection of the appropriate model depends upon the rail being used, load capacity of the crane and monorail, service duty class, and other factors.

Interlock Model Numbers:

(general information for all interlocks)

- The first character(s) of the Model Number identifies the rail size used with this interlock:
 - 2 = 200 Series Rail
 - 3 = 325 Series Rail
 - 45 = 450 Series Rail

Note: for 400 Series Rail, contact the factory
- The second character:
 - I = Interlock
- The number, or number and letter pair, identify a model series:
 - 513 = 200 Series, Connecting Interlock
(for 7" deep rail, for non-electrified or Bottom Contact electrification)
 - 515 = 200 Series, Crane Interlock and Operating Mechanism
(for 7" deep rail, for non-electrified or Bottom Contact electrification)
 - 850 = 200 Series, Connecting Interlock
(for 11" deep rail, for non-electrified and either Side or Bottom Contact electrification)
 - 930 = 200 Series, Crane Interlock and Operating Mechanism
(for 11" deep rail, for non-electrified and either Side or Bottom Contact electrification)
 - 613 = 325 Series, Connecting Interlock
(for 3RL8-18 rail, for non-electrified or Bottom Contact electrification)
 - 615 = 325 Series, Crane Interlock and Operating Mechanism
(for 3RL8-18 rail, for non-electrified or Bottom Contact electrification)
 - 450 = 325 Series, Connecting Interlock
(for 3RL13-27 or 3RL14-35 rail, for non-electrified or with either Side or Bottom Contact electrification)
 - 430 = 325 Series, Crane Interlock and Operating Mechanism
(for 3RL13-27 or 3RL14-35 rail, for non-electrified or with either Side or Bottom Contact electrification)
 - 9A = 325 Series, Crane Interlock and Operating Mechanism
(for mounting in 3RH14-41 rail, for non-electrified or with either Side or Bottom Contact electrification)
 - 9B = 325 Series, Crane Interlock and Operating Mechanism
(for mounting in 3RH16-47 rail, for non-electrified or with either Side or Bottom Contact electrification)
 - 9C = 450 Series, Crane Interlock and Operating Mechanism
(for mounting in 45R20-79 rail, for non-electrified or with either Side or Bottom Contact electrification)
 - 10A = 325 Series, Connecting Interlock
(for mounting in 3RH14-41 rail, for non-electrified or with either Side or Bottom Contact electrification)
 - 10B = 325 Series, Connecting Interlock
(for mounting in 3RH16-47 rail, for non-electrified or with either Side or Bottom Contact electrification)
 - 10C = 450 Series, Connecting Interlock
(for mounting in 45R20-79 rail, for non-electrified or with either Side or Bottom Contact electrification)

NOTE: See the appropriate section(s) of these instructions for assembly, installation and maintenance details specific to your Interlock model.

NOTE: For a specific parts breakdown of the Interlock provided with an order, see the drawings provided with that shipment.

General Installation Instructions

Interlock Overview

Interlocks allow a crane to mechanically connect to one or more spur rails, to a crossover rail section between parallel runways, or directly from one crane to another on parallel runways. Loads may then be transferred directly from crane to spur rail, or crane to crane, without re-handling the load.

Interlocks are factory mounted into monorail and crane bridges, and are shipped complete. Attention to field alignment and adjustment procedures (similar to typical crane and monorail alignment and adjustments) will provide years of trouble free operation.

For more information, please see the Crane Interlocks section of the TC/American Crane Systems Catalog.

Before beginning the installation:

- When shipment is received, remove all shipping materials and visually inspect all parts for damage. Repair and/or replace if necessary.
- Check packing lists against materials received and identify all parts.
- Gather all TC/American Crane drawings, plus any vendor equipment drawings, and keep in a secure location for reference during installation and start-up, and to give to the end user for future reference.
- See the TC/American Crane Systems Catalog and drawings provided with the shipment for details, part number information and electrical schematics.
- Store all equipment in a clean, secure area prior to installation.

