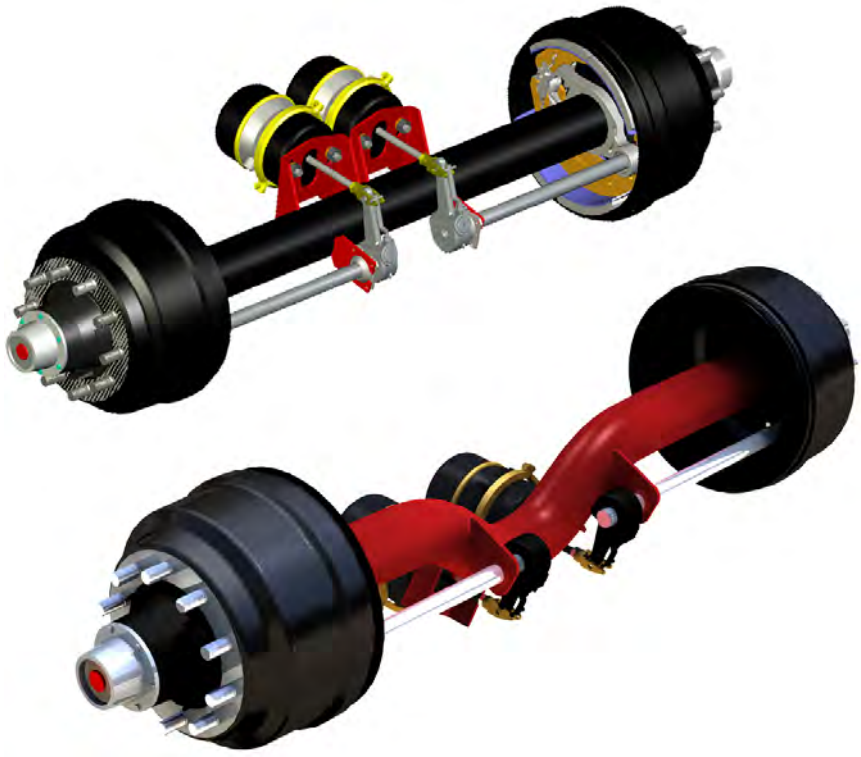
WATSON & CHALIN MANUFACTURING INC.

Watson Suspension Systems

# AXLE INSTALLATION AND MAINTENANCE MANUAL




972.547.6020 • 800.445.0736 • FAX: 972.542.0097
725 E. UNIVERSITY ST. McKINNEY, TEXAS 75069
www.WatsonSuspensions.com


Quality System
Quality Endorsed Company
ISO 9001:2000
QEC15136

Table of Contents

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# Watson & Chalin Axle Application Guide

| Axle | Bearings | Bearing Capacity (lbs/Kg)* |
|---|---|---|
| **WCN** | Outer Cup HM212010 | 25000/11350 |
| | Outer cone HM212049 | |
| | Inner cup HM218210 | |
| | Inner cone HM218248 | |
| **WCP** | Outer Cup HM518410 | 26000/11800 |
| | Outer cone HM518445 | |
| | Inner cup HM518410 | |
| | Inner cone HM518445 | |

Recommendations:

1- Follow the Watson & Chalin “Normal Service” Capacity chart to select an axle for applications running a majority of time on highway travel with “**SPRING SUSPENSION**” installed on it.

2- When the applications involves running a significant amount of off-road miles, or on exceptionally rough roads - select the next heavier tube wall than was identified on the applicable Watson & Chalin Capacity chart.

3- When installing the axle on air suspensions or high torsion single pivot suspensions -select the tube wall axle than was identified on Watson & Chalin “**AIR RIDE SUSPENSION**” Capacity chart. Minimum wall thickness to be used on an air ride suspension is 0.58”

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# Watson & Chalin Axle Part Numbering Guide

| Prefix | Spindle type | Wall Thickness | Brake Size | Axle type | Track Width | Numbering |
|---|---|---|---|---|---|---|
| **WC** | **N** | **5** | **67** | **ST** | **715** | **-XXX** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **N*** | N Spindle or D22 | **3** | 10mm | **27** | 12.25 x 7.5 | **ST** | Straight | **715** | 71.5” |
| **P** | Propar type | **4** | 0.5 | **67** | 16.5 x 7 | **6D** | 6” Drop | **730** | 73.0” |
| **F** | FF Spindle | **5** | 0.58 | **54** | 15 x 4 | **9D** | 9” Drop | **775** | 77.5” |
| **K** | A26/K30 Spindle | **6** | 0.75 | **87** | 18 x 7 | **6I** | 6” Inverted Drop | **955** | 95.5” |
| **A** | A45 Spindle | **S** | Solid | | | **9I** | 9” Inverted Drop | **120** | 120” |

By 1/8 increments

| **SAMPLE AXLE NUMBERS** |
|---|
| **WCN167ST775-001** |
| **WCP167ST715-002** |
| **WCP167ST715-003** |
| **WCN127ST120-004** |

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# Model: WCN

**Bearing Group**: Inner: HM218248, Outer: HM 212049

## *Outside Diameter: 5” - Straight Tube*

| Tube wall | Max. Capacity –Mechanical susp’n* | Max. Capacity – Air susp’n* |
|---|---|---|
| 0.58” | 25,000 lbs (normal service) | 22,500 lbs (normal service) |
| 0.75” | 27,000 lbs (Normal service) | 25,000 lbs (normal service) |

*See capacity charts for details

## *Track lengths*
71.5” (standard)
77.5” (standard)
Other tracks also available (38” to 108”)

## *Brakes (Refer to: Brake Lining Certification List)*
16 ½ x 7” quick change, Q, FMSI-4515E
16½ x 7” quick change, Q+, FMSI-4707
16 ½ x 8 5/8” quick change GP, FMSI-4551
12 ¼ x 7 ½” quick change DA, FMSI-4692

## ABS
Bracket is standard - in the SAE recommended position.

## *Tire Inflation*
Spindle preparation is standard - fits PSI, Tiremax and Airgo hardware

## *Hub and Drum Assemblies*
All standard North American “N” type products will assemble to the WCN spindle.

## *Parts X- Reference*
See “Reference Information” section

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# WCN 5” O.D.

**BRGS: HM218248 = HM212049**

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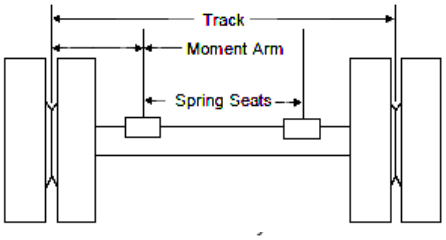
| W&C AXLE CAPACITY RATING NORMAL SERVICE (See Notes) | | | | SPRING SUSPENSION | | AIR RIDE SUSPENSION | |
|---|---|---|---|---|---|---|---|
| | | | | TUBE WALL | | TUBE WALL | |
| THIS IS NOT A CERTIFICATION ( FOR INFORMATION ONLY) | | | | 0.58” | 0.75” | 0.58” | 0.75” |
| SPINDLE TYPE | TRACK (INCHES) | SPRING SEATS (INCHES) | MOMENT ARM (INCHES) | AXLE BEAM CAPACITY GAWR. (lbs.) | AXLE BEAM CAPACITY GAWR. (lbs.) | AXLE BEAM CAPACITY GAWR. (lbs.) | AXLE BEAM CAPACITY GAWR. (lbs.) |
| WCN | 71.5 | 38 | 16.75 | 25,000 | 27,000 | 25,000 | 25,000 |
| WCN | 71.5 | 37 | 17.25 | 24,320 | 27,000 | 24,320 | 25,000 |
| WCN | 71.5 | 36 | 17.75 | 23,640 | 27,000 | 23,640 | 25,000 |
| WCN | 71.5 | 35 | 18.25 | 22,990 | 26,800 | 22,990 | 25,000 |
| WCN | 71.5 | 34 | 18.75 | 22,380 | 26,100 | 22,380 | 24,870 |
| WCN | 71.5 | 33 | 19.25 | 21,800 | 25,400 | 21,800 | 24,230 |
| WCN | 71.5 | 32 | 19.75 | 21,240 | 24,700 | 21,240 | 23,610 |
| WCN | 71.5 | 31 | 20.25 | 20,720 | 24,100 | 20,720 | 23,030 |
| WCN | 71.5 | 30 | 20.75 | 20,220 | 23,500 | 20,220 | 22,480 |
| WCN | 71.5 | 29 | 21.25 | 19,740 | 23,000 | 19,740 | 21,950 |
| WCN | 71.5 | 28 | 21.75 | | | 19,290 | 21,440 |
| | | | | | | | |
| WCN | 77.5 | 44 | 16.75 | 25,000 | 27,000 | 25,000 | 25,000 |
| WCN | 77.5 | 43 | 17.25 | 24,320 | 27,000 | 24,320 | 25,000 |
| WCN | 77.5 | 42 | 17.75 | 23,640 | 27,000 | 23,640 | 25,000 |
| WCN | 77.5 | 41 | 18.25 | 22,990 | 26,800 | 22,990 | 25,000 |
| WCN | 77.5 | 40 | 18.75 | 22,380 | 26,100 | 22,380 | 24,870 |
| WCN | 77.5 | 39 | 19.25 | 21,800 | 25,400 | 21,800 | 24,230 |
| WCN | 77.5 | 38 | 19.75 | 21,240 | 24,700 | 21,240 | 23,610 |
| WCN | 77.5 | 37 | 20.25 | 20,720 | 24,100 | 20,720 | 23,030 |
| WCN | 77.5 | 36 | 20.75 | 20,220 | 23,500 | 20,220 | 22,480 |
| WCN | 77.5 | 35 | 21.25 | 19,740 | 23,000 | 19,740 | 21,950 |
| WCN | 77.5 | 34 | 21.75 | | | 19,290 | 21,440 |

**NOTES:**

1. Ratings are for spring or air suspensions used in normal service.
2. High torsion single point spring suspensions are considered same as air suspensions.
3. For off-road use, find the rating above, then use the next heavier wall.
4. Special applications: call Watson & Chalin for technical assistance

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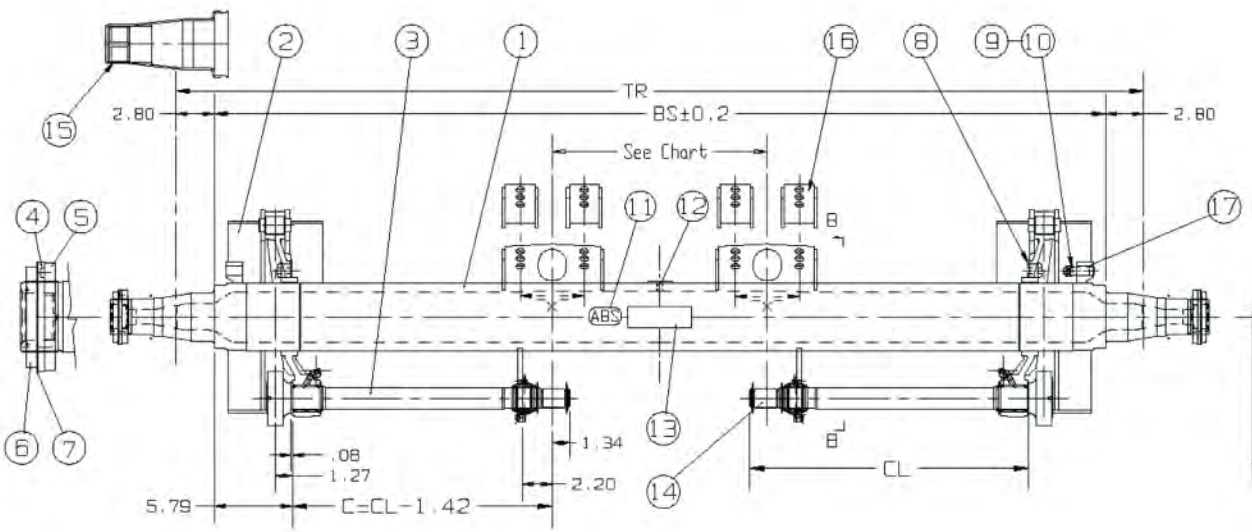
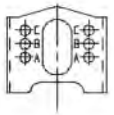
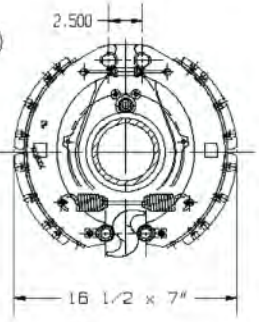
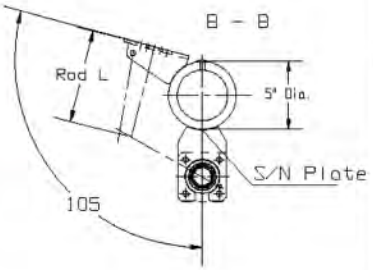
WATSON & CHALIN CAPACITY CHART



| A/C Brkt angle = 105 | | |
|---|---|---|
| Holes | Slack | Rod L |
| A-A | 5" | 6" |
| B-A | 5.5" | |
| B-B | 6" | |




| | | | | |
|---|---|---|---|---|
| 17 | B15-0103 | ABS Bracket | 2 | |
| | B14-0202 | A/C Brackets 5" | (4) | 105 degrees - Twin |
| 16 | B14-0201 | A/C Brackets 5" | 2 | 105 degrees - Single |
| 15 | A23-0101 | FN Spindle cover | 2 | Apply light grease coating |
| 14 | A22-0100 | Slack Adjuster | 1 | Option-must be specified |
| 13 | A21-00 | S/N Tag | 1 | Custom Private Labels |
| 12 | A18-0101 | TIS option | 1 | 1/8"-27NPT Drill Tap & Plug |
| 11 | A17-0101 | ABS sticker | 1 | Option-must be specified |
| 10 | A16-0100 | ABS clip | 2 | Option-must be specified |
| 9 | A15-00 | ABS sensor | 2 | Option-must be specified |
| 8 | A14-0101 | ABS Grommet | 2 | Option-must be specified |
| 7 | A25-0101 | Lock washer | 2 | Standard |
| 6 | A24-0101 | Outer nut | 2 | Standard |
| 5 | A12-0201 | Adjusting nut | 2 | Standard |
| 4 | A11-0201 | Spindle Washer | 2 | Standard |
| | C10-0302C | Camshaft + Tube | (2) | AM, 1.63 x 10 spl cam w/tube |
| | C10-0301C | Camshaft + Tube | (2) | AM, 1.63 x 28 spl cam w/tube |
| | C10-0302 | Camshaft Group | (2) | AM, 1.63 x 10 spl cam |
| 3 | C10-0301 | Camshaft Group | 2 | AM, 1.63 x 28 spl cam |
| | 16.5" Brake | GP+ (D+) Brake | (1) | 0.87" FMSI-4707 |
| 2 | 16.5" Brake | GP (D) Brake | 1 | 0.75" FMSI-4515E |
| 1 | FN20AM00 | Tubing Ass'y | 1 | |
| Item | P/N | Description | Qu. | Notes |

Track available from 38" to 108"

| TR | | BS | |
|---|---|---|---|
| 71.5" | 1816 | 65.9" | 1674 |
| 77.5" | 1968 | 71.9" | 1826 |

Camshafts

| Part number | Head | Spider | Splines | Notes | |
|---|---|---|---|---|---|
| C11-0301-XXX | AM, 1 1/8" | 1 5/8" | 28 | Cam only | * |
| C11-0301C-XXX | AM, 1 1/8" | 1 5/8" | 28 | Cam W/Tube | |
| C11-0302-XXX | AM, 1 1/8" | 1 5/8" | 10 | Cam only | |
| C11-0302C-XXX | AM, 1 1/8" | 1 5/8" | 10 | Cam W/Tube | |

| Length CL | XXX | |
|---|---|---|
| 17 1/2" | 445 | |
| 20 5/8" | 524 | |
| 21 3/8" | 543 | |
| 23 3/4" | 604 | |
| 24 1/8" | 613 | * |

* STANDARD

| | | |
|---|---|---|
| Maximum Capacity (105km/h) | 5"x 0.46" | 22500 lbs* |
| | 5"x 0.58 | 25000 lbs* |
| | 5"x 0.75" | 27000 lbs* |
| Bearings | Inner | HM218248/10 |
| | Outer | HM212049/11 |
| Brake Size | 16.5 x 7" GP (D) | |
| | 16.5 x 7" GP+ (D+) | |
| | 16.5 x 8 5/8 GP (D), ℄ | |
| CAM | AM 1 1/8 Head, 1 5/8" lrnl | |

* Max. beam capacity, only. See "Certs" for lining capacity. See "Capacity Charts" and "Application guide" for tube wall thickness selection for specific applications

| Rev | Description | Date | By |
|---|---|---|---|
| 0 | New release | 04/06/08 | JCG |

| | | |
|---|---|---|
| Drawn by: | WYC | / / |
| Checked by: | | / / |
| Approved by: | | / / |

BB General Arrangement

5" O.D. 16.5 Brake

Rev 0 | WCN 5" AMBB

Sheet 1/1 | Size A2 | Scale 1:6

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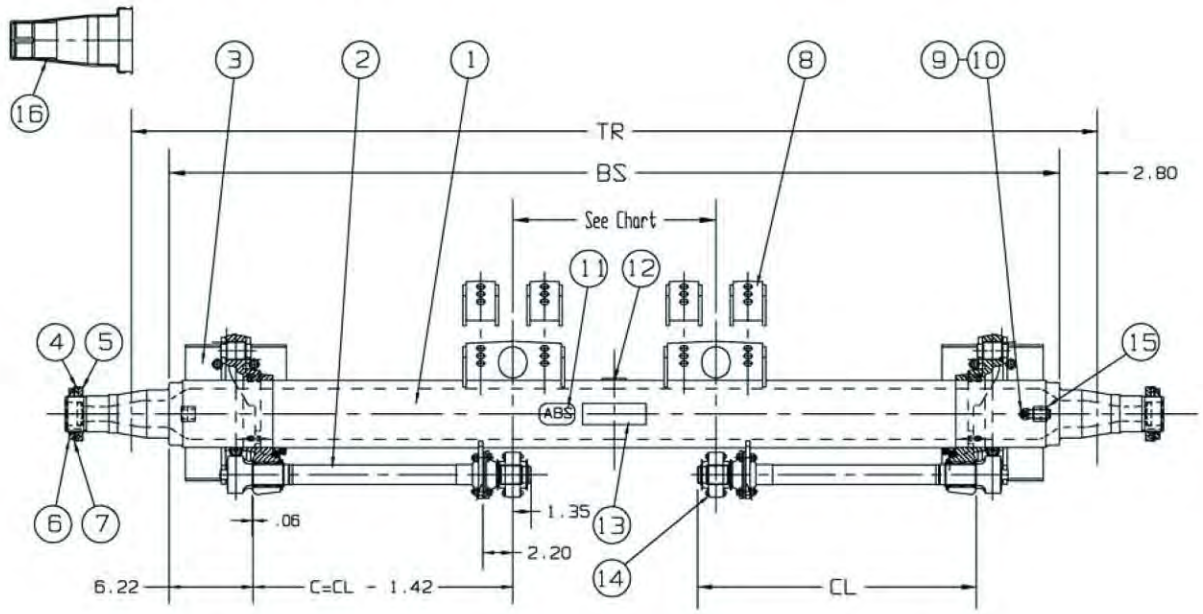
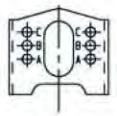
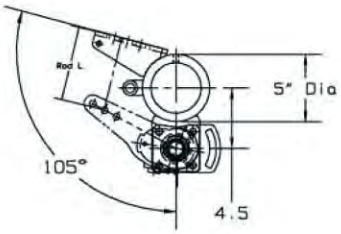


| A/C Brkt Angle = 105 | | |
|---|---|---|
| Holes | Slack | Rod L |
| A-A | / | / |
| B-A | 5" | 5 3/4 |
| B-B | 5.5" | 5 5/8 |
| B-C | 6" | 5 1/2 |
| C-C | 6.5" | 5 3/8 |


| Iten | P/N | Description | Qu. | Notes |
|---|---|---|---|---|
| 16 | A23-0101 | FN Spindle cover | 2 | Apply light grease coating |
| 15 | B15-0103 | ABS Bracket | 2 | Standard |
| 14 | A22-0100 | Curved Slack Adjuster | 2 | Option-must be spec'd |
| 13 | A21-00 | S/N Tag | 1 | Custom Private Label |
| 12 | A18-0101 | T.I.S. entry, Option | 1 | 1/8"-27NPT Drill Tap & Plug |
| 11 | A17-0101 | ABS Sticker | 1 | Option-must be spec'd |
| 10 | A16-0100 | ABS Clip | 2 | Option-must be spec'd |
| 9 | A15-00 | ABS Sensor | 2 | Option-must be spec'd |
| | B14-0202 | A/C Bracket | (4) | Twin, 105 degree mounting |
| 8 | B14-0201 | A/C Bracket | 2 | Single, 105 degree mounting |
| 7 | A25-0101 | Lock washer | 2 | Standard |
| 6 | A24-0101 | Outer nut | 2 | Standard |
| 5 | A12-0201 | Adjusting nut | 2 | Standard |
| 4 | A11-0201 | Spindle Washer | 2 | Standard |
| 3 | 12.25 Brake | DA quick change | 1 | FMSI-4692 |
| | C10-0402 | Camshaft group | (2) | DA 10 spline |
| 2 | C10-0401 | Camshaft group | 2 | DA 28 spline |
| 1 | FN200A00 | Tubing Ass'y | 1 | |

Track available from 38" to 108"

| TR | | BS | |
|---|---|---|---|
| 71.5" | 1816 | 65.9" | 1674 |
| 77.5" | 1968 | 71.9" | 1826 |

Camshafts

| Part number | Head | Spider | Splines | |
|---|---|---|---|---|
| C10-0401-XXX | DA | 1 1/2" | 28 | * |
| C10-0402-XXX | DA | 1 1/2" | 10 | |

| Length CL | XXX | |
|---|---|---|
| 20 2/4" | 527 | |
| 21 1/8" | 537 | |
| 23 3/8" | 595 | |
| 23 3/4" | 603 | * |

* STANDARD

| | | |
|---|---|---|
| Max. Capacity (105kn/h) | 0.47" | 22500 lbs* |
| | 0.58" | 25000 lbs* |
| | 0.75" | 27000 lbs* |
| Bearing | Inner | HM218248/10 |
| | Outer | HM212011/49 |
| Brake Size | 12.25 x 7.5" DA (Q) | |

* Max. beam capacity, only. See "Certs" for lining capacity. See "Capacity Charts" and "Application guide" for tube wall thickness selection for specific applications.

| Rev | Description | Date | By |
|---|---|---|---|
| 0 | New release | 04/16/08 | JCG |
| Drawn by: | | WYC | / / |
| Checked by: | | | / / |
| Approved by: | | | / / |

BB General Arrangement

FMSI-4692

5" O.D.

