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# **AAR Technical Standards Unit Condition Indicator Rule 59 Revisions**

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Committee Manager  
Transportation Technology  
Center, Inc.

## ◆ **AAR Technical Standards Overview**

- Committees
- Publications
- Certification Process

## ◆ **AAR Industry Activities**

- Unit Condition Indicators (UCI)
- UCI Waiver Status

## ◆ **Rule 59 Revisions**



◆ **AAR Committees are multi-faceted focusing on:**

- Developing performance based rules and standards for components of railcars and locomotives
- Maintaining and enforcing rules and standards
- Approving designs (car and component)
- Certification Testing
- Approving facilities (Technical and QA)
- Supporting industry needs
- Increasing awareness
  - ▲ Early Warnings and Maintenance Advisories
  - ▲ Standards needed due to changing environment and regulatory issues



- ◆ **AAR committees are responsible for engineering and administrative management for AAR**
  - ◆ **Technical Committees include:**
    - Equipment Engineering Committee (EEC)
    - Braking Systems (BSC)
    - Coupling System and Truck Castings (CSTCC)
    - Wheels, Axles, Bearings, and Lubrication (WABL)
    - Intermodal Car Performance (ICPC)
- Subordinate committees
- ◆ **Each committee is composed of experts from:**
  - Railroad Members
  - Car owners
  - Suppliers
  - Federal Railroad Administration (FRA)
  - Supplier Committees





# **Equipment Engineering Committee (EEC)**

- ◆ **Reports to Technical Services Working Committee (TSWC)**
- ◆ **Oversees subordinate committees (4)**
- ◆ **Reviews and approves cars and associated components**
  - An average of 30+ per year new car designs and components are approved for railroad use
- ◆ **Maintains MSRP Sections B, C, C-II, D, L and H-III and associated Field Manual Rules**
- ◆ **Oversees approvals under Office Manual Rule 88**
- ◆ **Lead industry in safety and efficiency efforts:**
  - Revising Field Manual Rule 59
  - Investigating possible alternatives for the CFR requirements for reflective materials replacement
  - M-976 introduction and implementation



# **AAR Certification Process**

- ◆ **Major task of technical committees is the oversight of component/facility approvals**
- ◆ **A component may have the requirement to meet none, one, two or all three of the following:**
  - QA M-1003 (Appendix A lists manufacturers, reconditioners, repair facilities, and assemblers required to have M-1003)
  - Technical manufacturing process (manufacturing specifications)
  - Component performance requirements (test specifications)
- ◆ **After thoroughly reading through applicable specifications, always check with the MID and appropriate Committee Manager(s) for requirements**



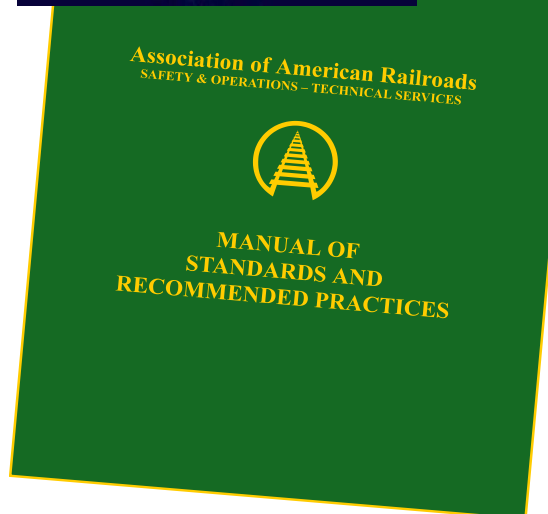
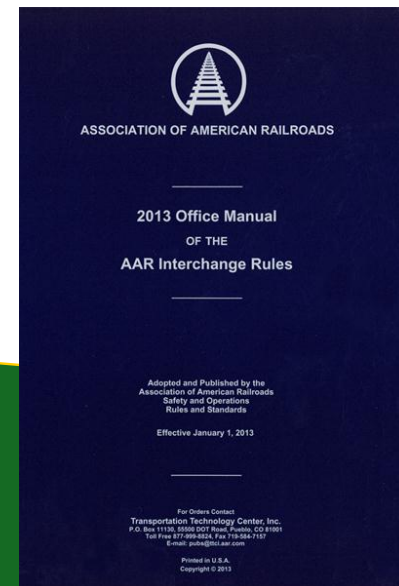
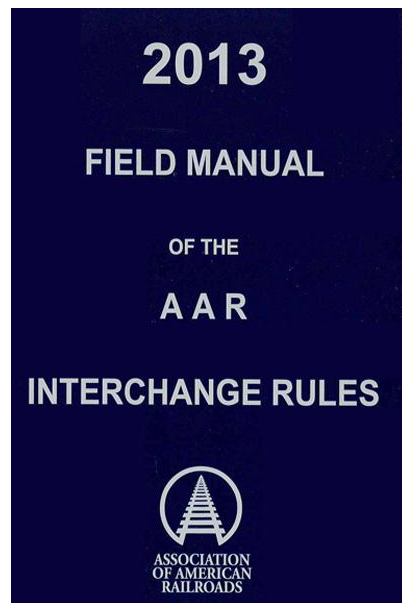
# **Technical Standards - Publications**

