



May 19, 2022

David L. Mayer, PhD  
Chief Executive Officer  
Washington Metrorail Safety Commission  
750 First Street, NE, Suite 900  
Washington, DC 20002

VIA Email

Dear Dr. Mayer:

Please find attached a link to WMATA's Return to Service Plan, which details how Metrorail plans to return each 7000 series railcar to passenger service, in accordance with the WMSC's orders dated October 17, 2021 and December 29, 2021.

All documents have been produced over recent weeks under the oversight of WMSC, with multiple written reviews and virtual working sessions. We now submit the whole package for WMSC's approval.

The Return to Service Plan has the following appendices:

Appendix A: MSI 140026 Rev.03, Wheel Back-to-Back and Journal Bearing Measurements

Appendix B: SBF 110 Rev. 04, Removing a 7K Car from Service Due to Back-To-Back Failures

Appendix C: MSI 000002 Rev. 00, Back to Back Tools – CMM Calibration Procedure

Appendix D: MSI 000003 Rev. 00, Procedure for Utilizing Tread Worn Hollow Gauge

Appendix E: CMOR SOP 10x.0x, Control of 7K Vehicles for Compliance with Wheelset Requirements

Appendix F: CMOR SOP 101.02 Procedures for Control of Non-Revenue 7K Vehicles and Release for Mainline Travel

Appendix G: Training Roster and Curricula for MSI 140026 and CMOR SOP 10x.0x

Once Metro receives WMSC's concurrence with the plan, Metro will then pass the documentation through internal controls and approvals prior to issuance.

Metro commits to continuing to keep the WMSC apprised daily of inspection activities and analysis of measurements. Any subsequent changes to the procedural documents listed above will first require review and approval by WMSC before issuance and implementation.

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Transit Authority**

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*A District of Columbia,  
Maryland and Virginia  
Transit Partnership*

Metro is proposing a phased approach to returning the 7000 series railcars. Once Metro successfully and safely implements Phase 1 using manual inspection methods, Metro will take a staged approach to introduce new wayside inspection devices, referred to as Automated Wayside Inspection System (AWIS), to supplement the inspections. AWIS provides automated measurements every time a train passes through in the normal direction of traffic. Metro will undertake a rigorous and iterative process to evaluate the performance of the AWIS system and develop the successive phases of the plan in consultation with critical stakeholders, including the WMSC. The immediate focus of using AWIS is to monitor back-to-back gauges. Metro's long-term vision is to use AWIS for other measurements to improve maintenance activities.

Metro will provide the WMSC with a plan for using AWIS as a method of monitoring back-to-back gauges, including all documentation needed to put the system into service. With the introduction of AWIS, Metro will reduce the single service-day inspection to another inspection interval. Metro will base this inspection interval on ETP results. All procedural items related to AWIS and changes to inspection intervals will be sent to WMSC for review and approval before advancing to implementation.

As we progress through the phases, once AWIS is validated with ongoing reporting of back-to-back measurements, we will evaluate the appropriate interval for manual inspections. Metro's plan at this time – based on the data available - is to extend the inspection interval from every day of service to a seven-day manual inspection interval. The current plan for a seven-day interval was derived from the results of the fleetwide inspection that occurred after the derailment and available data on historical failures. From this data set, the worst-case wheel movement was calculated as a function of time, and the minimum inspection interval of 10 days was determined. Metro conservatively applied a 20% safety factor to the calculation, reducing the inspection interval to eight days. Introducing additional safety factors, the interval was further reduced to seven days.

To validate the proposed inspection interval, an Engineering Test Plan (ETP) was conducted. ETP 140107 required that two consists comprised of cars with mixed pressing tonnage be operated at a load weight of AW2 (26,250 lbs.) for 800 miles on each of the Metro lines, for a total of 4800 miles. The duration of the test was determined by considering that vehicles can operate up to 400 miles/day for a period of 10 days, or 4000 miles. Applying a 20% safety factor to the duration yields 4800 miles. The back-to-back dimension of each wheelset (64 total) was measured daily after the operation for that day was completed.

David L. Mayer, PhD  
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The seven-day inspection interval was validated with the completion of 4800 miles during the ETP test period (15 days). The measured back-to-back data shows that no wheel movement exceeding the specified tolerance occurred on any wheelset (64 total). The detailed results have been submitted via ETR 140107, Rev. 01.

In addition, the 7000 series vehicle wheels have been prone to develop an Out-of-Round (OOR) condition during revenue service. Metro has been conducting a long-term test (nine months) to monitor the progression of the OOR condition and identify the root cause of this phenomenon. The test vehicles (7740/41 & 7742/43) are operated at a load weight of AW0 (empty railcar weight) and have accumulated over 8700 miles. The back-to-back measurements, performed on a seven-day interval, are fully compliant with Maintenance Service Instruction (MSI) 140026, Revision 02 with no recorded failures.

On behalf of Metro, I wish to express our gratitude to the WMSC for your attention and consideration as we matured our proposal. We remain committed to improving the safety of the Metrorail system.

Sincerely,

Theresa Impastato  
WMATA

Digitally signed by Theresa Impastato  
Date: 2022.05.19 14:59:59 -04'00'

Theresa M. Impastato  
Executive Vice President and Chief Safety Officer

Attachments



# Return to Service Plan

## Re-introduction of 7000-series railcars into passenger service

May 19, 2022

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## 1. PURPOSE OF DOCUMENT

This document explains Metro's process for safe re-introduction of 7000-series railcars into passenger service using new technologies and procedures. The plan consists of lessons learned, details on inspection intervals, explanation of processes for controlling cars, and criteria to enter service in a phased approach.

## 2. COORDINATION WITH WASHINGTON METRORAIL SAFETY COMMISSION (WMSC)

Any changes to this document will be submitted to WMSC. WMSC will review and respond no later than 14 days after submission.

To move forward into the next phase, listed in [Section 6](#), Metro will submit notice and all supporting materials to WMSC. Metro will not enter the next phase without satisfying phase requirements and receipt of no technical objection from WMSC.

## 3. LESSONS LEARNED

### 3.1. Tooling Limitations

Metro has been using a back-to-back gauge with a graduated scale (1/16" increments), in the same manner as a ruler. An exact measurement can be only achieved with this incremental gauge when the gauge sleeve is directly on a graduated line. If the gauge sleeve lies between graduated lines, 1/32" is added to the value from the next visible line.

It is now understood that the incremental gauge is insufficient in accuracy for the required tolerance on the back-to-back distance. Data from the reported failures per MSI 140026, Rev. 01 and 02 were remeasured utilizing the calibrated ORX dial gauge. An average difference of 0.022" was found between the distance measured via the incremental gauge versus the dial gauge. Relative to the pass/fail criteria, this observed difference is significant and indicates that use of the incremental gauge may have resulted in incorrect reporting of wheel movement.

### 3.2. Process Improvements Introduced by New and Revised Documents

Use of a new digital indicator gauge has been introduced in [MSI 140026 Rev. 03, Appendix A](#). The digital indicator gauge was qualified under Data Collection, Measurement and Validation (DCMV) 000011 Rev. 05. The digital indicator gauge provides a numerical display of the measurement which eliminates the need to interpret a graduated scale. The digital indicator gauge assembly is accurate to  $\pm 0.003$ ".

The revised MSI establishes a baseline for each wheelset by measuring four back-to-back dimensions around the wheel perimeter. The number of measurements required exceeds that defined in industry standard American Public Transportation Association (APTA) PR-M-S-019-17, Passenger Wheel Set Assembly, and best practices of wheelset assembly suppliers, including ORX. The maximum wheelset back-to-back dimension is then used to compare all subsequent periodic measurements.

Periodic measurements are performed at defined intervals at two locations on each wheelset. A maximum acceptable back-to-back dimension (Specified Wheelset Limit) is established for each wheelset, in consideration of the combination of tolerances that affect the back-to-back measurement. Wheelsets that exceed either the Specified Wheelset Limit or OEM defined back-to-back dimension must be replaced.

In addition, the journal bearing gaps are measured for each wheel. The sum of the journal bearing gaps must be less than 0.020" to maintain compliance. Wheelsets with non-compliant journal bearing gaps must be replaced.

Metro has developed an improved quality process to provide oversight of the back-to-back measurement process. Office of Car Maintenance (CMNT) and Office of Railcar Quality Assurance and Warranty Compliance (RQAW) work together to ensure wheelset compliance. CMNT executes the back-to-back measurements in

accordance with the MSI procedure. RQAW inspectors provide independent observation and recording of the measurement process and maintain all inspection records.

Metro has also developed a process that removes a 7000-series railcar from service if the back-to-back measurements are out of tolerance. This process is documented in [SBF 110 Rev. 04, Removing a 7K Car from Service Due to Back-To-Back Failures, Appendix B](#).

#### **4. INSPECTION INTERVAL**

Metro reiterates its commitment for a safe return to service of the 7000-series railcar fleet. Metro understands the root cause of the wheel migration has not been identified and resolved and is wholly committed to the safe and reliable return to service of the 7000-series through carefully controlled operation of the vehicles within the specified criteria for the wheelsets.

Therefore, Metro proposes that return to service of the 7000-series railcars be accomplished with a phased approach which institutes requiring daily (single-service) inspection, restrictions on car mileage, increased periodic inspection intervals and scope of the inspection, and additional RAIL policies and training. These requirements are detailed in the following sections as well as the appendices.

#### **5. CONTROL OF CARS**

In addition to Periodic Inspection (PI) requirements, active 7000-series railcars are required to maintain ongoing compliance with wheelset requirements. Wheelsets are inspected manually per MSI 140026, Rev. 03. Wheelsets must successfully complete inspection within the specified interval to remain compliant. The CMNT Service Delivery Team actively monitors and responds to wheelset inspection results, ensuring that non-compliant cars are prevented from service use.

Car status is controlled through MAXIMO, where Preventive Maintenance (PM) work orders cause an automatic trigger for wheelset inspection to be performed per the specified interval. Failing inspection results require removal of the car from service per [SBF 110 Rev. 04, Removing a 7K Car from Service Due to Back-To-Back Failures, Appendix B](#).

The standard operating procedure for this can be found in [CMOR SOP 10x.0x, Control of 7K Vehicles for Compliance with Wheelset Requirements, Appendix E](#).

#### **6. PHASES OF RETURN TO SERVICE**

Metro is proposing a multi-phase plan for the return of 7000-series railcars to passenger service. Metro shall submit to WMSC for approval a request for transitioning to each phase, including supporting documentation as necessary.

The phases of the plan and the documentation that will be provided before entering the phase are listed in [Table 1](#).

Table 1: Summary of Phases of Return to Service

Phase	Manual Inspection Interval	Criteria to Enter Phase
Phase 1	Single service-day manual inspection	MSI 140026, Rev. 03, approved and implemented MSI 000002, Rev. 00, approved and implemented MSI 000003, Rev. 00, approved and implemented SOP 10x.xx, approved and implemented System changes to MAXIMO and RPM implemented Training materials, approved Required thresholds for persons to be trained Training records for persons associated with car inspection, control, and operations All tools and equipment readily available at required inspection shops Proactive use of Vehicle Track Interaction (VTI)
Phase 2	To be determined by WMATA and approved by WMSC	To be determined by WMATA and approved by WMSC
Phase 3	To be determined by WMATA and approved by WMSC	To be determined by WMATA and approved by WMSC

**NOTE:** Single service day is defined as a single day of mainline operation in passenger service for operating hours, open to close.

If a car qualified for service has entered the mainline, the car will be qualified for passenger service for one single service day.

Cars qualified for service which have not entered mainline shall be considered qualified for passenger service for a maximum period of seven (7) days.

Cars that have entered the mainline for yard-to-yard movement/non-revenue operations may continue to be used for yard-to-yard movement/non-revenue operations for seven (7) days before needing another inspection. These cars may not be used for passenger service until they are qualified per MSI 140026.

### 6.1. Release of 7000-series Railcars

During Phase 1, WMATA will have a limited release of up to eight (8) 7000 series railcar consists per service day. Per **Section 2**, any proposed increase to the number of cars in service shall be submitted to WMSC.

Acceptable car numbers are 7500-7747 (248 cars). If these car numbers change, the revised list will be provided to all relevant Metrorail personnel and the WMSC. From this railcar population, WMATA will select railcars with mileage less than 350,000 as of May 17, 2022.

Out of the acceptable car numbers, WMATA will qualify two groups of eight consists. WMATA will assign the consists to A/B groups and operate on alternate days to allow time for completion of required back to back measurement and quality control processes. Additional cars required to replace cars in these groups shall be used from the acceptable car numbers.

There will not be a daily mileage limit. The proposed inspection intervals limit the mileage between inspections.

## 6.2. Operating Lines and Shops

WMATA will operate 7000-series cars on any of the operational lines.

WMATA may utilize all service & inspection (S&I) shops for single service-day manual inspections as long as they meet the criteria mentioned in **Table 1** and have the appropriate facilities to perform the MSIs.

Yards without an available pit (e.g., Branch Avenue) cannot be used to perform baseline inspections.

## 6.3. Track and Structure (TRST) Mitigations

Rail Infrastructure Maintenance and Engineering (RIME) is continuing current mitigation efforts, defined in **Table 2**, that supports better wheel-rail interaction. These efforts will continue to address rail geometry defects, rail profile mismatches on the mainline, curves, interlockings, and special track work.

RIME will also review VTI data as an input for work planning.

*Table 2: TRST Mitigations*

Mitigation	Type	Description
<b>Vehicle Track Interaction (VTI)</b>	Expanded	MOWE-TE will continue to monitor VTI data from 7000-series railcars in passenger service operation.  RIME and CMOR will coordinate on communicating all VTI exceptions generated to Maintenance of Way (MOWE-TE), Office of Rail Vehicle Engineering (CENV), and Car Maintenance (CMNT) for review. WMSC will also be on the distribution list for this data.
<b>Track Geometry Vehicle (TGV)</b>	Continuing	Maintenance of Way Engineering, Track Engineering (MOWE-TE) will continue to facilitate TGV mainline track and interlocking geometry testing a minimum of twice a year. Ultrasonic Testing will continue at a minimum of three times a year on mainline track and a minimum of two times a year on mainline interlockings.
<b>Track Inspections</b>	Continuing	TRST inspects 118 miles of mainline track twice a week. Rail defects are identified and captured by trained and certified Track Inspectors in an electronic database. TRST and MOWE-TE use this information to plan and coordinate track maintenance to ensure optimal wheel-rail interaction.

## 6.4. Training Requirements

All personnel involved in the maintenance, movement coordination, and operation of the 7000-series railcars as defined in the Return to Service plan shall be trained to the requirements defined herein. As listed in the criteria defined in **Table 1**, WMATA will determine thresholds - the count or percentage of people to train – and meet those thresholds in order to enter Phase 1. The class presentations and tests are available in **Appendix G Curricula for MSI 140026 and CMOR SOP 10x.0x**.

## 6.5. Data Collection and Communication

The Car Maintenance (CMNT) Service Delivery Team shall monitor all data from MSI 140026. Any reported failure shall be communicated to RAIL and investigated by the Office of Rail Vehicle Engineering (CENV). All data analysis, including confirmed failures, shall be communicated to RAIL, SAFE, and WMSC. CMNT will use this analysis to identify, track, review, and communicate trends.

## **7. REFERENCES**

- Data Collection, Measurement and Validation (DCMV) 000011 Rev. 05
- American Public Transportation Association (APTA) PR-M-S-019-17, Passenger Wheel Set Assembly

## **8. APPENDICES**

Appendix A MSI 140026 Rev. 03, Wheel Back-to-Back and Journal Bearing Measurements

Appendix B SBF 110 Rev. 04, Removing a 7K Car from Service Due to Back-To-Back Failures

Appendix C MSI 000002 Rev. 00, Back-to-Back Tools – CMM Calibration Procedure

Appendix D MSI 000003 Rev. 00, Procedure for Utilizing Tread Worn Hollow Gauge

Appendix E CMOR SOP 10x.0x, Control of 7K Vehicles for Compliance with Wheelset Requirements

Appendix F CMOR SOP 101.02 Procedures for Control of Non-Revenue 7K Vehicles and Release for Mainline Travel

Appendix G Curricula for MSI 140026 and CMOR SOP 10x.0x



**VEHICLE PROGRAM SERVICES (CENV)  
MAINTENANCE SERVICE INSTRUCTIONS  
SIGNED AUTHORIZATION FORM (SAF)**

MSI 140026

REV. 03

**TITLE:** WHEEL BACK-TO-BACK AND JOURNAL BEARING MEASUREMENTS

**SERIES RAILCAR:** 7K **CAR BUILDER:** KAWASAKI **INITIATING DOCUMENT(S):** N/A

**ASSOCIATED MSIs:** MSIs 000002 AND 000003

REPA Tracking

**CENV/RAIL VEHICLE ENGINEER**

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DATE: May 23, 2022

ALWAYS CHECK SOURCE DOCUMENT FOR CURRENT REVISION

MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

WHEEL BACK-TO-BACK AND JOURNAL BEARING MEASUREMENTS

KAWASAKI 7000 SERIES RAILCARS

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**MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES**

**WHEEL BACK-TO-BACK AND JOURNAL BEARING MEASUREMENTS**

**KAWASAKI 7000 SERIES RAILCARS**

**REVISION HISTORY**

<b>Rev. #</b>	<b>Date</b>	<b>Description</b>
01	12/15/21	Added Section 9.2, revised per pilot training
02	12/27/21	Removed dial gauge requirement and updated procedure in Sections 6.0, 9.3.8, 9.3.9. Updated Attachments A & B.
03	5/23/2022	Revised to require measurement using only the digital indicator gauge. References to incremental gauge and analog dial gauge removed. Updated Attachments A & B accordingly. Defined the four measurement points on each wheelset for baseline measurement and recording the measurements only up to 3 decimal points. Added the sum of Journal Bearing Gaps to be less than 0.020" to PASS. Allowable difference from baseline measurement changed to 0.036".

ALWAYS CHECK SOURCE DOCUMENT FOR CURRENT REVISION

## MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

## WHEEL BACK-TO-BACK AND JOURNAL BEARING MEASUREMENTS

## KAWASAKI 7000 SERIES RAILCARS

**1.0 PURPOSE**

This MSI provides the procedure to verify the wheel gauge dimension (back-to-back) and journal bearing clearance. These instructions apply to both the existing Periodic Inspections (PI) and inspection intervals that fall between normal PIs.

Back-to-Back measurements shall be made using the digital indicator gauge. Baseline back-to-back measurements shall be taken at four locations on each wheelset. The maximum of the four measurements shall be considered the baseline for all subsequent measurement intervals. The Specified Wheelset Limit has been defined as the sum of the maximum wheelset baseline dimension plus 0.036" (measurement tolerance). At each periodic measurement interval, measurements shall be taken only at two locations.