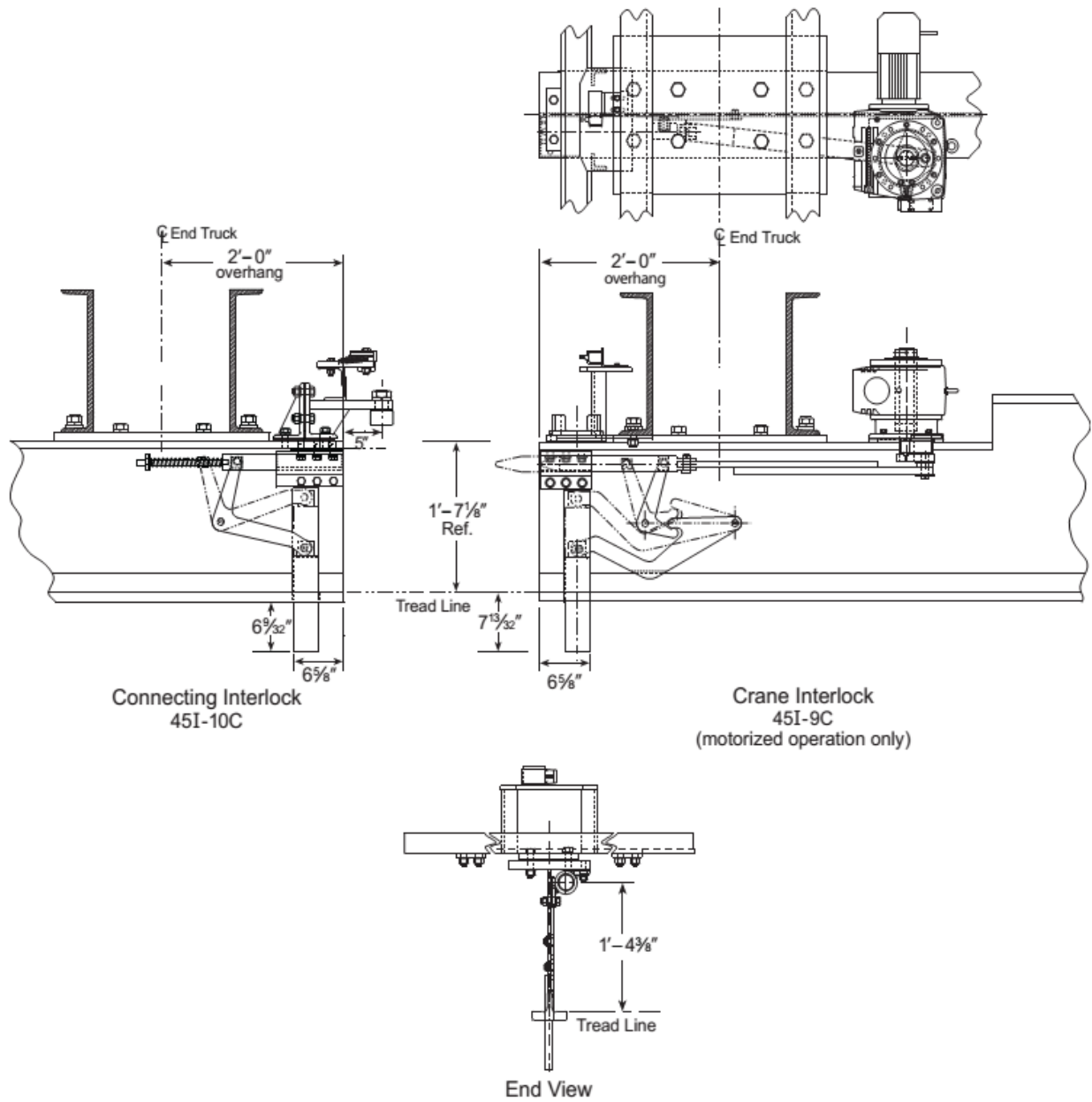
Installing Cranes and Spur Rails in an Interlocking System:

- Check layout drawings for any notes.
- TC/American Crane crane interlocks mounted in crane bridges and monorails are shipped fully assembled.
- Installation of a runway, crane and monorail system with interlocks should begin at the point where a spur rail or crossover section is located and work outward from that point, adding runway rail and monorail pieces sequentially. For systems with multiple spur rails or crossovers, begin with the groupings and proceed from that point. For more information, see *Monorail and Runway Rail Installation Instructions*. If the monorail portion of the system includes switches, see the appropriate *Switch Installation Instructions*. For electrification systems, see the appropriate *Conductor Bar Installation Instructions*. For suspension of the runway and monorail, see *Suspension Installation Instructions*.
- Verify treadline alignment at all interlock locations.

Initial Start-Up:

- After installation of runway, crane and spur rail components, operate all interlocks several times.
- Verify proper alignment at each interlock location.
- Verify proper engagement of each Crane Interlock to a corresponding Connecting Interlock.
- Run hoist carriers or trolleys through the interlocks to check all clearances and for smooth transition across the interlock gaps.
- Verify that safety stops on the interlocks properly contact the hoist carrier or trolley to prevent it from falling off when an interlocking rail end is not aligned to a corresponding rail end.

450 Series Interlocks



Crane to Crane Interlock Shown

450 Series Interlocks

Crane Interlock with Motorized Operating Mechanism

Model	Part Number	Figure
45I-9C	10-3302-xx	Figure 1

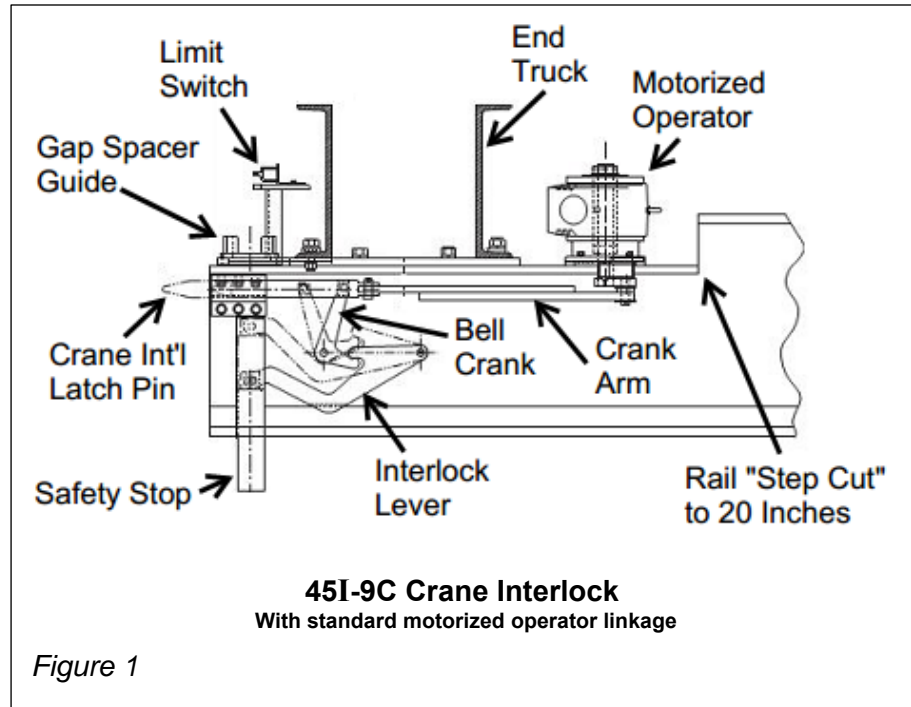
For typical installation in 45R20-79 rail.