12.25 Brake

Rev 0

WCN 5" DA 12.25

DA

Size A2

Scale 1:6

Sheet 1/1

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Watson Suspension Systems

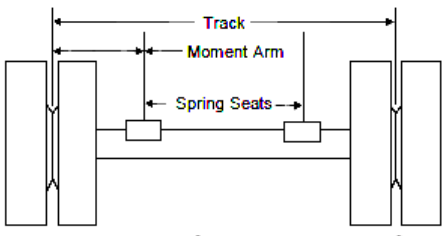
WATSON & CHALIN MANUFACTURING INC.

Watson Suspension Systems

| | | | WCN6D | | |
|---|---|---|---|---|---|
| 6" DROP CENTER AXLE | | | BEARINGS: HM218248 + HM212049 | | |
| WATSON & CHALIN CAPACITY RATING for AIR RIDE SUSPENSIONS | | | | Air Ride SUSPENSION | |
| | | | | TUBE WALL | |
| THIS IS NOT A CERTIFICATION ( FOR INFORMATION ONLY) | | | | 0.58" | 0.75 |
| SPINDLE TYPE | TRACK (INCHES) | SPRING SEATS (INCHES) | MOMENT ARM (INCHES) | AXLE BEAM CAPACITY GAWR. (lbs.) | AXLE BEAM CAPACITY GAWR. (lbs.) |
| WCN | 71.5 | 38 | 16.75 | 22,500 | 25,000 |
| WCN | 71.5 | 37 | 17.25 | 21,850 | 24,320 |
| WCN | 71.5 | 36 | 17.75 | 21,230 | 23,640 |
| WCN | 71.5 | 35 | 18.25 | 20,650 | 22,990 |
| WCN | 71.5 | 34 | 18.75 | 20,100 | 22,380 |
| WCN | 71.5 | 33 | 19.25 | 19,580 | 21,800 |
| WCN | 71.5 | 32 | 19.75 | 19,080 | 21,240 |
| WCN | 71.5 | 31 | 20.25 | 18,610 | 20,720 |
| WCN | 71.5 | 30 | 20.75 | 18,160 | 20,220 |
| WCN | 71.5 | 29 | 21.25 | 17,730 | 19,740 |
| WCN | 77.5 | 44 | 16.75 | 22,500 | 25,000 |
| WCN | 77.5 | 43 | 17.25 | 21,850 | 24,320 |
| WCN | 77.5 | 42 | 17.75 | 21,230 | 23,640 |
| WCN | 77.5 | 41 | 18.25 | 20,650 | 22,990 |
| WCN | 77.5 | 40 | 18.75 | 20,100 | 22,380 |
| WCN | 77.5 | 39 | 19.25 | 19,580 | 21,800 |
| WCN | 77.5 | 38 | 19.75 | 19,080 | 21,240 |
| WCN | 77.5 | 37 | 20.25 | 18,610 | 20,720 |
| WCN | 77.5 | 36 | 20.75 | 18,160 | 20,220 |
| WCN | 77.5 | 35 | 21.25 | 17,730 | 19,740 |

## NOTES:

1. Ratings are for air suspensions used in normal service.
2. For off-road use, find the rating above, then use the next heavier wall.
3. **Special applications: call Watson & Chalin for technical assistance**

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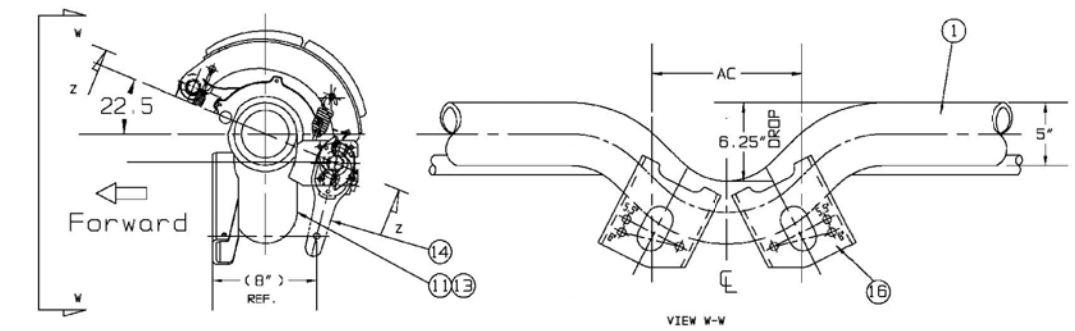
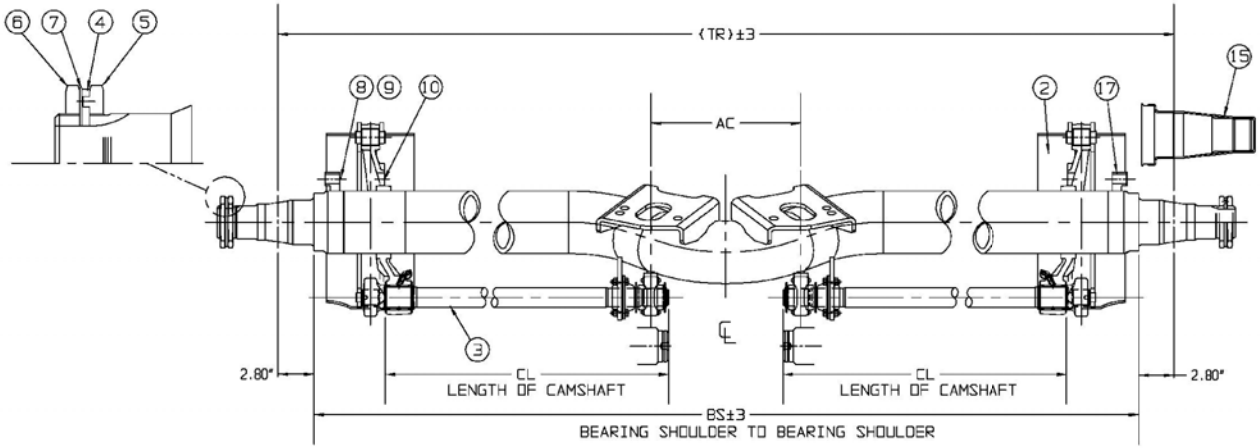



Camshafts

| Part number | Head | Spider | Splines | Notes | |
|---|---|---|---|---|---|
| C11-0301-XXX | AM, 1 1/8" | 1 5/8" | 28 | Can only | * |
| C11-0301C-XXX | AM, 1 1/8" | 1 5/8" | 28 | Can W/Tube | |
| C11-0302-XXX | AM, 1 1/8" | 1 5/8" | 10 | Can only | |
| C11-0302C-XXX | AM, 1 1/8" | 1 5/8" | 10 | Can W/Tube | |

| Length CL | XXX | |
|---|---|---|
| 22 5/8" | 575 | * |
| 23 1/8" | 587 | |
| 25 5/8" | 651 | |

* Standard




VIEW Z-Z

| | |
|---|---|
| Maximum Capacity (105km/h) | 5"x 0.58" 22500 lbs* |
| | 5"x 0.75" 25000 lbs* |
| Bearings | Inner HM218248/10 |
| | Outer HM212049/11 |
| Brake Size | 16.5 x 7" GP (D) |
| | 16.5 x 7" GP+ (D+) |
| | 16.5 x 8 5/8 GP (D), ℄ |
| CAM | AM 1 1/8 Head. 1 5/8" Jrnl |

* Max. beam capacity, only. See "Certs" for lining capacity. See "Capacity Charts" and "Application guide" for tube wall thickness selection for specific applications.

Other Tracks & Configurations available - Please consult Watson & Chalin

| BRAKE SIZE | TR:71.5" | | | | TR:72.5" | | | | TR:77.5" | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WALL | CL | AC | BS | WALL | CL | AC | BS | WALL | CL | AC | BS |
| 16.5x7" | 0.58" | 22-5/8" | 12" | 65.9" | 0.58" | 23-1/8" | 12" | 66.9" | 0.58" | 25.5/8" | 12" | 71.9" |
| | 0.75" | 22.5/8" | 12" | 65.9" | 0.75" | 23-1/8" | 12" | 66.9" | 0.75" | 25.5/8" | 12" | 71.9" |

NOTES:

1. AIR CHAMBER BRACKET CAN USE 5.5" & 6" SLACK ADJUSTER, TOP HOLE IS 5.5",& BOTTOM HOLE IS 6".
2. 8" ROD FROM A/C FACE TO CL PIN FOR 6" SLACK ADJUSTER.

| ITEM | PART NO. | DESCRIPTION | QTY. | REMARK |
|---|---|---|---|---|
| 9 | A16-0100 | ABS clip | 2 | Option-must be specified |
| 8 | A15-00 | ABS sensor | 2 | Option-must be specified |
| 7 | A25-0101 | Lock Washer | 2 | Standard |
| 6 | A24-0101 | Outer nut | 2 | Standard |
| 5 | A12-0201 | Adjusting nut | 2 | Standard |
| 4 | A11-0201 | Spindle Washer | 2 | Standard |
| | C10-0302C | Camshaft + Tube | (2) | 1.63 x 10 spl can w/tube |
| | C10-0301C | Camshaft + Tube | (2) | 1.63 x 28 spl can w/tube |
| | C10-0302 | Camshaft Group | (2) | 1.63 x 10 spl can |
| 3 | C10-0301 | Camshaft Group | 2 | 1.63 x 28 spl can |
| | 16.5" Brake | GP+ (D+) Brake | (1) | 0.97 FMSI-4707 |
| 2 | 16.5" Brake | GP (D) Brake | 1 | 0.75 FMSI-4515E |
| 1 | 3200-0272 | Tubing Ass'y | 1 | |

| ITEM | PART NO. | DESCRIPTION | QTY. | REMARK |
|---|---|---|---|---|
| 17 | 815-0103 | ABS Bracket | 2 | Standard |
| 16 | 3203-1008L/R | A/C Brackets 5" tube | 2 | 105 degrees - Single |
| 15 | A23-0101 | FN Spindle cover | 2 | Lgt grease coating on spindle |
| 14 | A22-0100 | Slack Adjuster | 1 | Option-must be specified |
| 13 | A21-00 | S/N Tag | 1 | Custom Private Labels |
| 12 | A18-0101 | TIS option | 1 | 1/8"-27NPT Drill Tap & Plug |
| 11 | A17-0101 | ABS sticker | 1 | Option-must be specified |
| 10 | A14-0101 | ABS Grommet | 2 | Option-must be specified |

| Iten | Revision | Rev. By | Date |
|---|---|---|---|
| 0 | New Release | JCE | 2/19/08 |

Designed By: WSS
Checked By:
Approved By:
Date:

Title: 6" D/C AXLE - WCN Spindle

Dwg. No. DCN6AM8B

Revision: 0

Scale: 1:1

Sheet 1 of 1

WATSON & CHALIN

# Model: WCP

**Bearing Group:** Inner: HM518445, Outer: HM518445

**Outside Diameter: 5" – Straight Tube**

| Tube wall | Max. Capacity –Mechanical susp'n* | Max. Capacity – Air susp'n* |
|---|---|---|
| 0.58" | 25,000 lbs (normal service) | 22,500 lbs (normal service) |
| 0.75" | 27,000 lbs (Normal service) | 25,000 lbs (normal service) |

* See capacity charts for details

**Outside Diameter: 5 ¾" Straight Tube**

| Tube wall | Max. Capacity –Mechanical susp'n* | Max. Capacity – Air susp'n* |
|---|---|---|
| 0.39" | 25,000 lbs (normal service) | 25,000 lbs (normal service) |

**Track lengths**

71.5" (standard)
77.5" (standard)
Other tracks also available (38" to 108")

**Brakes (Refer to: Brake Lining Certification List)**

16 ½ x 7" quick change, Q, FMSI4515E
16 ½ x 7" quick change, Q+, FMSI4707
16 ½ x 8 5/8" quick change GP, FMS
I4551 12 ¼ x 7 ½" quick change DA, FMSI4692

**ABS**

Bracket is standard in the SAE position

**Tire Inflation**

Spindle preparation is standard fits PSI, Tiremax and Airgo hardware

**Hub and Drum Assemblies**

All standard North American "P" type products will assemble to the WCP spindle.

**Parts XReference**

See "Reference Information" section

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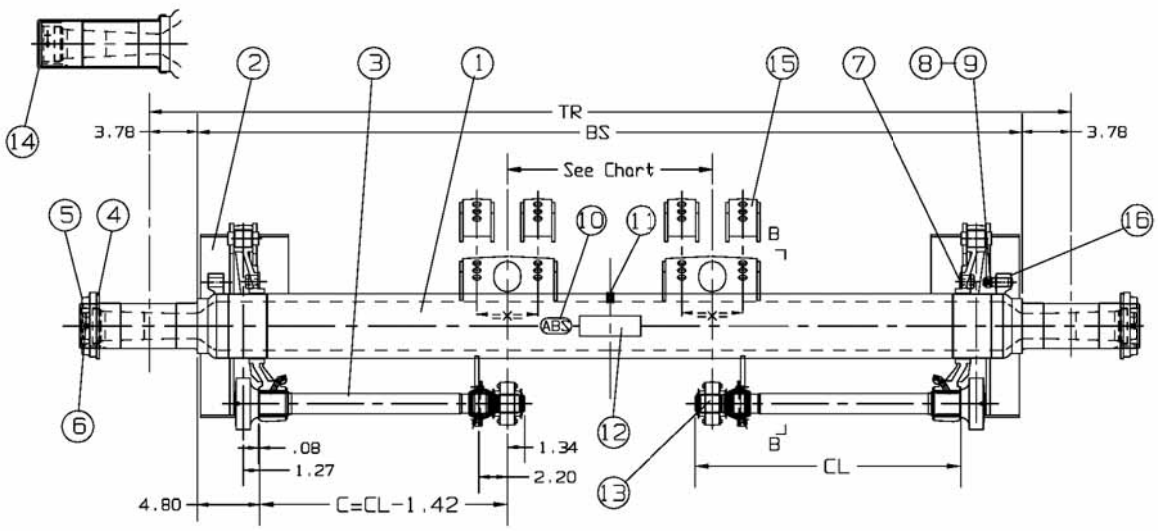
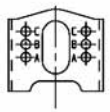
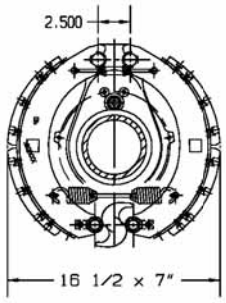
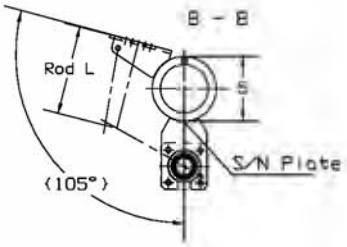
Watson Suspension Systems



| A/C Brkt angle = 105 | | |
|---|---|---|
| Holes | Slack | Rod L |
| B-A | 5.5" | 6 |
| B-B | 6" | 6 7/8 |




| Iten | P/N | Description | Qu. | Notes |
|---|---|---|---|---|
| 16 | B15-0103 | ABS Bracket | 2 | |
| | B14-0202 | A/C Brackets 5" | (4) | 105 degrees - Twin |
| 15 | B14-0201 | A/C Brackets 5" | 2 | 105 degrees - Single |
| 14 | A23-0201 | FP Spindle cover | 2 | Lgt grease coatng on spndl |
| 13 | A22-0100 | Slack Adjuster | 1 | Option-must be specified |
| 12 | A21-00 | S/N Tag | 1 | Custon Private Labels |
| 11 | A18-0101 | TIS option | 1 | 1/8"-27NPT Drill Tap & Plug |
| 10 | A17-0101 | ABS sticker | 1 | Option-must be specified |
| 9 | A16-0100 | ABS clip | 2 | Option-must be specified |
| 8 | A15-00 | ABS sensor | 2 | Option-must be specified |
| 7 | A14-0101 | ABS Gronmet | 2 | Option-must be specified |
| 6 | A13-0101 | Cotter pin | 2 | Standard |
| 5 | A12-0101 | Adjusting nut | 2 | Standard |
| 4 | A11-0101 | Spindle Washer | 2 | Standard |
| | C10-0302C | Camshaft + Tube | (2) | 1.63 x 10 spl cam w/tube |
| | C10-0301C | Camshaft + Tube | (2) | 1.63 x 28 spl cam w/tube |
| | C10-0302 | Camshaft Group | (2) | 1.63 x 10 spl cam |
| 3 | C10-0301 | Camshaft Group | 2 | 1.63 x 28 spl cam |
| | 16.5" Brake | GP+ (Q+) Brake | (1) | 0.87 FMSI-4707 |
| 2 | 16.5" Brake | GP (Q) Brake | 1 | 0.75 FMSI-4515E |
| 1 | FP20AM00 | Tubing Ass'y | 1 | |