## ◆ **AAR/TTCI staff contribution to AAR publications included:**

- Engineering (Technical Committees)
- Editing
- Publishing/Printing
- Sales and Distribution

## ◆ **Publications include:**

- MSRPs
- Field Manual
- Office Manual





# Manual of Standards and Recommended Practices (MSRP)

- ◆ The set of AAR MSRPs is a collection of 27 Volumes, plus Administrative Standards and an Index detailing
  - Specifications, standards, and recommended practices, published in specialty areas
  - Methods to maintain Interoperability
  - Equipment designs and repair standards
  - Basic components and systems
  - Complete car construction and design criteria
  - Locomotive standards
  - M-1003, AAR Quality Assurance Program

AAR Manual of Standards and Recommended Practices Tables of Content				NUMERIC INDEX
NUMERIC INDEX				
Standard	Subject	Section	Circulars?	
M-101	Axles, Carbon Steel, Heat-Treated	G	<a href="#">Update Available</a>	
M-105	Forgings, Carbon Steel Blooms, Billets, and Slabs	S		
M-107/ M-208	Wheels, Carbon Steel	G	<a href="#">Update Available</a>	
M-114	Helical Springs, Heat-Treated Steel	D		
M-118	Pin, Coupler Knuckle Pivot and Coupler Shank Connecting, Steel	B		
M-119	Retaining Pin and Keeper for F-Type Cushion Yoke	B		
M-126	Forgings, Carbon Steel	S		
M-127	Forgings, Alloy Steel	S		
M-131	Blooms, Billets, and Slabs—Alloy Steel	S		
M-201	Castings, Steel	S		
M-202	Truck Bolsters, Cast or Structural—Design and Testing	S		
M-203	Truck Side Frames, Cast Steel—Design and Testing	S	<a href="#">Update Available</a>	
M-203A	Bolster Design Loads	S		
M-204	Truck, Freight Car, with Car Body/Side Frame Load Path—Design and Testing	S	<a href="#">Update Available</a>	
M-205	Yoke, Coupler—Test Requirements	S		
M-210	Side Frame and Bolsters, AAR Approved—Purchase and Acceptance	S		
M-211	Couplers and Yokes, AAR Approved—Purchase and Acceptance	S	<a href="#">Update Available</a>	
M-212	Couplers and Yokes, Secondhand—Classification and Reconditioning Procedure	S	<a href="#">Update Available</a>	
M-213	Truck Frames, Fabricated Steel	S		
M-214	Side Frames and Bolsters, Used and Reconditioned—Classification and Repair Procedure	S		
M-215	Coupling Systems	S		
M-216	Knuckles, Types E and F—Fatigue Test	S		
M-220	Casting Component NonDestructive Testing Requirements	S	<a href="#">Update Available</a>	
M-269	Wear Plate, Coupler Carrier, Performance Specification—Non Metallic	B		
M-300	Reconditioned Brake Beams	E	<a href="#">Update Available</a>	
M-402	Brake Shoe, Cast Iron, High-Phosphorus Type	E		
M-601	Hose, Wrapped, Air—Brake, "End Hose"	E		
M-602	Gaskets, Air Hose	E		
M-618	Hose, Air, Wire-Reinforced	E	<a href="#">Update Available</a>	
M-619	Brake Cylinder Line Hose Assemblies—Performance Requirements	E		
Note: Click the "Update Available" link in the column entitled "Circulars?" to identify any circular letters that implement specifications, standards, or recommended practices revised since the MSRP section was last printed. Call 877-999-8824 with questions.				
A.I-1				

EFFECTIVE 04/19/2013





## ◆ **Field Manual**

- Used to publish rules for acceptance of railcars
  - ▲ Allowable repairs to rolling stock
  - ▲ Condemning limits
  - ▲ Responsibility for damage
  - ▲ Handling of disputes
- Lists cars and components prohibited
- Specifies mechanical car requirements

## ◆ **Office Manual**

- System for billing of charges for car repair
- Payment schedule based on time standards
- AAR mechanical requirements for new, rebuilt, and upgraded cars (Rule 88)



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# **AAR Industry Activities**

## **Unit Condition Indicator**

What they are, governing Rules and Standards, and UCI Waiver Status

# Unit Condition Indicator (UCI)



One 1 oz shot glass of Hydraulic Fluid equals...