Note: this interlock is provided standard with a motorized operating mechanism. No hand operation.

Part Number Note: last two digits of the crane interlock part number vary, depending upon web thickness of bridge beam.

Step Cut or Notch: if bridge beam is deeper than 20", it must be "step cut" or "notched" to 20". See Figure 1.

Conductor Bar Note: 450 Series interlocks are designed to be used only with bottom contact conductors. Conductor bars are not shown in these views for clarity. For information on TC/American Crane Shielded Channel-Bar or Shielded Figure-8 Bar electrical conductor bar installations, see *Shielded Channel-Bar Electrical Conductor Installation Instructions* or *Shielded Figure-8 Electrical Installation Instructions*.



Details of 45I-9C Crane Interlock

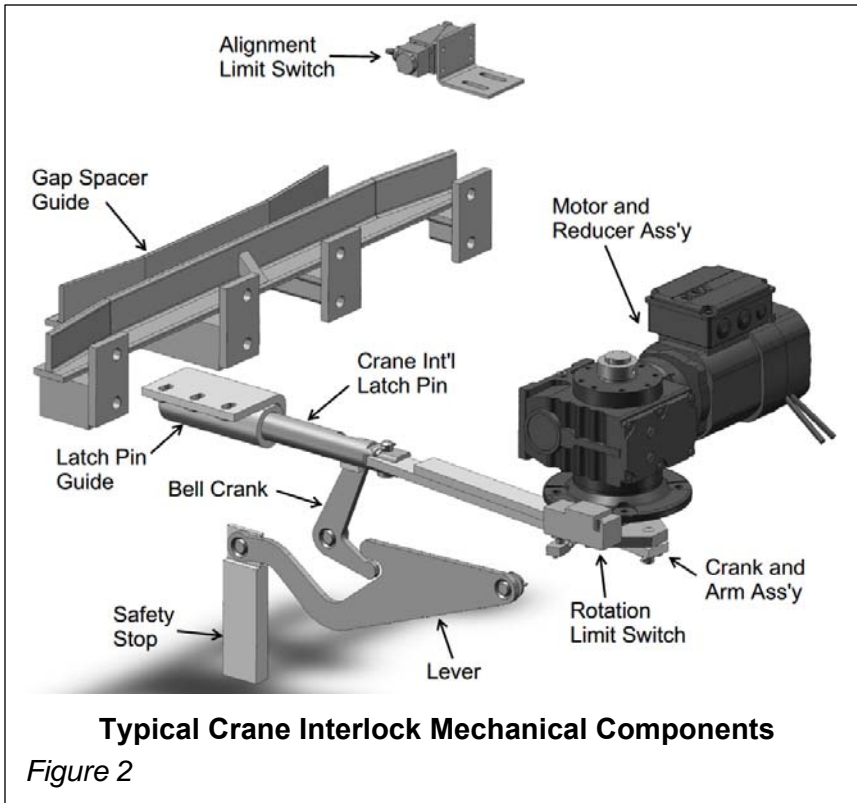


Figure 2: Typical arrangement of Crane Interlock components (bridge beam and end truck channels not shown for clarity).

Figures 3 and 3A: Crane Interlock parts details.

An Adjustment Block is mounted on a pin of the Bell Crank and engages a machined notch in the Latch Pin. Rotate Adjustment Block as required (eccentric adjustment) to most completely engage the Latch Pin notch throughout the travel arc of the Bell Crank arm.