Track available from 38" to 108"

| TR | | BS | |
|---|---|---|---|
| 71.5" | 1816 | 63.9" | 1623 |
| 77.5" | 1968 | 69.9" | 1775 |

Camshafts

| Part number | Head | Spider | Splines | Notes | |
|---|---|---|---|---|---|
| C11-0301-XXX | AM, 1 1/8" | 1 5/8" | 28 | Cam only | Standard |
| C11-0301C-XXX | AM, 1 1/8" | 1 5/8" | 28 | Cam W/Tube | |
| C11-0302-XXX | AM, 1 1/8" | 1 5/8" | 10 | Cam only | |
| C11-0302C-XXX | AM, 1 1/8" | 1 5/8" | 10 | Cam W/Tube | |

| Length CL | XXX | |
|---|---|---|
| 17 1/2" | 445 | |
| 20 5/8" | 524 | |
| 21 3/8" | 543 | |
| 23 3/4" | 604 | |
| 24 1/8" | 613 | Standard |

| | | |
|---|---|---|
| Maximum Capacity (105kn/h) | 5"x 0.46" | 22500 lbs* |
| | 5"x 0.58 | 25000 lbs* |
| | 5"x 0.75" | 27000 lbs* |
| Bearings | Inner | HM518445/10 |
| | Outer | HM518445/10 |
| Brake Size | 16.5 x 7" GP (Q) | |
| | 16.5 x 7" GP+ (Q+) | |
| | 16.5 x 8 5/8 GP (Q), ℄ | |
| CAM | AM 1 1/8 Head, 1 5/8" jrnl | |

* Max. beam capacity, only. See "Certs" for lining capacity. See "Capacity Charts" and "Application guide" for tube wall thickness selection for specific applications.

| Rev | Description | Date | By |
|---|---|---|---|
| 0 | New release | 04/06/08 | JCG |

Drawn by: WYC / /
Checked by: / /
Approved by: / /

BB General Arrangement

5" O.D.
16.5 Brake

Rev 0

WCP 5" AMBB

Size A2 | Scale 1:5

Sheet 1/1

WATSON & CHADN

# WCP 5” O.D.

BRGS (2) HM518445

## AXLE CAPACITY RATING NORMAL SERVICE (See Notes)

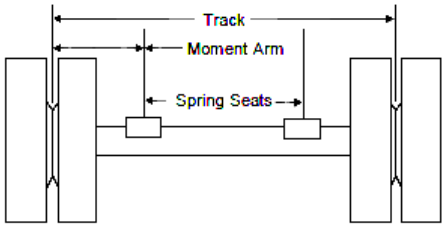
THIS IS NOT A CERTIFICATION ( FOR INFORMATION ONLY)

**TUBE WALL**

| SPINDLE TYPE | TRACK (INCHES) | SPRING SEATS (INCHES) | MOMENT ARM (INCHES) | Spring Suspension 0.58 “ AXLE BEAM CAPACITY GAWR. (lbs.) | Spring Suspension 0.75 “ AXLE BEAM CAPACITY GAWR. (lbs.) | Air Ride Suspension 0.58 “ AXLE BEAM CAPACITY GAWR. (lbs.) | Air Ride Suspension 0.75 “ AXLE BEAM CAPACITY GAWR. (lbs.) |
|---|---|---|---|---|---|---|---|
| WCFP” “ | 71.5 | 38 | 16.75 | 25,000 | 27,000 | 25,000 | 25,000 |
| | | 37 | 17.25 | 24,320 | 27,000 | 24,320 | 25,000 |
| | | 36 | 17.75 | 23,640 | 27,000 | 23,640 | 25,000 |
| | | 35 | 18.25 | 22,990 | 26,800 | 22,990 | 25,000 |
| | | 34 | 18.75 | 22,380 | 26,100 | 22,380 | 24,,870 |
| | | 33 | 19.25 | 21,800 | 25,400 | 21,800 | 24,230 |
| | | 32 | 19.75 | 21,240 | 24,700 | 21,240 | 23,610 |
| | | 31 | 20.25 | 20,720 | 24,100 | 20,720 | 23,030 |
| | | 30 | 20.75 | 20,220 | 23,500 | 20,220 | 22,480 |
| | | 29 | 21.25 | 19,740 | 23,000 | 19,740 | 21,950 |
| WCFP” “ | 77.5 | 44 | 16.75 | 25,000 | 27,000 | 25,000 | 25,000 |
| | | 43 | 17.25 | 24,320 | 27,000 | 24,320 | 25,000 |
| | | 42 | 17.75 | 23,640 | 27,000 | 23,640 | 25,000 |
| | | 41 | 18.25 | 22,990 | 26,800 | 22,990 | 25,000 |
| | | 40 | 18.75 | 22,380 | 26,100 | 22,380 | 24,870 |
| | | 39 | 19.25 | 21,800 | 25,400 | 21,800 | 24,230 |
| | | 38 | 19.75 | 21,240 | 24,700 | 21,240 | 23,610 |
| | | 37 | 20.25 | 20,720 | 24,100 | 20,720 | 23,030 |
| | | 36 | 20.75 | 18,160 | 23,500 | 18,160 | 22,480 |
| | | 35 | 21.25 | 17,730 | 19,740 | 17,730 | 21,950 |
| WCFP” “ | 84 “ | 50.5 | 16.75 | 22,500 | 25,000 | **Call Watson & Chalin for technical assistance.** | **Call Watson & Chalin for technical assistance.** |
| | | 49.5 | 17.25 | 24,320 | 27,000 | | |
| | | 48.5 | 17.75 | 23,640 | 27,000 | | |
| | | 47.5 | 18.25 | 22,990 | 26,800 | | |
| | | 46.5 | 18.75 | 22,380 | 26,100 | | |
| | | 45.5 | 19.25 | 21,800 | 25,400 | | |
| | | 44.5 | 19.75 | 21,240 | 24,700 | | |
| | | 43.5 | 20.25 | 20,720 | 24,100 | | |
| | | 42.5 | 20.75 | 20,220 | 23500 | | |
| | | 41.5 | 21.25 | 19,740 | 23000 | | |

**NOTES:**

1. **Ratings are for spring or air suspensions used in normal service.**
2. **High torsion single point spring suspensions are considered same as air suspensions.**
3. **For off-road use, find the rating above, and then use the next heavier wall.**

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WATSON & CHALIN CAPACITY CHART

# Model: WCPX676D

**Bearing Group**
Inner: HM518445
Outer: HM518445

**Outside Diameter**: 5” **Drop Center & Camel Back Tube: 6” drop**.
(8” and 9” drops also available)

| Tube wall | Maximum capacity* |
|---|---|
| 0.58” (X=’s 5) | 22,500 lbs (normal service) |
| 0.75” (X=’s 6) | 25,000 lbs (normal service) |

*See capacity charts for details

**Track lengths**
71.5” (standard)
77.5” (standard)
Other tracks available – please consult Watson & Chalin Sales and Technical support.

**Brakes**
16 ½ x 7” quick change, FMSI4515
16 ½ x 7” quick change, GP+ (Q+), FMSI4707

**ABS**
Bracket is standard in the SAE position

**Tire Inflation**
Spindle preparation for PSI, Tiremax and Airgo is standard.

**Cam position**
Ahead of axle
Behind the axle

**Cam Length**
See specific model drawing

**Hub and Drum Assemblies**
All standard North American “P” type products will assemble to spindle.

**Parts XReference**

See “Reference Information” section

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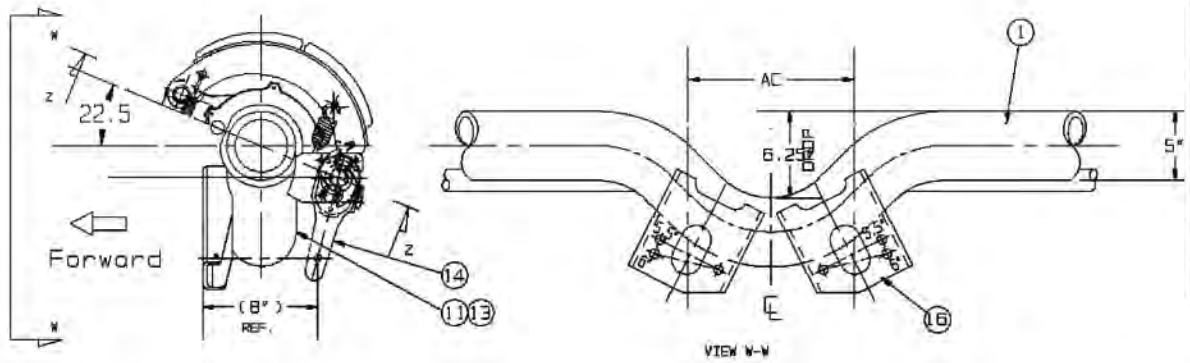
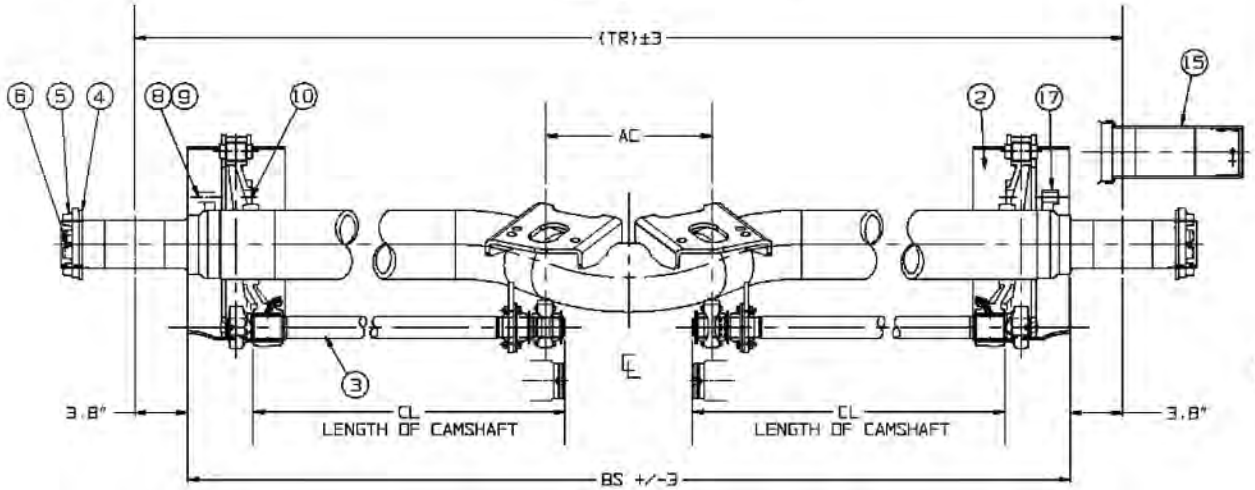



Camshafts

| Part number | Head | Spider | Splines | Notes | |
|---|---|---|---|---|---|
| C11-0301-XXX | AM, 1 1/8" | 1 5/8" | 28 | Cam only | Standard |
| C11-0301C-XXX | AM, 1 1/8" | 1 5/8" | 28 | Cam W/Tube | |
| C11-0302-XXX | AM, 1 1/8" | 1 5/8" | 10 | Cam only | |
| C11-0302C-XXX | AM, 1 1/8" | 1 5/8" | 10 | Cam W/Tube | |

| Length CL | XXX | |
|---|---|---|
| 22 5/8" | 575 | Standard |
| 23 1/8" | 587 | |
| 25 5/8" | 651 | |




VIEW Z-Z

| Maximum Capacity (105kn/h) | | |
|---|---|---|
| | 5"x 0.58 | 22500 lbs* |
| | 5"x 0.75" | 25000 lbs* |
| Bearings | Inner | HM518445/10 |
| | Outer | HM518445/10 |
| Brake Size | 16.5 x 7" GP (D) | |
| | 16.5 x 7" GP+ (D+) | |
| | 16.5 x 8 5/8 GP (D), ℄ | |
| CAM | AM 1 1/8 Head, 1 5/8" Jrnl | |

* Max. beam capacity, only. See "Certs" for lining capacity. See "Capacity Charts" and "Application guide" for tube wall thickness selection for specific applications.

Other Tracks & Configurations available - Please consult Watson & Chalin

| BRAKE SIZE | TR:71.5" | | | | TR:72.5" | | | | TR:77.5" | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WALL | CL | AC | BS | WALL | CL | AC | BS | WALL | CL | AC | BS |
| 16.5x7" | 0.58" | 22-5/8" | 12" | 63.9" | 0.58" | 23-1/8" | 12" | 64.9" | 0.58" | 25.5/8" | 12" | 69.9" |
| | 0.75" | 22.5/8" | 12" | 63.9" | 0.75" | 23-1/8" | 12" | 64.9" | 0.75" | 25.5/8" | 12" | 69.9" |

| ITEM | PART NO. | DESCRIPTION | QTY. | REMARK |
|---|---|---|---|---|
| 8 | A16-0100 | ABS clip | 2 | Option-must be specified |
| 8 | A15-00 | ABS sensor | 2 | Option-must be specified |
| 7 | | | 2 | Option-must be specified |
| 6 | A13-0101 | Cotter pin | 2 | Standard |
| 5 | A12-0101 | Adjusting nut | 2 | Standard |
| 4 | A11-0101 | Spindle Washer | 2 | Standard |
| | C10-0302C | Camshaft + Tube | (2) | 1.63 x 10 spl cam w/tube |
| | C10-0301C | Camshaft + Tube | (2) | 1.63 x 28 spl cam w/tube |
| | C10-0302 | Camshaft Group | (2) | 1.63 x 10 spl cam |
| 3 | C10-0301 | Camshaft Group | 2 | 1.63 x 28 spl cam |
| | 16.5" Brake | GP+ (D+) Brake | (1) | 0.87 FMSI-4707 |
| 2 | 16.5" Brake | GP (D) Brake | 1 | 0.75 FMSI-4515E |
| 1 | 3200-0282 | Tubing Ass'y | 1 | |

| ITEM | PART NO. | DESCRIPTION | QTY. | REMARK |
|---|---|---|---|---|
| 17 | 815-0103 | ABS Bracket | 2 | Standard |
| 16 | 3203-1008L/R | A/C Brackets 5" | 2 | 105 degrees - Single |
| 15 | A23-0201 | FP Spindle cover | 2 | Lgt grease coating on spindle |
| 14 | A22-0100 | Slack Adjuster | 1 | Option-must be specified |
| 13 | A21-00 | S/N Tag | 1 | Custom Private Labels |
| 12 | A18-0101 | TIS option | 1 | 1/8"-27NPT Drill Top & Plug |
| 11 | A17-0101 | ABS sticker | 1 | Option-must be specified |
| 10 | A14-0101 | ABS Grommet | 2 | Option-must be specified |

NOTES:

1. AIR CHAMBER BRACKET CAN USE 5.5" & 6" SLACK ADJUSTER, TOP HOLE IS 5.5",& BOTTOM HOLE IS 6".
2. 8" ROD FROM A/C FACE TO CL PIN FOR 6" SLACK ADJUSTER.

| Item | Revision | Rev. By | Date |
|---|---|---|---|
| 0 | New Release | JCG | 29/08/08 |

Designed By: WSS
Checked By:
Approved By:
Date:

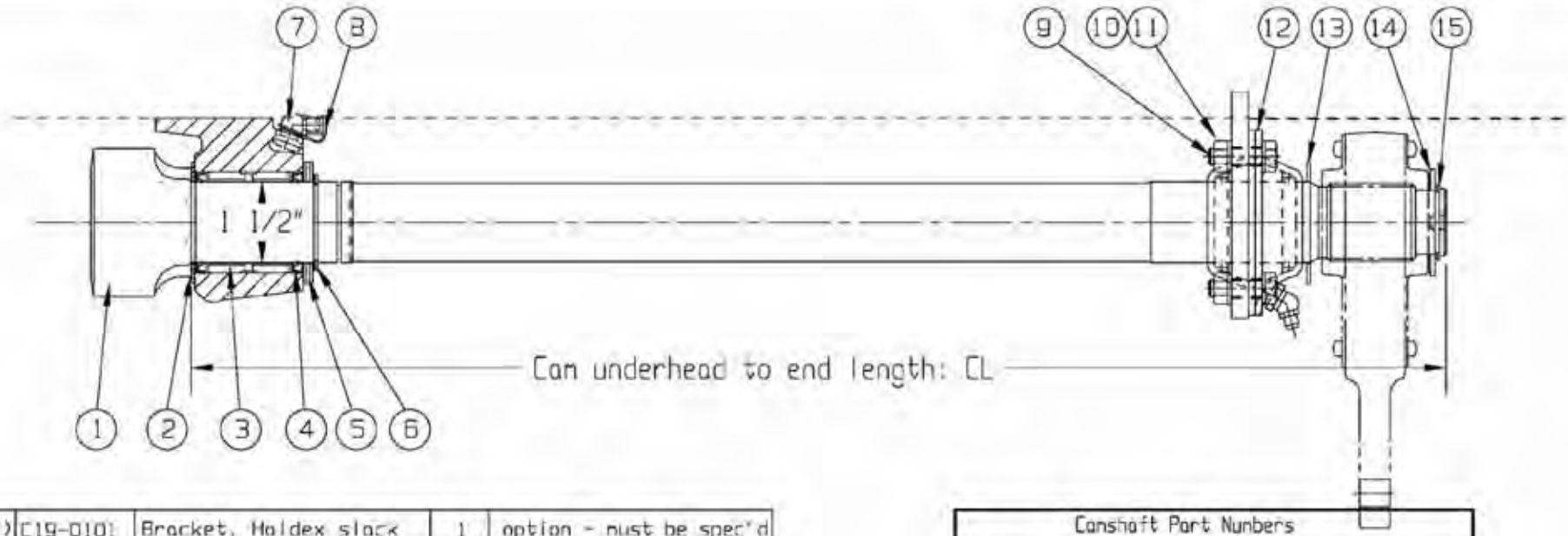
Title: 6" D/C AXLE - WCP Spindle

Dwg. No. DCP6AMBB

| Revision | Scale |
|---|---|
| 0 | 1:1 |

Sheet 1 of 1

WATSON & CHALIN MANUFACTURING INC.
Watson Suspension Systems




| Item | P/N | Description | Q | Notes |
|---|---|---|---|---|
| (16) | C19-0101 | Bracket, Haldex slack | 1 | option - must be spec'd |
| | C16-0501 | Spline retaining ring | (1) | 10 spline |
| 15 | C16-0301 | Spline retaining ring | 1 | 28 spline |
| | C15-0102 | Spline washer | (1) | 10 spline |
| 14 | C15-0105 | Spline washer | 1 | 28 spline |
| 13 | C15-0102 | Washer, Spline journal | 1 | |
| 12 | C20-0201 | Cam support bshg ass'y | 1 | |
| 11 | C28-0102 | Washer | 4 | 8 mm, (Can use 5/16") |
| 10 | C27-0102 | Nut, cam support bshg | 4 | M8,(Can use 5/16") |
| 9 | C26-0201 | Bolt, cam support bshg | 4 | M8X30,(Can use 5/16") |
| 8 | C18-0103 | Grease ftg plastic cap | 1 | |
| 7 | C17-0201 | Grease fitting | 1 | 1/8 NTP |
| 6 | C16-0501 | Spider retaining ring | 1 | |
| 5 | C15-0102 | Cam journal washer | 2 | 1 1/2" ID |
| 4 | C14-0201 | Spider seals | 2 | |
| 3 | C13-0201 | Spider cam bushing | 1 | 1 1/2" ID |
| 2 | C15-0102 | Outer cam washer | 1 | 1 1/2" ID |
| | C11-0402 | Camshaft group | (1) | DA, 1.5" jrnl, 10 spl |
| 1 | C11-0401 | Camshaft group | 1 | DA, 1.5" jrnl, 28 spl |

| Camshaft Part Numbers | | | | | |
|---|---|---|---|---|---|
| Length: CL | | | | | |
| Inches | MM | Spline | Head | Spdr Bshg | P/N |
| 20 3/4 | 527 | 28 | DA | 1 1/2" | C11-0401-527L/R |
| 21 1/8 | 537 | 28 | DA | 1 1/2" | C11-0401-537L/R |
| 23 3/8 | 595 | 28 | DA | 1 1/2" | C11-0401-595L/R |
| 23 3/4 | 603 | 28 | DA | 1 1/2" | C11-0401-603L/R |
| 20 3/4 | 527 | 10 | DA | 1 1/2" | C11-0402-527L/R |
| 21 1/8 | 537 | 10 | DA | 1 1/2" | C11-0402-537L/R |
| 23 3/8 | 595 | 10 | DA | 1 1/2" | C11-0402-595L/R |
| 23 3/4 | 603 | 10 | DA | 1 1/2" | C11-0402-603L/R |

| Rev | Description | Date | By |
|---|---|---|---|
| 0 | New release | 04/16/08 | JCG |
| Drawn by: | | WYC | / / |
| Checked by: | | | / / |
| Approved by: | | | / / |