685 "Clearly Formed Droplets"

Oil Volume by Unit type:

10" EOC ~4 gals

15" EOC ~5 gals

20" COC ~15 gals



15" Unit has 438,400 drops....can lose approximately  
219,200 drops with no change in performance!

SAFETY FACTOR: UCI will indicate a bad unit after losing  
approximately 76,000 Droplets!

## ◆ History

- Introduced in 1992 to assist railcar inspectors in determining the 'health' of a cushion unit

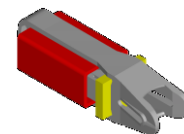
## ◆ Removal

- FRA 49 CFR S215.127 (C)(1) requires that any 'clearly formed droplets of oil' is the cause for removal.
  - ▲ Subjective and difficult to evaluate based on visual inspection



# **Unit Condition Indicator Research**

- ◆ **AAR established a Task Force to improve cushion unit safety and utilization through the use of proven Unit Condition Indicator (UCI) technology**
- ◆ **Task Force included representation from:**
  - Federal Railroad Administration
  - EEC
  - Cushioning Unit Manufacturing Engineering Committee (CUMEC)
- ◆ **TF established that “leaking clearly formed droplets” is not a good measure of health**



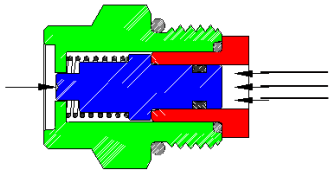
~20% Fleet Equipped with Hydraulic Cushioning Lading Protection (automotive, paper, building materials, etc.)





# How the UCI functions

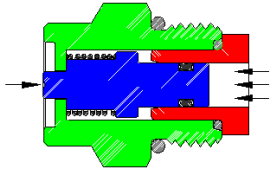
**PIN IN  
BAD UNIT**



**UNIT PRESSURE**

Unit pressure overcomes spring pressure, poppet extends.

**PIN OUT  
GOOD UNIT**



**UNIT PRESSURE**

Unit pressure drops, spring pressure retracts poppet.

Figure D (AAR Rule 59)



**Acceptable**



**Unacceptable**







**Where the UCI is inspected. (Blue Flag Rules Must be Followed!)**



# **FRA Unit Condition Indicator Waiver Status**

- ◆ **FRA granted AAR a waiver (Docket FRA-2013-0077) on the “clearly formed droplets” defect for cushion units (Title 49 Code of Federal Regulations Section 215.127(c)(I)).**
- ◆ **Rule 59 changes are being cleared through ARB**
  - Cushion units leaking clearly formed droplets may remain in service provided the Unit Condition Indicator (UCI) still indicates the unit is in working condition
  - Units leaking clearly formed droplets that are not equipped with a UCI are still to be considered defective
  - As previously stated, if the UCI indicates defective, the unit is defective regardless of leak



# **FRA Unit Condition Indicator Waiver Status**

- ◆ **As an FRA condition for the waiver, member roads need to identify and monitor 100 tests units that are leaking clearly formed droplets but UCI still indicates OK**
- ◆ **Try to target older/high mileage cars and collect the following on each sample:**
  - Car Mark and Number
  - Built Date
  - Car type
  - End of car with leaking unit
  - A dated photo of the leaking unit showing leak and UCI so that OK condition is easily identifiable
  - Stencil each end of car with “CUSHION UNIT INDICATOR TEST CAR – FRA-2013-0077” in 2 inch block letters







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# **Rule 59 Revisions**

# **AAR MSRP/UCI Service History**

- ◆ **1992: Entered service**
- ◆ **1996: Required by AAR M-921D (cushioning devices, end-of-car, motor vehicle carrying)**
- ◆ **1997: Required by AAR M-921B (cushioning devices, end-of-car)**
- ◆ **1996-97: Required AAR M-921C (reconditioning specification)**
- ◆ **2001: Operating instructions added to FM Rule 59**
- ◆ **2004: AAR M-921H issued (UCI Specification)**
  - Sets min requirements and provides uniformity of actuation, verification of operation, corrosion resistance, and safe actuation criteria