**2.0 BACKGROUND**

The ongoing investigation into the recent 7K derailment identified vehicles that had non-compliant wheel gauge dimensions. The wheel gauge dimensions of the 7K wheelsets will be verified at more frequent intervals to ensure wheelset compliance between standard PI inspection intervals. To improve measurement accuracy and ease of use, WMATA developed a digital indicator gauge that was qualified by DCMV 000011.

**3.0 APPLICABLE CARS**

Kawasaki 7000 Series Cars

**4.0 APPLICABLE EQUIPMENT**

Wheels and axles on trucks

**5.0 REFERENCES**

See Section 11.0 Attachments

**6.0 TOOLS**

- Calibrated/Validated Back-to-Back Digital Indicator Gauge, latest drawing WDE0001080
- Validated Gauge Block 53.312" +/- 0.002" latest drawing WDE0001082
- Long blade feeler gauge set (0.001" to 0.025")

## MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

## WHEEL BACK-TO-BACK AND JOURNAL BEARING MEASUREMENTS

## KAWASAKI 7000 SERIES RAILCARS

## 7.0 MATERIALS

- Cleaning rags (WMATA P/N: R79-20-0045)
- 3M maroon Scotch-Brite (Oxide Non-Woven Hand Pad) (WMATA P/N: R79-20-0028)
- Aerosol Lubricant (WMATA P/N: 061000502)
- Stiff Scraper, 3-in. Carbon Steel Blade (Commercial)
- Paint Stick (WMATA P/N: R80-10-0048)

## 8.0 GENERAL SAFETY

All work shall be conducted in a safe manner and in accordance with the latest edition of the Metrorail Safety Rules and Procedures Handbook. All work shall be performed in such a manner that there is no danger to WMATA personnel or damage to WMATA Property.

## 9.0 PROCEDURE



**CAUTION:** Ensure that proper personal protective equipment (PPE) is utilized in all procedural steps

## 9.1 Requirement for Two Independent Verification of Measurements and Records

- 9.1.1 To ensure the validity and integrity of the measurements, both the Quality Inspector and the CMNT Supervisor shall verify the measurements from the gauge and record the agreed measurements. After the inspection has been completed, both the Quality Inspector and the CMNT Supervisor shall sign the datasheet. The datasheet shall not be signed if all field(s) are not populated.
- 9.1.2 Each data sheet and associated information must be entered and stored in Maximo.
- 9.1.3 Visually inspect the wheels, including the back rim. Record any observed anomaly in "Notes/Comment" section of Attachment B or Attachment C and report it to the CMNT Supervisor. Damage, deformation, gouging, or abnormal markings on the back rim must be recorded and reported to the CMNT Supervisor. Proceed to measure and record back to back and journal bearing measurements on the wheelset assembly.



## MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

## WHEEL BACK-TO-BACK AND JOURNAL BEARING MEASUREMENTS

## KAWASAKI 7000 SERIES RAILCARS

## 9.2 Calibration/Validation of Digital Indicator Gauge and Gauge Block

9.2.1 The digital indicator gauge shall be calibrated annually by an independent lab and assembly validated annually by the MRO shop. Gauges that do not have a valid calibration certification and validation date shall not be used.

9.2.2 The gauge block shall be validated annually utilizing a calibrated Coordinate Measuring Machine (CMM). Gauge blocks that do not have a valid validation date shall not be used.

## 9.3 Validation of Digital Indicator Gauge

**Important:**

- The digital indicator gauge shall be validated at the start of every shift. If the digital indicator gauge fails validation, select a different digital indicator gauge and different gauge block, and perform the validation check.
- The failed digital indicator gauge and gauge block shall be red tagged and returned to Greenbelt MRO for repairs. After repair, the gauge shall be calibrated/validated (as applicable) prior to use.
- If calibrated and validated digital dial gauges are not available, the measurement cannot be conducted, and work must be postponed until calibrated and validated digital indicator gauge and gauge block are available.

9.3.1 Confirm the gauge block fasteners are torque-striped and intact.



**Important:** If torque stripes are broken, the user should select a different gauge block, red tag the defective gauge block and return the failed gauge block to MRO for repair and validation

9.3.2 Place the Digital Indicator Gauge in the gauge block as shown below in Figure 1.

9.3.3 Press and hold (2 sec. or more) the DATA 'On/Off' button (green) to turn on the digital gauge.

9.3.4 Confirm the "H" symbol is not displayed in the digital indicator. To release the hold state, press the DATA 'On/Off' button (green).

MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

WHEEL BACK-TO-BACK AND JOURNAL BEARING MEASUREMENTS

KAWASAKI 7000 SERIES RAILCARS

Digital Indicator  
Screen Icons



Lock Function Activated – All functions disabled except:

- Power on/off
- Hold/Release of displayed value.



Hold Display Activated - Press the DATA key in Measurement mode. "H" appears, and the displayed value is held. Press the DATA key again to release the hold state.

The Digital Indicator is programmed by MRO, no programming action is required from the end user.

9.3.5 The gauge block has been set to 53.312" +/- 0.002". The value on the digital indicator gauge must read 53.312" +/- 0.003" (53.309" – 53.315"). If not, the failed digital indicator gauge and gauge block shall be red tagged and returned to Greenbelt MRO for repairs.

9.3.6 Remove the digital indicator gauge from the gauge block.



**NOTICE:** Only a validated gauge block and validated digital indicator gauge should be used for measurement.

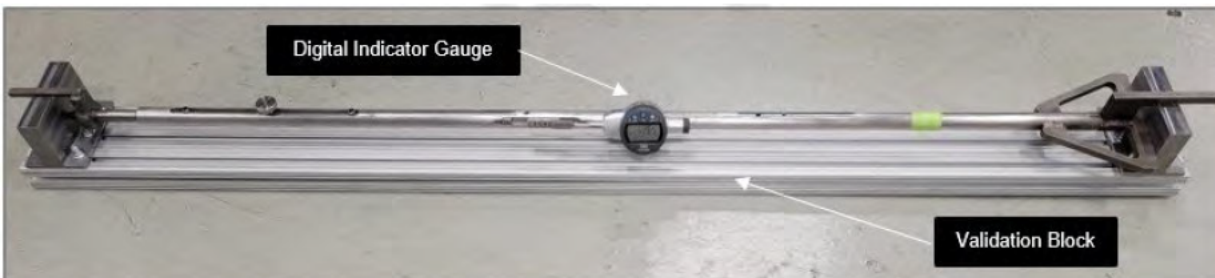


Figure 1. Validation of the Digital Indicator Gauge

## MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

## WHEEL BACK-TO-BACK AND JOURNAL BEARING MEASUREMENTS

## KAWASAKI 7000 SERIES RAILCARS

## 9.4 Baseline Back-To-Back Dimensions Measurement

**Important:**

- The Baseline Back-to-Back dimension measurement procedure requires the train to be moved to complete all four (4) measurement points. The train must be positioned over a pit to perform this task.
- Do not perform baseline Back-to-Back dimension measurement procedure on a lift.

9.4.1 If baseline measurements for all eight (8) wheelsets of the Married Pair are already available, proceed to step 9.6.

9.4.2 Each inspection team will consist of two mechanics (technicians), one Resident (Quality) Inspector (RI), and one CMNT Supervisor. Each team member must have successfully completed the specific training session for this MSI before completing these tasks. If the complete inspection team is unavailable, the measurements cannot be completed, and work must be postponed until the full inspection team is available.

9.4.3 The role of each team member is identified below:

- Supervisor – Obtain all necessary documents (Procedure and required datasheets) from the Inspection Office. Verify measurements with Resident Inspector and sign datasheet.
- RI – Verify measurements with Supervisor, record all data, and sign datasheet.
- Technician – Clean wheels and make the measurements.

9.4.4 Refer to the measurement flowchart in Attachment A. If instructions on Attachment A are unclear, do not proceed. Contact CMNT Supervisor for clarification as required.

9.4.5 The baseline back-to back measurement shall be performed on each wheelset assembly of the car.

9.4.6 Clean the back face of the wheels where the gauge probes contact using degreaser and a scotch-brite pad. Lightly scrape the flange as needed to remove grease and dirt build up. Apply degreaser a second time and wipe surface clean using shop rags.

## MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

## WHEEL BACK-TO-BACK AND JOURNAL BEARING MEASUREMENTS

## KAWASAKI 7000 SERIES RAILCARS

- 9.4.7 Using a validated digital indicator gauge (See Figure 2), measure the back-to-back dimensions at locations 1 and 2, adjacent to the of the pedestal tie bar as shown in Figure 4. Insert the gauge between the wheels such that the gauge probes contact both inner faces of the wheel. Ensure the gauge is perpendicular to the wheel such that the triangular probe is flush with the wheel surface and the gauge alignment stops are in contact with the wheel flange (See Figure 3). Read the measurement from the gauge and record only 3 decimal places as measurement 1 and 2 in Attachment B. The digital indicator gauge displays 4 decimal places. Ignore the 4<sup>th</sup> decimal digit and record only up to 3 decimal places. Do not round the measurement up or down.

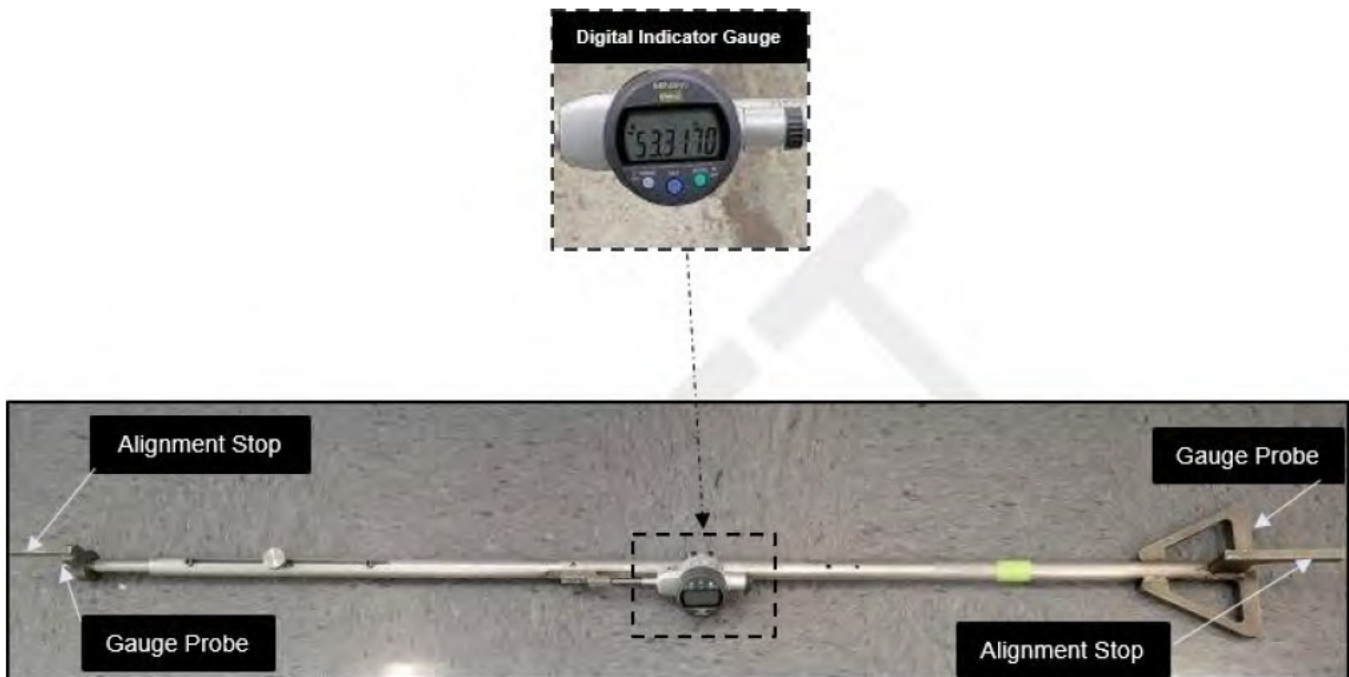


Figure 2. Back-to-Back Digital Indicator Measuring Gauge



**CAUTION:** Avoid hard contact between the spring-loaded probe and wheel to prevent damage to the probe. Ensure digital indicator gauge does not rest on the rails of the track.



## MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

## WHEEL BACK-TO-BACK AND JOURNAL BEARING MEASUREMENTS

## KAWASAKI 7000 SERIES RAILCARS



**Figure 3.** Position of Gauge Between Wheels



**NOTICE:** Figure 3 only shows the placement of the gauge on the wheel and does not depict all team members. The inspection team requires two (2) mechanics, one (1) Resident (Quality) Inspector (RI), and one (1) CMNT Supervisor. Each mechanic will hold one end of the measurement gauge.

- 9.4.8 Mark all the wheels as shown in Figure 4 and move the married pair so that the wheels turn approximately 180° to access measurement locations 3 and 4 in Figure 4.
- 9.4.9 Clean the back face of the wheels where the gauge probes contact using degreaser and a scotch-brite pad. Lightly scrape the flange as needed to remove grease and dirt build up. Apply degreaser a second time and wipe surface clean using shop rags.
- 9.4.10 Measure the back-to-back dimension in locations 3 and 4 using the same procedure described in Step 9.4.7. Record these two measurements as measurements 3 and 4 in Attachment B.



MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

WHEEL BACK-TO-BACK AND JOURNAL BEARING MEASUREMENTS

KAWASAKI 7000 SERIES RAILCARS

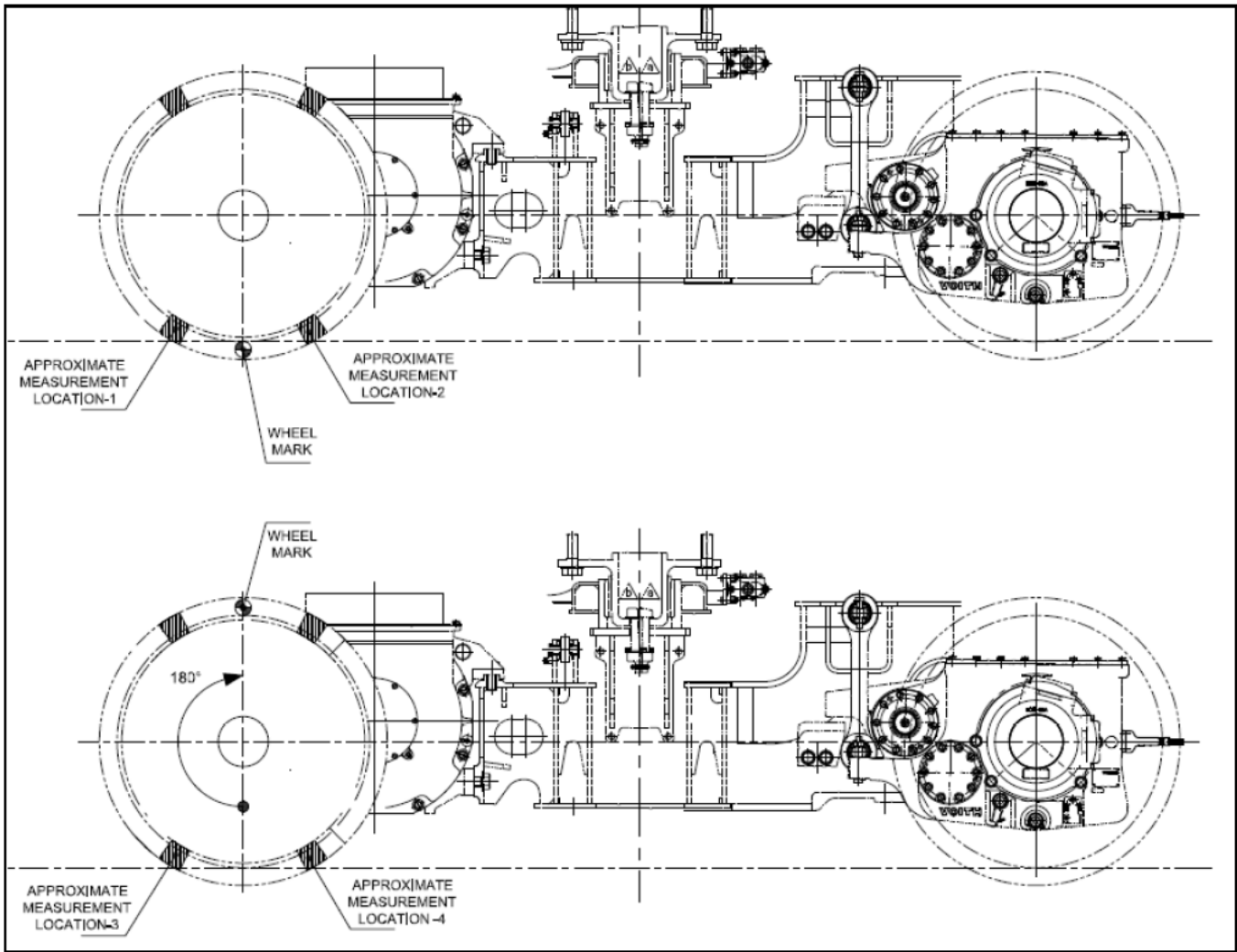


Figure 4. Back-to-Back measurement locations

ALWAYS CHECK SOURCE DOCUMENT FOR CURRENT REVISION

## MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

## WHEEL BACK-TO-BACK AND JOURNAL BEARING MEASUREMENTS

## KAWASAKI 7000 SERIES RAILCARS

9.4.11 After the four Back-to-Back baseline measurements have been recorded in Attachment B, compare the measurements and also record the maximum of the four measurements as the maximum measurement in Attachment B.

9.4.12 If all baseline measurements are greater than or equal to 53.250" AND less than 53.375", mark Attachment B as PASS.

9.4.13 If any baseline measurement is less than 53.250" OR greater than or equal to 53.375", mark Attachment B as FAIL.

### 9.5 Baseline Journal Bearing Gap Measurement

9.5.1 Using a 0.005" feeler gauge, check the gap between the journal bearing seal wear ring and the wheel hub (See Figure 5). Check multiple locations around the wheel hub. If the feeler gauge cannot be inserted, record the measurement as "0.000"

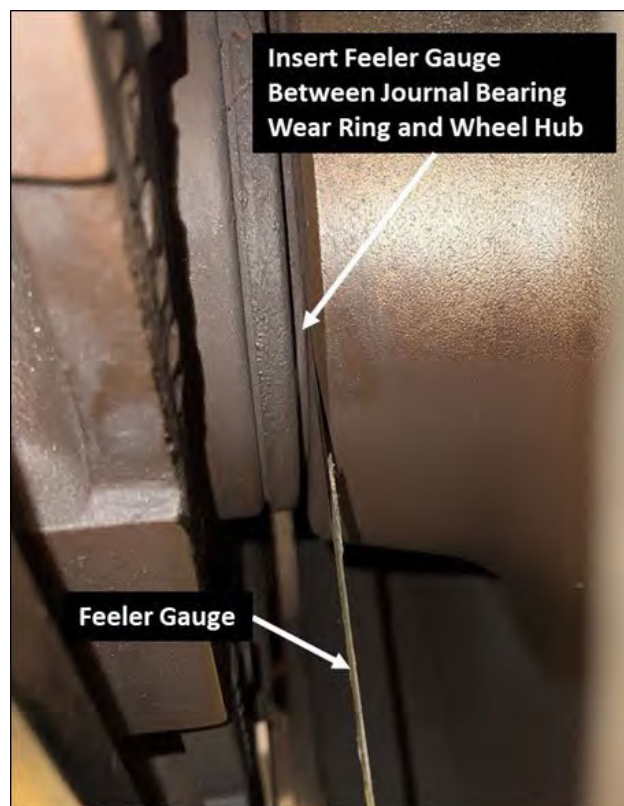


Figure 5. Measure Journal Bearing Gap

## MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

## WHEEL BACK-TO-BACK AND JOURNAL BEARING MEASUREMENTS

## KAWASAKI 7000 SERIES RAILCARS

9.5.2 If the gap exceeds 0.005", use additional feeler gauges to measure the exact width of the maximum gap at both wheels and record in Attachment B.