CAM General Arrangement

FMSI-4692

12 1/4"

Rev 0

Cam DA 1.5

DA

Size | Scale

Sheet 1/1

WATSON & CHALIN

# Brake Lining Certifications on Watson & Chalin Axles

| Lining Marerial | Manufacturer | Brake size (inches) | FMSI # | Tire Loaded Radius (inches) | Spring Brake Size (inches²) | Auto-Slack Arm Length (inches) | Rating (lbs) | Country / Continent | Certification |
|---|---|---|---|---|---|---|---|---|---|
| PL133 | Fuwa | 16.5 x 7 | 4515E | 20.6 | 30-30 | 5.5 | 20,000 | USA,Canada | FMVSS121/CMVSS121 |
| PL133 | Fuwa | 16.5 x 7 | 4515E | N/R (1) | Type-30 | 6 | 12 tonnes (2 | Australia | ADR Schedule-4, SARN#35665 |
| MB21 | Carlisle | 16.5 x 7 | 4515E | 20.6 | 30-30 | 5.5 | 20,000 | USA,Canada | FMVSS121/CMVSS121 |
| PL244 | Fuwa | 16.5 x 7 | 4515E | 20.6 | 30-30 | 5.5 | 23,000 | USA,Canada | FMVSS121/CMVSS121 |
| PL133XT | Fuwa | 16.5 x 7 | 4707 | 20.6 | 30-30 | 5.5 | 20,000 | USA,Canada | FMVSS121/CMVSS121 |
| PL244 | Fuwa | 16.5 x 7+(3 | 4707 | 20.6 | 30-30 | 5.5 | 23,000 | USA,Canada | FMVSS121/CMVSS121* |
| | | | | | | | | | |
| PL244 | Fuwa | 12.25 x 7.5 | 4692 | 15 | 30-30 | 6 | 20,000 | USA,Canada | FMVSS121/CMVSS121 |

Notes:
1- N/R = Not required for this certification
2- Metric tonnes.
3- 16.5 x 7 is Q+

REV. 2 - 09.28.2009

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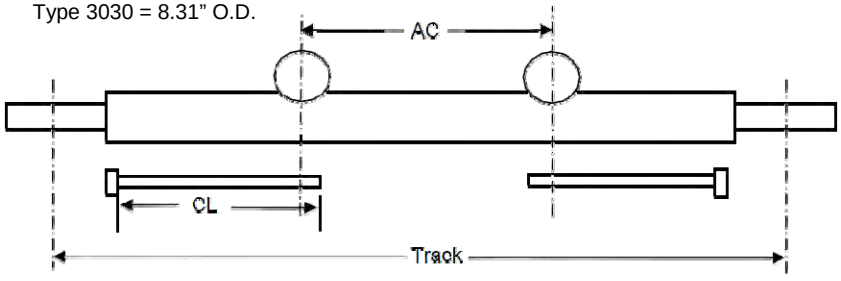
# *Air Chamber Spacing (Inches)*

| | | | AC | |
|---|---|---|---|---|
| **BRAKE SIZE** | **TRACK** | **CL** | **WCN** | **WCP** |
| 12.25 x 7.5” | 65 | 20.75 | 8.3 | |
| 12.25 x 7.5” | 71.5 | 20.75 | 14.8 | N/A |
| 12.25 x 7.5” | 71.5 | 21.13 | 14 | N/A |
| 12.25 x 7.5” | 71.5 | 23.38 | 9.5 | N/A |
| 12.25 x 7.5” | 71.5 | 23.75 | 8.8 | N/A |
| 12.25 x 7.5” | 77.5 | 20.75 | 20.8 | N/A |
| 12.25 x 7.5” | 77.5 | 21.13 | 20 | N/A |
| 12.25 x 7.5” | 77.5 | 23.38 | 15.5 | N/A |
| 12.25 x 7.5” | 77.5 | 23.75 | 14.8 | N/A |
| 16 ½ x 7” | 71.5 | 17.52 | 22.1 | 22.1 |
| 16 ½ x 7” | 71.5 | 20.63 | 15.9 | 15.9 |
| 16 ½ x 7” | 71.5 | 21.38 | 14.4 | 14.4 |
| 16 ½ x 7” | 71.5 | 23.75 | 9.7 | 9.7 |
| 16 ½ x 7” | 71.5 | 24.13 | 8.9 | 8.9 |
| 16 ½ x 7” | 77.5 | 17.52 | 28.1 | 28.1 |
| 16 ½ x 7” | 77.5 | 20.63 | 21.9 | 21.9 |
| 16 ½ x 7” | 77.5 | 21.38 | 20.4 | 20.4 |
| 16 ½ x 7” | 77.5 | 23.75 | 15.7 | 15.7 |
| 16 ½ x 7” | 77.5 | 24.13 | 14.9 | 14.9 |
| 16 ½ x 8 5/8” | 71.5 | 17.52 | 22.1 | 22.1 |
| 16 ½ x 8 5/8” | 71.5 | 20.63 | 15.9 | 15.9 |
| 16 ½ x 8 5/8” | 71.5 | 21.38 | 14.4 | 14.4 |
| 16 ½ x 8 5/8” | 71.5 | 23.75 | 9.7 | 9.7 |
| 16 ½ x 8 5/8” | 71.5 | 24.13 | 8.9 | 8.9 |
| 16 ½ x 8 5/8” | 77.5 | 17.52 | 28.1 | 28.1 |
| 16 ½ x 8 5/8” | 77.5 | 20.63 | 21.9 | 21.9 |
| 16 ½ x 8 5/8” | 77.5 | 21.38 | 20.4 | 20.4 |
| 16 ½ x 8 5/8” | 77.5 | 23.75 | 15.7 | 15.7 |
| 16 ½ x 8 5/8” | 77.5 | 24.13 | 14.9 | 14.9 |

Notes: 16.5 x 8 5/8” is a centerline brake -same spider position as 16.5 x 7”
Type 2424 = 7.5” O.D.
Type 3030 = 8.31” O.D.

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# Axle Options

**ABS Sensors Installed:**

- Wabco
- Haldex
- Bendix
- Other

**Bearings:**

- Watson & Chalin standard
- Timken
- Stemco
- Others

**Hub Cap:**

- Watson & Chalin Standard
- Stemco
- Others

**Air Chambers and Spring Brakes**

- Watson & Chalin – BTC
- Others

10 spline camshafts: (28 spline standard)

**Camshaft Enclosures**

**Slack Adjusters:**

- Haldex
- Bendix
- Watson & Chalin - BTC

**Seals:**

- Watson & Chalin standard
- SKF C/R
- Stemco
- Others

**Dust Shield**

- 16.5”
- 12.25”

**Notes:**

- Total axle price varies according to the options.
- “Watson & Chalin Standard” is usually the best priced option.
- New options can be added upon request when quantities/price/availability are suitable.

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# WCN Axle

## 12.25" Brake Part Number X-Reference

| | | |
|---|---|---|
| **WCN Spindle:** | Threads | 2 5/8"-16 UNS 2A |
| | Fuwa | FN |
| | Hendrickson | HN |
| | Meritor | TN, TQ |
| | Spicer (Dana) | D22, K22 |
| | IMT | F22 |

| | | |
|---|---|---|
| **Bearings:** | HM212049 | Outer |
| | HM218248 | Inner |

| | | |
|---|---|---|
| **Brake shoes:** | 12 1/4" X 7 1/2" | 0.715: Standard |
| | FMSI | 4692 |
| | Fuwa | DA |
| | Meritor | Q |
| | Spicer | Fast Change |
| | IMT | TIME |

| **Camshafts:** | Standard | Lining: GP Std | 1 1/2" Cam Bushing, 28 splines | |
|---|---|---|---|---|
| Manufacturer | Fuwa | IMT | Meritor | Euclid |
| 20 3/4" Left | C11-0401-527L | 202129-206-LH | R607247 | E-9753 |
| 20 3/4" Right | C11-0401-527R | 202129-206-RH | R607248 | E-9754 |
| 21 1/8" Left | C11-0401-537L | N/A | N/A | N/A |
| 21 1/8" Right | C11-0401-537R | N/A | N/A | N/A |
| 23 3/8" Left | C11-0401-595L | 202129-233-LH | R607253 | E-9759 |
| 23 3/8" Right | C11-0401-595R | 202129-233-RH | R607254 | E-9760 |
| 23 3/4" Left | C11-0401-603L | N/A | N/A | E-10925 |
| 23 3/4" Right | C11-0401-603R | N/A | N/A | E-10926 |
| Repair Kit: | N/A | 2028 | R615014 | E-2469 |

| | Fuwa / NEW | Fuwa / OLD | IMT | Meritor | Euclid |
|---|---|---|---|---|---|
| **Spider Bushing** | C13-0201 | 3305-0038 | 405129 | N/A | E-759/807 |
| **Spider Seal** | C14-0201 | 3957-0038 | 408101 | 1205M1105 | E-1416 |
| **Cam bushing** | C20-0201 | 3302-0038 | N/A | A2-3105-G-1151 | E-1318AHD |

| **Hub Seals** | Stemco | C/R | Out-Runner | Timken |
|---|---|---|---|---|
| 6" 0D x 4 5/8" ID | 320-2110 seal | 46303 Pro | 859 | WB116GST |
| | 315-1504 ring | 46305 Classic | | NLGI#2 Grease |

**Hub Cap Bolts:** (6) 5/16" NC Bolts on 5 1/2" BCD

**Notes:** 1- Rollers, anchor pins, springs, snap rings, etc. are all industry standard.
2- Above supplied for information only. Please measure parts before installing.
3- N/A = Not available

**Options:** Many options are available - Consult Watson & Chalin Customer Service.

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# WCN Axle

## 16.5" Brake Part Number X-Reference

| | | |
|---|---|---|
| **WCN Spindle:** | Threads | 2 5/8"-16 UNS 2A |
| | Fuwa | FN |
| | Hendrickson | HN |
| | Meritor | TN, TQ |
| | Spicer (Dana) | D22, K22 |
| | IMT | F22 |
| **Bearings:** | HM212049 | Outer |
| | HM218248 | Inner |

| | | | |
|---|---|---|---|
| **Brake shoes:** | 16 1/2" X 7" | 0.75: Standard | 0.88" Thick |
| | FMSI | 4515E | 4707 |
| | Fuwa | GP | GP+ |
| | Meritor | Q | Q+ |
| | Spicer | Fast Change | XL |
| | IMT | TIME | SL |

| **Camshafts:** | GP & GP+, 1 5/8" Cam Head Journal, 28 Spline | | | | |
|---|---|---|---|---|---|
| Manufacturer | Fuwa / NEW | Fuwa / OLD | Spicer/Dana | Meritor | Euclid |
| 17 1/2" Left | C11-0301-445L | N/A | M16WKL25-175 | R607227 | E-9731 |
| 17 1/2" Right | C11-0301-445R | N/A | M16WKR25-175 | R607228 | E-9732 |
| 20 5/8" Left | C11-0301-524-L | 3304-0621L | M16WKL25-205 | R607229 | E9733 |
| 20 5/8" Right | C11-0301-524R | 3304-0621R | M16WKR25-205 | R607230 | E9734 |
| 21 3/8" Left | C11-0301-543-L | N/A | M16WKL25-213 | N/A | N/A |
| 21 3/8" Right | C11-0301-543R | N/A | M16WKR25-213 | N/A | N/A |
| 23 3/4" Left | C11-0301-604-L | N/A | M16WKL25-236 | R607231 | E-9735 |
| 23 3/4" Right | C11-0301-604R | N/A | M16WKR25-236 | R607232 | E-9736 |
| 24 1/8" Left | C11-0301-613-L | 3304-0622L | M16WKL25-242 | R607277 | E-10909 |
| 24 1/8" Right | C11-0301-613-R | 3304-0622R | M16WKR25-242 | R607278 | E-10910 |
| Repair Kit: | N/A | N/A | 8132803 | R615019 | E-9790A |

| | Fuwa / NEW | Fuwa / OLD | Spicer/Dana | Meritor | Euclid |
|---|---|---|---|---|---|
| **Spider Bushing** | C13-0302 | 3306-0011 | M16HD106 | R627034 | E-9789 |
| **Spider Seal** | C14-0300 | 3307-0011 | M16HH103 | R627015 | E-3991 |
| **Cam bushing** | C20-0201 | 3302-0038 | N/A | A2-3105-G-1151 | E-1318AHD |

| **Hub Seals** | Stemco | C/R | Out-Runner | Timken |
|---|---|---|---|---|
| 6" 0D x 4 5/8" ID | 320-2110 seal | 46303 Pro | 859 | WB116GST |
| | 315-1504 ring | 46305 Classic | | NLGI#2 Grease |

**Hub Cap Bolts:** (6) 5/16" NC Bolts on 5 1/2" BCD

**Notes:** 1- Rollers, anchor pins, springs, snap rings, etc. are all industry standard.
2- Above supplied for information only. Please measure parts before installing.
3- N/A = Not available

**Options:** Many options are available - Consult Watson & Chalin Customer Service.

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# WCP Axle

## 16.5" Brake Part Number X-Reference

| | | |
|---|---|---|
| **WCP Spindle:** | Threads | 3.48"-12 UN-2A |
| | Fuwa | FP |
| | Hendrickson | HP |
| | Meritor | TP |
| | Spicer (Dana) | P22 |
| | IMT | F24 |

| | | |
|---|---|---|
| **Bearings:** | **HM518445** | Outer |
| | **HM518445** | Inner |

| | | | |
|---|---|---|---|
| **Brake shoes:** | 16 1/2" X 7" | Standard | Thick |
| | FMSI | 4515 | 4707 |
| | Fuwa | GP | GP+ |
| | Meritor | Q | Q+ |
| | Spicer | Fast Change | XL |
| | IMT | TIME | SL |

| **Camshafts:** | GP & GP+, 1 5/8" Cam Head Journal, 28 Spline | | | | |
|---|---|---|---|---|---|
| Manufacturer | Fuwa / NEW | Fuwa / OLD | Spicer/Dana | Meritor | Euclid |
| 17 1/2" Left | C11-0301-445L | N/A | M16WKL25-175 | R607227 | E-9731 |
| 17 1/2" Right | C11-0301-445R | N/A | M16WKR25-175 | R607228 | E-9732 |
| 20 5/8" Left | C11-0301-524-L | 3304-0621L | M16WKL25-205 | R607229 | E9733 |
| 20 5/8" Right | C11-0301-524R | 3304-0621R | M16WKR25-205 | R607230 | E9734 |
| 21 3/8" Left | C11-0301-543-L | N/A | M16WKL25-213 | N/A | N/A |
| 21 3/8" Right | C11-0301-543R | N/A | M16WKR25-213 | N/A | N/A |
| 23 3/4" Left | C11-0301-604-L | N/A | M16WKL25-236 | R607231 | E-9735 |
| 23 3/4" Right | C11-0301-604R | N/A | M16WKR25-236 | R607232 | E-9736 |
| 24 1/8" Left | C11-0301-613-L | 3304-0622L | M16WKL25-242 | R607277 | E-10909 |
| 24 1/8" Right | C11-0301-613-R | 3304-0622R | M16WKR25-242 | R607278 | E-10910 |
| Repair Kit: | N/A | N/A | 8132803 | R615019 | E-9790A |

| | Fuwa / NEW | Fuwa / OLD | Spicer/Dana | Meritor | Euclid |
|---|---|---|---|---|---|
| **Spider Bushing** | C13-0302 | 3306-0011 | M16HD106 | R627034 | E-9789 |
| **Spider Seal** | C14-0300 | 3307-0011 | M16HH103 | R627015 | E-3991 |
| **Cam bushing** | C20-0201 | 3302-0038 | N/A | A2-3105-G-1151 | E-1318AHD |

| **Hub Seals** | Stemco | C/R | Out-Runner | Timken |
|---|---|---|---|---|
| 6" 0D x 4 5/8" ID | 320-2110 seal | 46303 Pro | 859 | WB116GST |
| | 315-1504 ring | 46305 Classic | | NLGI#2 Grease |

**Hub Cap Bolts:** (6) 5/16" NC Bolts on 5 1/2" BCD

**Notes:** 1- Rollers, anchor pins, springs, snap rings, etc. are all industry standard.
2- Above supplied for information only. Please measure parts before installing.
3- N/A = Not available

**Options:** Many options are available - Consult Watson & Chalin Customer Service.

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# AXLE LUBRICATION

Oil and grease suggested change intervals:

Varying loads and driving conditions will affect the service interval requirements. This chart is a generally accepted guide. Always work in a clean area and clean all parts with proper solvents before use. Never refill the hub with used oil. Contaminated lubricants can quickly destroy the entire assembly.

| TIME or DISTANCE | OIL | GREASE | BRAKES COMPONENTS |
|---|---|---|---|
| 1,000 miles 1,600 km | Check the oil level and replace the oil if it is contaminated. Check for leaks. Replace oil and seal if hub has been removed. See the "Add" and "Full" rings on the hub cap | | |
| 12,000 miles 19,200 km | | | Check brake adjustment |
| 30,000 miles 48,00 km or six months | **Heavy Duty Use** (On/Off Road) Change the oil | **Heavy Duty Use** (On/Off Road) Grease the bearings | Check wear in the linings, the cams, and the spider bushings. Grease the brake actuating |
| 100,00 miles 160,000km or every year | **Normal Use** Change the oil | **Normal Use** Grease the bearings | |
| Varies | Consult the semi-fluid synthetic grease Manufactrurer for recommendations. Also replace this grease if the hub is removed. | | |

 CAUTION: Do not mix lubricants types.

**Lubricants:**

The following **GREASE** properties are recommended
Soap type - Lithium Complex or Equivalent
Dropping point - 446ºF (230ºC) Minimum
Consistency - NLGI No. 2 or No.1
Additives - Corrosion & Oxidation Inhibitors, EP optional
Base Oil - Solvent Refined Petroleum oil

The following Oil properties are recommended

Gear Oil API GL-5 Performance level

| | |
|---|---|
| SAE 90 | Normal Duty |
| SAE 75W, | SAE 80W Extreme cold environment |
| SAE 140 | Extreme hot environment |

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# FASTENER TORQUE SPECIFICATIONS

| Description | Thread | Grade | Torque |
|---|---|---|---|
| Cam bracket bolts: | 3/8” | 5 | 40 ft-lbs, 55Nm |
| | 10mm | 8.8 | 40 ft-lbs, 55Nm |
| Hub Cap | 5/16”-18UNC | 5 | 15 ft-lbs, 28Nm |
| Dust Shield | 5/16” – 18UNC | 5 | 15 ft-lbs, 28Nm |

Air Chambers

- Type 9, 12, 16 7/16”- 14UNC N/A 30-40 ft-lbs, 40-55Nm
- Type 20, 24, 30 5/8”- 11UNC N/A 100-115 ft-lbs, 135-155Nm

Spindle nuts; see “Wheel Bearing Adjustment Procedures” TMC RP618

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# Recommended Practice

**RP 609B** **VMRS 013-001, 013-002**

# SELF-ADJUSTING AND MANUAL BRAKE ADJUSTER REMOVAL, INSTALLATION AND MAINTENANCE

**PREFACE**
The following Recommended Practice is subject to the Disclaimer at the front of TMC's *Recommended Maintenance Practices Manual*. Users are urged to read the Disclaimer before considering adoption of any portion of this Recommended Practice.

**PURPOSE AND SCOPE**
The purpose of this Recommended Practice (RP) is to provide information regarding the removal, installation, operation, maintenance, and selection of heavy-duty vehicle manual and self-adjusting brake adjusters.

**INTRODUCTION**
In an S-cam type foundation brake, the final link between the pneumatic system and the foundation brake is the brake adjuster. The arm of the brake adjuster is fastened to the push rod of the chamber with a clevis and the spline end is installed on the brake camshaft. Primarily, the brake adjuster is a lever that converts the linear force of the air chamber push rod into a torque which turns the brake camshaft and applies the brakes.

Two types of brake adjusters are in use: manual type brake adjusters, which periodically require a manual adjustment; and self-adjusting brake adjusters, which automatically adjust during normal service braking applications. All brake adjusters use the worm and gear principle and fundamentally differ only in their torque limit specification.