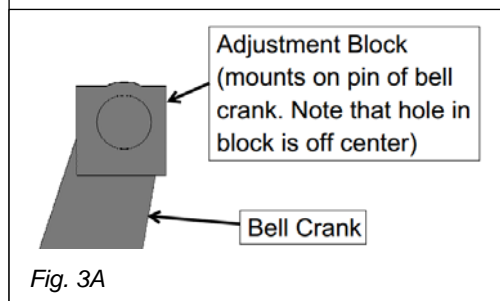
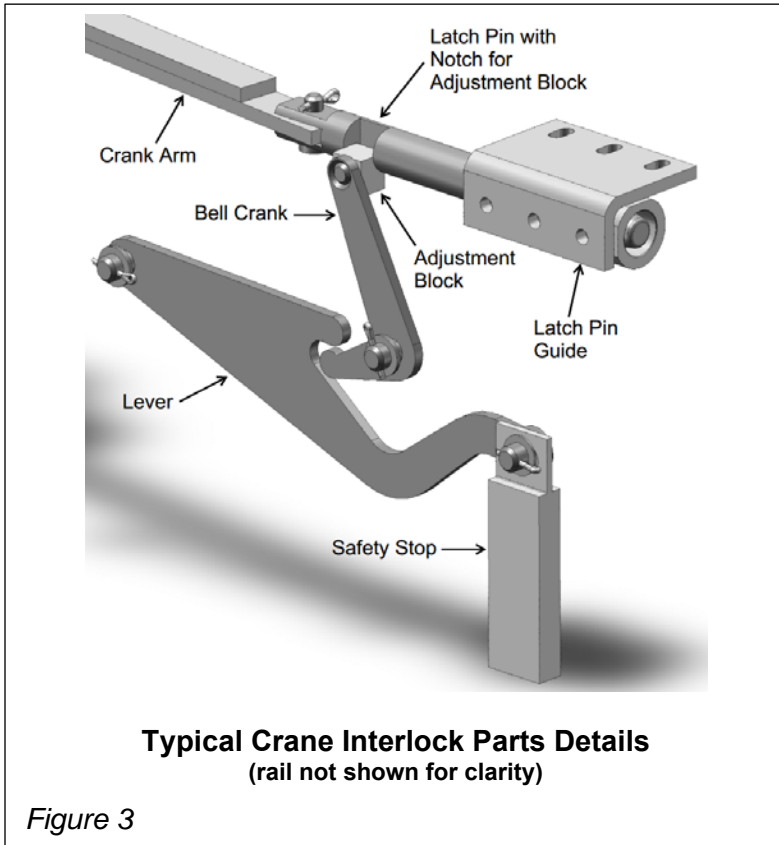
The Adjustment Block “floats” on the Bell Crank pin and within the Latch Pin notch, and is captured on the Bell Crank pin by the rail web.

The Lever and Bell Crank are secured to the rail web with machine bushings and cotter pins. Use machine bushings as required to space the Lever and Bell Crank so they do not “scrub” the face of

the web during operation.

The Crank Arm assembly is two halves that are overlapped and welded to length as required during shop assembly. See Figures 2 and 3. When the operator crank is fully retracted (interlock disengaged), the nose of the latch pin should be flush with the end of the Latch Pin Guide (ref: Fig. 3), and project 4 3/4” beyond the end of the bridge when extended.

The 4 3/4” dimension will actuate the connecting interlock mechanism sufficiently to raise the connecting interlock Safety Stop flush with the bottom of the tee section, or high enough to clear all trolley components.



Latch Pin Location: see Figure 4 for the design location of the center of the Crane Interlock Latch Pin. Adjust to these dimensions with shims between the Latch Pin Guide (formed bracket and barrel weldment) and the top flange and web. These dimensions must exactly match a similar latch pin location on the Connecting Interlock.

Gap Spacer Guide Location: see Figure 5 for the design location of the Gap Spacer Guide, as measured from end of rail to centerline of gap spacer. Adjust to dimension with shims between guide and end truck frame.

The Gap Spacer Roller on the Connecting Interlock engages the Gap Spacer Guide on the Crane Interlock to hold bridge-to-bridge or bridge-to-spur clearance of 1/8" minimum, 3/16" maximum.

Note: this gap is maintained by the difference between the 4 7/8" dimension from end of rail to centerline of Gap Spacer Guide (see Figure 5) as compared to 5" dimension from end of rail to the centerline of the Gap Spacer Arm Roller (see Figure 7).