# **Rule 59 – Cushioned Underframe Devices**

- ◆ **Rule 59 gives instruction on cushion unit replacements**
  - Contains a list of cushion units for each of the 26 end-of-car and 8 center-of-car “pockets”
  - Rule is 38 pages long -- 27 of those are tables for all the pockets
- ◆ **Older version of Rule 59 presented many challenges for replacements of units and resulted in various application errors**
- ◆ **CUMEC under the direction of the EEC changed the layout and function of Rule 59 in an effort to reduce cushion unit application errors**



# Challenges with old Rule 59

**Scenario:** An old unit is removed the model number is not readable but you know this is pocket # 1 on a flat car.

**True or false?** If I have a cushion unit in your inventory that is on the list for pocket #1 will it be a direct replacement?

15F-KECD is in your inventory, can it be applied directly to the car?



Group EOC-1D Originally a pocket set up for a 10-12-15 inch travel unit with E-69 series couplers, Now blocked down for a 10 inch travel unit for autorack service, M-921D, 50K, PRELOAD.		
Removed	What Can Be Applied	Remarks
EOC-1D	EOC-1D	See RP-227-75 for pocket.
Qualifier	Group EOC-1D**, Name and Type	
01	F/M 15MC5FT, 15MC2FT	Requires F Yoke
02	AHO 15F-MD, 15F-MCD	
03	AHO 15F-KECD	
04	KRE F-15SGR/C-D, F-15SGR/C-D/U	
05	KRE F-15GR-D, F-15GR-D/U	
06-08	Vacant	Requires F Yoke
09	KRE F-15GRT-D, F-15GRT-D/U	
10	KRE MFT-GRC-D, MFT-GRC-D/U	
11	KRE F-15GRC-D, F-15GRC-D/U	
12	Vacant	
13	KRE 15GT-D, 15GT-D/U	Change in Kind Only
†14	F/M F15HUC5T	
15	Vacant	
†16	F/M F15VMC5T	
17-18	Vacant	
19	F/M 15SN5FT, 15SN2FT	Requires F Yoke Requires F Yoke
20	F/M 15KNU5T, 15KNU2T	
21	F/M 15GT5T	
22	F/M F15GR5T	
*23	EHI 15-DMF	
*24	EHI 15-DMFR	
*25	EHI 15-DMFV	
*26	EHI 15-DMFT	

\* No longer in production.  
†Requires carrier plate without slot to retain coupler pin.



# Challenges with old Rule 59

**Answer** – Likely false....You have a 25% chance that it will fit directly. What happens if you are wrong?



# TTCI Improvements in Rule 59

## ◆ Clarifies identification and replacement instructions

- Identify model and type
- Same types are one-to-one change out
- Instructions in tables for change outs of dissimilar type

EOC-3B	100K Preload		Billing Qualifier
Type	Manufacturer	Model	
1	AHO	10F-MCEB	15
1	EHI	10-BME	*06
1	FMI	10MC1E, 10MC2E	01
1	FMI	10SN1E, 10SN2E	02
1	KRE	E-10GRC-B, BIU, 10SNE-B	05
1	KRE	E-10SGRC-B, BIU	*04
2	AHO	10F-MEB K/S, 10F-MCEB K/S W/ SPRING LUG	15
2	FMI	10SN1EP, 10SN2EP	08
2	FMI	E10GR1 W/ SPRING LUG	07
2	KRE	E-10GR-B, BIU W/ SPRING LUG	03
3	FMI	E10VMC1, E10VMC2	14
3	AHO	10F-V/MCEB	
4	KRE	E-10GR-B, BIU W/ C BRACKET	03
4	FMI	E10GR1 W/ C BRACKET	07
4	AHO	10F-MEB K/S, 10F-MCEB K/S W/ C BRACKET	15

FIGURE B—NEWLY ORGANIZED TABLE FROM EOC 3 POCKET DESIGN

REMOVED	INSTALL	OWNER'S PERMISSION REQUIRED	MODIFICATIONS REQUIRED
Type 1	Type 1	NO	None required
Type 2	Type 2	NO	None required
Type 3	Type 3	NO	None required
Type 4	Type 4	NO	None required
Type 1	Type 2	NO	Add carrier shims. Vertical height must be 13 1/16 ± 1/16 inch.