**NOTE:** Manual and self-adjusting brake adjusters are for brake adjustment and will not compensate for normal wear characteristics and maintenance requirements associated with foundation brakes.

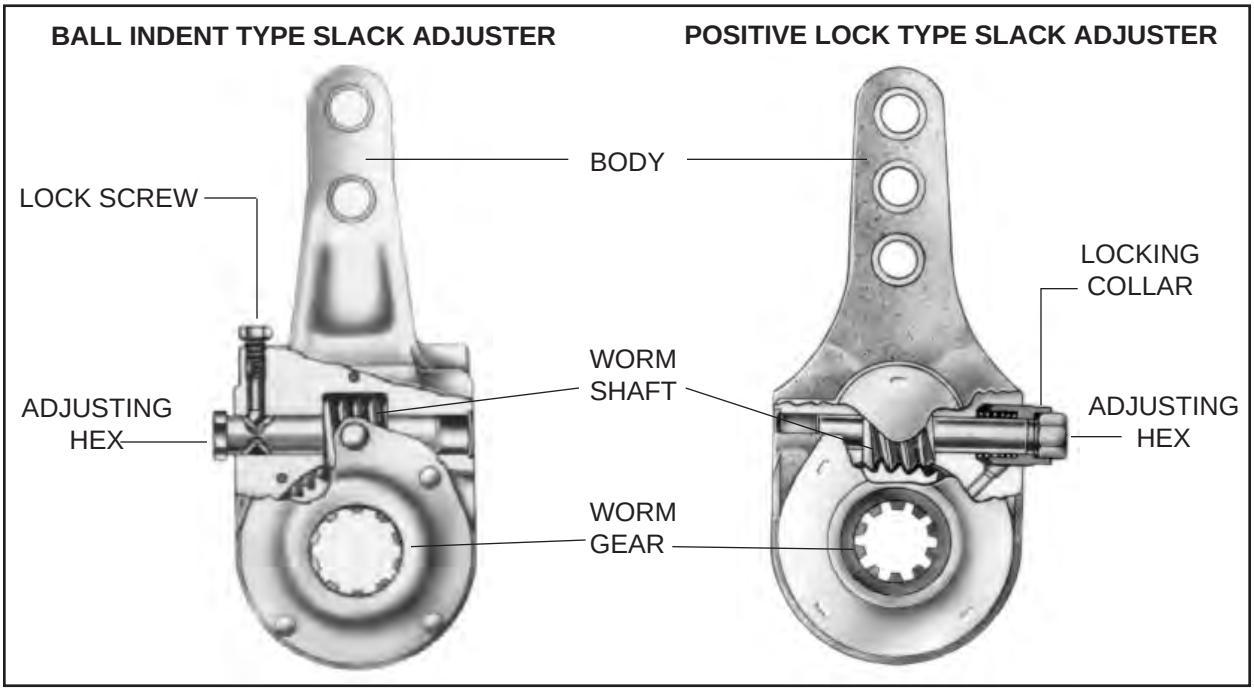



**Fig. 1: Manual Brake Adjusters**





Issued 3/80
Revised 3/2002

## MANUAL BRAKE ADJUSTERS

Manual brake adjusters contain four basic components: the body, worm gear, worm shaft, and locking screw or collar. See **Fig. 1.**

The worm shaft of a brake adjuster incorporates an external adjusting hex. Turning the adjusting hex rotates the worm shaft which turns the worm gear and brake cam shaft, thus spreading the brake shoes and reducing drum-to-lining clearance.

Light to medium gross axle weight rating (GAWR) vehicles utilize either a spring-loaded locking sleeve or a lock ball indent adjustment lock to prevent the worm shaft from backing off.

Higher torque-rated brake adjusters use the lock ball or plunger and worm shaft indent principle adjustment lock. The lock ball or plunger must engage the worm shaft indent after the adjustment is completed. An audible metallic click can be heard when engagement is made.

## SELF ADJUSTING BRAKE ADJUSTERS

While self-adjusting brake adjuster designs vary in the manner in which they are installed and operate, all are designed to automatically maintain a predetermined drum-to-lining clearance or brake chamber stroke. Some self-adjusting brake adjusters adjust upon the brake application stroke, others adjust upon release. Self-adjusting brake adjusters should not have to be manually adjusted while in service. However, manual adjustments can be made temporarily to get a vehicle to a maintenance facility for inspection and repair, if necessary.

**⚠ CAUTION** Self-adjusting brake adjusters do not eliminate or reduce the need for periodic inspection and maintenance of the adjuster components and attaching hardware. Self-adjusting brake adjusters should never be operated as a manual adjuster, if the self-adjusting function is not operating properly.

## BRAKE ADJUSTER REPLACEMENT

When replacing a brake adjuster, it is recommended that the replacement be of the same size as the original equipment. All self-adjusting brake adjusters on a vehicle should be made by the same manufacturer. To identify the proper replacement, the following slack adjuster key dimensional checks are recommended.

- Arm length (center of spline to center of arm hole to be used).
- Type, width, number, and diameter of splines.
- Clevis pin diameter (do not drive out bushing to accommodate a larger clevis pin).
- Brake chamber push rod size (5/8" or 1/2").
- If offset configuration, determine the offset dimension (right or left side).

## BRAKE ADJUSTER REMOVAL AND INSTALLATION

**⚠ WARNING:** To avoid possible injury, proper precautions must be taken to prevent automatic actuation of the brake chambers while removing or installing slack adjusters. Always block the wheels or mechanically secure the vehicle. Spring brakes must be mechanically caged. All brakes should be released.

### A. Manual Brake Adjuster Removal—

1. Remove the brake chamber push rod clevis pin.
2. Remove the retaining mechanism from the end of the brake camshaft.
3. Rotate the adjusting hex to back the brake adjuster out of the clevis.
4. Remove the brake adjuster from the spline end of the brake cam shaft.

### B. Manual Brake Adjuster Installation—

1. Install the brake adjuster on the cam shaft so the adjustment hex and grease fitting (if so equipped) are accessible for servicing.
2. Align the brake adjuster arm with center of the push rod clevis. Install the clevis pin and secure it with a new cotter pin.
3. Check to be sure the angle formed by the brake adjuster arm and the brake chamber push rod is greater than 90° when the brake adjuster is in the released position.
4. Install the brake adjuster retaining mechanism on the end of the brake cam shaft, being sure to shim it to less than 0.060 inch of end play.
5. Tighten the jam nut on the push-rod-to-clevis attachment (1/2 - 20 300-400 in. lbs. 5/8 - 18 400 in. lbs.).
6. After installation, make certain there is adequate clearance in both the fully applied and fully released positions. Check to ensure that all brake adjusters rotate freely and without binding.
7. Adjust the brakes by following the procedure in the section entitled BRAKE ADJUSTMENT PROCEDURE.

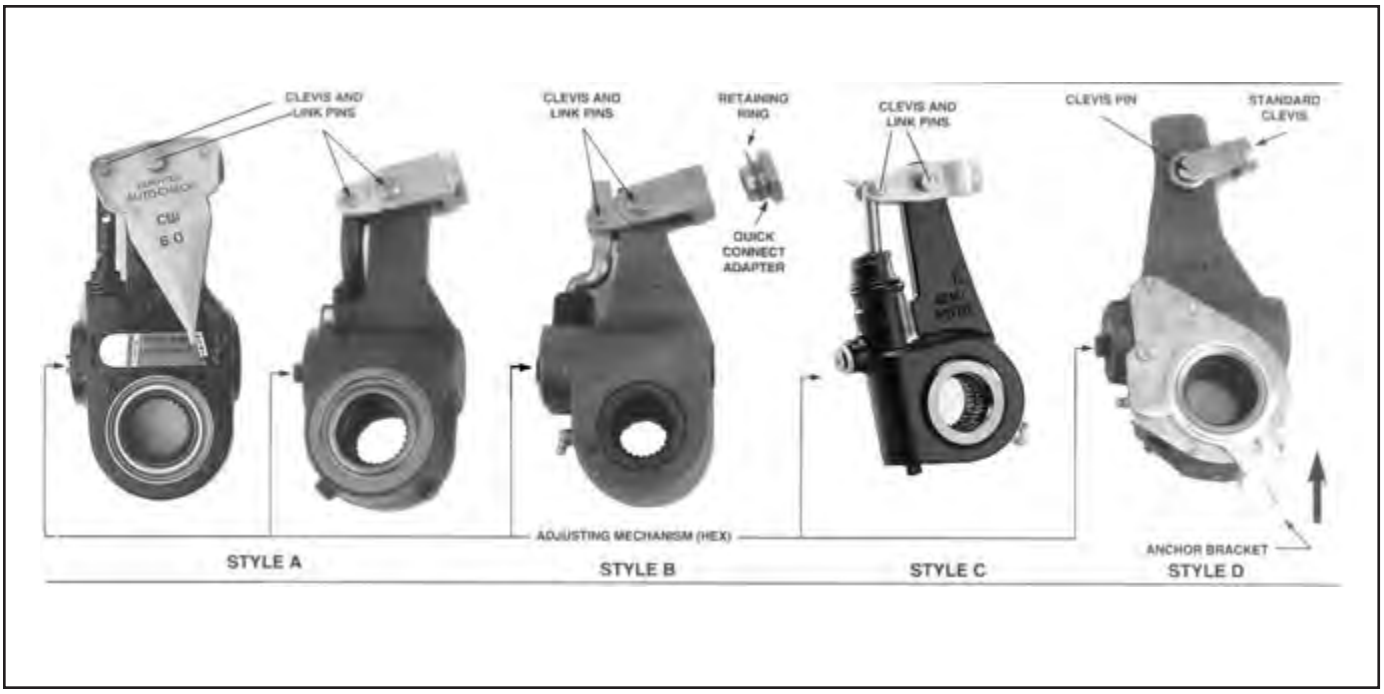



**Fig. 2: Self-Adjusting Brake Adjuster Types**

**C. Self-Adjusting Brake Adjuster Removal—**

1. Remove the clevis and link pins and the anchor bracket nut or pawl, if necessary (see **Fig. 2**).
   a. Style A—Remove the clevis and link pins.
   b. Style B—Remove the retaining ring quick connect yoke.
   c. Style C—Remove the pawl, clevis, and link pins.
   d. Style D—Remove the clevis pin and anchor bracket nuts.
2. Remove the retaining mechanism from the end of the brake cam shaft.
3. Rotate the adjusting mechanism to back the self-adjusting brake adjuster out of the clevis, if necessary.
4. Remove the self-adjusting brake adjuster from the spline end of the brake cam shaft.

   **NOTE:** If a manual brake adjuster is being removed to be replaced with a self-adjusting brake adjuster, the manual or threaded clevis must be removed from the brake chamber push rod (with Style D self-adjusting brake adjuster, the existing clevis is used and additional anchor bracket hardware is required). Leave the jam nut on the push rod.

**D. Self-Adjusting Brake Adjuster Installation—**

1. Ensure that the brake chamber is installed in the bracket holes appropriate for the self-adjusting brake adjuster arm length.
2. Clean the camshaft splines.
3. Coat the camshaft splines and the end of the brake chamber push rod with an anti-seize type product.
4. Install either a quick connect nut or threaded clevis on the brake chamber push rod per the manufacturer's recommendations. Some manufacturers offer both quick connect and threaded clevises.
5. Install the self-adjusting brake adjuster on the camshaft.
6. Install the self-adjusting brake adjuster retaining mechanism on the end of the brake cam shaft, being sure to shim it to less than 0.060 inch of end play.

7A. Rotate the adjusting mechanism to either install a clevis and link pin or to connect the clevis with a quick connect nut (see **Fig. 2**, Styles A, B, and C).

7B. For Style D, install the anchor bracket loosely and then rotate the adjusting mechanism to install the clevis pin.

8A. Using the correct gauge or template, (see **Fig. 2**, Styles A, B, and C) check for the proper mounting angle. Adjust the clevis for the correct angle, if necessary.

**NOTE:** The brake chamber push rod may require shortening or replacement to obtain the proper installation length.

8B. Make sure the control arm is bottomed out in the direction of the arrow or if the control arm has a pointer, align with the cut-out gap provided (see **Fig. 2**, Style D) and then secure all anchor bracket hardware.

9. Tighten the jam nut.

10. After installation, make a brake application to make certain there is no interference between the axle and the suspension components in both fully applied and fully released positions. Check to ensure that the brake adjusters rotate freely and without binding.

11. Adjust the brakes following the procedure in the section entitled BRAKE ADJUSTMENT PROCEDURE, below.

## BRAKE ADJUSTMENT PROCEDURE

**NOTE:** All adjustments should be made with cold brake drums and the brakes fully released.

**WARNING:** To avoid possible injury, proper precautions must be taken to prevent automatic actuation of the brake chambers while adjusting brake adjusters. Always block the wheels or mechanically secure the vehicle. Spring brakes must be mechanically caged or released with air. All brakes should be released.

### A. ManualBrake Adjuster

**Brake Adjustment Procedure—**

1. **Brake adjusters with locking collar (positive lock type)—**Jack up the vehicle. Thoroughly clean the adjusting hex and locking sleeve area. Position a wrench or socket over the adjusting hex and disengage the locking sleeve by depressing it. With the locking sleeve fully depressed, adjust the brakes while rotating the tire and wheel. Use the wrench or socket to turn the adjusting hex until the shoes contact the drum. Then back off the adjusting hex until the tire and wheel turn freely. The actuator stroke should be as short as possible without the brakes dragging.

   If the vehicle cannot be jacked up, thoroughly clean the adjusting hex and locking sleeve area. Position a wrench or socket over the adjusting hex and disengage the locking sleeve by depressing it. With the locking sleeve fully depressed, use the wrench or socket to turn the adjusting hex until it will go no further indicating that either the shoes have contacted the drum or the adjusting hex has been turned in the wrong direction. Pull on the brake adjuster to make sure it will not move. If there is movement, adjustment was made in the wrong direction and the adjusting hex must be turned in the opposite direction until it will go no further. After establishing solid shoe-to-drum contact, back off the adjusting hex 1/4 turn for worn linings and 1/2 turn when relining brakes. The actuator stroke should be as short as possible without the brakes dragging. Measure the chamber power stroke at 90-100 psi as described in subsection “B,” “Self-Adjusting Brake Adjuster Brake Adjustment Procedure,” below. Take a free stroke measurement as outlined in the section entitled FAILURE ANALYSIS. Ensure there is at least 3/8"

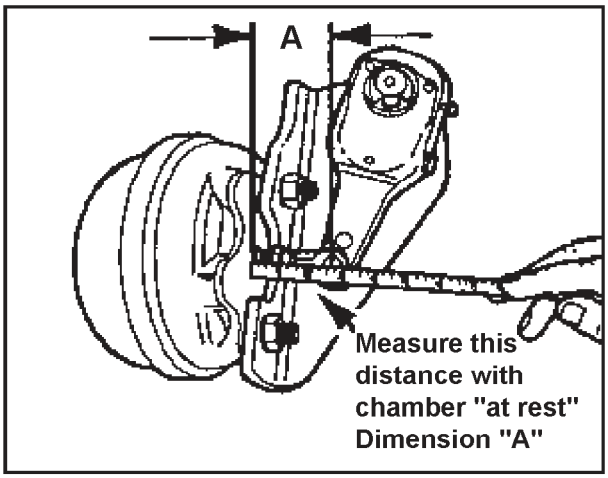



**Fig. 3**

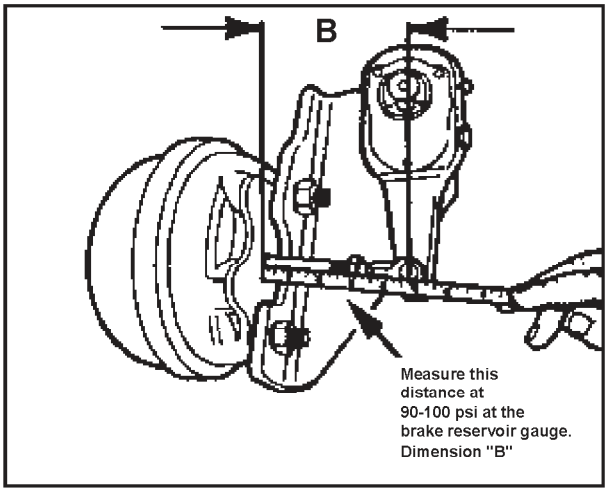



**Fig. 4**

**TABLE 1**

**CHAMBER TYPE VS. MAXIMUM LEGAL STROKE AT 90-100 PSI BRAKE APPLICATION PRESSURE**

| Chamber Type | Maximum Legal Stroke |
|---|---|
| 12 | 1-3/8" or less |
| 12 Long Stroke | 1-3/4" or less |
| 16 | 1-3/4" or less |
| 16 Long Stroke | 2.0" or less |
| 20 | 1-3/4" or less |
| 20 Long Stroke | 2.0" or less |
| 24 | 1-3/4" or less |
| 24 Long Stroke | 2.0" or less |
| 24 Extra Long Stroke | 2.5" or less |
| 30 | 2.0" or less |
| 30 Long Stroke | 2.5" or less |
| 36 | 2-1/4" or less |

of free stroke. Free stroke less than 3/8" can cause brake drag. If you can't maintain maximum legal stroke and the free stroke is less than 3/8", contact the brake manufacturer for foundation or brake geometry problems.

⚠ **CAUTION:** When the manual brake adjuster brake adjustment is completed, the adjusting hex should be positioned so the locking sleeve engages it, thus locking it in place. If the locking sleeve does not engage the adjusting hex, the brake adjuster can back itself off.

2. **Brake adjuster with lock screw ball Indent type lock mechanism**—Back off (turn counterclockwise) the worm shaft lock screw (if applicable). Make the necessary adjustment by turning the adjusting hex as described in item number 1 of this section. Following brake adjustment, make certain that the lock ball or plunger engages the worm shaft indent. Without such engagement, the slack adjuster can back itself off.

**B. Self-Adjusting Brake Adjuster**
**Brake Adjustment Procedure—**
A self-adjusting brake adjuster should not have to be manually adjusted except for initial installation and at brake reline. Instead of manually adjusting the slack, perform the following procedure during inspection:

Chamber Power Stroke: A power stroke at 90-100 psi brake application pressure will check both adjustment and foundation brake condition. Perform the following:

1. Measure from the brake chamber face to the center of the clevis pin at all wheel locations (see **Fig. 3).**
2. Make brake applications until the air reservoir gage reads 90-100 psi. Then have an assistant make a full brake application and hold it.
3. Measure from the brake chamber face to the center of the clevis pin (see **Fig. 4).**
4. The difference between the brakes released and applied measurements is the power stroke measurement. If the stroke is less than the maximum stroke for the chamber size (see **Table 1),** the inspection is complete. If the power stroke is more than the maximum stroke for the chamber size (see **Table 1** ), refer to the section entitled FAILURE ANALYSIS.

**SELF-ADJUSTING BRAKE ADJUSTER ADJUSTMENT PROCEDURE AT RELINE AND INSTALLATION**
A self-adjusting brake adjuster should be manually adjusted after a brake reline and/or installation using the following procedure:

1. Position a wrench or socket over the adjusting mechanism.

   **NOTE:** If the self-adjusting brake adjuster is equipped with a pawl, remove the pawl for the brake adjustment and then properly reinstall the pawl (see **Fig. 2**, Style C) . Tighten the pawl to 15 - 20 ft.-lbs.

2. Rotate the adjusting mechanism until the brake shoes contact the drum. Pull on the brake adjuster by hand to make sure it will not move. If there is movement, adjustment was made in the wrong direction and the adjusting hex must be turned in the opposite direction until it will go no further.
3. Reverse the rotation, backing the brake adjuster off one-half (1/2) turn.
4. Measure the chamber power stroke at 90-100 psi brake application pressure as described in the previous section.
5. Take a free stroke measurement as outlined in the section entitled FAILURE ANALYSIS. Make sure you have at least 3/8" free stroke. Free stroke of less than 3/8" can cause brake drag. If you cannot maintain the maximum legal stroke and the free stroke is less than 3/8", contact the brake manufacturer for foundation or brake geometry problems.