9.5.2.1 Calculate the sum of the gaps (if any) from the gearbox side wheel and motor side wheel for each axle. Record the sum for each axle in Attachment B.

9.5.2.2 If the sum of the gaps is less than 0.020", mark Attachment B as PASS.

9.5.2.3 If the sum of the gaps is equal to or greater than 0.020", the wheelset must be condemned. Mark Attachment B as FAIL.

#### 9.6 Periodic Back-To-Back Dimension Measurement

9.6.1 Each inspection team will consist of two mechanics (technicians), one Resident (Quality) Inspector (RI), and one CMNT Supervisor. Each team member must have successfully completed the specific training session for this MSI before completing these tasks. If complete team is unavailable the measurements cannot be completed and work must be postponed until full team is available.

9.6.2 The role of each team member is identified below:

- Supervisor – Obtain all necessary documents (Procedure and required datasheets) from the Inspection Office. Verify measurements with Resident Inspector and sign datasheet.
- RI – Verify measurements with Supervisor, record all data, and sign datasheet.
- Technician – Clean wheels and make the measurements.

9.6.3 Refer to the measurement flowchart in Attachment A. If instructions on Attachment A are unclear, do not proceed. Contact CMNT Supervisor for clarification as required.

9.6.4 Obtain the 7000 Series Wheel Back-to-Back Measurement and Journal Bearing Gap Verification Checklist for the specific car that is being measured. Pre-populated checklists for all the cars can be downloaded from the Maximo work order for the car that being measured. Review the specified Wheelset Limit, which is already populated for each wheelset assembly S/N and Specified Wheelset Limit. The specified Wheelset Limit must be equal to or less than 53.375" and wheelset S/N must match with the wheelsets on the car. See Attachment C for a sample checklist.

## MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

## WHEEL BACK-TO-BACK AND JOURNAL BEARING MEASUREMENTS

## KAWASAKI 7000 SERIES RAILCARS



**NOTICE:** The Specified Wheelset Limit is the sum of the maximum wheelset baseline dimension plus 0.036" (measurement tolerance). Maximum Specified Wheelset Limit cannot exceed 53.375"

- 9.6.5 The back-to-back measurement shall be performed on each wheelset assembly of the car.

**Important:**

- If any of the wheelsets have been replaced and 7000 Series Wheel Back-to-Back Measurement and Journal Bearing Gap Verification Checklist has not been updated, please contact RQAW to obtain latest updated revision.
- Any axle set that is repaired or replaced by the Truck Shop, requires a new baseline.
- The baseline will be recorded on the truck shop form # 50.076 Rev April 2022 on a per Axle basis.

- 9.6.6 Clean the back face of the wheels where the gauge probes contact using degreaser and scotch-brite pad. Lightly scrape the flange as needed to remove grease and dirt build up. Apply degreaser a second time and wipe surface clean using shop rags.
- 9.6.7 Measure the back-to-back dimension in locations 1 and 2 using the same procedure described in Step 9.4.7. Record these two measurements as measurements 1 and 2 in the checklist.
- 9.6.8 If both measurements obtained in step 9.6.7 are greater than or equal to 53.250" AND less than the Specified Wheelset Limit, mark the checklist as PASS.
- 9.6.9 If either measurement obtained in step 9.6.7 is less than 53.250" OR equal to or greater than the Specified Wheelset Limit, mark the checklist as FAIL.

## MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

## WHEEL BACK-TO-BACK AND JOURNAL BEARING MEASUREMENTS

## KAWASAKI 7000 SERIES RAILCARS

**9.7 Periodic Journal Bearing Gap Measurement**

- 9.7.1 Using a 0.005" feeler gauge, check the gap between the journal bearing seal wear ring and the wheel hub (See Figure 5). Check multiple locations around the wheel hub. If the feeler gauge cannot be inserted, record the measurement as "0.000"
- 9.7.2 If the gap exceeds 0.005", use additional feeler gauges to measure the exact width of the maximum gap at both wheels and record in the checklist.
- 9.7.2.1 Calculate the sum of the gaps (if any) from the gearbox side wheel and motor side wheel for each axle. Record the sum for each axle in the checklist.
- 9.7.2.2 If the sum of the gaps is less than 0.020", mark the checklist as PASS.
- 9.7.2.3 If the sum of the gaps is equal to or greater than 0.020", the wheelset must be condemned. Mark the checklist as FAIL.

**9.8 Disposition Wheelset Assembly**

- 9.8.1 If the wheelset assembly has passed the criteria for both the Back-to-Back and Journal Bearing Gap, the wheelset is PASSED.
- 9.8.2 If any wheelset assembly has failed the criteria for Back-to-Back or Journal Bearing Gap, the wheelset is FAILED. The wheelset must be replaced, and the car must be removed from service, per SBF-110.

**10.0 DOCUMENTATION**

N/A

**11.0 ATTACHMENTS****11.1 Attachment 'A'**

7K Back-to-Back and Journal Bearing Verification Flowchart

**11.2 Attachment 'B'**

7000 Series Wheel Back-to-Back Baseline Measurement and Journal Bearing Gap Verification Checklist

**11.3 Attachment 'C'**

7000 Series Wheel Back-to-Back Measurement and Journal Bearing Gap Verification Sample Checklist



**VEHICLE PROGRAM SERVICES (CENV)  
SERVICE BULLETIN  
SIGNED AUTHORIZATION FORM (SAF)**

**SB** F110

**Rev.** 04

**TITLE:** REMOVING A 7K CAR FROM SERVICE DUE TO BACK-TO-BACK FAILURES

**SERIES RAILCAR:** 7K **CAR BUILDER:** KAWASAKI **INITIATING DOCUMENT(S):** N/A

**ASSOCIATED SBs:** N/A

- SB to be tracked as a campaign     Manuals are affected (ECN Required)  
 Information (APPLICABLE FOR QUICKFLOW ONLY)     REPA Tracking

**CENV/RAIL VEHICLE ENGINEER**

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**DATE:** Apr 5, 2022

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Always Check Source Document for Current Revision,

**PROCEDURE FOR REMOVING AND RELEASING 7K CARS FROM SERVICE  
DUE TO BACK-TO-BACK AND/OR JOURNAL BEARING GAP FAILURES**

**KAWASAKI 7000 SERIES RAILCARS**



**NOTICE:**

1. This service bulletin supersedes and obsoletes SBF 110, Rev. 03.
2. This revision includes the following updates:
  - Includes changes to The Rail Performance Monitor (RPM) application
  - Further clarifies some of the tasks to be performed

**1.0 PURPOSE**

The purpose of this service bulletin is to provide Car Maintenance (CMNT) with a procedure for the removal and return to service of 7K rail vehicles due to wheelset back-to-back measurement failures and/or journal bearing gap inspection failures per MSI 140026.

**2.0 BACKGROUND**

7K rail vehicles have been identified with back-to-back and/or journal bearing gap measurements that exceed specifications. 7K vehicles that exceed the allowable back-to-back measurement and/or journal bearing gap measurement must be removed from service.

**3.0 FAILURE CONDITIONS**

- a. Back-to-Back wheelset measurement per MSI 140026, and/or
- b. The Journal Bearing gap measurement per MSI 140026.

## PROCEDURE FOR REMOVING AND RELEASING 7K CARS FROM SERVICE DUE TO BACK-TO-BACK AND/OR JOURNAL BEARING GAP FAILURES

### KAWASAKI 7000 SERIES RAILCARS

#### 4.0 PROCEDURE FOR REMOVING FAILED RAIL VEHICLES FROM SERVICE



**Important:** Any failed condition defined in MSI 140026 must be reported to the Supervisor.

Follow the steps below on all 7K vehicles that fail the back-to-back measurement and/or journal bearing gap measurement as defined in MSI 140026.

##### 4.1 Generate Corrective Maintenance Work Order

CMNT must generate a corrective maintenance work order (WO) to replace the failed wheelset.

##### 4.2 Update Maximo & RPM Status

4.2.1 In MAXIMO, set the vehicle status to "REMOVE FROM SERVICE."

4.2.2 In RPM, verify that the color of the vehicle has changed to BLACK. Set the vehicle status to "Movement Restricted."

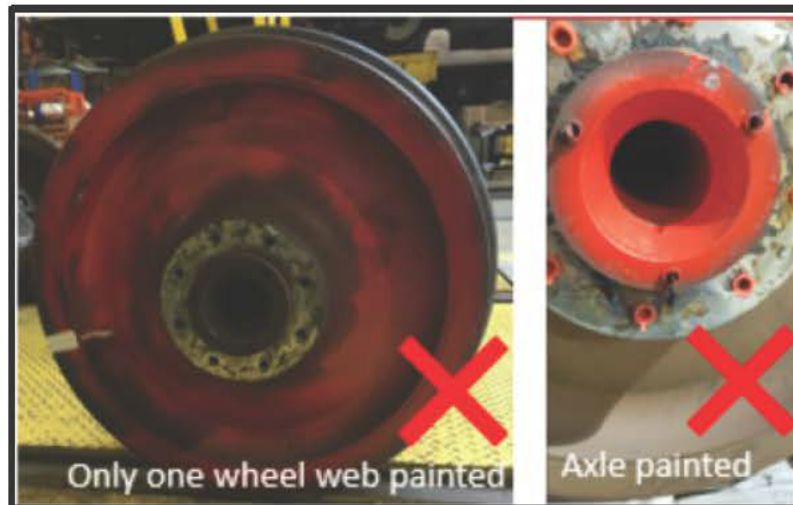
##### 4.3 Paint Wheels Red

Paint the outer exposed faces (web) of each wheel on the failed wheelset **RED** (P/N R80-10-0004) as shown in Figure 1. **DO NOT PAINT** the center portion of the axle (see Figure 2).



**Figure 1.** Correct Paint Application on Failed Wheelsets



**PROCEDURE FOR REMOVING AND RELEASING 7K CARS FROM SERVICE  
DUE TO BACK-TO-BACK AND/OR JOURNAL BEARING GAP FAILURES****KAWASAKI 7000 SERIES RAILCARS**

**Figure 2.** Incorrect Paint Application on Failed Wheelsets

#### 4.4 Red Flag

All failed vehicles stored in the yard and/or shop lead(s) must follow the requirements of Permanent Order T-21-22 Operating Rule 3.126.

#### 4.5 Affix Out-of-Service (OOS) Tag

An OOS tag (WMATA p/n: R76-90-0001) must be placed on the Master Controller (MC) of each 7K A-car and Hostler panel of the B-car. The OOS tag must be properly populated and include the supervisor's name and the date the tag was applied to the rail vehicle.

**PROCEDURE FOR REMOVING AND RELEASING 7K CARS FROM SERVICE DUE TO BACK-TO-BACK AND/OR JOURNAL BEARING GAP FAILURES**

**KAWASAKI 7000 SERIES RAILCARS**

**4.6 Affix Decal**

An OOS decal (see Figure 3) must be placed on the inside of the windshield of the operator's cab of each 7K A-car and Hostler panel of the B-car.

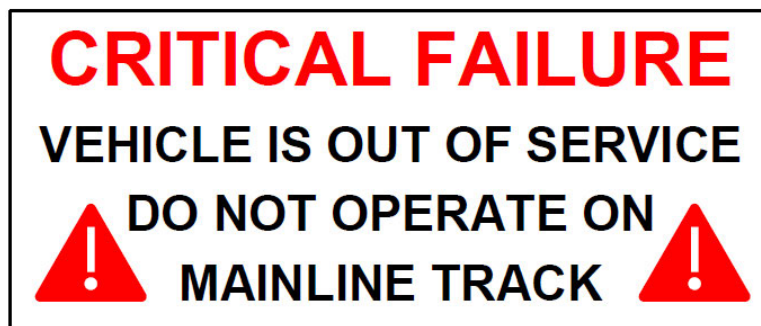


Figure 3. Out of Service Decal

**5.0 PROCEDURE FOR RETURNING REPAIRED CARS TO SERVICE**

After the failed car has been repaired, follow the procedure below to close out the repair and review of the wheelset failure.

**5.1 Inspection Office Notifies RQAW**

The on-duty CMNT Supervisor will notify RQAW via email that the wheelset repair(s) have been completed.

**5.2 Review Work Order Documentation & Wheelset Inspection**

Railcar Quality Assurance and Warranty Compliance (RQAW) must review the WO(s), the wheelset inspection records, including the failed and passed inspection records, for proper and accurate documentation. RQAW must notify CMNT\_ServiceDelivery via email of the status of the repaired vehicle. If the information (failed and passed inspection records) cannot be validated, are inaccurate, or incomplete, the identified discrepancies must be resolved before the railcar is identified as repaired.

**PROCEDURE FOR REMOVING AND RELEASING 7K CARS FROM SERVICE  
DUE TO BACK-TO-BACK AND/OR JOURNAL BEARING GAP FAILURES**

**KAWASAKI 7000 SERIES RAILCARS**

**5.3 Update Maximo & RPM Status**

CMNT\_ServiceDelivery will change the Maximo Asset Status to the appropriate current condition based on any maintenance required. CMNT\_ServiceDelivery must also update or remove the RPM restriction of "Move Restricted" to the appropriate status based on the current condition. CMNT\_ServiceDelivery must then notify the on-duty CMNT Supervisor to perform the Daily Safety Test and Daily Inspection.

**5.4 Perform Daily Safety Test and Daily Inspection**

The on-duty CMNT Supervisor will direct the technician to perform a Daily Safety Test (DST) and Daily Inspection (DI) of the vehicle.

**5.5 Remove OOS Tag**

Upon successful completion of the DST/DI, the on-duty CMNT Supervisor will remove the OOS tags from the Master Controller of the A-car and Hostler Panel of the B-car.

**5.6 Remove OOS Decal**

The on-duty CMNT Supervisor will remove the OOS decal from the windshield of the operator's cab of the A-car and the Holster panel of the B-car.

MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

BACK TO BACK TOOLS – VALIDATION PROCEDURE

ALL SERIES RAILCARS

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**BACK TO BACK TOOLS – VALIDATION PROCEDURE**

**ALL SERIES RAILCARS**

**REVISION HISTORY**

<b>Rev. #</b>	<b>Date</b>	<b>Description</b>
00	April 19 <sup>th</sup> -2022	First Release

**MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES****BACK TO BACK TOOLS – VALIDATION PROCEDURE****ALL SERIES RAILCARS****1.0 PURPOSE**

This inspection guide is used to provide instructions for inspecting machined and assembled tools. The procedure applies to WDE0001082 – Digital Indicator, Gauge Block using a calibrated Coordinate Measurement Machine (CMM) and the WDE0001080 – Back to Back Digital Indicator using a validated Gauge Block (standard) drawing WDE0001082.

**2.0 BACKGROUND**

To improve measurement accuracy and ease of use, WMATA developed a digital indicator gauge and a gauge block (standard) that was qualified by DCMV 000011 Revision 4.

**3.0 APPLICABLE CARS**

N/A

**4.0 APPLICABLE EQUIPMENT**

Digital Indicator Back to Back Tool and Gauge Block to Measure the Back to Back Wheels

**5.0 REFERENCES**

- Drawing WDE0001082 – Digital Indicator, Gauge Block
- Drawing WDE0001080 – Back to Back Digital Indicator  
(no drawings attached, refer to latest drawing versions in DOCUMENTUM)

**6.0 TOOLS**

- Calibrated Coordinate Measurement Machine (CMM)
- Calibrated Calipers
- Calibrated Micrometers
- Calibrated Dial indicators

**7.0 MATERIALS**

N/A

## MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

## BACK TO BACK TOOLS – VALIDATION PROCEDURE

## ALL SERIES RAILCARS

**8.0 GENERAL SAFETY**

All work shall be conducted in a safe manner and in accordance with the latest edition of the Metrorail Safety Rules and Procedures Handbook. All work shall be performed in such a manner that there is no danger to WMATA personnel or damage to WMATA Property.

**9.0 PROCEDURES****9.1 Responsibilities**

## 9.1.1 RQAW Inspectors

- a. Conduct detailed inspection of all critical geometric dimensioning and tolerancing denoted on a drawing associated with the assembly under validation.
- b. Assure the accurate validation of the tool assemblies, assure the correct identification numbers for each asset tool, and verifies the documentation for MAXIMO records per asset.

## 9.1.2 CMNT - MRO Machine Shop

- a. Provides inspection equipment that is calibrated and maintains the desired calibration intervals.
- b. Provides CMM skilled trained technician.
- c. Develops the CMM tool program file for part WDE0001082 (Gauge Block).
- d. Provides the CMM inspection reports of the gauge blocks to RQAW for MAXIMO assets validation records.
- e. Provides the digital indicator programming checklist for each unit and provides the ID-C (MITUTOYO) calibration certificates to RQAW for MAXIMO assets records as part of assembly WDE0001080.
- f. Applies a legible WMATA validation sticker in the outer rod for part, refer to drawing WDE0001080 for details. Applies legible engravings to the tool as indicated on drawing WDE0001080.
- g. Applies a legible WMATA validation sticker in the outer face of one of the brackets for part, refer to drawing WDE0001082 for details. Applies legible engravings to the tool as indicated on drawing WDE0001082. See Figure 1.

MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

BACK TO BACK TOOLS – VALIDATION PROCEDURE

ALL SERIES RAILCARS

9.1.3 CENV - Engineering

- a. Provides interpretation of design intent of drawing and clarifies ambiguous drawing details and notes.
- b. Revises the MSI and updates the assembly drawings, if required.