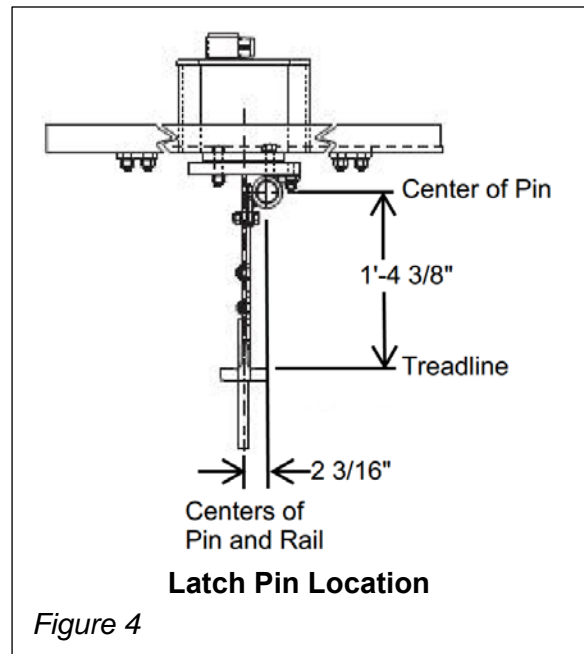


Figure 4

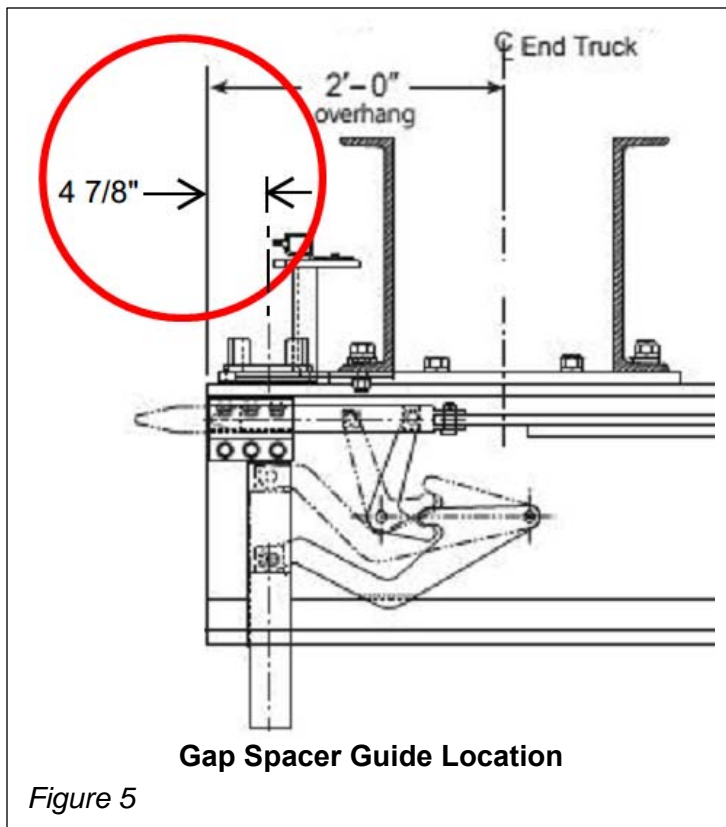


Figure 5

450 Series Interlocks

Connecting Interlock

Model	Part Number	Figure
45I-10C	10-3303-xx	Figure 6

For typical installation in 45R20-79 rail.

Part Number Note: last two digits of the connecting interlock part number vary, depending upon bridge or spur rail web thickness.

Figure 10: typical 45I-10C Connecting Interlock. Note the Gap Spacer Arm with Guide Roller and the Trip Assembly for the Alignment Limit Switch of the Crane Interlock.

If a spur rail or connecting crane bridge is deeper than 20", it must be "step cut" or "notched" to 20".

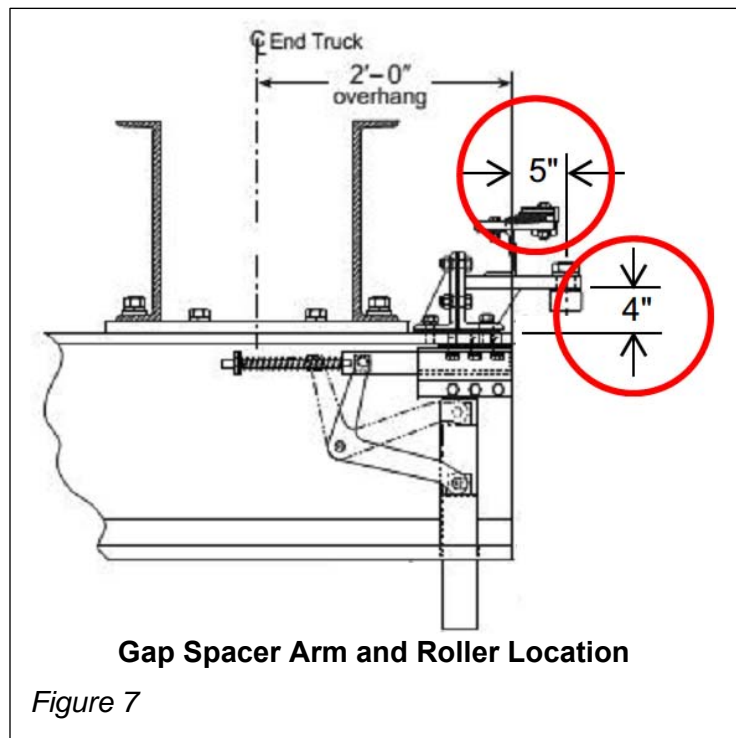
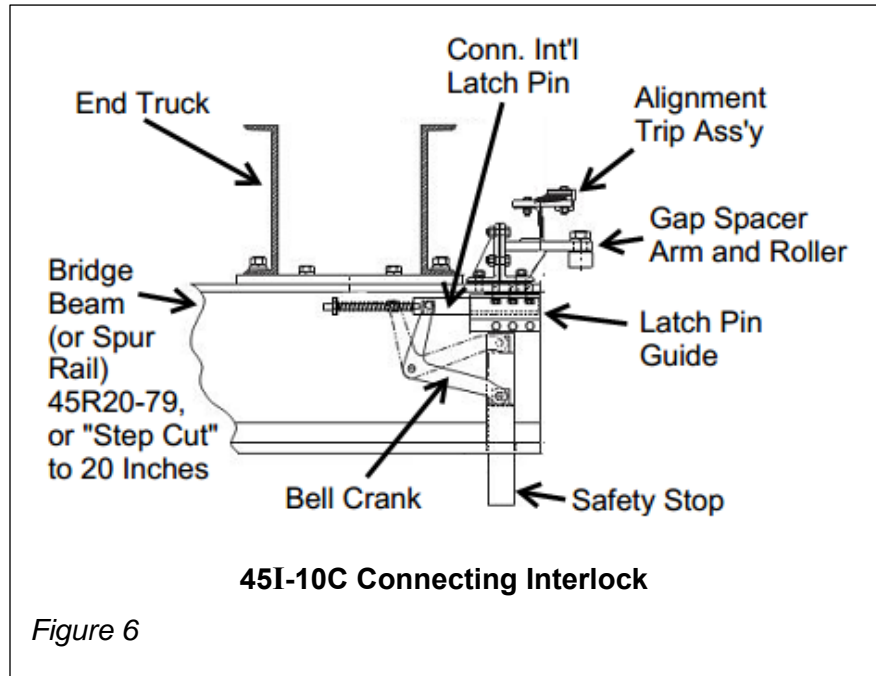
Gap Spacer Arm and Roller