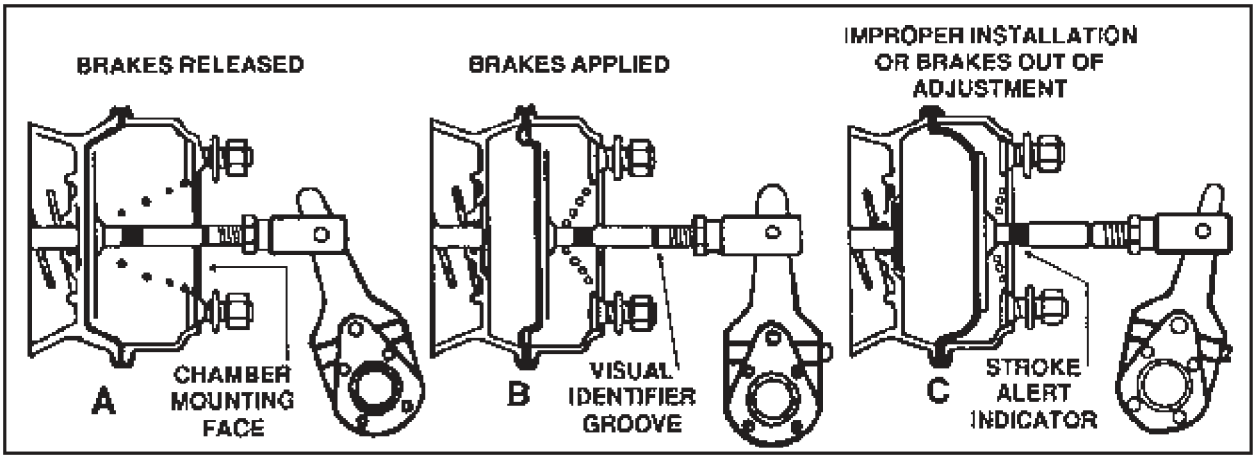



Fig. 5

## ROADSIDE BRAKE ADJUSTMENT

If the driver has to adjust brakes on the road, the following procedure is recommended:

If the vehicle is equipped with an self-adjusting brake adjuster, use a pry bar to pull on the brake adjuster. If movement is more than 5/8", a manual adjustment should be made following the same procedure as described below for a manual brake adjuster. If the self-adjusting brake adjuster is equipped with a pawl remove the pawl for the brake adjustment and then properly reinstall the pawl. If the self-adjusting brake adjuster needs adjustment, inform maintenance personnel.

1. Block the wheels or mechanically secure the vehicle. On the brakes to be adjusted, spring brakes must be mechanically caged or released with air.
2. Rotate the adjusting mechanism until the brake shoes contact the drum. Using a pry bar, pull on the brake adjuster by hand to make sure it will not move. If there is movement, adjustment was made in the wrong direction and the adjusting mechanism must be turned in the opposite direction. Tap the brake drum with a wrench; you should hear a dull clunk indicating the brake linings are tight against the drum.
3. Back off the brake adjuster a small amount at a time, while tapping on the brake drum with a wrench in between adjustments. Stop backing off the adjuster when you hear a clear ringing sound from the brake drum when tapped with a wrench.
4. Using a pry bar, pull on the slack adjuster by hand. If movement is more than 5/8", adjustment was not done properly or there is a problem with the foundation brake.

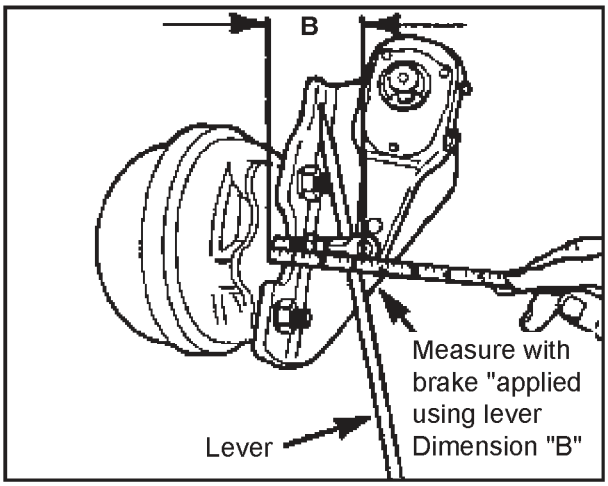



Fig. 6

**NOTE:** Some brake chamber push rods are marked to warn of an over-stroke condition. While the marking themselves may vary, the marking system has two basic features. They are: There is a mark on the brake chamber push rod near its clevis attachment to signal that it incorporates a stroke alert indicator (see **Fig. 5,** diagram B). There also is a mark on the brake chamber push rod opposite its clevis attachment end which is exposed from the brake chamber wherever over-stroke occurs (see **Fig. 5,** diagram C).

## FAILURE ANALYSIS

**Manual Brake Adjuster Failure Analysis**—Manual slack adjusters should be inspected for gear set wear. To do this, back off the adjusting hex until all

spring pressure is relieved from the clevis. Work the adjusting nut 1/4 turn back and forth while watching for cam rotation. If you have 1/8 to 1/4 turn of play without the cam rotating, the manual brake should be replaced. Repeat this procedure every 1/4 turn of the adjusting nut to check the whole gear set.

**Self-Adjusting Brake Adjuster Failure Analysis**—If the power stroke is at or more than the maximum stroke, measure free stroke and check/inspect the adjuster components and attaching hardware to determine if the slack adjuster is operational.

**FREE STROKE MEASUREMENT**

Free stroke is the amount of brake arm movement required to move the brake shoes against the drum. To measure free stroke, perform the following:

1. With the brakes released, measure from the brake chamber face to the center of the clevis pin.
2. With a lever, pry the brake adjuster arm until the brake shoes contact the drum and measure the brake adjuster movement (see **Fig. 6**).
3. The difference between the brake released and applied measurements is the free stroke. The free stroke should be 3/8" - 5/8". If the free stroke is in the correct range, the out of spec stroke is due to a foundation brake problem. Check for missing or worn components, cracked brake drums, or improper lining-to-drum contact. If the free stroke is greater than recommended, a self-adjusting brake adjuster function test should be performed.

**SELF-ADJUSTING BRAKE ADJUSTER FUNCTION TEST**

1. Remove the pawl, then rotate the adjusting mechanism at least one complete turn as if backing off the brake adjustment (see **Fig. 2**, Style C). The pawl must be installed properly and tightened to 15 - 20 ft-lbs after backing off the adjuster.
2. Apply the brakes several times and observe whether the adjustment mechanism is rotating in the direction needed to reduce brake chamber pushrod stroke. If the adjusting mechanism does not rotate, the brake adjuster should be replaced.
3. Check back-off torque by rotating the adjusting hex as follows (see **Fig. 2**):
   - Style A: Minimum 15 ft-lbs counter clockwise (CCW)
   - Style B: Minimum 15 ft-lbs CCW
   - Style C: Less than 45 in-lbs CCW (pawl removed)
   - Style D: Minimum 15 ft-lbs CCW

Consult the manufacturer for more information.

**PREVENTIVE MAINTENANCE**

Every month, 8,000 miles, or 300 operating hours, check brake chamber push rod travel;chamber stroke should be in compliance with the maximum allowable adjusted strokes indicated in Table 1, without the brakes dragging or the pushrod binding. Adjust manual slacks if necessary. Due to different operating conditions, adjustments may be necessary at earlier intervals.

Every 6 months, 50,000 miles, or 1,800 operating hours, lubricate all brake adjusters and clevis pins with manufacturer's recommended lubricant. Check for worn clevises, clevis pins, clevis pin bushings, and worn or broken control arm/attaching brackets. Failure to replace worn, broken, or disconnected components will increase chamber stroke. Lubrication and inspection may be necessary at earlier, intervals due to different operating conditions.

# Recommended Practice

**RP 618** **VMRS 018**

# WHEEL BEARING ADJUSTMENT PROCEDURES

**PREFACE**
The following Recommended Practice is subject to the Disclaimer at the front of TMC's *Recommended Maintenance Practices Manual*. Users are urged to read the Disclaimer before considering adoption of any portion of this Recommended Practice.

**OBJECTIVE**
The goal of this Recommended Procedure is to achieve a verifiable wheel bearing end play of 0.001" to 0.005" (0.025 mm to 0.127 mm).

**SCOPE**
The following service procedures apply to steer, drive, and trailer axle assemblies using conventional double nut or single nut systems. Follow these service procedures carefully to prevent premature wheel end component failure and increase seal and bearing life.

ABS (anti-lock braking systems) and traction control systems with wheel end sensing require precise bearing adjustment to function properly.

This Recommended Practice details proper service procedures for D-type, bendable-type, and dowel-type spindle nut washers.

**NOTE:** For single nut self-locking systems, consult manufacturers' instructions.

If you have a system that differs from what is indicated in this procedure, consult the vehicle manufacturer's recommended procedure.

**WARNING: Never work under a unit supported by only a jack. Always support the vehicle with stands. Block the wheels and make sure the unit will not roll before releasing brakes.**

**CAUTION**: **If your axle is equipped with spoke wheels and the rim clamps have been disassembled to remove the tire and rim assembly, the tire and rim assembly must be reinstalled and the rim clamps properly torqued BEFORE adjusting the wheel bearings. Failure to do this may result in improper wheel bearing adjustment.**

**REFERENCES**
TMC RP 622, *Wheel Seal and Bearing Removal, Installation and Maintenance.*

**PROCEDURES**
**Step 1:** Lubricate the bearing with clean axle lubricant of the same type used in the axle sump or hub assembly.

**IMPORTANT**
**(a) In oil bath systems that rely on differential fill to provide lubricant to the wheel seals, do not pack bearings with grease before installation. Grease will temporarily restrict or prevent the proper circulation of axle lubricant and may contribute to wheel seal failure.**

**(b) Never use an impact wrench to adjust wheel bearings.**

**Step 2:** After the wheel hub and bearings are assembled on the spindle or axle tube, torque the inner (adjusting) nut to 200 lbf• ft (271 N•m) while rotating the wheel hub assembly. Refer to **Table 1** at the end of this Recommended Practice.

**Step 3:** Back off the inner (adjusting) nut one full turn. Rotate the wheel.

**Step 4:** Re-torque the inner (adjusting) nut to 50 lbf• ft (68 N•m) while rotating the wheel hub assembly. Refer to **Table 1** at the end of this Recommended Practice.

**Step 5:** Back off the inner (adjusting) nut. Refer to **Table 1** at the end of this Recommended Practice for the proper back-off amount.

**Step 6:** Install the locking washer.



Issued 3/93

If dowel pin and washer (or washer tang and nut flat) are not aligned, remove the washer, turn it over and reinstall. If required, loosen the inner (adjusting) nut just enough for alignment.

**IMPORTANT**
**Never tighten the inner (adjusting) nut for alignment at this point of the procedure. This may pre-load the bearing and cause premature failure.**

**Step 7:** Install and torque the outer (jam) nut. Refer to **Table 1** at the end of this Recommended Practice for proper torque values.

**NOTE: This adjustment allows the wheel to rotate freely with 0.001" to 0.005" (0.025 mm to 0.0127 mm) end play.**

**Step 8:** Verify end play with a dial indicator. Wheel end play is the free movement of the tire and wheel assembly along the spindle axis.

(a) Make sure the brake drum-to-hub fasteners are tightened to the manufacturers' specifications.

(b) Attach a dial indicator with its magnetic base to the hub or brake drum.

(c) Adjust the dial indicator so that its plunger or pointer is against the end of the spindle with its line of action approximately parallel to the axis of the spindle. See **Fig. 1.**

(d) Grasp the wheel assembly at the 3 o'clock and 9 o'clock positions. Push the wheel assembly in and out while oscillating it to seat the bearings. Read bearing end play as the total indicator movement.

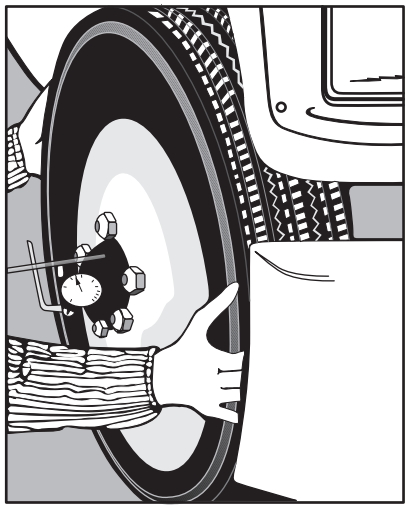
**NOTE: If end play is not within specification, readjustment is required.**

**Step 9: RE-ADJUSTMENT PROCEDURE**

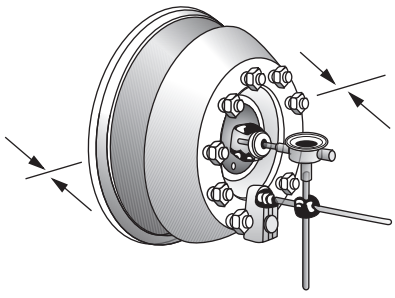
**Excessive End Play**
If end play is too loose, remove the outer (jam) nut and pull the washer away from the inner (adjusting) nut, but not off the spindle. Tighten the inner (adjusting) nut to the next alignment hole of the washer. Reassemble the washer and re-torque the outer (jam) nut. Refer to **Table 1** for torque values. Verify end play with a dial indicator.

**Insufficient End Play**
If end play is not present, remove the outer (jam) nut and pull the washer away from the inner (adjusting) nut, but not off the spindle. Loosen the inner (adjusting) nut to the next alignment hole of the washer. Reassemble the washer and re-torque the outer (jam) nut. Refer to **Table 1** for torque values. Verify end play with a dial indicator.

**FINE TUNING THE ADJUSTMENT**
If, after performing the readjustment procedures, end play is 0.004" - 0.005" (0.102 mm - 0.127 mm) range, repeat the appropriate procedures, removing the washer from the spindle, tighten or loosen



**(a) with tire assembly**



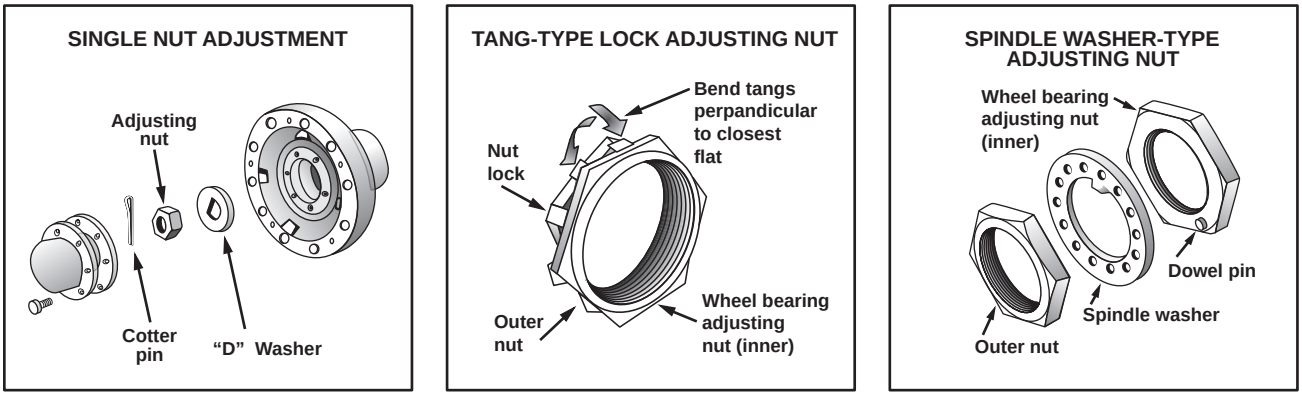

**(b) without tire assembly**

**Fig. 1: Dial Indicator Set-Up**

the inner adjusting nut the equivalent of 1/2 of an alignment hole of the washer, or reversing the alignment washer, and reinstalling it onto the spindle. Reassemble and re-torque the outer (jam) nut. Refer to **Table 1** for torque values. Verify end play with a dial indicator.

**NOTE: Bendable-type washer lock only: Secure nuts by bending one wheel nut washer tang over the inner and outer nut. Bend the tangs over the closest flap perpendicular to the tang. See Fig. 2.**

**CAUTION: Before operating the unit, the wheel hub cavities and bearings must be lubricated to prevent failure. For final wheel end assembly refer to TMC RP 622.**




**"D" Type** **"Tang" Type** **"Dowel" Type**

**Fig. 2: Adjusting Nut Identification and Installation**

## TABLE 1

### WHEEL BEARING ADJUSTMENT PROCEDURE

STEP 1: Lubricate the wheel bearing with clean axle lubricant of the same type used in the axle sump or hub assembly.
**Note: Never use an impact wrench when tightening or loosening lug nuts or bolts during the procedure.**

| INITIAL ADJUSTING NUT TORQUE | INITIAL BACK OFF | FINAL ADJUSTING NUT TORQUE | BACK OFF | | | JAM NUT TORQUE | | ACCEPTABLE END PLAY |
|---|---|---|---|---|---|---|---|---|
| | | | AXLE TYPE | THREADS PER INCH | FINAL BACK OFF | NUT SIZE | TORQUE SPECIFICATIONS | |
| STEP 2 | STEP 3 | STEP 4 | | STEP 5 | STEP 6 | STEP 7 | | STEP 8 |
| 200 lb•ft (271 N•m) While Rotating Wheel | One Full Turn | 50 lb•ft (68 N•m) While Rotating Wheels | Steer (Front) Non-Drive | 12 | 1/6 Turn * | Install Cotter Pin to Lock Axle Nut in Position | | 0.001"-0.005" (.025-.127 mm) |
| | | | | 18 | 1/4 Turn * | | | |
| | | | | 14 | 1/2 Turn | Less Than 2-5/8" (66.7 mm) | 200-300 lb•ft (271-407 N•m) | |
| | | | | 18 | | | | |
| | | | Drive | 12 | 1/4 Turn | Dowel Type Washer | 300-400 lb•ft (407-542 N•m) | As Measured Per Procedure With Dial Indicator |
| | | | | 16 | | Tang Type Washer ** | 200-275 lb•ft (271-373 N•m) | |
| | | | Trailer | 12 | 1/4 Turn | 2-5/8" (66.7 mm) and over | 300-400 lb•ft (407-542 N•m) | |
| | | | | 16 | | | | |

* If dowel pin and washer (or washer tang and nut flat) are not aligned, remove the washer, turn it over, and reinstall. If required, loosen the inner (adjusting) nut just enough for alignment.

** Bendable type washer lock only: Secure nuts by bending one wheel nut washer tang over the inner and outer nut. Bend the tangs over the closest flat perpendicular to the tang.

Recommended Practice

RP 631A VMRS 018

# RECOMMENDATIONS FOR WHEEL END LUBRICATION

## PREFACE

The following Recommended Practice is subject to the Disclaimer at the front of TMC's *Recommended Maintenance Practices Manual*. Users are urged to read the Disclaimer before considering adoption of any portion of this Recommended Practice.

## PURPOSE AND SCOPE

The purpose of this Recommended Practice is to offer equipment users recommendations and operational considerations for selecting lubricants for use in wheel end applications.

This Recommended Practice applies to Class 3-8 trucks, buses, tractors, and trailers designed for on-highway applications.

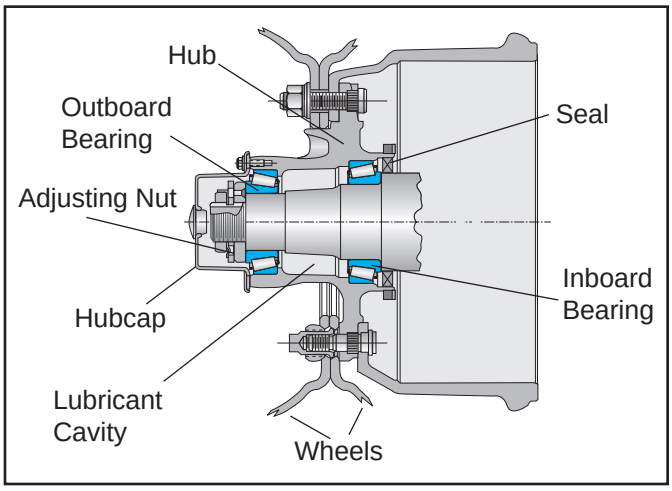



**Fig. 1: Non-Drive Wheel End**

This Recommended Practice applies to only "traditionally" equipped axles and hubs. This Recommended Practice defines "traditionally" equipped axles and hubs as wheel ends equipped with two single row, widespread, tapered roller bearing assemblies which are manually adjusted.