**9.2 Validation Procedures**

9.2.1 Validation of Digital Indicator, Gauge Block- WDE0001082

- 9.2.1.1 Remove the existing validation sticker from tools under revalidation.
- 9.2.1.2 Verify the correct assembly of the “Digital Indicator-Block Gauge” per drawing WDE0001082. Verify the dimensions using standard calibrated tools, except the block gauge standard main dimension.
- 9.2.1.3 Turn-on the CMM machine and CMM computer and verify the Coordinate Measurement Machine is operational.
- 9.2.1.4 Visually inspect the CMM machine, ensure the probe is clear to move to the home position and the machine table is clear.
- 9.2.1.5 Start the CMM application software program on the CMM computer
- 9.2.1.6 Move the probe to the home position by the software control or by the pendant (handheld control).
- 9.2.1.7 If the probe is changed, calibrate the probe tip, and return it to home.
- 9.2.1.8 Follow the instructions in the Attachment A to perform the validation/inspection of the Digital Indicator Gauge Block, Drawing WDE0001082.
- 9.2.1.9 Verify the information contained in the report includes:
  - a. Part Name: Back to Back Gauge Block Standard
  - b. Part Number or assembly number: WDE0001082
  - c. Inspector Name or CMM ID tool: E.g. Endeavor CMM
  - d. Company Name: E.g. WMATA or Washington Metropolitan Area Transit.
  - e. Date of the inspection: DD-MM-YYYY
  - f. Time of the Inspection: HH:MM

MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

BACK TO BACK TOOLS – VALIDATION PROCEDURE

ALL SERIES RAILCARS

- g. Units Used: INCH
  - h. Asset Number of Unit Under Test (UUT)
  - i. Serial Number of UUT.
- 9.2.1.10 Print-out the CMM final report and export to PDF file format. See Attachment B for a SAMPLE.
- 9.2.1.11 Etch or engrave the drawing number and the as-built actual dimension from CMM report using four decimal digits (round-up the 5<sup>th</sup> decimal digit). Refer to drawing WDE0001082 for the engraving location.



Figure 1 – Engravings, Tool WDE0001082

- 9.2.1.12 Print and apply a legible validation sticker for part WDE0001082, including the asset number, serial number, and the validation due date. Refer to drawing WDE0001082 for the location.

## MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

## BACK TO BACK TOOLS – VALIDATION PROCEDURE

## ALL SERIES RAILCARS

9.2.2 Programming and validation of the Back to Back Digital Indicator, drawing WDE0001080.

9.2.2.1 Remove the existing validation sticker from tools under re-validation.

9.2.2.2 Verify the correct assembly of the “Back to Back Digital Indicator” per the drawing WDE0001080 and calibrated ID-C MITUTOYO installed.

9.2.2.3 Press and hold (2 sec. or more) the DATA ‘On/Off’ button (green) to turn on the digital indicator.

9.2.2.4 Seat the “Back to Back Digital Indicator” into the validated “Digital Indicator - Gauge Block” (standard).

9.2.2.5 Connect the designated computer with the digital indicator ID-C unit under programming using the “Parameter Setting Cable (USB)”.

9.2.2.6 Programming the first ID-C MITUTOYO unit (No saved file settings)

**NOTE:** See the MITUTOYO quick reference manual from Attachment C to navigate in the “ID-C Parameter Setting Software” or refer to the MITUTOYO user manual (document 99MAH045B).

- a. Start the “ID-C Parameter Setting Software” from the connected computer and then click on [Connect ID-C].
- b. When the software communicates with the ID-C unit, click [All parameters], a new pop-up screen will show.
- c. In the All parameters editing screen, enter the values and settings as follow:

❖ Preset Value P1: the value from Table 1 that is in-line with the AS-BUILT dimension for the validated gauge block used.

**NOTE:** For any value not indicated in Table 1, the gauge block is considered out of tolerance. The tool (gauge block) will be decommissioned and scrapped.

- ❖ Measuring System: Absolute Value Measurement (ABS)
- ❖ Display Units: Inches
- ❖ Measurement mode: Reverse Direction
- ❖ Tolerance Judgement: OFF
- ❖ Resolution: 0.0005"



## MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

## BACK TO BACK TOOLS – VALIDATION PROCEDURE

## ALL SERIES RAILCARS

- ❖ Calculation Mode: OFF
- ❖ Program the Key-lock section in “ON” mode, selecting (check marks) all options available for the digital indicator, except for the [DATA/HOLD].
- ❖ Program the Parameter-lock section in “ON” mode, selecting (check marks) all options available for the digital indicator.

- d. Click the [Send all] bottom, then close the pop-up screen to return to the main screen and then click [Save File] bottom.
- e. Name the file “ID-C B2B Tool” and save it on the computer.
- f. Click the [Disconnect] bottom to stop the communication.
- g. Click [Exit] on the default window to exit the “Parameter Setting Software’ and disconnect the “Parameter Setting Cable (USB)” from the digital indicator (communication port) and protect the communication port with the rubber lid.

## 9.2.2.7 Programming the ID-C MITUTOYO unit using the saved file settings

- a. Start the “ID-C Parameter Setting Software” from the connected computer and then click [Connect ID-C].
- b. When the software communicates with the ID-C unit, click [load file] to recall the programming file saved in the computer from the previously unit programmed, file named “ID-C B2B Tool”.
- c. Click the [All parameters] bottom on the left panel, then type-in the [PRESET] Value P1 field the value from Table 1 that in in-line with the AS-BUILT dimension for the validated gauge block used.

**NOTE:** Any value not indicated in Table 1, the gauge block is considered out of tolerance. The tool (gauge block) will be decommissioned and scrapped.

- d. Confirm all remaining parameters match with Section 9.2.2.6.b above.
- e. Click the [Send all] bottom, then close the pop-up screen to return to the main screen then click [Save File] bottom.
- f. Click the [Disconnect] bottom to stop the communication.

MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

BACK TO BACK TOOLS – VALIDATION PROCEDURE

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g. Click [Exit] on the default window to exit the “Parameter Setting Software” and disconnect the “Parameter Setting Cable (USB)” from the digital indicator (communication port) and protect the communication port with the rubber lid.

9.2.2.8 Print and apply a legible validation sticker for part WDE0001080, including the asset number, serial number, and the validation due date. Refer to drawing WDE0001080 for the location

AS-BUILT Gauge Block	PRESET VALUE TO PROGRAMING		AS-BUILT Gauge Block	PRESET VALUE TO PROGRAMING
5 3 . 3 1 0 5	53.3105		5 3 . 3 1 2 6	53.3130
5 3 . 3 1 0 6	53.3110		5 3 . 3 1 2 7	
5 3 . 3 1 0 7			5 3 . 3 1 2 8	
5 3 . 3 1 0 8			5 3 . 3 1 2 9	
5 3 . 3 1 0 9			5 3 . 3 1 3 0	
5 3 . 3 1 1 0			5 3 . 3 1 3 1	
5 3 . 3 1 1 1			5 3 . 3 1 3 2	
5 3 . 3 1 1 2			5 3 . 3 1 3 3	
5 3 . 3 1 1 3			5 3 . 3 1 3 4	
5 3 . 3 1 1 4			5 3 . 3 1 3 5	
5 3 . 3 1 1 5		53.3115		5 3 . 3 1 3 6
5 3 . 3 1 1 6	53.3120		5 3 . 3 1 3 7	
5 3 . 3 1 1 7			5 3 . 3 1 3 8	
5 3 . 3 1 1 8			5 3 . 3 1 3 9	
5 3 . 3 1 1 9			5 3 . 3 1 4 0	
5 3 . 3 1 2 0			5 3 . 3 1 4 1	
5 3 . 3 1 2 1			5 3 . 3 1 4 2	
5 3 . 3 1 2 2			5 3 . 3 1 4 3	
5 3 . 3 1 2 3			5 3 . 3 1 4 4	
5 3 . 3 1 2 4			5 3 . 3 1 4 5	53.3145
5 3 . 3 1 2 5		53.3125		

Table 1- Programming Rule for Digital Indicators

MAINTENANCE AND SERVICE INSTRUCTIONS PROCEDURES

BACK TO BACK TOOLS – VALIDATION PROCEDURE

ALL SERIES RAILCARS



10.0 TEST

10.1 Digital Indicator - Gauge Block

- No Test required.

10.2 Back to Back Digital Indicator

- 10.2.1 Press and hold (2 sec. or more) the DATA 'On/Off' button (green) to turn "ON" the digital indicator.
- 10.2.2 Confirm the "H" symbol is not displayed in the digital indicator. To release the hold state, press the DATA 'On/Off' button (green).
- 10.2.3 Manually compress the tool to travel inwards, the values displayed must be reduced while is compressing the tool.
- 10.2.4 Seat the "Back to Back Digital Indicator" into the calibrated "Digital Indicator - Gauge Block" (standard). The readings shall be in concordance with one value from Table 1 using the as-built dimension from the gauge block used.
- 10.2.5 Press and hold (2 sec. or more) the DATA 'On/Off' button (green) to turn "OFF" the digital indicator and remove it from the gauge block.

Digital Indicator Screen Icons		Lock Function Activated – All functions disabled except: <ul style="list-style-type: none"> <li>• Power on/off</li> <li>• Hold/Release of displayed value.</li> </ul>
		Hold Display Activated - Press the DATA key in Measurement mode. "H" appears, and the displayed value is held. Press the DATA key again to release the hold state.

11.0 DOCUMENTATION

- No documentation affected.

**BACK TO BACK TOOLS – VALIDATION PROCEDURE**

**ALL SERIES RAILCARS**

**12.0 ATTACHMENTS**

**12.1 Attachment ‘A’**

Tool Inspection Procedure for CMM ..... 13 to 24

**12.2 Attachment ‘B’**

CMM Report SAMPLE ..... 25

**12.3 Attachment ‘C’**

MITUTOYO Parameter Setting Software-Literature, Series 543 BOM ..... 26 to 70

## VERIFY GAUGE PROCEDURE

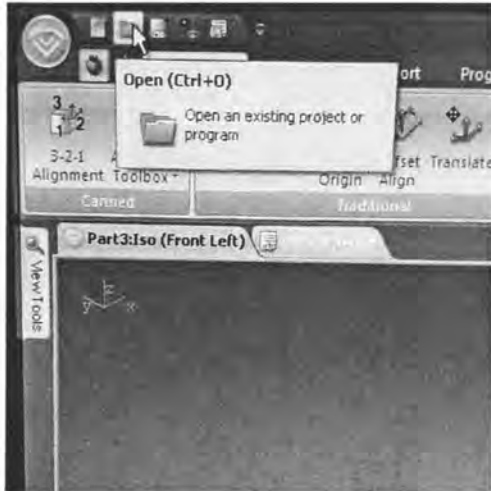
### -POSITION PART ON TABLE

(Note: Part must be placed diagonal on table to be inside of machine working limits.)

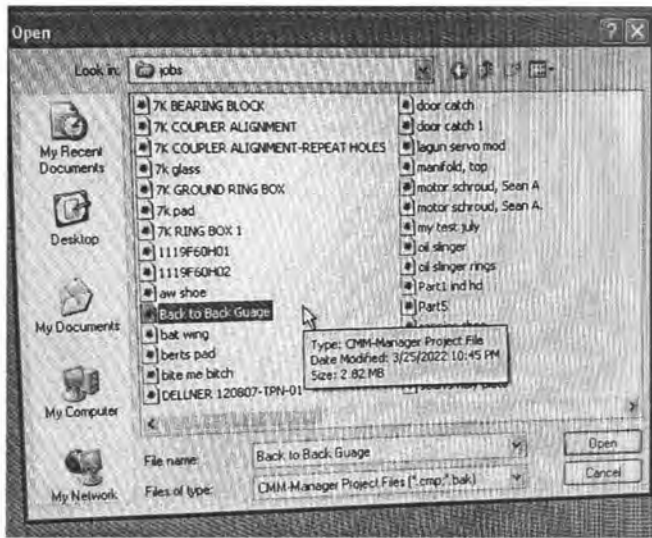


### -OPEN EXISTING PROGRAM

# Attachment A - MSI 000002 rev. 00 - CMM Procedure



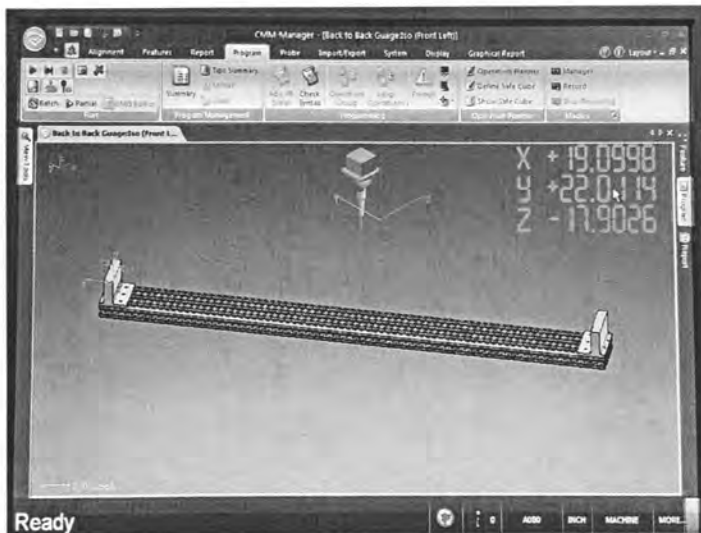
**-AELECT BACK TO BACK GAUGE**



**-SELECT PROGRAM TAB ON RIGHT SIDE OF SCREEN**



# Attachment A - MSI 000002 rev. 00 - CMM Procedure



**-PIN PROGRAM TO SCREEN**



**-SELECT RUN PROGRAM**

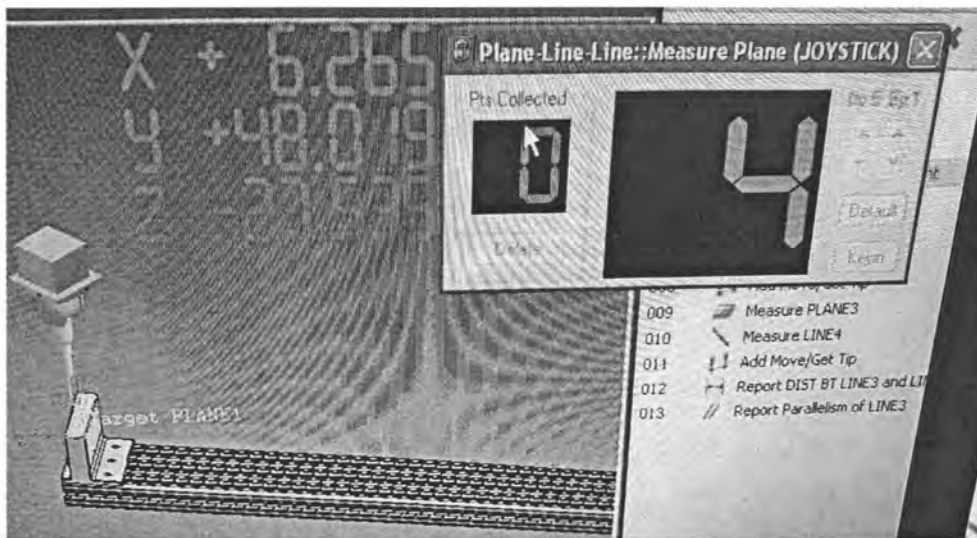
# Attachment A - MSI 000002 rev. 00 - CMM Procedure



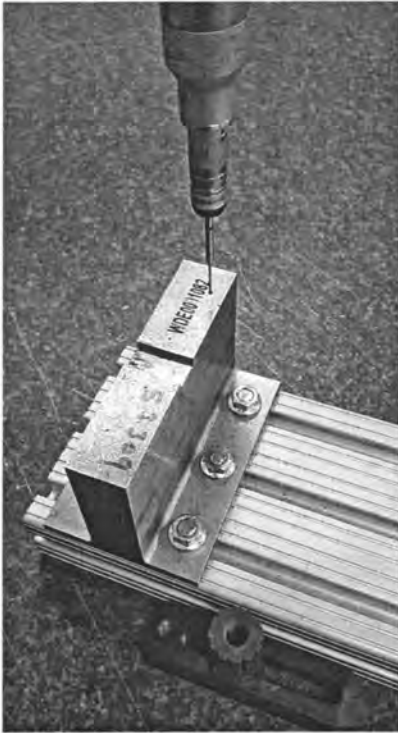
## -PLANE-LINE-LINE ALIGNMENT

(NOTE: Must use joystick manual mode to align part.)

## -ALIGN TOP PLANE



# Attachment A - MSI 000002 rev. 00 - CMM Procedure



-ALIGN SHORT FACE



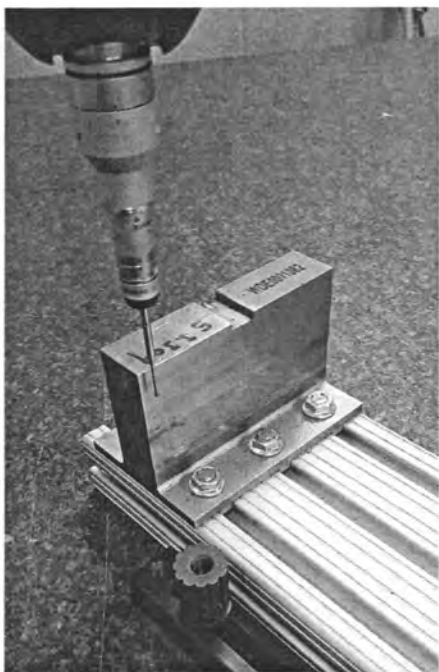
# Attachment A - MSI 000002 rev. 00 - CMM Procedure



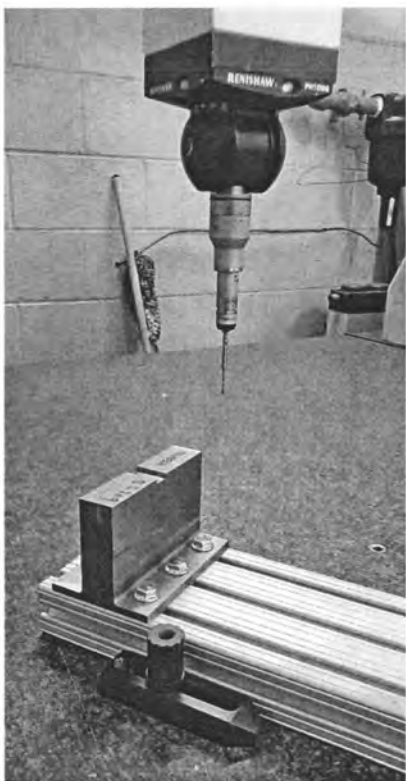
**-ALIGN PERPENDICULAR FACE**



# Attachment A - MSI 000002 rev. 00 - CMM Procedure



**-MOVE PROBE AWAY FROM PART**



**-SELEC AUTO MODE**



# Attachment A - MSI 000002 rev. 00 - CMM Procedure

(NOTE: Probe will move automatically and inspect part.)