FIGURE C—TRUNCATED LIST OF REQUIRED CHANGES WHEN REMOVING AND APPLYING CUSHION UNITS FROM DIFFERENT TYPES



Pocket Group EOC-1 OBSOLETE (10-12-15 inch travel) used with E-69 couplers

EOC-1	OBSOLETE		Billing Qualifier
Type	Manufacturer	Model	
1	FMI	15MCFE	01
1	AHO	15F-M, 15F-MC	02
1	FMI	15MCFe	06
1	FMI	15SNF	07
1	KRE	MFT-GRC	10
1	KRE	F-15GRC	11
1	FMI	15MFT	18

Obsolete: Any cushion unit removed that does not have a preload (“B” or “D”) will be upgraded



◆ An online version of Rule 59 is available at:  
[http://aar.com/standards/equipment\\_engi\\_approvals.php](http://aar.com/standards/equipment_engi_approvals.php)

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### Equipment Engineering Committee

Welcome	Responsibilities	Approvals
<b>Approved Products Lists</b> <ul style="list-style-type: none"><li>Decal Material</li><li>Draft Gears</li><li>Gratings</li><li>Hatch Covers</li><li>Outlet Gates</li><li>Side Bearings</li></ul> <b>Approved Products (No Lists)</b> <ul style="list-style-type: none"><li>New Freight Car Designs</li><li>Car Builders</li><li>High Level Radioactive Waste Cars</li><li>Box Car Floor Materials</li><li>Rule 88 Car Modifications</li><li>Running Boards</li><li>M-965 Trucks</li><li>M-976 Trucks</li><li>Friction Wedges</li></ul>	<b>Facilities Lists</b> <ul style="list-style-type: none"><li>Draft Gears</li><li>Cushioning Devices</li></ul>	<b>Coupler Retention Installation Procedures</b> <ul style="list-style-type: none"><li>SKC2397D E-G Style Application</li><li>SKC2904A E-10 &amp; 15 Style Application</li><li>SKC3729A Freightmaster Type E - M, SN &amp; KN Style Application</li><li>SKC3730A Freightmaster Type E - HD, &amp; SR Style Application</li><li>SKC3731A Freightsaver Type E15H Style Application</li><li>SKC3732A Freightsaver Type E15H Style Application</li><li>SKC3733A Freightmaster Type F - M Style Application</li><li>SKC3734A Freightmaster Type F - SN Style Application</li><li>SKC3735A Freightmaster Type F - HD &amp; AR Style Application</li><li>SKC3737A Freightmaster Type F - KNU Yoke Style Application</li><li>SKC3738A Freightmaster Type F - KN Style Application</li><li>SKC3766A E-10 &amp; 15 GR Style Application</li><li>Strato Floating Yoke Components</li><li>Rule 59 Cushion Unit Installation (30mb)</li></ul>

Link to File



## ◆ Index contains link to each pocket in the document

**Bookmarks**


- Improved Field Manual Rule 59 Instructions
- EOC-1
- EOC-2
- EOC-3
- EOC-4
- EOC-5
- EOC-6
- EOC-7
- EOC-8
- EOC-9
- EOC-10
- EOC-11
- EOC-12
- EOC-13
- EOC-14
- EOC-15
- EOC-16
- EOC-17
- EOC-18
- EOC-19
- EOC-20
- EOC-21
- EOC-22
- EOC-23
- EOC-24

### Improved Field Manual Rule 59 Instructions

The Cushion Unit Mechanical Committee under the direction of the Equipment Engineering Committee reformed the layout and function of Rule 59 in an effort to reduce cushion unit application errors. This section describes by example how the rule is used to make correct cushion unit applications.

a. Identifying the Correct Pocket

Typically, a car and the cushion unit will be stencilled with an "EOC" pocket number (circle #1 in Figure A). This is used to reference a table (discussed below) that is labelled "EOC 3B." The "B" in the pocket reference indicates that the unit is equipped with a 100,000 pound preload feature per AAR M-921B; a "D" indicates that the unit is equipped with the 50,000 pound preload feature per AAR M-921D. If you do not see either a D or B in the pocket reference, e.g., "EOC 3," then this is a historical pocket reference for units that did not have a preload feature. Both new and reconditioned units are *not* available without the preload; therefore any cushion unit removed that does not have preload will be upgraded to a B or D by default. In general, B cushion units are intended for 100 ton cars and D cushion units are intended for autoracks.