This Recommended Practice addresses two categories of wheel ends: driven and non-driven. Non-driven wheel ends include steer, dolly, trailer, pusher and tag axles. (See **Figures 1 and 2**).

The lubricant used in the wheel ends can be either ***petroleum-based*** or ***synthetic-based*** oils or greases.

## REFERENCE

For additional information on wheel bearing adjustment, installation and maintenance, refer to TMC:

- RP 618, *Wheel Bearing Adjustment Procedures*.
- RP 622, *Wheel Seal and Bearing Removal, Installation, and Maintenance*.

Other relevant TMC Recommended Practices include:

- RP 624, *Lubricant Fundamentals.*
- RP 709, *Hubcap Standardization — Bolted-On Type.*

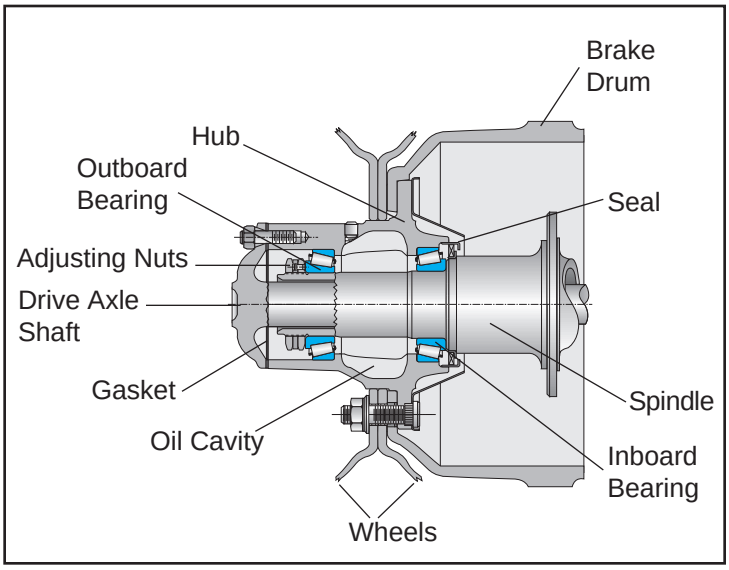



**Fig. 2: Drive Axle Wheel End**





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Fleet managers should also reference original equipment manufacturer (OEM) maintenance and service manuals as appropriate.

## NON-DRIVEN AXLE LUBRICANT CONSIDERATIONS

Non-driven wheel ends can be lubricated effectively with either oil or grease, depending on the fleet application. Both lubricating substances use oil as the lubricating medium. (Refer to RP 624, *Lubricant Fundamentals* for details.)

### A. Non-Driven Oil-Lubricated Wheel Ends

#### Inspection and Preparation

Clean and inspect the wheel end components including all bearings, hubcaps, hub and bearing cups, axle spindle, and fasteners, removing all contaminants and lubricant residue. Replace seal, hubcap gasket, and all questionable parts. For detailed procedures, refer to TMC RP 622.

#### Component Lubrication

Pre-lubricate the inner and outer wheel bearing cones with clean lubricant of the same type used in the hub assembly.

⚠ **CAUTION:** Failure to lubricate bearing correctly, and maintain proper lubrication, may result in bearing damage. For additional information refer to TMC RP 618 and RP 622.

⚠ **CAUTION:** In oil bath systems, do not pack bearings with grease before installation. Grease will temporarily restrict or prevent the proper circulation of lubricant and may contribute to wheel seal failure.

#### Hub Fill Procedures: Oil

Install the wheel seals as documented in RP 622. Apply lubricant to the bearing journals and bearing cones. Use the same lubricant that will be used to lubricate the system. This will help inhibit fretting corrosion and make assembly easier. Use lifting equipment to align the hub assembly with the spindle taking care not to damage the seal and spindle threads. While the hub is supported/suspended, fill the hub cavity with clean oil and push the hub into position, or push the hub into position and then fill the hub cavity.

Install the outer bearing, and adjusting nut systems. Adjust wheel bearings using TMC RP 618 or OEM Maintenance Manual. Verify end play (0.001" to 0.005") with a dial indicator.

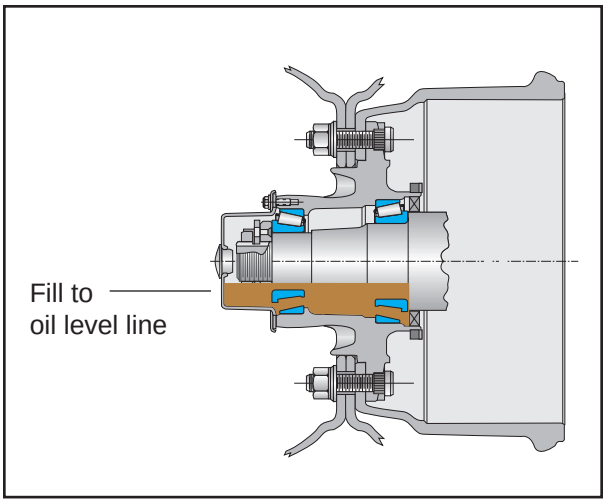


**Fig. 3: Lubrication Fill Oil (Static)**

#### Hubcap Considerations: Oil

Select the proper vented, bolt-on or threaded hubcap for the application and follow hubcap suppliers' instructions for proper attachment to the wheel hub. Fill wheel end assembly through the fill port with the same oil. Allow time for the oil to seep through the outer bearing and fill the hub cavity. Continue to add oil until the oil reaches the oil fill line as indicated on the hubcap. (See **Figure 3**.)

**NOTE:** For hubcaps with side fill plugs, do not allow the oil to go past the centerline or vent hole.

⚠ **CAUTION:** Overfilling or under filling a wheel hub with lubricant may result in premature component failure.

Install center fill or side fill plug. Torque side fill plug to hubcap manufacturer's specifications. Clean-up any over spills that would give the appearance of a leaking hubcap.

### B. Non-Driven Grease-Lubricated Wheel Ends

**NOTE:** Semi-fluid greases are NLGI 000 and 00. NLGI 0 is a soft grease. All three grades listed above are treated as semi-fluid greases in this RP. Hard greases are defined as NLGI 1, 2, and 3 consistencies in this RP.

#### Inspection and Preparation

Clean and inspect the wheel end components including all bearings, hubcaps, hub and bearing cups, axle spindle, and fasteners, removing all contaminants and lubricant residue. Replace seal, hubcap

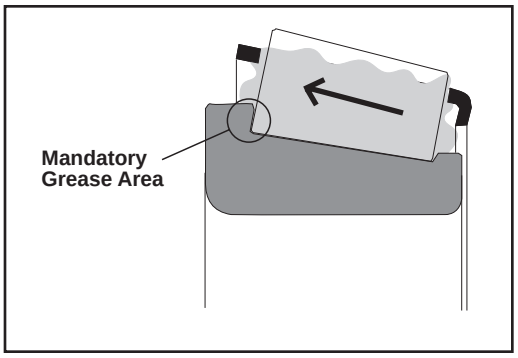


**Fig. 4: Packing of Bearing Cone**

gasket, and all questionable parts. For detailed procedures, refer to TMC RP 622.

**NOTE:** If retrofitting an oil or grease system with a semi-fluid grease, be sure to note the need for special cleaning instructions, fill procedures and equipment (i.e., vented hubcap).

**Component Lubrication**
Pack the inner and outer wheel bearing cones full with grease. Work the grease into the bearing in the direction of the arrow shown in **Figure 4** by machine or hand such that the grease goes under the bearing cage toward the cone rib and roller ends.

For corrosion prevention, place a light film of grease on all metal components, including the hubcap. Wipe off the excess grease. Install the wheel seals as described in TMC RP 622.

**⚠ CAUTION:** Failure to lubricate bearing correctly and maintain proper lubrication may result in bearing damage. For detailed procedures, refer to TMC RP 618 and RP 622.

**Fig. 5: Semi-Fluid Grease Top Off Procedure**

**⚠ WARNING:** If grease packing is done by hand, appropriate protection — such as gloves and clothing — should be worn to minimize skin contact with the grease.

**⚠ CAUTION:** Overfilling or under filling a wheel hub with lubricant may result in premature component failure.

**Hub Fill Procedures: Semi-fluid Grease**
If tires are not mounted, install the hub on the spindle. Take care to not damage the seal. Use lifting equipment to align the hub assembly with the spindle taking care to not damage the seal and spindle threads and push the hub assembly into position.

With the hub supported, before installing the outer bearing cone, begin filling from the bottom of the hub cavity. Top-off by placing the pump nozzle above the spindle, and continue pumping grease into the hub cavity. (See **Figure 5**.)

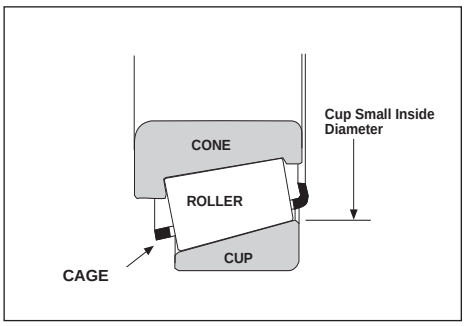


**Fig. 5B: Tapered Bearing Nomenclature**

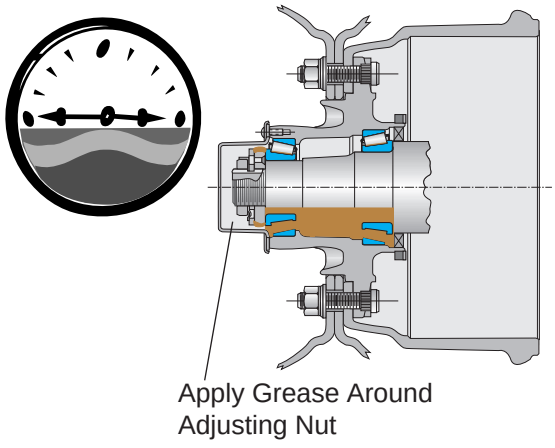


**Fig 5A: Lubrication Fill
Semi-Fluid Grease (No. 00)**

**Fig. 5C: Using Template to Hold Lubricant**

The grease fill amount should be to a 3 o'clock and 9 o'clock level. This represents 50 percent hub cavity fill. (See **Figures 5A and 5B**.)

**NOTE**: A template may be used to hold the lubricant in place while filling the hub cavity. (See **Figures 5 and 5C.**)

⚠ **CAUTION:** Make sure that there are no air-pockets trapped under the grease. If pumping equipment is used, ensure the pump does not aerate the grease. Aeration of the grease may result in underfilling.

Install the outer bearing, washers and adjusting nuts. Adjust wheel bearings per TMC's RP 618 or per OEM Maintenance Manual. Verify end play (0.001" to 0.005") with a dial indicator. Before installing the hubcap, apply a coating of grease around the wheel bearing adjustment nut(s).

**Hubcap Considerations: Semi-fluid Grease**
Use an appropriate tamper-proof, vented hubcap. These hubcaps prevent gear oils from being accidentally added to grease-filled wheel ends.

**NOTE:** Because of the hubcap's special venting capability and the properties of the semi-fluid grease, do not fill the hubcap with grease.

**NOTE:** If a metal hub cap is used, it is necessary to coat the interior surfaces with a film of grease. Use special care not to cover the vent with grease.

**Hub Fill Procedures: Hard Grease**
Before installing the hub, pack grease into the hub cavity. Fill the circumference of the hub cavity using the bearing races as the proper level guide. (See **Figure 6**.)

Use lifting equipment to align the hub assembly with the spindle taking care to not damage the seal and spindle threads. Push the hub assembly into position.

Install the outer bearing, washers and adjusting nuts. Adjust wheel bearings per TMC's RP 618 or OEM Maintenance Manual. Verify end play (0.001" to

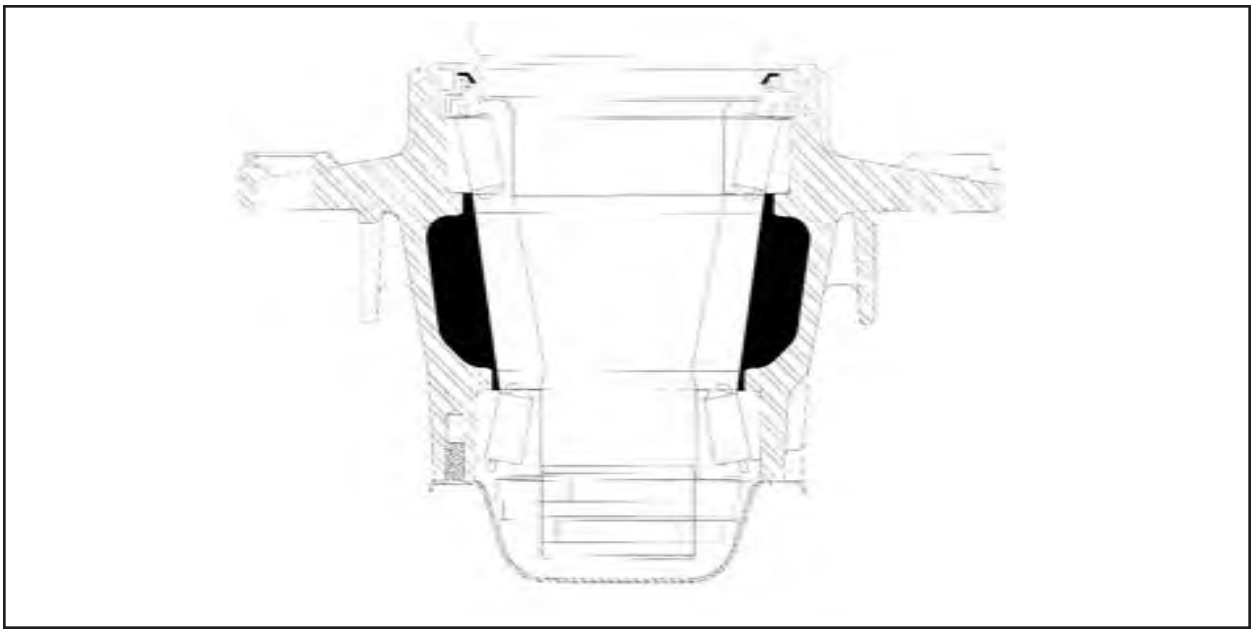

**Fig. 6: Lubrication Fill Greases (Nos. 1,2, & 3)**

0.005") with a dial indicator. Apply a coating of grease around the adjusting nut(s).

**Hubcap Considerations: Hard Grease**
Use an appropriate tamper-proof, hubcap. These hubcaps prevent gear oils from being accidentally being added to grease-filled wheel ends. Follow the recommendation of the seal supplier to determine if the hubcap should be vented or non-vented.

**NOTE:** If a metal hub cap is used, it is necessary to coat the interior surfaces with a film of grease. Use special care not to cover the vent with grease.

**DRIVEN AXLE LUBRICANT WHEEL END CONSIDERATIONS**

**NOTE:** In this Recommended Practice, all driven axles are oil lubricated.

**Inspection and Preparation**
If the wheel end is disassembled, clean and inspect the wheel end components including all bearings, axle shafts, hub and bearing cups, axle, and fasteners, removing all contaminants and lubricant residue. Replace seal, axle flange gasket, and all questionable parts. For detail procedures, refer to TMC RP 622.

**Component Lubrication**
Pre-lubricate the inner and outer wheel bearing cones with clean lubricant of the same type used in the axle reservoir.

**⚠ CAUTION:** Failure to lubricate bearing correctly and maintain proper lubrication may result in bearing damage. For additional information refer to TMC RP 618 and RP 622.

**⚠ CAUTION:** In oil bath systems, do not pack bearings with grease before installation. Grease will temporarily restrict or prevent the proper circulation of lubricant and may contribute to wheel seal failure.

**Hub Fill Procedures: Oil**
Install the wheel seals, as documented in RP 622. Fill hub cavity with oil. Use lifting equipment to align the hub assembly with the spindle taking care to not damage the seal and spindle threads. Push the hub assembly into position.

While the hub is supported, fill the hub cavity with clean oil and push into position or push into position and then fill the hub cavity.

Install the outer bearing, washers and adjusting nuts. Adjust wheel bearings per TMC's RP 618 or OEM Maintenance Manual. Verify end play (0.001" to 0.005") with a dial indicator.

Install the flanged drive axle shaft with a new axle flange gasket. Torque flange nuts to axle manufacturer's specification. Clean-up any over spills that would give the appearance of a leaking system.

Oil is supplied directly to the wheel ends at assembly and through the axle tube during operation. To achieve final fill level, each end of the drive axle must be raised a minimum of eight inches for one minute to move the lubricant into the opposite wheel end. Recheck the main sump for the proper oil level and top off the lubricant level, if required. The oil fill level is always to the bottom of the fill plug or hole in the axle reservoir.

**⚠ CAUTION:** Do not pack the drive axle wheel bearings with grease when the wheel ends will be lubricated with oil from the axle differential. (See RP 622 and RP 618.)

**NOTE:** Always check the axle breather to be sure it is operating properly and completely free of dirt and debris.

**MAINTENANCE AND INSPECTION REQUIREMENTS**
The following inspection criteria are intended for units whose vocation is strictly on-highway use only. The inspection criteria are not intended for unitized or pre-set wheel ends, refer to systems manufacturer for inspection and service recommendations.

These recommendations depend on the proper assembly of the system, including the proper lubricant fill level.

**A. OIL LUBRICATED WHEEL ENDS INSPECTION CRITERIA**

**Level 1—Simple Inspection (Pre-Trip/In-Service)**
Walk around vehicle and check wheel-ends for obvious signs of lubricant leakage, such as hubcap gasket and wheel seal areas, oil soaked brake linings. Check for broken or missing components. Any seepage is reason for further inspection and appropriate action.

Take appropriate action if leaks or oil soaked brake linings are noted.

**NOTE FOR DRIVERS:** After making an en route stop, walk around the unit and feel the hubs. If there is any significant differences in temperatures or excessive temperature, contact your maintenance department. When feeling hubs for temperature, seasonal influences should be taken into consideration.

If wheel-ends are equipped with a sight glass on the hubcaps, check to ensure the oil is at the proper fill level.

**NOTE:** Oil residue may be present at the vent area. This is an indicator that the system is venting properly. This should not be construed as system leakage.

**Level 2—100,000 miles or Annual Inspection:**
For non-driven axles check lubricant level and condition. If lubricant is contaminated replace old lubricant with the same type lubricant. If lubricant condition is good and level is low, fill to the proper level. Check for any signs of leakage at the seal or hubcap gasket areas. Check for oil soaked brake linings.

For driven axles, check for any signs of leakage at the seal or axle flange gasket areas. Also check for leaks at hub fill hole if so equipped. Check for oil soaked brake linings.

Take appropriate action if leaks or oil soaked brake linings are noted.

**B. GREASE LUBRICATED WHEEL ENDS INSPECTION CRITERIA**

**Level 1—Simple Inspection (Pre-Trip/In-Service)**
Walk around vehicle and check wheel-ends for obvious signs of lubricant leakage, such as hubcap gasket and wheel seal areas, grease soaked brake linings. Check for broken or missing components. Any seepage is reason for further inspection and appropriate action.

**NOTE FOR DRIVERS:** After making an en route stop, walk around the unit and feel the hubs. If there is any significant differences in temperatures or excessive temperature contact the maintenance department. When feeling hubs for temperature, seasonal influences should be taken into consideration.

**Level 2—Detailed External Inspection (Conducted at PM or at least annually)**
Check wheel-ends for obvious signs of lubricant leakage, such as hubcap gasket and wheel seal areas, grease soaked brake linings. Any seepage is reason for further inspection and appropriate action.

Raise the vehicle and check for smooth rolling of wheels. Check for signs of excessive end play in the wheel-end. This does not include removal of the hub cap.

**NOTE:** Leaking grease may not spread over the hub and brake components as with hubs filled with oil. When inspecting for grease leaks the inspection must be done very carefully with the aid of a bright beam of light from a flashlight or droplight.

**NOTE:** Some grease seals will purge very small amounts of grease in normal operation.

If there is seepage around the hubcap flange area, take appropriate action to eliminate seepage as directed by your maintenance instructions.