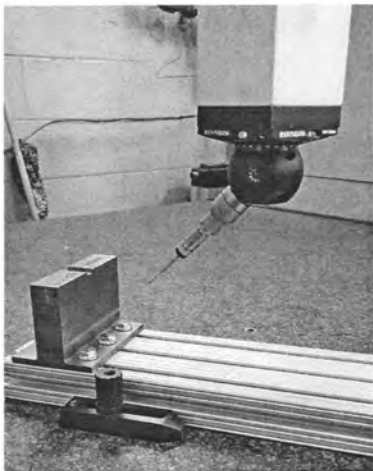


-PROBE A45B-150

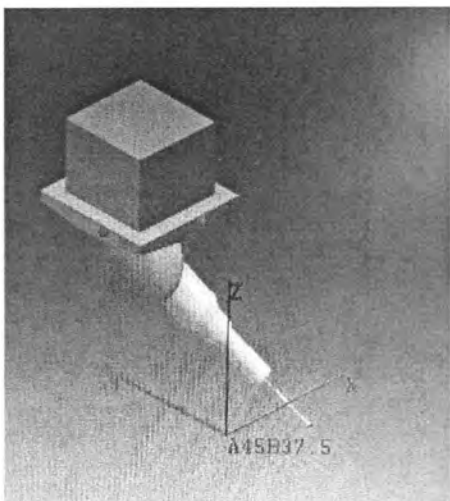




# Attachment A - MSI 000002 rev. 00 - CMM Procedure



**-PROBE A45B35**



## Attachment A - MSI 000002 rev. 00 - CMM Procedure



**-UPON PROGRAM COMPLETION. YOU WILL BE PRESENTED WITH DEFAULT REPORT. RIGHT CLICK ON TOP BOX IN REPORT TO EDIT PROPRITIES. THEN SELECT SAVE ON CMM MANAGER HEADER, SELECT PDF, AND CHOOSE WHERE TO SAVE.**

# Attachment A - MSI 000002 rev. 00 - CMM Procedure

The screenshot shows the CMM-Manager software interface. The main window displays a 'CMM-Manager Report' with the following details:

CMM-Manager Report	
Report Name	Default Report
Part Name	MyPartName
Part No.	MyPartNo
Inspector	Endeavor CMM
Company	Washington Metropolitan Area Transit
Date	Thursday, April 14, 2022
Time	06:40 PM
Unit	INCH

#1 Tolerance Report							
Feature	LINE3						
Feature	LINE4						
Type	DIST BTW						
	Nom	Act	Dev	LoTol	UpTol	OutTol	
3D	53.31200	53.30911	-0.00289	-0.00200	0.00200	-0.00089	

#2 Tolerance Report							
Feature	LINE3						
Type	LINE						
	Nom	Act	Dev	LoTol	UpTol	OutTol	
PARA_3D			0.00042		0.00200		
	Datum1	LINE4					

On the right side, the 'Program' tree shows a list of steps:

- 001 Program Settings
- 002 Get Probe Assembly 0
- 003 Get Probe Assembly 0
- 004 Plane-Line-Plane Alignment
- 005 Add Move/Get Tip
- 006 Measure PLANE2
- 007 Measure LINE3
- 008 Add Move/Get Tip
- 009 Measure PLANE3
- 010 Measure LINE4
- 011 Add Move/Get Tip
- 012 Report DIST BTW LINE3 and LINE4
- 013 Report Parallelism of LINE3

At the bottom of the window, a status bar contains the text: "Click left mouse button to close feature report window." and a toolbar with buttons for "A0B0", "INCH", "Unnamed", and "MORE...". The system tray at the bottom right shows the time as 6:46 PM.

CMM-Manager Report	
Report Name	Default Report
Part Name	Back To Back Standard
Part No.	WDE0001082
Inspector	Endeavor CMM
Company	Washington Metropolitan Area Transit
Date	Monday, April 18, 2022
Time	07:32 PM
Unit	INCH
Asset Number	xxxxxx
Serial Number	xxxxxxx

#1 Tolerance Report						
Feature	LINE3					
Feature	LINE4					
Type	DIST_BTW					
	Nom	Act	Dev	LoTol	UpTol	OutTol
3D	53.31250	53.31308	0.00058	0.0200	0.00200	

#2 Tolerance Report						
Feature	LINE3					
Type	LINE					
	Nom	Act	Dev	LoTol	UpTol	OutTol
PARA_3D			0.00184		0.00200	
	Datum1	LINE4				

SAMPLE



**Introducing Parameter Setting Software**  
**Calculation Type/Peak-Value Hold/ Bore Gauge Type**  
**ABS Digimatic Indicator**



## Parameter Setting Software can solve your trouble shooting problems!

Parameter setting takes time. You have to push the button many times to check the parameter. **With our software you can input all parameters by PC and all setting items can be set and displayed at once, making your measurement time shorter!**



It is hard to remember all parameters. You may be worried whether it can be set when replaced. **Parameter settings remains on your software and are easy to copy the same parameter for multiple IDs, this will again create a shorter measurement time, but also it will prevent misconfiguration.**





## Parameter Setting Software can solve your trouble shooting problems!

Are you afraid that your parameter settings will be overwritten incorrectly while your indicator is in use? Set parameters and lock them by using the hold button, this will make sure that nothing will be changed while working with your tool.





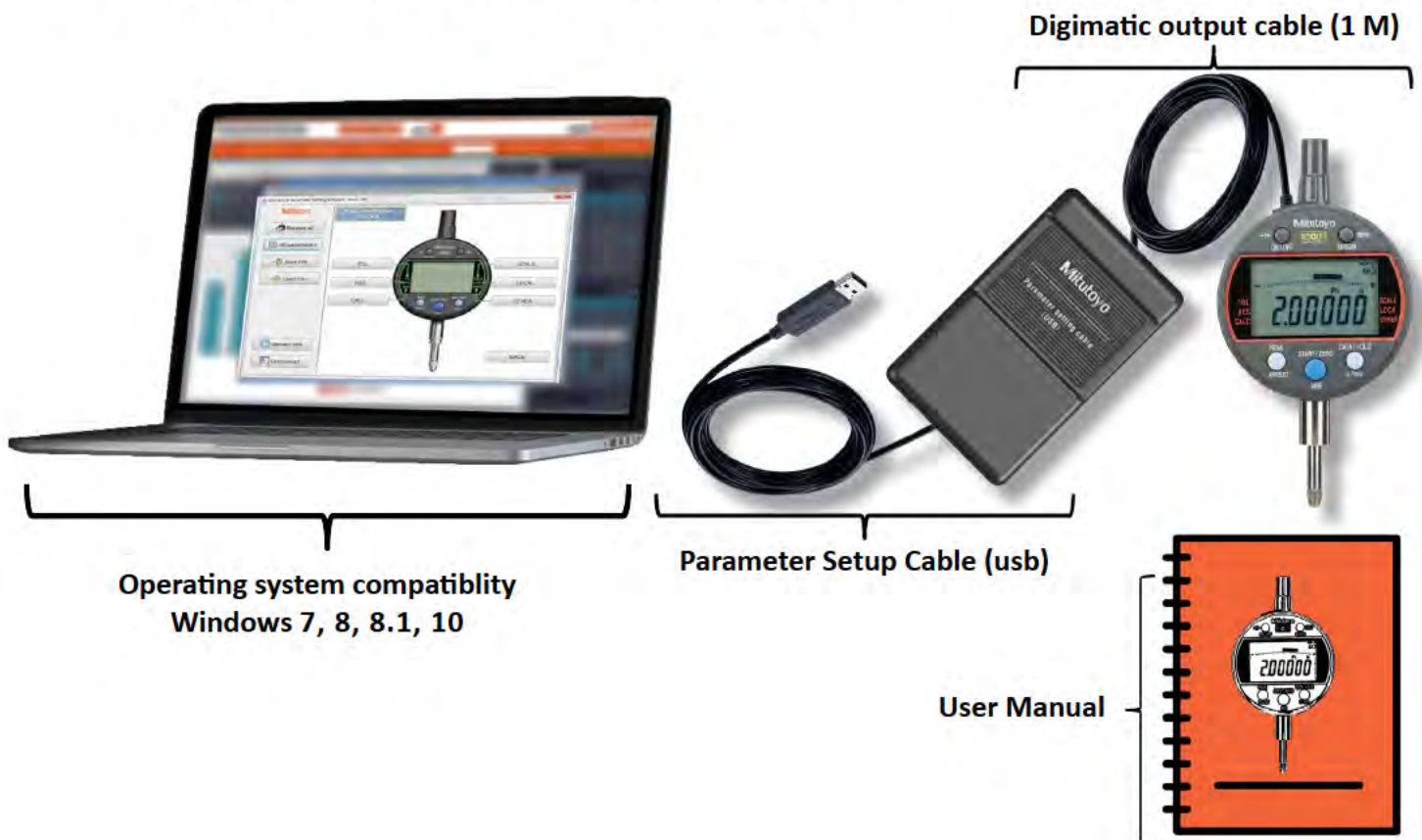
You can download Parameter Setting Software for free by following the link below.

[www.mitutoyo.co.jp/eng/contact/products/idc-ps/](http://www.mitutoyo.co.jp/eng/contact/products/idc-ps/)

YOU MUST PURCHASE THE FOLLOW PARAMETER SET-UP KIT TO GET STARTED!

1. Parameter set-up cable (USB)
2. Digimatic output cable (1 Meter)
3. User Manual

\*Mitutoyo Tip - If you buy 1 pc of the Parameter kit above Order No. 21EZA313, you can use it with ID for calculation, peak-value Hold and Bore Gauge Models.



Operating system compatibility  
Windows 7, 8, 8.1, 10

Parameter Setup Cable (usb)

Digimatic output cable (1 M)

User Manual

**Configurable functions & how to use**  
**Step by step process.**



## Easy Operation

After downloading and installing your Mitutoyo Parameter software you can now connect each cable to PC and ID.

No. BSE-ODD18054E

### Easy operation!

① After download and installed software, connect each cable to PC and ID.

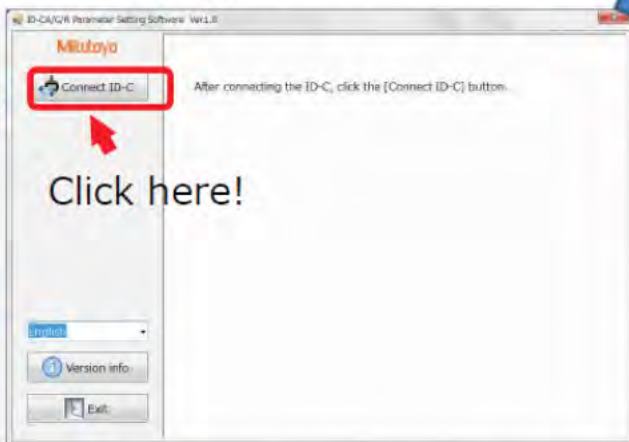


② Set ID-C to PC communication state.

③ Starting Parameter setting software installed on PC

④ Click the "Connect ID-C"

⑤ Click "All parameters" and set the parameter\*

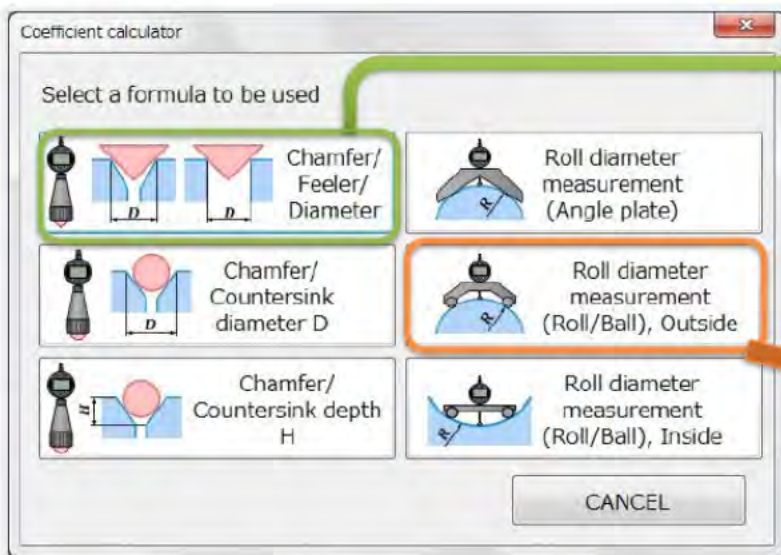


\*Please check page 6 and after for configurable content and how to use.

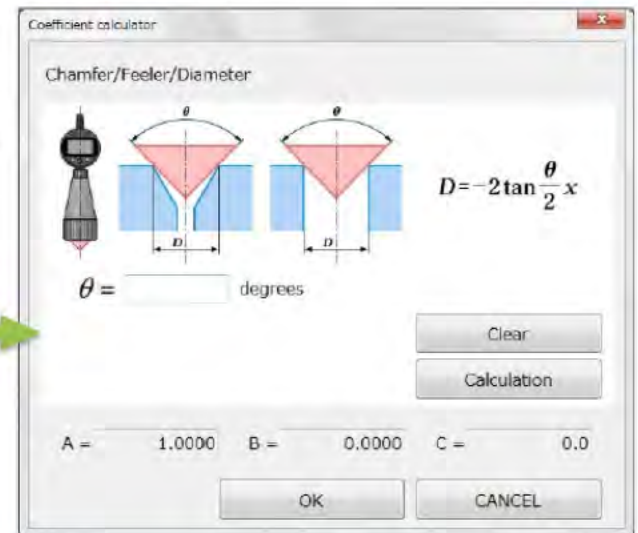
The screen differs for each type of ID.

## Calculation ID type can be calculated with the program in the measuring instrument.

Simply entering the necessary dimensions of the jig, the calculation coefficient can be calculated in software! Conversion is unnecessary and quick measurement is possible.



You can set the calculation formula according to your jig.





## 1-1. Configurable function (1/2)

Configurable items	Setting details	Calculation Type	Peak-Value Hold Type	Bore Gage type
Presetting	Preset No. Selection: P1/P2/P3 Preset value setting: P1/P2/P3	○	○	○
Measurement system selection	ABS/INCsystem	○	○	-
Peak detection mode	OFF / TIR / Max / Min	○	○	-
Tolerance judgment function	ON / OFF	○	○	○
	Upper/lower limits of each measurement system	○	○	○
Select minimum display amount	Vary depending on the model	○	○	○
Mathematical function	ON / OFF	○	○	-
	Calculation coefficient A	○	○	-
	Calculation coefficient B	○	-	-
	Calculation coefficient C	○	-	-
Analog Bar Weight Selection		○	○	○
Key-lock ※	ON / OFF	○	○	○
	Setting of Key Lock Items (Multiple selectable)			
	•PEAK (switching between peak-detection modes)	○	○	-
	•PRESET (preset setting)	○	○	○
	•ZERO (zero-set of indicated values)	○	○	-
	•ABS (switching of measuring system)	○	○	-
	•DATA/HOLD (Hold/Output Indicated values)	○	○	○
	•→ ≠ (centering of analog bar guidances)	○	○	-
•In/mm (Display unit switch)	○	○	○	
•ORIGIN (Origin Point Setting)	○	-	-	
•+-(Counting direction switch)	-	○	-	

“-” means No function (even on the PC screen)

## 1-2. Configurable functions (2/2)

Configurable items	Setting details	Calculation Type	Peak-Value Hold Type	Bore Gage type
Unit display	ON / OFF	○	-	-
Origin offset	ON / OFF	○	-	-
	Origin offset value	○	-	-
Analog bar display	ON / OFF	○	○	○
FAST modes	ON / OFF	○	○	○
Parameter lock ※	ON / OFF	○	○	○
	Setting of Parameter Lock Item (Multiple selectable)			
	•Preset value setting: P1/P2/P3	○	○	○
	•Tolerance setting	○	○	○
	•Calculation factor setting: A/B/C	○	○ (A only)	-
	•Origin offset value setting	○	-	-
•MENU keys	○	○	○	

### ※What is the difference between “Key lock” and “Parameter lock”

- Key Lock: Disable each key operation of the Digimatic Indicator → Cancel is available by main unit operation.
- Parameter Lock: Disables the set values and MENU key operation → can be set only by PC communication, and cannot be released by the main unit operation.



The combination of the key lock and the parameter lock makes it impossible for the measurement operator to perform any key operation.

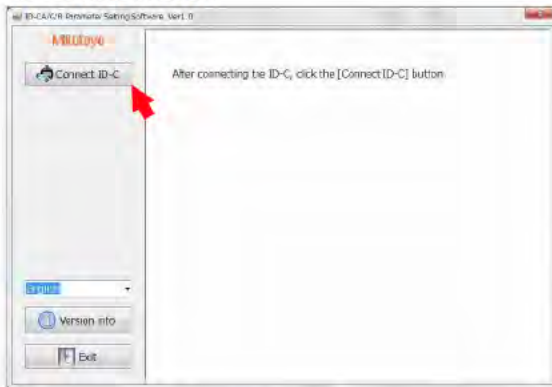
(Prevention of setting change/incorrect rewriting of set value due to incorrect operation)



## 2-1. How to use (Connection to PC and Display of Main screen)



1. Connect the PC - Parameters setting Cable (USB) - Digimatic Output Cable - ID-C as shown above.
2. Set ID-C to PC communication state
3. Starting Parameter setting software installed on PCs
4. Click [ID-C and Connection] on the initial screen to read the settings of the connected ID-C and open the main screen.



Initial screen



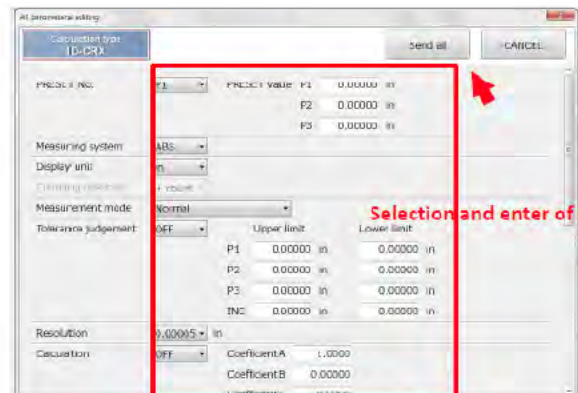
Main screen

(Display changes depending on connected model)

## 2-2. How to use (Enter the parameter and save)



Click [All parameters] on the main screen.



Enter various settings on the All Items display screen, Click Send All Data

# Attachment C - MSI 000002 rev. 00

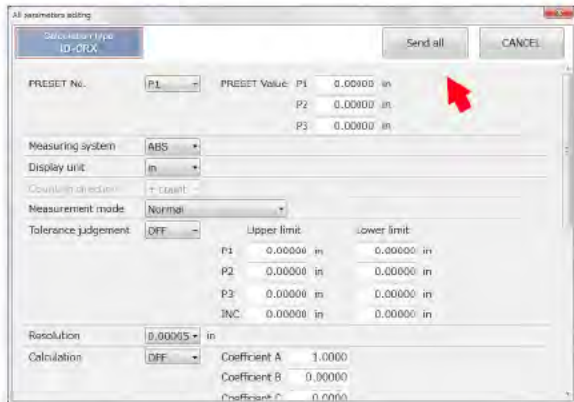
## 2-3. How to use (Copy of Parameter setting to multiple IDs)



Click [Save File] on the main screen.  
The save screen opens and the settings can be saved.