Location: see Figure 7 for a view of the Connecting Interlock with design dimensions for location of the interlock Gap Spacer Arm. Adjust to 5" dimension with shims between the arm and the mounting brackets on the end truck frame or Spur Support Bracket (crane assembly shown). Compare to Crane Interlock Gap Spacer Guide, Figure 5.

Adjust to 4" dimension via slots in mounting plate of Gap Spacer Arm. Compare to Gap Spacer Guide, Figure 5.

Treadline Alignment: alignment of the treadline of cranes to spur rails is as critical as any runway or monorail installation. Adjust the spur rail treadline elevation to the crane treadline elevation by adding or removing shims under the Spur Support Bracket where it rests upon the top flange of the runway. See Figure 12. Also see *Monorail and Runway Rail Installation Instructions*.

Electrification Note: 450 Series interlocks are designed to be used only with bottom contact conductors. Conductor bars are not shown in these views for clarity. For information on TC/American Crane Shielded Channel-Bar or Shielded Figure-8 Bar electrical conductor bar installations, see *Shielded Channel-Bar Electrical Conductor Installation Instructions* or *Shielded Figure-8 Electrical Installation Instructions*.



Details of 45I-10C Connecting Interlock

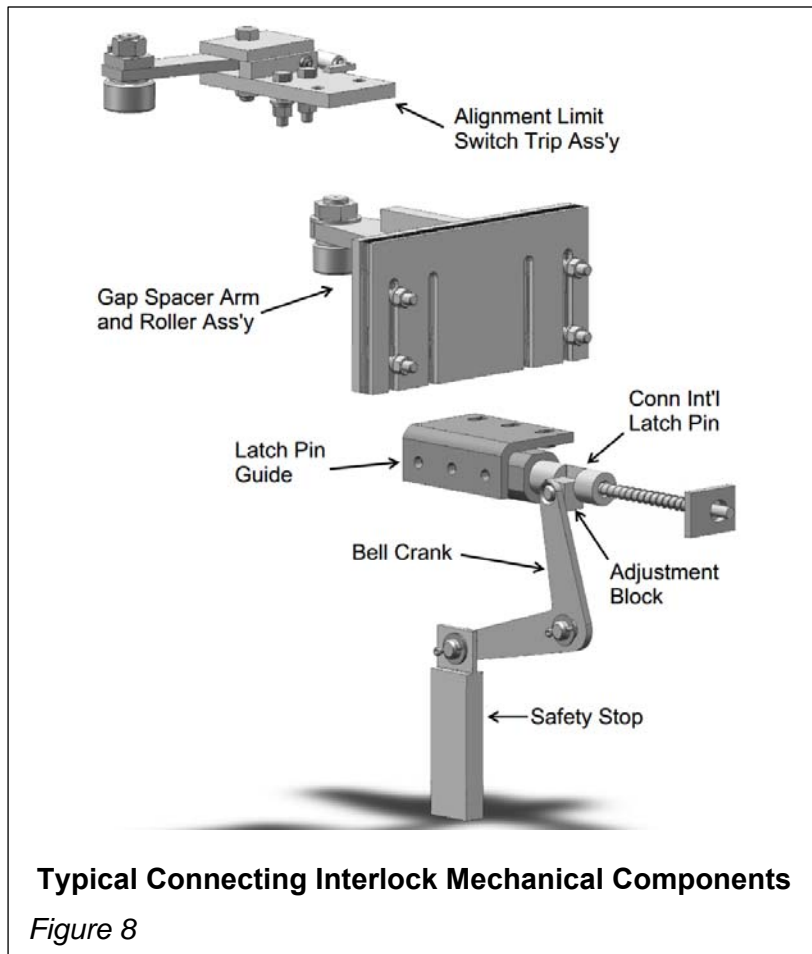


Figure 8: arrangement of Connecting Interlock mechanical components.

An Adjustment Block is mounted on the Bell Crank pin and engages the machined notch in the Latch Pin. Rotate Adjustment Block as required (eccentric adjustment) to most completely engage the Latch Pin notch throughout the travel arc of the Bell Crank arm.

Note: the Bell Crank is secured to the rail web with machine bushings and cotter pins. Use machine bushings as required to space the Bell Crank so it does not “scrub” the face of the web during operation. Latch Pin is held in position by the Latch Pin Guide and a tab welded to the rail web for the tail of the latch. Adjustment Block “floats” on the Bell Crank pin and within the Latch Pin notch, and is captured on the Bell Crank pin by the rail web.