If leakage in the seal area is found, remove the wheel end and replace the hubcap gasket, seal and lubricant. Inspect the spindle and bearings for damage and replace if needed. Anything abnormal requires Level 3 Inspection.

**⚠ CAUTION:** A clogged vent can damage the wheel seal allowing internal pressure build up in the wheel end.

**Level 3—Lube Level Inspection (Per OEM Recommendation)**
When using grease in a wheel-end the only method to accurately check the lubricant level is by pulling the outer bearing. If using a hard grease, there is no need for a Level 3 Inspection.

**⚠ CAUTION:** Failure to remove the outer bearing may provide a false lubricant level reading.

To verify proper lube level the following procedures need to be performed.

1. Before performing any maintenance on the vehicle take appropriate action to ensure the vehicle is safely secured.
2. Remove hubcap, hubcap gasket and inspect hubcap for adequate venting capabilities.
3. Verify wheel-bearing end play for conformance to RP 618.
4. Record end play measurements.

**⚠ CAUTION:** Apply the parking brake, if axle is equipped. This will ensure that the wheel/hub

assembly is supported and held steady during removal of the spindle nut and outer bearing. This will eliminate the possibility of spindle, bearing or seal damage due to the cocking or slipping of the wheel-hub assembly.

⚠ **CAUTION:** Care should be taken so the wheel-end assembly is properly supported.

5. Remove adjusting nuts.
6. Remove outer bearing.
7. While maintaining proper support to the wheel-end or hub, visually check lube level. In a semi-fluid grease system, if the lubricant flows out of the hub cavity, the hub cavity should be refilled to the 3 o'clock and 9 o'clock level. This represents 50 percent hub cavity fill. (See **Figures 5 and 5A**.)

In a semi-fluid grease system, if the grease doesn't flow, inspect lubricant condition in the hub cavity. Go to Level 4 Inspection if abnormal conditions are noted. If no abnormal conditions are noted, add grease until it flows out of the hub cavity.

**NOTE:** If changing grease types or brands, contact your lubricant supplier to insure compatibility.

8. Clean bearing and inspect for wear and damage. When reassembling industry standard wheel-ends, assemble per RP 618.

**NOTE:** Manufacturer is defined as the final assembler of the product or the particular system supplier.

**Level 4—Wheel-end Disassembly Inspection (Complete System Tear-down)**
If any abnormal conditions are found during inspection Levels 1, 2, or 3, remove wheel-end for inspection.

Lube change intervals as determined by the manufacturer dictate when Level 4 service is performed.

**NOTE:** Manufacturer is defined as the final assembler of the product or the particular system supplier.

When reassembling industry standard wheel-ends, assemble per RP 622 and RP 618. Seals and gaskets must be replaced.

**Failed Component Analysis**
Save prematurely failed parts and lube samples for analysis. The lubricant sample collected should be at least four ounces. A similarly sized new lubricant sample (not previously used) is also required. This will aid in supplier assisted detection and prevention of premature failures. The components' history of usage should also be provided (i.e., vehicle's vocation, mileage, maintenance records, and history of inspection and repair/replacement of components such as seals, seal wear rings, lubricant, bearings, etc.).

**OPERATIONAL CONSIDERATIONS FOR LUBRICANTS**
Service interval ranges from 100,000 miles to five years in over-the-road service, depending on axle type, manufacturer recommendations, and lubricant performance. Mineral oil based lubricants have lower initial costs than synthetics lubricants, but need to be changed more frequently in some equipment. When choosing a lubricant, the fleet needs to consider:

- the manufacturer's recommendation for the axle make and model in service.
- the fleet savings associated with extended service intervals.
- the total cost of the lubricant.

**NOTE:** Because seal performance may vary when switching lubricants, consult your seal supplier for compatibility concerns.

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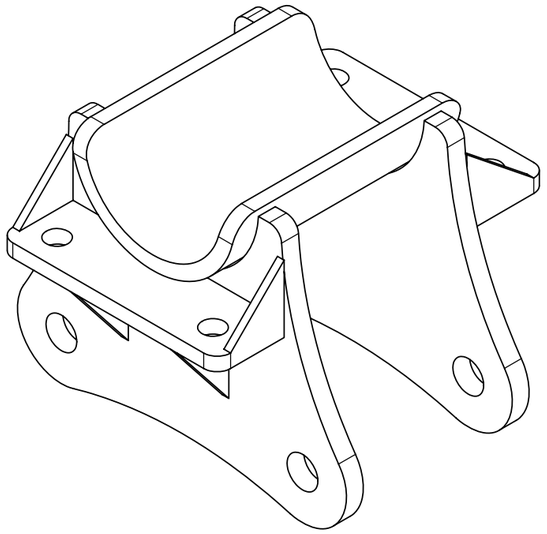
| REV. | DESCRIPTION | ECN | DATE | BY |
|---|---|---|---|---|
| A | NEW DRAWING | - | 03/01/95 | RON |
| B | CORRECTED NOTE 4 | 3042 | 12/03/03 | JFF |
| C | ADDED DANA & MERITOR SPECS | 3042 | 12/09/03 | JFF |
| D | ADDED SUDISA NOTE 4 | 3042 | 12/10/03 | JFF |
| E | CHANGED NOTE 4 & 6 | C-5073 | 12/26/07 | EFR |
| F | CHANGED NOTE 4 BACK | C-5305 | 04/03/08 | EFR |
| G | INTO SOLIDWORKS AND UPDATED | C-6299 | 4/22/2009 | TEG |

# WELD PROCEDURE FOR 1/2 ROUND ARM/SEAT TO AXLE ONLY

FOR OTHERS SEE PAGE 2



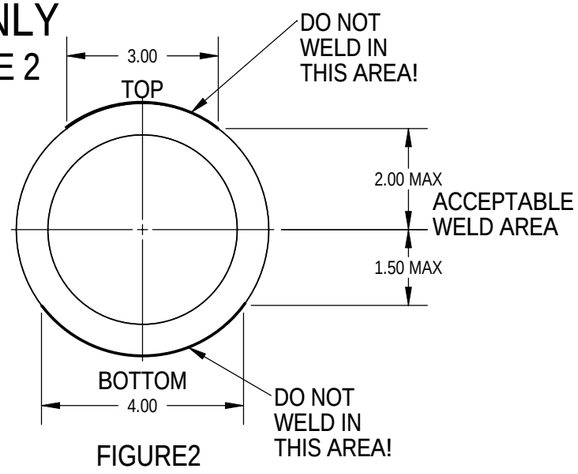
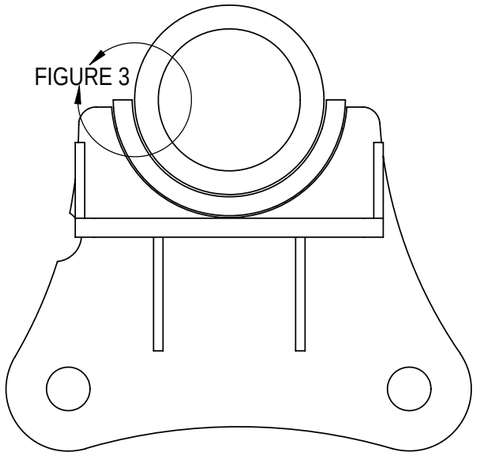



FIGURE2

NOTES:
1. AXLE SEATS TO BE CLAMPED SECURELY IN THE PROPER POSITION WITH ARMS PARALLEL AND SQUARED IF ASSEMBLED.
2. THE WELDING RODS SHOULD CONFORM TO AWS GRADE E-7018 (OVEN-DRIED) OR COMPARABLE. USE COMPARABLE WIRE IS USING MIG WELDER.
3. AXLE TUBE AND AXLE SEATS MUST BE CLEANED.
4. DO NOT WELD AXLES WHEN AXLES ARE COLD. NORMAL PREHEAT RECOMMENDATIONS ARE BETWEEN 100 AND 300 DEGREES F. CONSULT AXLE MANUFACTURER IF NECESSARY.
   (E)--IMT REQUIRES 60-200° F PRIOR TO WELDING.
   --DANA REQUIRES AXLE AND MATING BRACKETS MUST BE 60° F PRIOR TO WELDING.
   (F)--MERITOR REQUIRES AXLE TUBE AND HARDWARE BEING WELDED TO AXLE TO BE MINIMUM OF 60° F PRIOR TO WELDING.
   (D)--SUDISA REQUIRES AXLE TUBE AND HARDWARE BEING WELDED TO AXLE TO BE MINIMUM OF 60°F PRIOR TO WELDING.
   IF OTHER MANUFACTURER'S AXLE IS USED, CONSULT THEM PRIOR TO WELDING, FOR PREHEAT SPECIFICATIONS.
5. APPLY WELDS IN THE SIZES AND SEQUENCE SHOWN IN FIRGURE 1, AND 3. APPLY WELDS IN AREAS SHOWN IN FIGURE 4. THE ELECTRODE SHOULD BE BACKED UP TO FILL IN THE FILLET CRATER AT THE END OF EACH PASS.
   (E) THE CORNERS SHOULD BE WRAPPED. CLEAN THE WELD BETWEEN EACH PASS.
6. SEQUENCE 1 SHOULD BE PERFORMED ON BOTH AXLE SEATS PRIOR TO CONTINUING WITH PASSES 2 AND 3. THE SEQUENCE SHOULD BE PASS #1 ON BOTH AXLE SEATS, THEN PASS 2 AND 3 ON EACH SEAT IN SERIES.



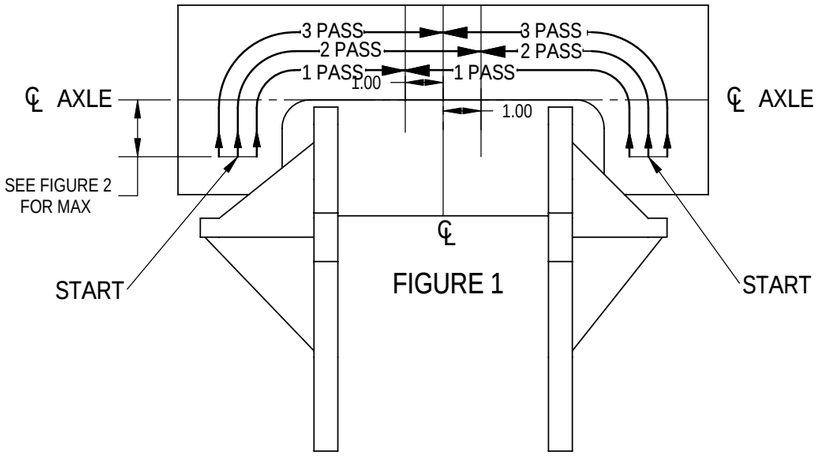
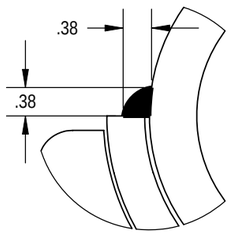
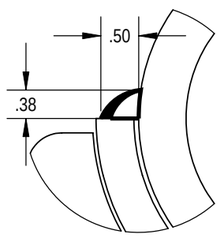




FIGURE 1

DO NOT "TEST THE ARC" ON THE AXLE BEAM

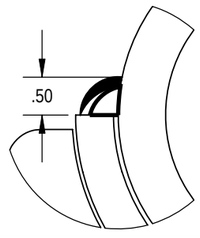



FIRST PASS




SECOND PASS

FIGURE 3




THIRD PASS

**NOTE: PARENTHESIS ( ) DENOTES REFERENCE DIMENSION**

WELD PROCEDURE FOR 1/2 ROUND ARM/SEAT TO AXLE ONLY

FOR OTHERS SEE PAGE 2

| DEPTS AFFECTED | TOLERANCES (EXCEPT AS NOTED) | DESCRIPTION: AXLE SEAT WELDING SPECS | | |
|---|---|---|---|---|
| - | DECIMAL ± .06 | PREVIOUS ASSY: - | SHEET: 1 OF 2 | WATSON & CHALIN |
| - | FRACTIONAL ± 1/16 | SUSPENSION MODEL: - | SCALE: 1:1 | |
| WEIGHT: - | ANGULAR ± 1° | DATE: 03/01/95 / DRAWN BY: RON | SIZE: B | DRAWING NO: 11621 |

# WELD PROCEDURE FOR MONO PIVOT BUSHING TYPE ARMS

## REFER TO ES006 FOR ALIGNMENT TO AXLE

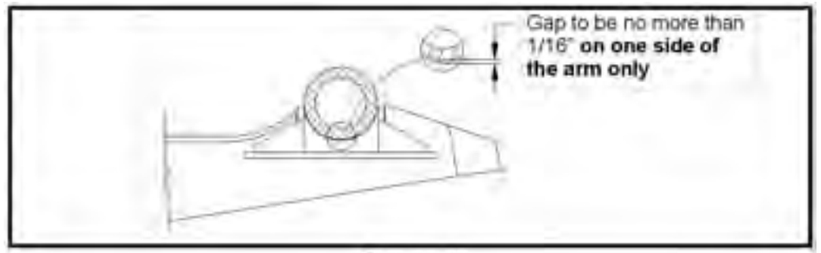



Figure 4

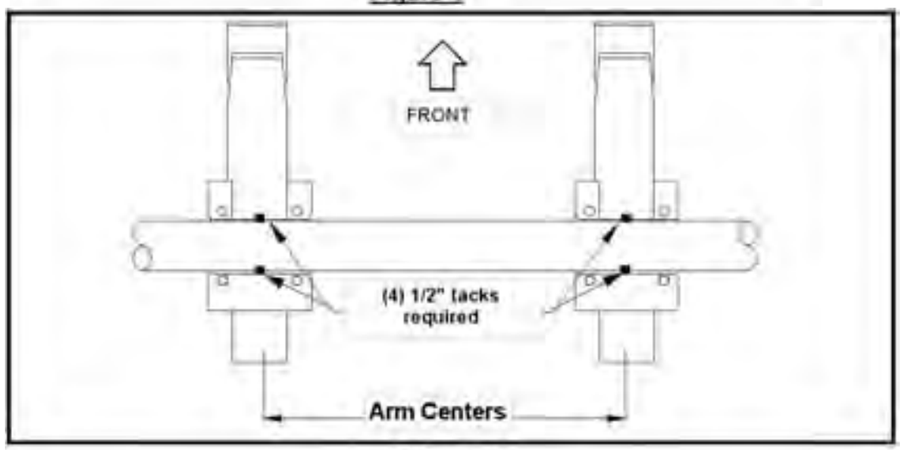



Figure 5

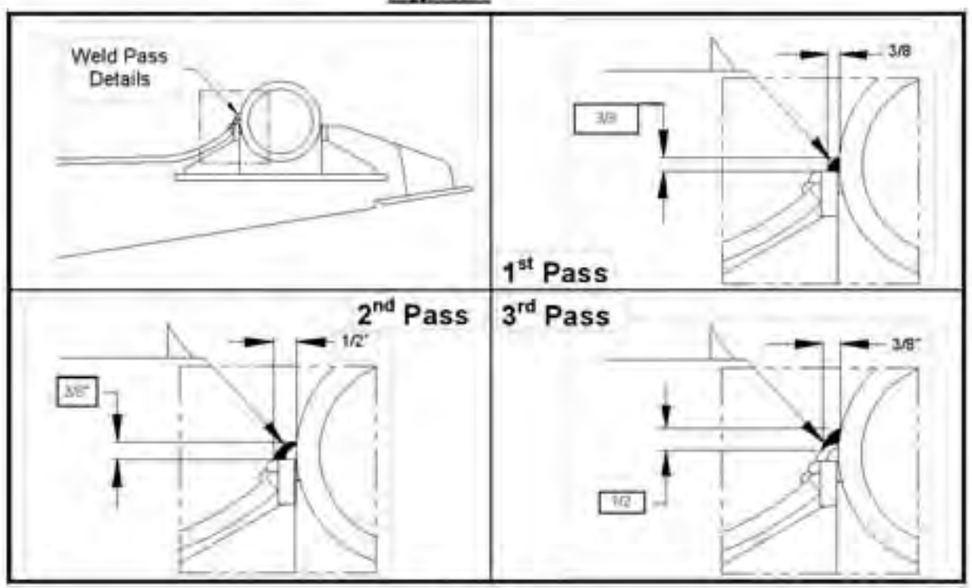



Figure 6

## Preparation

1. The surface must be free of paint, water, and other contaminants where welding is to occur.
2. Suspension parts must be at least 60°F. * Normal recommendations is to preheat 100-300 degrees F.

*** Note:** Some axle manufacturers recommend preheating the axle before it is welded. Consult the axle manufacturer for recommended guidelines on welding to the axle.

3. Welding needs to be done in a flat horizontal position.

## Welding Procedures

**Warning ! Clean welds between passes and incorporate tacks into the first pass on the tacked side. Fill weld craters and avoid undercuts and cold laps over welds.**

**Welds should not be started or stopped at the end of the weld pass.**
**They should stopped and started away from the ends as shown in Figure 7.**
**Do not wrap the corners of the axle seat while welding.**

1. Three passes are required on each area where the axle is welded to the arms. **Figure 6** shows the size of the weld of each pass.
2. Start welding in the sequence shown in **Figure 7** at the rear side where the axle and seat meet . Make all first pass welds at all areas before proceeding to the second pass.
3. **Figure 7** also shows the length of weld for both overslung and underslung models.

## Welding Axle to Suspension

### Weld Specifications

**Caution ! The welding procedures must be followed carefully to avoid damage to the axle and suspension which could cause an accident and or serious personal injury.**

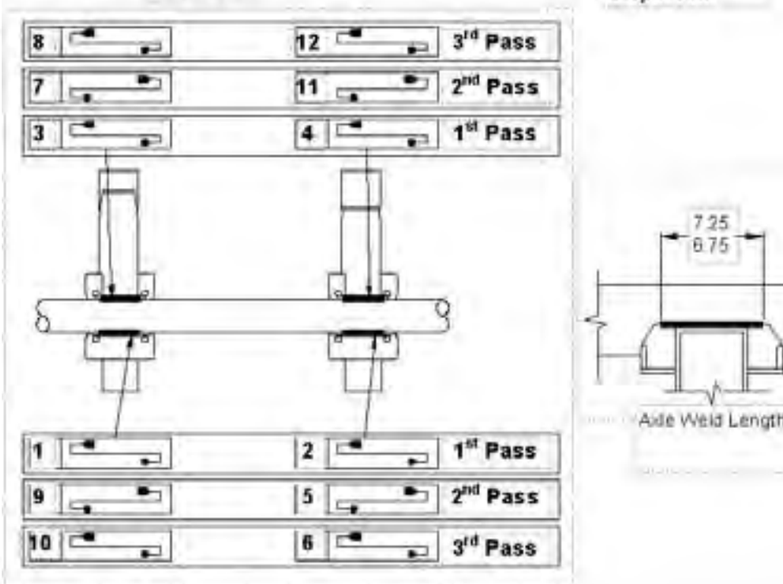
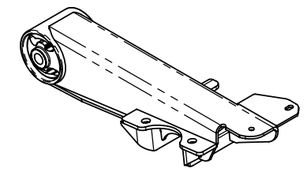
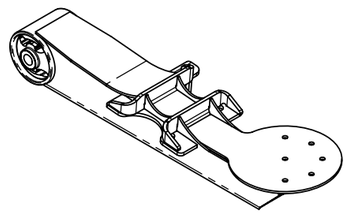



Figure 7

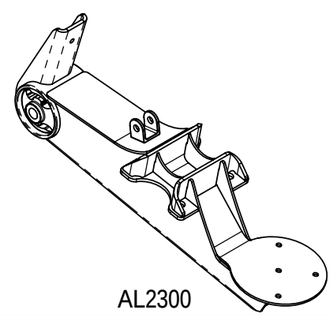
## WELD PROCEDURE FOR COMMON:



TA250/300 TOP MOUNT



TA250/300 UNDERSLUNG



AL2300

| | | | | |
|---|---|---|---|---|
| DESCRIPTION: AXLE SEAT WELDING PROCEDURE<br>SHEET: 2 OF 2 | | | | WATSON & CHALIN |
| DATE: 04/22/09 | SCALE: 1:8 | DRAWN BY: tgreaves | SIZE: B | DRAWING NO: 11621 |