Replace the Digimatic Indicator,  
Click [Load File] on the main screen.



All parameter was entered automatically.  
Check the contents and if there is no error, click [Send all].

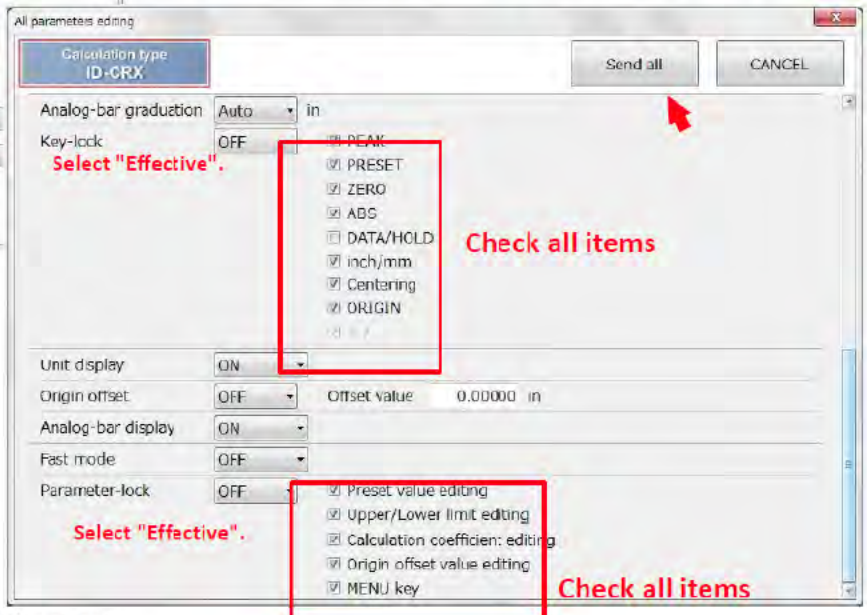
Set multiple units by repeating this operation,  
Or can be copied to a alternative machine

## 2-4. How to use (Key Lock and Parameter Lock)

Click [All parameters] on the main screen,  
Open all items.



After selecting and checking, click [Send all].



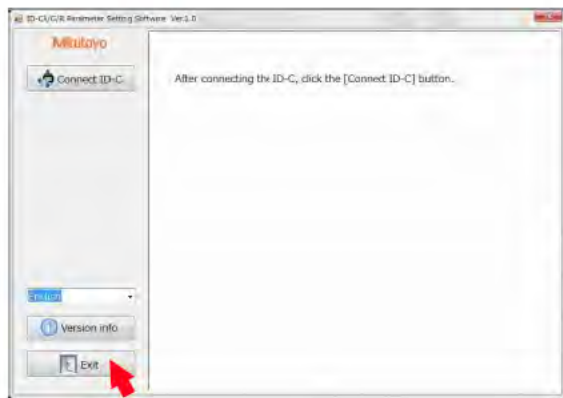
※Setting is also possible on the Individual Setting screen.



## 2-5. How to use (End of communication)



Click [Disconnect] on the main screen after completion of setting.  
⇒ The connected ID-C automatically terminates the PC communication status,  
⇒ Go to measurement mode  
The PC screen moves to the initial screen.



Click [Exit] in the default window to exit the Parameter setting software.

**Have more questions?**  
Please contact us today



[www.mitutoyo.ca](http://www.mitutoyo.ca)



Head Office 905 821 1261



[info@mitutoyo.ca](mailto:info@mitutoyo.ca)



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**MiCAT**

Mitutoyo Intelligent Computer Aided Technology

the standard in world  
metrology software

**MeasurLink**

No. 99MH045B  
SERIES No. 543

# Parameter Setting Software

## ABS Digimatic Indicator ID-CAX/ID-CGX/ID-CRX

# User's Manual (Software Guide)

Read this User's Manual thoroughly  
before operating the instrument. After reading,  
retain it close at hand for future reference.

**Mitutoyo**

---

# Parameter Setting Software End User License Agreement

---

**IMPORTANT – PLEASE READ THIS PARAMETER SETTING SOFTWARE END USER LICENSE AGREEMENT ("EULA") CAREFULLY BEFORE USING THE PARAMETER SETTING SOFTWARE (FOR CALCULATION TYPE, PEAK-VALUE HOLD FUNCTION TYPE, BORE GAGE TYPE ABS DIGIMATIC INDICATOR. (COLLECTIVELY, "SOFTWARE PRODUCT"). THIS EULA SHALL CONSTITUTE A LEGAL AGREEMENT BETWEEN YOU/CUSTOMER AND MITUTOYO CORPORATION ("MITUTOYO"). BY INSTALLING THE SOFTWARE PRODUCT ON AND/OR USING THE EQUIPMENT THAT CONTAINS THIS SOFTWARE PRODUCT, YOU ARE CONSENTING TO BE BOUND BY THE TERMS OF THIS EULA. IF YOU DO NOT AGREE TO ALL OF THE TERMS AND CONDITIONS OF THIS EULA, DO NOT INSTALL OR USE THE SOFTWARE PRODUCT. THE GRANT OF LICENSE SET FORTH BELOW WILL BE EFFECTIVE ONLY WHEN YOU AGREE TO ALL TERMS AND CONDITIONS SET FORTH IN THIS EULA.**

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The foregoing limitations shall apply even if the above-stated warranty fails of its essential purpose.

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## **7 Termination**

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## **8 Export control**

The Software Product is subject to Japanese export control laws as well as any other applicable export or import control laws and regulations in other countries. Customer agrees to comply strictly with all such applicable regulations and acknowledges that it has the responsibility to obtain licenses to export, re-export, or import the Software Product.

## **9 Miscellaneous**

This EULA shall be governed by and construed in accordance with the laws of Japan, without giving effect to the principles of conflict of law. Customer agrees to submit to the exclusive jurisdiction of the district courts in Tokyo, Japan with respect to any dispute, controversy or claim arising out of or relating to this EULA and the parties respective rights and obligations hereunder. This EULA shall not be governed by the United Nations Convention on Contracts for the International Sale of Goods, the application which is expressly excluded.

If any portion hereof is found to be void or unenforceable, the remaining provisions of this EULA shall remain in full force and effect.

This EULA constitutes the entire agreement between Customer and Mitutoyo with respect to the subject matter hereof.

Customer shall indemnify, defend and hold harmless Mitutoyo from and against any and all claims and liability of any nature whatsoever arising out of or in connection with Customer's breach of this EULA.

---

# CONVENTIONS USED IN THIS MANUAL

---

## Types of Notes

The following types of **notes** are used in this manual to help the operator obtain reliable measurement data through correct instrument operation.

---

**NOTE** A *note* provides information to be especially noted or supplemented to use the product. A *note* also supplies information to be noted for specific operations (e.g., memory limitation, instrument configuration, or details that apply to specific versions of a program).

---

The specifications and information in this manual are subject to change without notice.

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---

## Export Control Compliance

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This Product falls into the Catch-All-Controlled Goods and/or Catch-All-Controlled Technologies (including Programs) under Category 16 of Appended Table 1 of Export Trade Control Order or under Category 16 of Appended Table of Foreign Exchange Control Order, based on Foreign Exchange and Foreign Trade Law of Japan.

If you intend re-exporting the product from a country other than Japan, re-selling the product in a country other than Japan, or re-providing the technology (including program), you shall observe the regulations of your country.

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## Service Network



MEMO

# 1

## Installation and Startup

---

### 1.1 Installing the Software

---

Execute "Parameter Setting Software.msi" downloaded from the Mitutoyo home page. The setup processing will start. Install the software according to the guidance on the screen.

If an old version has been installed, however, be sure to perform the procedure in "4. Uninstallation", and then execute this installation.

After the software has been installed successfully, connect the parameter setting cable (USB) to the PC.

### 1.2 Starting the Software

---

Start Parameter Setting Software of the Windows start program.

A Digimatic indicator in the state of PC communication ON, in a state where the connection parameter setting cable and a Digimatic indicator, start the following operation. Click the [Connect ID-C] button, then the program automatically identifies the indicator model currently connected.

If the parameter setting cable is not connected to the PC, the [Connect ID-C] button is disabled. However, if the [Connect ID-C] button is disabled with the parameter setting cable connected to the PC, something is wrong with communication. If this is the case, terminate the software once and then restart it.

---

**NOTE**

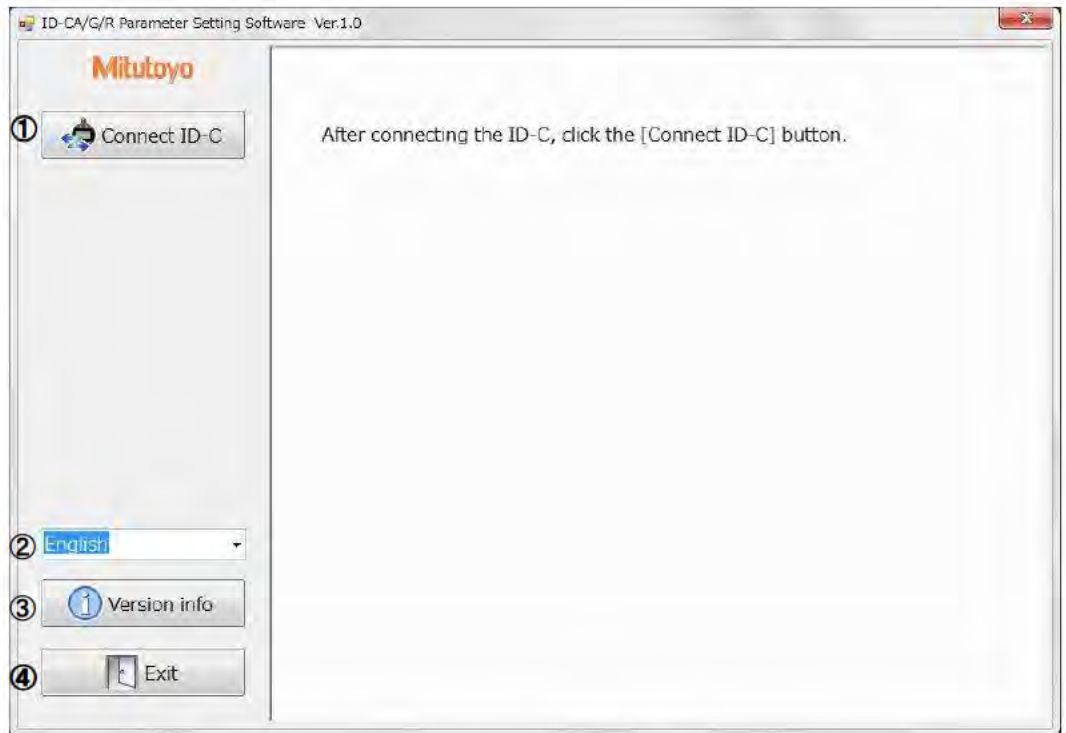
- In order to start the software, the .Net Framework environment needs to have been installed. For information about operating environments, refer to "5. Operating Environments".
  - Use only a single parameter setting cable to connect to one PC. If multiple cables are connected to a PC, normal communication may not be performed.
  - Refer to "6.3.1.1 PC communication" user's manual of a Digimatic indicator for PC communication settings.
-

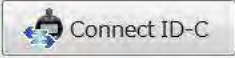
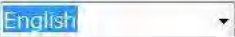


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# 2

## Description of Functions

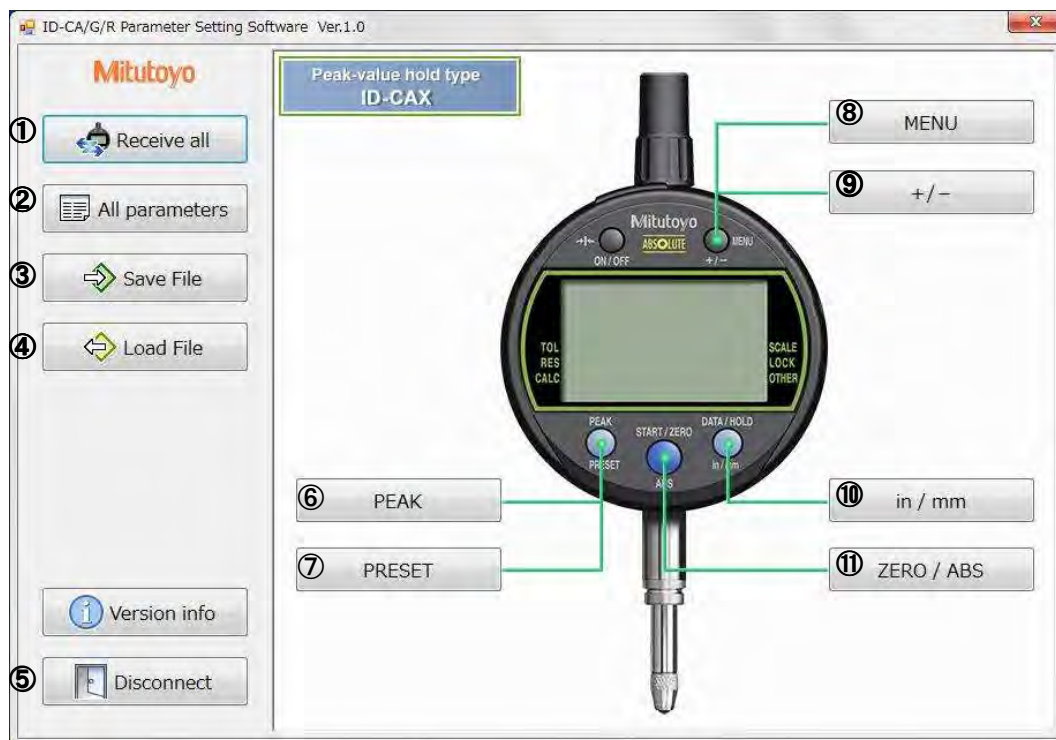
### 2.1 Start Screen



- ①  Reads setting information from a Digimatic indicator (ID-C) currently connected.
- ②  Allows you to select a language to be displayed on the software.
- ③  Displays version information of this software.
- ④  Allows you to exit the software.

## 2.2 Main Screen

ID-CAX



- |   |  |                                                                                            |
|---|--|--------------------------------------------------------------------------------------------|
| ① |  | Reads setting information from ID-C currently connected.                                   |
| ② |  | Moves to the All parameters editing screen.                                                |
| ③ |  | Saves current setting information as a file on the PC.                                     |
| ④ |  | Loads setting information from the file saved on the PC.                                   |
| ⑤ |  | Terminates communication with ID-C and returns to the Start screen.                        |
| ⑥ |  | Sets the measurement mode of ID-C. (Unavailable in ID-CGX)                                 |
| ⑦ |  | Sets a preset number and a preset value.                                                   |
| ⑧ |  | Moves to the MENU screen.                                                                  |
| ⑨ |  | Sets the count direction of a value for a spindle displacement. (Available only in ID-CAX) |
| ⑩ |  | Sets a unit to be displayed on LCD. (Available only in export models)                      |
| ⑪ |  | Sets a measurement system. (Unavailable in ID-CGX)                                         |

## 2. Description of Functions

### ID-CGX



### ID-CRX





## 2.3 MENU Screen

### ID-CAX



- ①  Sets ON/OFF of the tolerance judgment function and a tolerance judgment value.
- ②  Sets a resolution of LCD display value.
- ③  Sets ON/OFF of the calculation function and a calculation coefficient. (Unavailable in ID-CGX)
- ④  Sets the analog-bar graduation.
- ⑤  Sets ON/OFF of the key-lock function.
- ⑥  Moves to the OTHER screen.
- ⑦  Returns to the Main screen.

## 2. Description of Functions

### ID-CGX

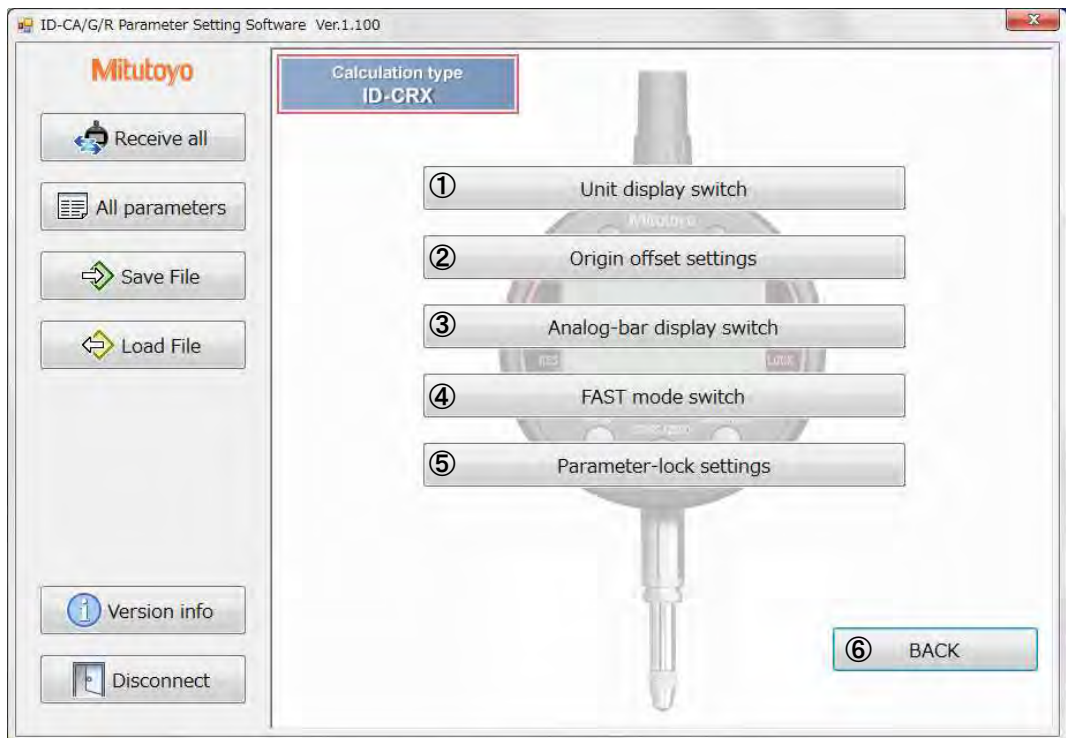


### ID-CRX



## 2.4 OTHER Screen

### ID-CRX



- ①   
Sets ON/OFF of unit display on LCD. (Available only in ID-CRX)
- ②   
Sets an offset value at the origin position of ID-C. (Available only in ID-CRX)
- ③   
Sets ON/OFF of analog-bar display on LCD.
- ④   
Sets ON/OFF of the FAST mode.
- ⑤   
Sets ON/OFF of editing of settings such as numeric values.
- ⑥   
Returns to the MENU screen.