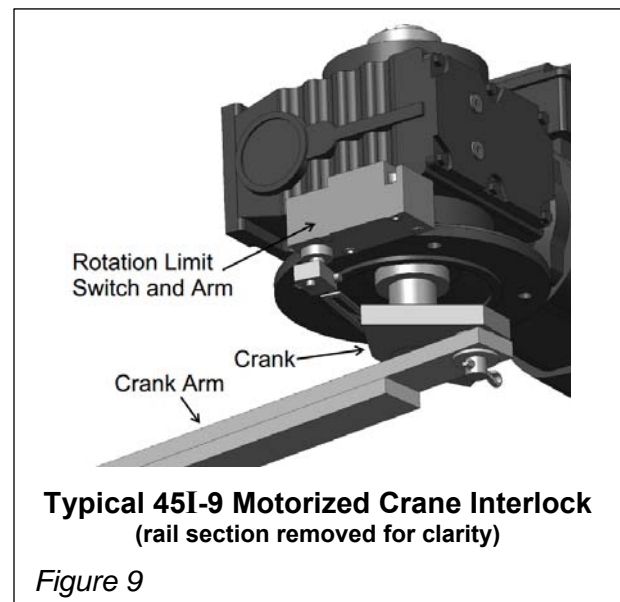
Latch Pin Location: the Connecting Interlock Latch Pin location must exactly match that of the Latch Pin on the Crane Interlock. See Figure 4 for dimensions. Adjust with shims between the Latch Pin Guide (formed bracket and barrel weldment) and the top flange and web.

Motorized Interlock

Motorized Operating Mechanism Limit Switch Adjustment:

See Figures 9, 10 and 11. The Rotation Limit Switch is a lever operated, spring-return-to-neutral switch. The switch is mounted on the motor base plate with the centerline of the switch shaft in line with the center of the gearbox output shaft.

With the switch in the neutral position, install lever on the switch shaft so the lever is pointed at the gearbox output shaft. Adjust length of the limit switch arm as required to contact the faces of the cam so as to fully extend or retract the latch pin when the motor operates. Motion of the gearbox should stop so the end of the latch pin is flush with the end of the latch pin guide when retracted, and project 4 3/4” beyond the end of the bridge when extended. Note: the crank arm pivots toward the web of the rail during operation. Verify phasing for correct motor rotation.



Included with motorized interlock operation are a limit switch, alignment trip arm, and indicator lights to show crane to spur rail alignment.

Indicator lights show when the crane bridge rail is aligned with the spur rail, when the interlock is fully engaged, and when the interlock is fully disengaged.

Light colors are typically as follows:

- Red: Crane Interlock stop is down and interlock is not engaged (latched). This is the normal condition during crane movement.
- Amber: Interlock is aligned with a spur rail or another crane bridge (interlock operation can proceed).
- Green: Crane Interlock and Connecting Interlock stops are raised and transfer of the carrier may proceed.

Note: Motorized operator can only be actuated (via pendant station or other controller) when the crane is aligned to a connecting interlock.

The signal lights and circuitry to allow interlock operation are part of the wiring schematic for the Crane Alignment Limit Switch and the Motorized Operator Limit Switch.

Figure 10: view of typical crane alignment limit switch.

Figure 11: overhead view of typical crane and spur rail in alignment. Roller on gap spacer arm is engaged with the gap spacer guide. Alignment trip arm has contacted the alignment limit switch to illuminate a signal light to show “Crane Aligned” (signal lights not shown).

See the crane mechanical and electrical drawings for component part numbers and electrical schematics.

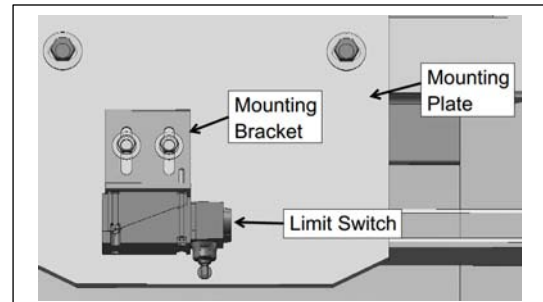
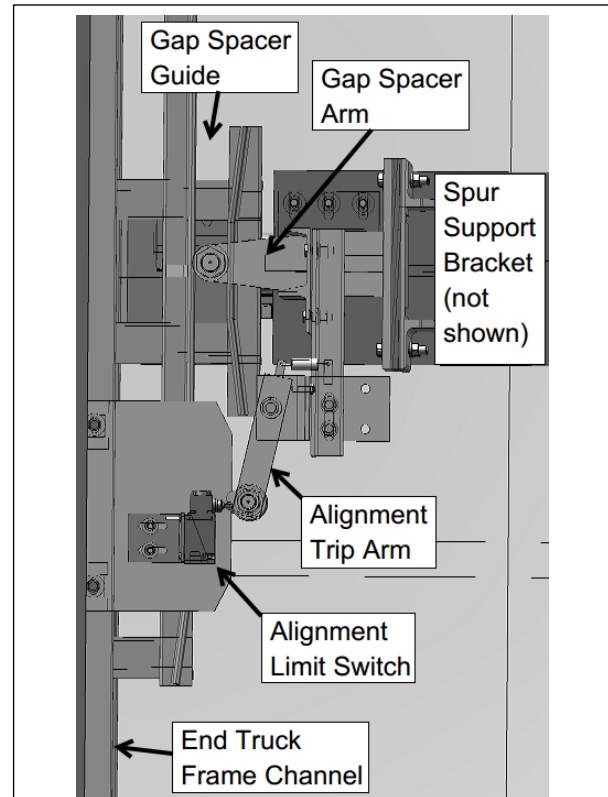


Figure 10



Typical Crane to Spur Alignment

Figure 11

Interlock Adjustments

Factory installed Crane and Connecting Interlocks should be properly adjusted as received. However, prior to initial operation and after any maintenance or repair, check the following items and adjust as noted. Before making any adjustments, verify that all parts are installed correctly and are not worn.