## ◆ Simplified pocket diagram helps identify the unit

Bookmarks

Improved Field Manual Rule 59 Instructions

EOC-1

EOC-2

EOC-3

EOC-4

EOC-5

EOC-6

EOC-7

EOC-8

EOC-9

EOC-10

EOC-11

EOC-12

EOC-13

EOC-14

EOC-15

EOC-16

EOC-17

EOC-18

EOC-19

EOC-20

EOC-21

EOC-22

EOC-23

EOC-24

### EOC-1

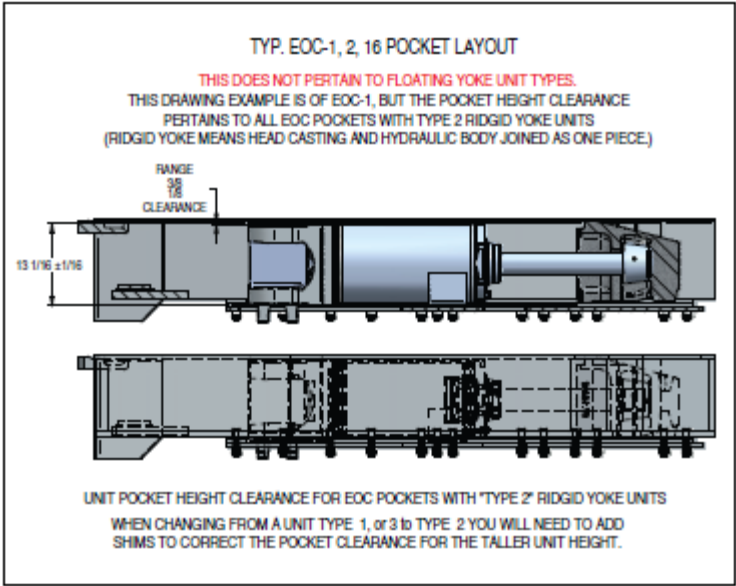
**Pocket Group EOC-1 OBSOLETE (10-12-15 inch travel) used with E-69 couplers**

EOC-1 Type	Manufacturer	OBSOLETE Model	Billing Qualifier
1	FMI	15MCFT	01
1	AHO	15F-M, 15F-MC	02
1	FMI	15MCFe	06
1	FMI	15SNF	07
1	KRE	MFT-GRC	10
1	KRE	F-15GRC	11
1	FMI	15MFT	18
1	EH	MF-15G	23
2	KRE	F-15SGR/C	04
2	KRE	F-15GR	05
2	KRE	F-15GRT	09
2	EH	MF-15GR	24
3	FMI	F15VMC	08
3	FMI	F15VMT	16

◆ Repair instruction are linked in the document

Replacement guidelines for EOC-1 pocket			
REMOVED	INSTALL	OWNER'S PERMISSION REQUIRED	MODIFICATIONS REQUIRED
Type 1	Type 1	NO	None required
Type 2	Type 2	NO	None required
Type 3	Type 3	NO	None required
Type 4	Type 4	NO	None required
Type 1	Type 2	NO	<ul style="list-style-type: none"> <li>Add carrier shims; vertical height must be 13 1/16 ± 1/16 in.</li> </ul>
Type 1	Type 3	NO	<ul style="list-style-type: none"> <li>Modify or change out carrier plate for coupler pin support</li> </ul>
Type 2	Type 1	NO	<ul style="list-style-type: none"> <li>Remove carrier shims. Vertical height must be 12 3/4\ ± 1/16 in.</li> <li>Carrier slot mod for pin block vs. clevis.</li> </ul>
Type 2	Type 3	NO	<ul style="list-style-type: none"> <li>Remove carrier shims. Vertical height must be 12 3/4\ ± 1/16 in.</li> <li>Modify or change out carrier plate for coupler pin support</li> </ul>
Type 3	Type 1	NO	<ul style="list-style-type: none"> <li>Modify or replace carrier plate for coupler pin support clearance.</li> <li>Cut or enlarge a hole to allow charging/inspection.</li> </ul>
Type 3	Type 2	NO	<ul style="list-style-type: none"> <li>Add carrier shims; vertical height must be 13 1/16 ± 1/16 in.</li> <li>Modify or replace carrier plate for coupler pin support clearance.</li> <li>Cut or enlarge a hole to allow charging/inspection.</li> </ul>
Type 4	Type 1, 2, or 3	YES	Will not convert to types 1 through 3 without significant pocket modification. Call owner.
Group S			Contact manufacturers for guidance.

Add carrier shims; vertical height must be 13 1/16 ± 1/16 in.  
(for any pocket except EOC-3 and EOC-4)





# Thank you!



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