## 2. Description of Functions

### ID-CAX



### ID-CGX








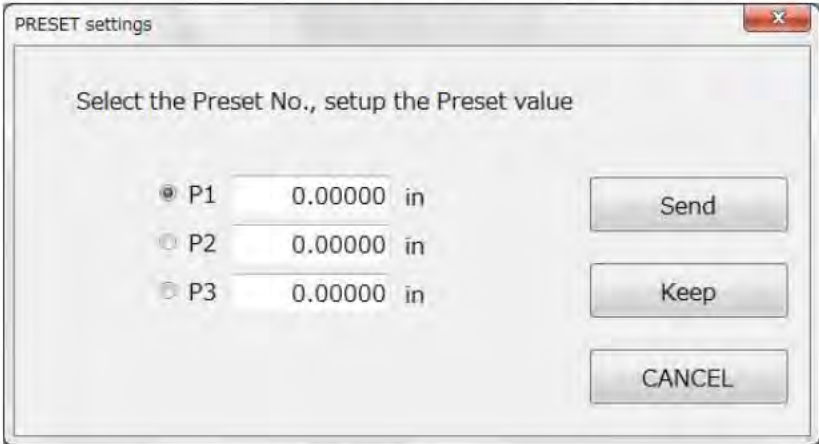
# 3

## Operating Procedure

### 3.1 Parameters Setting (Example: PRSET)

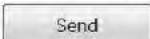
This chapter describes the procedure for setting the PRESET item as a typical example of parameters setting. Use the same operating procedure for other items.


Click  on the Main screen to display the PRESET settings screen.



(1) Select a Preset No. to be set on ID-C.

(2) Enter a Preset value to be set on ID-C.

(3) Click  to send the entered settings to ID-C and then exit the screen.

(4) Click  to cancel the entered settings and then exit the screen.

(5) Click  to retain the entered settings and then exit the screen.

※ At this time, the entered settings will not be sent to ID-C.

- NOTE**
- Before setting a preset value and a tolerance judgment value, set a unit system and a resolution in advance.
  - If you change the unit system or resolution after setting its numeric value, it is recommended that you confirm the numeric value again after setting it.




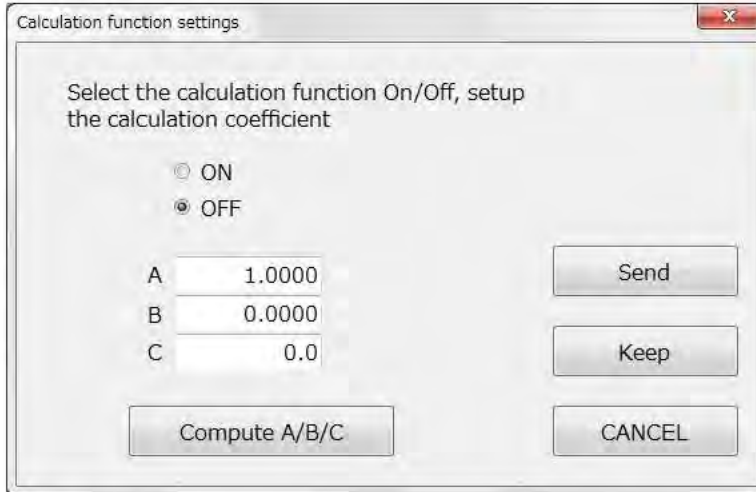
3.2


Coefficients

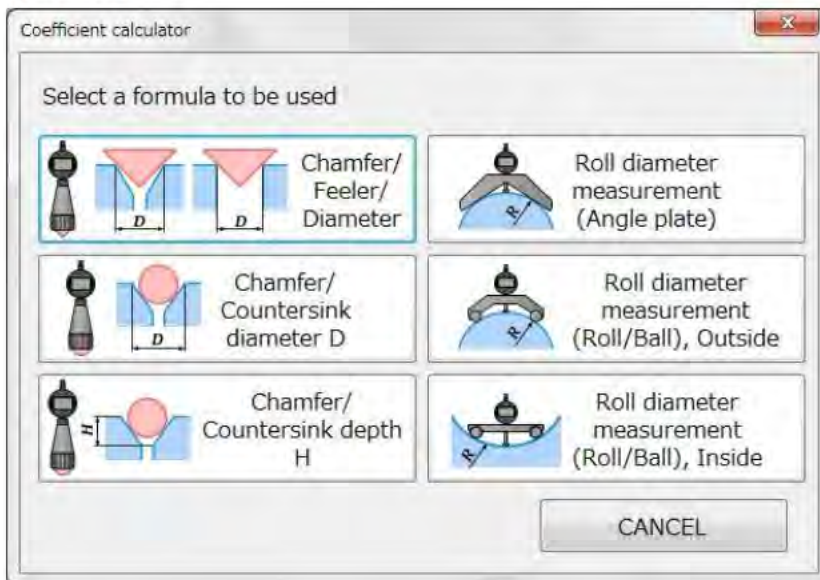
(for ID-CRX only)

As for model ID-CFX a typical coefficient calculation screen calculation function of calculation coefficients in formula be used.

Click  to display the calculation settings screen.



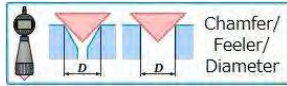
Here click  Coefficient calculator selecting a typical formula.

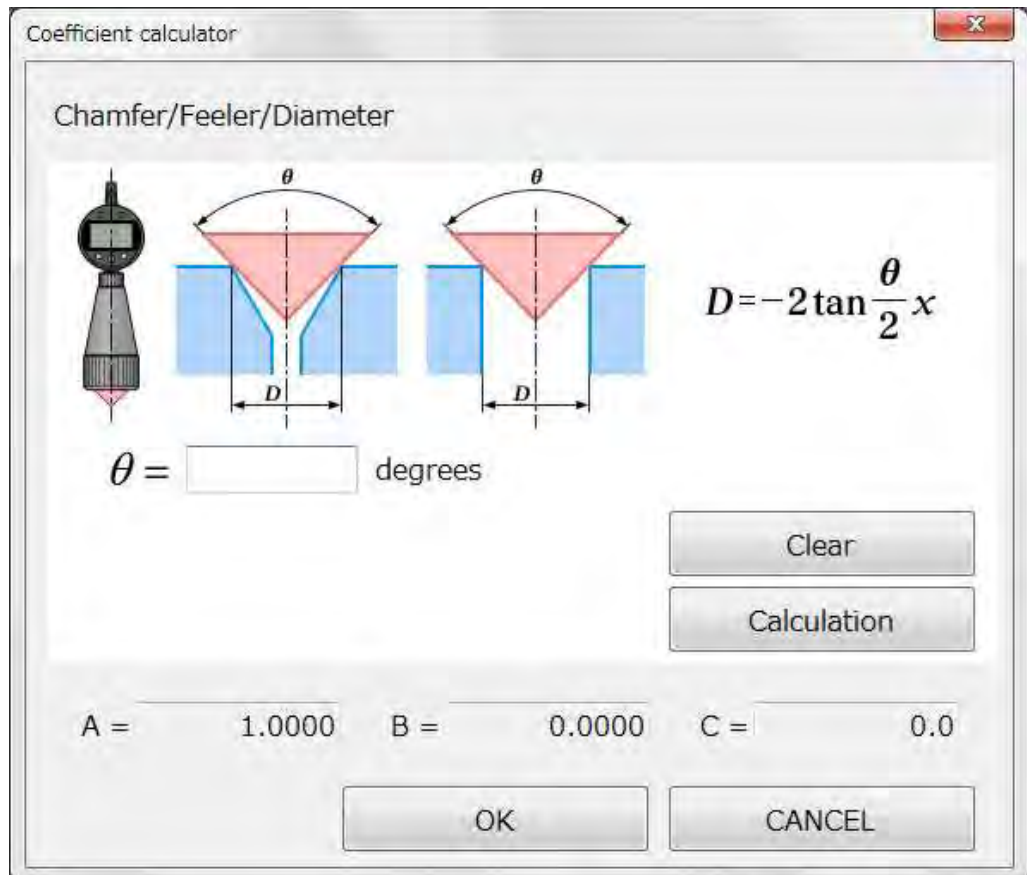


Measurement item.

### 3. Operating Procedure

This section describes the procedure for calculating Chamfer/Feeler/Diameter as a typical example. Use the same operating procedure for other items.

Click the  button to display the Coefficient calculator settings screen of the selected jig formula.



In the case of this jig, D is calculated using the tip angle  $\theta$  of a contact point. (The calculation coefficients displayed at the beginning are the current setup values.)

- (1) Enter the tip angle of the contact point to measure your jig to be used.
- (2) Click the  button.
- (3) Then, the calculation coefficients are automatically calculated and displayed in the calculation coefficient fields.
- (4) If nothing is wrong with any calculated value, click the  button.

This exits the screen and reflects the above values in the calculation coefficient fields on the Calculation function settings screen.

- (5) To abort calculation coefficient settings, click the  button.

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# 4

## Uninstallation

---

- (1) Open the Control Panel and select [Add/Remove Programs].
- (2) Select "Parameter Setting Software" from the list and then click [Uninstall].
- (3) When the message to confirm whether to uninstall it appears, click [Yes].

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# 5

## Operating environment and other

(1) Tested environment

OS	Windows 7 / Windows 8 / Windows 8.1
Execution environment	Microsoft .Net Framework 3.0 or Higher
Display	1024 × 768 dots or more, High color (16bit) or more

(2) Windows is a trademark of Microsoft Corporation in the United States.

(3) Other corporate and product names that appear in this manual are generally their trademarks or registered trademarks.

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## Mitutoyo Corporation

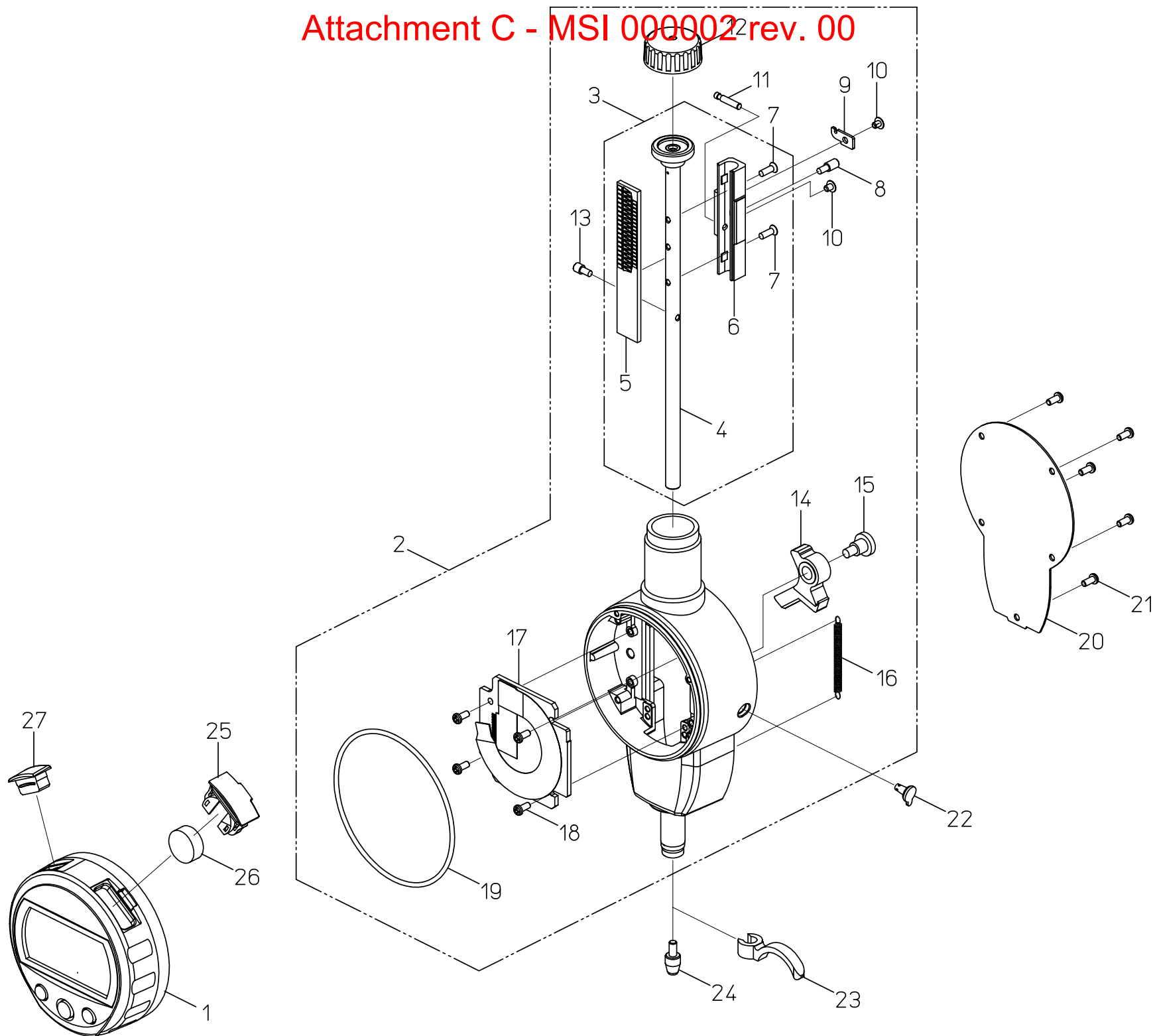
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Attachment C - MSI 000002 rev. 00







**VEHICLE PROGRAM SERVICES (CENV)  
MAINTENANCE SERVICE INSTRUCTIONS  
SIGNED AUTHORIZATION FORM (SAF)**

MSI 000003

REV. 00

**TITLE:** PROCEDURE FOR UTILIZING TREAD WORN HOLLOW GAUGE

**SERIES RAILCAR:** OTHER **CAR BUILDER:** OTHER **INITIATING DOCUMENT(S):** N/A

**ASSOCIATED MSIs:** MSI 140026 (7K) and MSI 000002

REPA Tracking

**CENV/RAIL VEHICLE ENGINEER**

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PROCEDURE FOR UTILIZING TREAD WORN HOLLOW GAUGE

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PROCEDURE FOR UTILIZING TREAD WORN HOLLOW GAUGE

REVISION HISTORY

Rev. #	Date	Description
00	5/21/2022	Initial release to revision 00 on May 21, 2022

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**PROCEDURE FOR UTILIZING TREAD WORN HOLLOW GAUGE**

**1.0 PURPOSE**

Provide instructions for measurement of hollow tread on all WMATA railcar wheels. Specify procedures for using the AAR Wheel Tread Worn Hollow gauge as defined in AAR Rule 41 for all fleets.

**2.0 BACKGROUND**

As part of the return to service plan for the 7000-Series railcars and an improvement to inspection practices, a new hollow tread wheel measurement is introduced for all periodic inspection intervals across all fleets. This procedure details use of the AAR Wheel Tread Worn Hollow gauge as defined in AAR Rule 41.

This procedure will supersede MSI 180265 Rev00 and 150074 Rev00.

**3.0 APPLICABLE CARS**

All fleets.

**4.0 APPLICABLE EQUIPMENT**

All WMATA railcar wheels.

**5.0 REFERENCES**

AAR Rule 41, Section A.1. ab.

**6.0 TOOLS**

AAR Wheel Tread Worn Hollow Gauge

**7.0 MATERIALS**

- Cleaning rags
- Mineral spirits

**8.0 GENERAL SAFETY**

All work shall be conducted in a safe manner and in accordance with the latest edition of the Metrorail Safety Rules and Procedures Handbook. All work shall be performed in such a manner that there is no danger to WMATA personnel or damage to WMATA Property.

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PROCEDURE FOR UTILIZING TREAD WORN HOLLOW GAUGE

9.0 PROCEDURES

9.1 Using Wheel Tread Worn Hollow Gauge

- 9.1.1 Clean the wheel tread using rag and mineral spirits, or other approved cleaning solution.
- 9.1.2 Place the gauge in figure 1 over the tread of the wheel ensuring the gauge is fully seated on the front face of wheel rim as shown in figure 2.

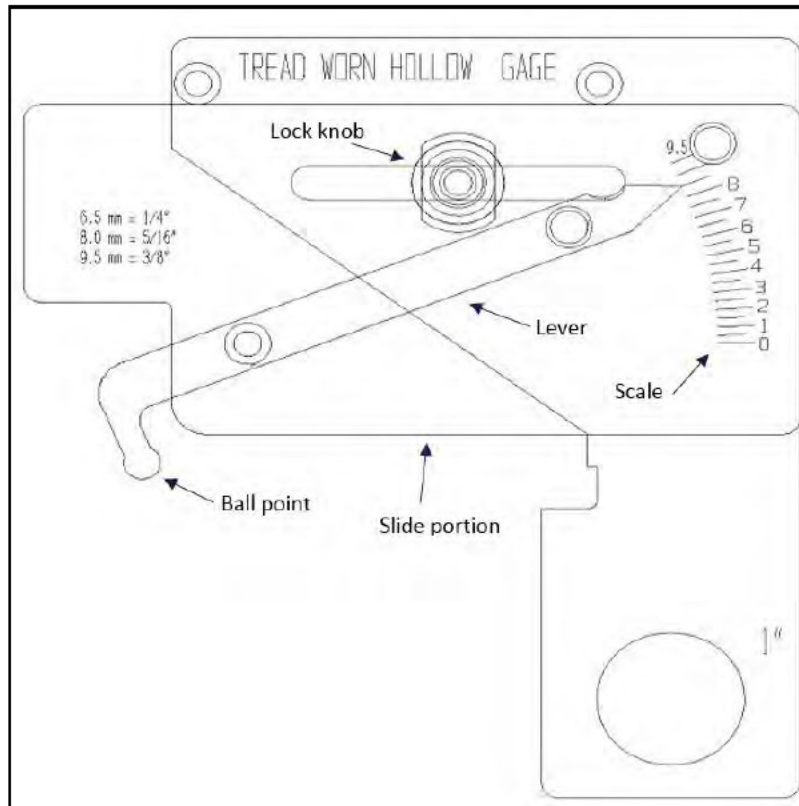


Figure 1. Tread Worn Hollow Gauge

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## PROCEDURE FOR UTILIZING TREAD WORN HOLLOW GAUGE



**Figure 2.** Tread Worn Hollow Gauge positioned Correctly

- 9.1.3 Loosen lock knob to move the slide portion of the gauge so that the ball point of the lever is directly over the deepest part of the wheel tread.
- 9.1.4 Use knob to lock sliding portion of the gauge in place.
- 9.1.5 Rotate the lever so that the ball contacts the deepest part of the wheel tread while ensuring the gauge is still sitting flush against the rim face.
- 9.1.6 Take reading from the scale and record the tread hollow value. The unit of the gauge scale is millimeter (mm).
- 9.1.7 Record measured values in Attachment B.