A. Treadline to Treadline Alignment

See Page 9 for a note about Spur Rail-to-Crane Bridge treadline adjustment. Similar procedure for crane to crossover treadline adjustment. Also see a separate document, *Monorail and Runway Rail Installation Instructions*.

Crane-to-Crane treadline alignment should be within factory manufacturing tolerances. Adjustments may be made by adding or removing shims between the end truck frame and the top flange of the bridge beam.

B. Gap Between End of Bridge Beam to End of Spur Rail (or Bridge Beam to Bridge Beam)

Adjust Crane Interlock Gap Spacer Guide assembly as shown in Figure 5. Adjust Connecting Interlock Gap Spacer Arm and Roller assembly as shown in Figure 7. See Gap Clearance Note on Page 8.

C. Latch Pin, Crane Interlock

The Crank Arm, see Figures 1, 2 and 3, consists of two segments, shop welded together at crane assembly. Verify that the nose of the Latch Pin is flush with the end of the Latch Pin Guide when the Operating Mechanism Crank is fully retracted. When the crank is fully extended, the nose of the Latch Pin must project 4 3/4" beyond the end of the bridge beam (to fully actuate the Connecting Interlock mechanism).

If the Crane Latch Pin is not flush with the end of the Latch Pin Guide when retracted, or if it does not extend properly past the bridge beam when extended, verify that Operating Mechanism is operating properly, with the Crank Arm properly positioned for full extension or retraction. Verify that Crank Arm is welded to proper length.

D. Adjustment Block for Crane and Connecting Interlock Latch Pins

Position the Adjustment Block on the pin of the Bell Crank of both the Crane and Connecting Interlocks so the adjustment block engages the machined notch in the Latch Pin most completely throughout the travel arc of the Bell Crank as it pivots. See Figures 3 and 3A.

E. Latch Pin Location

Verify location dimensions for the Crane and Connecting Interlock Latch Pin are correct. See Figure 4. Adjust as required by adding or removing shims. Note: in a system with multiple interlock points, verify that all latch pin locations are correct.

F. Motorized Interlock, Operating Mechanism Travel Limit Switch

See Page 10, Figure 9 for installation and adjustment of the travel limit switch and arm.

G. Motorized Interlock, Crane Alignment Limit Switch

See Figures 10 and 11. Adjust the position of the Limit Switch and the Trip Arm to properly actuate the limit switch when it contacts the trip arm.

Lubrication

General Lubrication Information

Work a small amount of grease or light machine oil into the following areas as appropriate (see Figures 1, 2 3, 6 and 8 for parts identification):

1. Interlock Arm and Lever Mechanisms
 - a) connecting interlock – pivot points where the bell crank arm is fastened to the rail web, the safety stop, and the latch pin
 - b) crane interlock – pivot points where stop lever and bell crane arms are fastened to the rail web, the safety stop, and the latch pin
 - c) crane interlock – where the bell crank engages the stop lever
2. Interlock Latch Pins – both crane and connecting interlocks
 - a) inside of the latch pin guide (receiver barrel)
 - b) body of latch pin where it slides into the guide
 - c) adjusting block at bell crank connection
 - d) connecting interlock – tail of latch pin where it slides through the support tab welded to the rail web
3. Safety Stop and Guide Tubes – both crane and connecting interlocks
 - a) inside of the safety stop guide tubes
 - b) surface of safety stop where it slides through guide tube
 - c) pivot connection to bell crank or lever
4. Operating Mechanism
 - a) Motorized – gear box assembly, lubricate per vendor instructions

Lubrication Frequency

Recommended approximately each 6 months for normal operation, more frequently for heavy useage. Each application must be evaluated on its own merits, including: service duty, number of operations per shift, and operating environment.

Maintenance personnel should develop and maintain a record of all monthly inspections. Frequency of lubrication may be adjusted to match operational demands, based upon inspection reports.

Recommended Interlock Lubricants

(for standard industrial operating environments)

Interlock Arm Mechanisms	Good grade multi-purpose lithium grease
Latch Pins	Good grade multi-purpose lithium grease
Safety Stop and Guide Tubes	Good grade multi-purpose lithium grease
Pivot Points	Good grade light machine oil
Motor and Reducer for Motorized Interlock	See vendor manuals for motor and gearbox

Note: TC/American Crane does not normally make a "brand name" recommendation for lubricants. Each customer may have a preference based upon many legitimate reasons. TC/A recommends to use a "good quality" lubricant and, when one is chosen, not to mix them.

Adjust lubrication type and frequency based upon the operating environment and customer requirements.

NOTE: before lubricating equipment that will be taken onto a customer's site, check with the customer for any preferences on brands or types (to maintain customer stock uniformity of products used and records maintenance).

NOTE: have Material Safety Data Sheet (MSDS) info available for any lubricants brought onto a work site.

NOTE: verify with customer that lubricants being used will not have an effect upon any production processes.