**PROCEDURE FOR UTILIZING TREAD WORN HOLLOW GAUGE**

**9.2 Criteria**

- 9.2.1 Attachment B shall be marked as PASS if the worn hollow tread measured is less than or equal to 4mm.
- 9.2.2 Attachment B shall be marked as FAIL for any wheel measuring greater than 4 mm of worn hollow and shall be reprofiled in accordance with MSI 000001.

**10.0 ATTACHMENTS**

**10.1 Attachment 'A'**

Winchester Industries – Tread Worn Hollow Gauge

**10.2 Attachment 'B'**

Tread Worn Hollow Measurement Checklist

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Washington Metropolitan Area Transit Authority

OFFICE OF CHIEF MECHANICAL OFFICER, RAIL

Standard Operating Procedure

<b>CATEGORY</b> Operational/Maintenance	<b>TOPIC</b> Control of 7K Vehicles for Compliance with Wheelset Requirements
--------------------------------------------	----------------------------------------------------------------------------------

<b>SOP NO.</b> 102.07	<b>TITLE</b> Procedure for Control of 7K Vehicles for Compliance with Wheelset Requirements		
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<b>LATEST REVISION NO.</b> 0.0	<b>ORIGINATION DATE</b> May 20, 2022	<b>DATE REVIEW DUE</b> May 20, 2024	<b>EXPIRATION DATE</b> May 20, 2030
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<b>LATEST REVISION DATE</b> May 20, 2022	<b>LATEST REVIEW DATE</b> May 20, 2022		
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**SOP APPLIES TO:**  
CMNT, CENV, RQAW and RTRA

**DEPARTMENT/OFFICE/INDIVIDUAL OF PRIMARY RESPONSIBILITY (OPR)**  
CMOR/ RQAW/ Railcar Quality Assurance Warranty and Compliance Senior Manager

**EFFECTIVE PAGES/NOTES**  
None

<b>DISTRIBUTION</b> CMNT, CENV, RQAW, RTRA, SAFE, MTPD, and QICO	<b>COORDINATION WITH OTHER PUBLICATIONS</b> SBF-110, MSI 140026, Permanent Order T-21-22, CMOR SOP 101.02
---------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------

<p><b>APPROVAL:</b></p> <p>Shushil Ramnaress, P.E. <small>Digitally signed by Shushil Ramnaress, P.E. Date: 2022.05.23 11:03:03 -04'00'</small> Date: <u>5/23/22</u></p> <p>Shushil Ramnaress Vice President &amp; Chief Mechanical Officer (VP-CMO) -Acting Vehicle Program Services (CENV)</p>	<p><b>DIRECTED BY:</b></p> <p>Michael Hass <small>Digitally signed by Michael Hass Date: 2022.05.23 14:41:05 -04'00'</small> Date: <u>5/23/22</u></p> <p>Michael J. Hass Senior Vice President (VP) Department Rail Services, (RAIL)</p>
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**Concurrence for CMOR SOP 102.07**

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<p>Stephen Baldassano</p> <hr/>	<p><small>Digitally signed by Stephen Baldassano Date: 2022.05.20 14:47:32 -04'00'</small></p>	<p>Date: <u>5/20/22</u></p>
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<p>Shanita Wilkinson</p> <hr/>	<p><small>Digitally signed by Shanita Wilkinson Date: 2022.05.23 11:00:23 -04'00'</small></p>	<p>Date: _____</p>
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<p>Shushil Ramnaress Deputy Chief Mechanical Officer–Rail Vehicle Engineering Vehicle Program Services (CENV)</p>		

# Procedure for Control of 7K Vehicles for Compliance with Wheelset Requirements

## 1. PURPOSE

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*The Standard Operating Procedure (SOP) provides the process steps and instructions to control the movement of the 7K Series Rail Vehicles to ensure positive control of the fleet with respect to compliance with wheelset requirements.*

## 2. SCOPE

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*The SOP applies to Office of Car Maintenance (CMNT), Railcar Quality Assurance and Warranty Compliance (RQAW), Office of Rail Transportation (RTRA), and Department of Safety (SAFE). The Maintenance Service Instructions (MSI) 140026 measurement data and Periodic Inspection (PI) data for the 7K fleet are utilized to establish Rail Vehicle status information. A **7K Active Cars Report** spreadsheet is maintained.*

## 3. RESPONSIBILITIES

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### **3.1 Railcar Quality Assurance and Warranty Compliance (RQAW)/Senior Manager:**

- 3.1.1 Has the responsibility to notify all affected personnel of this SOP or changes to SOP through the Washington Metropolitan Area Transit Authority (WMATA) email system.
- 3.1.2 Ensure an email is sent to Metro Transit Police Department (MTPD), Office of Quality Assurance, Internal Compliance & Oversight (QICO), and Department of Safety (SAFE) to notify them of the new or revised SOP that must reside within the **Documentum** domain.
- 3.1.3 The email notification shall identify the link where the SOP resides within the **Documentum** domain.
- 3.1.4 Must submit native (Microsoft Word<sup>®</sup>) SOP document(s) to RQAW for final review prior to signatures.
- 3.1.5 Must submit signed Portable Document Format (PDF) SOP to RQAW for final review, prior to being sent to Overhaul Support & Document Configuration Management (ODCM) for upload into **Documentum**.
- 3.1.6 Establishes and assigns staff to the RQAW Validation Team to complete the required responsibilities and procedural steps as indicated within this SOP.

### **3.2 Vice President & Chief Mechanical Officer (VP-CMO), Rail:**

- 3.2.1 Has overall responsibility for administration and compliance with this SOP.
- 3.2.2 Ensure all Chief Mechanical Officer–Rail (CMOR) Managers are made aware of this SOP and any changes thereto through the Scheduled Meetings and fully comply with all requirements herein.

### **3.3 Deputy Chief Mechanical Officer(s) / Senior Program Manager(s), Vehicle Program Services (CENV):**

- 3.3.1 Primary responsibility for administration and compliance with this SOP and its related forms.

## **Procedure for Control of 7K Vehicles for Compliance with Wheelset Requirements**

3.3.2 Ensure CENV personnel are made aware of this SOP and any changes thereto, through the weekly engineering staff meeting and fully comply with all requirements herein.

### **3.4 General Superintendent (GS), CMNT:**

3.4.1 Has overall responsibility for administration and compliance with this SOP.

3.4.2 Ensure all CMNT and Car Track Equipment Maintenance (CTEM) Assistant General Superintendents (AGSs), Superintendents, Assistant Superintendents, and Supervisors are made aware of this SOP and any changes thereto, through the Superintendent Meeting and fully comply with all requirements herein.

### **3.5 CMNT Service Delivery Team**

3.5.1 Ensure all CMNT Service Delivery Team members are aware of this SOP and any changes thereto through the Scheduled Meetings and fully comply with all requirements herein.

### **3.6 CMNT Supervisors**

3.6.1 Ensure all CMNT Shop Personnel are aware of this SOP and any changes thereto through the Scheduled Meetings and fully comply with all requirements herein.

3.6.2 Ensures that all 7K Cars in STORAGE fully comply with the latest revision of Service Bulletin SBF-110 and Operating Rule (OR) 3.126 (as updated in Permanent Order T-21-22).

3.6.3 Ensures that all cars in their assigned yard that are “RELEASED” (Green) have received a **Daily Inspection (DI)** prior to use and are compliant with MSI 140026 inspection and PI requirements.

### **3.7 RQAW Validation Team**

3.7.1 Ensure all RQAW Validation Team members are aware of this SOP and any changes thereto through the Scheduled Meetings and fully comply with all requirements herein.

3.7.2 Ensure that the Quality Checks per this procedure are completed in a timely manner and any anomalies are reported to all key stakeholders.

### **3.8 RTRA**

3.8.1 Ensure all RTRA Staff are aware of this SOP and any changes thereto through the Scheduled Meetings and fully comply with all requirements herein.

3.8.2 Only authorize the use of 7K cars for mainline travel that are **not** identified in Rail Performance Monitor (RPM) as “STORAGE” (Black).



**NOTICE:** All requests for mainline usage of 7K rail vehicle in storage status (black in RPM) for any reason must be coordinated through the Car Maintenance Service Delivery Team in accordance with CMOR SOP 101.02.

3.8.3 Ensure all RTRA Staff are trained using the color codes within the RPM system.

## 4. DEFINITIONS

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- 4.1 **Class 1 Rail Vehicles:** A type of rail vehicle that was originally designed for transportation of passengers.
- 4.2 **Daily Inspection:** An inspection performed by a CMNT technician to identify and correct problems with class 1 rail vehicles that cannot wait until the next scheduled inspection, as well as problems that may impact passenger safety and comfort.
- 4.3 **Documentum:** Electronic document management system software that provides a single source for documentation storage and controlled access.
- 4.4 **Stakeholders:** Departments and personnel that are directly affected by this SOP.
- 4.5 **MAXIMO:** Enterprise asset management software system that provides a single source for documentation, monitoring, maintaining, planning, scheduling, and analyzing assets and inventory.
- 4.6 **7K Active Car Report:** This report provides status information for all active 7K Cars. To include, but not limited to, MSI 140026 inspection schedule, PI compliance, and car location.

## 5. ABBREVIATIONS and ACRONYMS

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<b>AGS:</b>	Assistant General Superintendent
<b>CENV:</b>	Vehicle Program Services
<b>CM:</b>	Corrective Maintenance
<b>CMNT:</b>	Office of Car Maintenance
<b>CMO:</b>	Chief Mechanical Officer
<b>CMOR:</b>	Office of Chief Mechanical Officer - Rail
<b>CTEM:</b>	Car Track Equipment Maintenance
<b>DI:</b>	Daily Inspection
<b>GS:</b>	General Superintendent
<b>MSI:</b>	Maintenance Service Instructions
<b>MSRPH:</b>	Metrorail Safety Rules and Procedures Handbook
<b>MTPD:</b>	Metro Transit Police Department
<b>OPR:</b>	Office of Primary Responsibility
<b>OR:</b>	Operating Rule
<b>PDF:</b>	Portable Document Format
<b>PI:</b>	Periodic Inspection
<b>PM:</b>	Preventive Maintenance



## Procedure for Control of 7K Vehicles for Compliance with Wheelset Requirements

<b>PO:</b>	Permanent Order
<b>PTASP:</b>	Public Transportation Agency Safety Plan
<b>QICO:</b>	Office of Quality Assurance, Internal Compliance & Oversight
<b>ROCC:</b>	Rail Operations Control Center
<b>RPM:</b>	Rail Performance Monitor
<b>RQAW:</b>	Railcar Quality Assurance and Warranty Compliance
<b>RTRA:</b>	Office of Rail Transportation
<b>SAFE:</b>	Department of Safety
<b>SB:</b>	Service Bulletin
<b>SOP:</b>	Standard Operating Procedure
<b>WMATA:</b>	Washington Metropolitan Area Transit Authority

## 6. PROCEDURES

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### 6.1 Process for Wheelset Manual Inspections

- 6.1.1 CMNT Service Delivery Team shall distribute a list of the 7K Cars requiring inspection per MSI 140026 and their location to CMNT, RTRA, Rail Operations Control Center (ROCC), RAIL, SAFE and RQAW **stakeholders**.
- 6.1.2 CMNT and RQAW shall perform inspections per MSI 140026 on the 7K Cars identified by the CMNT Service Delivery Team as requiring inspection.
  - 6.1.2.1 CMNT Supervisor shall verify that measurement results are entered into corresponding PM Work Orders in **MAXIMO**.
  - 6.1.2.2 RQAW Inspector shall provide completed checklists to RQAW Validation Team.
- 6.1.3 RQAW Validation Team shall verify that measurement results in corresponding PM Work Orders in **MAXIMO** match those in completed checklists.
- 6.1.4 RQAW Validation Team shall provide pass/fail results and verified checklists to CMNT Service Delivery Team.
- 6.1.5 CMNT Service Delivery Team shall attach verified checklists to the corresponding PM Work Orders in **MAXIMO**.
  - 6.1.5.1 In case of passing results, CMNT Service Delivery Team shall verify closure of the corresponding PM Work Orders in **MAXIMO**.
  - 6.1.5.2 In case of failing results, CMNT Service Delivery Team shall verify that a corresponding CM Work Order has been created and opened.
  - 6.1.5.3 In case of failing results, CMNT shall perform removal from and subsequent return to service in accordance with SBF-110, Procedure for Removing and Releasing 7K Car from Service Due to Back-to-Back and/or Journal Bearing Gap Failures.
- 6.1.6 CMNT Service Delivery Team shall update the **7K Active Car Report** for the pass/fail results.

## **Procedure for Control of 7K Vehicles for Compliance with Wheelset Requirements**

- 6.1.7 CMNT Service Delivery Team shall distribute the updated **7K Active Car Report** to CMNT, RTRA, Rail Operations Control Center (ROCC), RAIL, SAFE and RQAW stakeholders.
- 6.1.8 CMNT Supervisors shall ensure that only 7K cars identified in that day's **7K Active Car Report** as compliant with MSI 140026 inspection and PI requirements, and that have successfully completed **Daily Inspection**, are released for service. Inability to verify compliance shall be progressively escalated to CMNT management (Assistant Superintendent, Superintendent, Assistant General Superintendent, and General Superintendent) until resolved.

## **7. SAFETY MANAGEMENT**

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This document has been created in compliance with WMATA's Public Transportation Agency Safety Plan (PTASP) and safety policy. Any hazards and risks associated with the processes within this document have been evaluated for safety and have appropriate mitigation strategies established as part of WMATA's overall risk assessment management, where applicable and/or relevant. This document is also subject to monitoring for safety risk mitigation adherence and safety performance, and has effective communication practices in place, including adequate safety training to ensure competencies, and to solicit feedback from the affected employees, where applicable and/or relevant. For further guidance on WMATA's safety plan, visit the Department of Safety's (SAFE) intranet homepage.

## **8. REFERENCES**

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- SBF-110 Procedure for Removing and Releasing 7K Car from Service Due to Back-to-Back and/or Journal Bearing Gap Failures
- MSI 140026 Wheel Back-to-Back and Journal Bearing Measurements
- Permanent Order T-21-22 Modification to Operating Rule 3.126 Storage of Rail Vehicles
- CMOR SOP 101.02 Procedures for Control of Non-Revenue 7K Vehicles and Release for Mainline Travel

## **9. RECORDS**

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- MSI 140026 Attachment C: 7000 Series Wheel Back-to-Back Measurement and Journal Bearing Gap Verification Checklist
- 7K Active Cars Report

## **10. ATTACHMENTS**

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N/A



Washington Metropolitan Area Transit Authority  
**OFFICE OF CHIEF MECHANICAL OFFICER,  
 RAIL**

**Standard Operating Procedure**

<b>CATEGORY</b> Operational/Maintenance	<b>TOPIC</b> Control of Non-Revenue 7K Vehicles and Release for Mainline Travel
--------------------------------------------	------------------------------------------------------------------------------------

<b>SOP NO.</b> 101.02	<b>TITLE</b> Procedures for Control of Non-Revenue 7K Vehicles and Release for Mainline Travel		
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<b>LATEST REVISION NO.</b> 0.0	<b>ORIGINATION DATE</b> April 04, 2022	<b>DATE REVIEW DUE</b> April 04, 2024	<b>EXPIRATION DATE</b> April 04, 2030
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<b>LATEST REVISION DATE</b> April 04, 2022	<b>LATEST REVIEW DATE</b> April 04, 2022		
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**SOP APPLIES TO:**  
 CMNT, CENV, RQAW and RTRA

**DEPARTMENT/OFFICE/INDIVIDUAL OF PRIMARY RESPONSIBILITY (OPR)**  
 CMOR/ RQAW/ Railcar Quality Assurance Warranty and Compliance Senior Manager

**EFFECTIVE PAGES/NOTES**  
 None

<b>DISTRIBUTION</b> CMNT, CENV, RQAW, RTRA, SAFE, MTPD, and QICO	<b>COORDINATION WITH OTHER PUBLICATIONS</b> SBF-110, MSI 140026 and Permanent Order T-21-22
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<p><b>APPROVAL:</b></p> <p>Shushil Ramnaress, P.E. <small>Digitally signed by Shushil Ramnaress, P.E. Date: 2022.04.05 12:39:43 -04'00'</small> Date: <u>4/5/22</u></p> <p>Shushil Ramnaress        Vice President &amp; Chief Mechanical Officer (VP-CMO) -Acting Vehicle Program Services (CENV)</p>	<p><b>DIRECTED BY:</b></p> <p>Michael Hass <small>Digitally signed by Michael Hass Date: 2022.04.05 11:16:47 -04'00'</small> Date: <u>4/5/22</u></p> <p>Michael J. Hass        Senior Vice President (VP)        Department Rail Services, (RAIL)</p>
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Always Check Source Document for Current Revision,

## Concurrence for CMOR SOP 102.02

Brand Loney [REDACTED] Digitally signed by Brand Loney  
WMATA [REDACTED] WMATA  
Date: 2022.04.04 15:42:33 -04'00' **Date:** 4/4/22

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Brand A. Loney  
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Office of Car Maintenance (CMNT)

Stephen Baldassano Stephen Baldassano [REDACTED]  
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Steve Baldassano  
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P.E. Ramnaress, P.E.  
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Shushil Ramnaress  
Deputy Chief Mechanical Officer–Rail Vehicle Engineering  
Vehicle Program Services (CENV)

# Procedures for Control of Non-Revenue 7K Vehicles and Release for Mainline Travel

## 1. PURPOSE

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*The Standard Operating Procedure (SOP) provides the process steps and instructions to control the movement of the 7K Series Rail Vehicles to ensure positive control of the fleet to prevent movement of non-qualified cars. In addition, specific permission must be granted each time a 7K Series Rail Vehicle is requested for mainline activities including, but not limited to, transfer from a rail yard to rail yard for maintenance and/or inspection and/or to travel on the Mainline for testing, deicing operations and/to for usage in training.*

## 2. SCOPE

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*The SOP applies to Office of Car Maintenance (CMNT), Railcar Quality Assurance and Warranty Compliance (RQAW), Office of Rail Transportation (RTRA), and Department of Safety (SAFE). The MSI 140026 measurement data, Periodic Inspection (PI) data, and accelerated inspection data for the 7K fleet are utilized to establish Rail Vehicle status information. Spreadsheets are maintained for 7K Axle Failures List, Cars Qualified for Non-Rev Movement List, and 7K Fleet Status.*

## 3. RESPONSIBILITIES

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### **3.1 Railcar Quality Assurance and Warranty Compliance (RQAW)/Senior Manager:**

- 3.1.1 Has the responsibility to notify all affected personnel of this SOP or changes to SOP through the Washington Metropolitan Area Transit Authority (WMATA) email system.
- 3.1.2 Ensure an email is sent to Metro Transit Police Department (MTPD), Office of Quality Assurance, Internal Compliance & Oversight (QICO), and Department of Safety (SAFE) to notify them of the new or revised SOP that must reside within the **Documentum** domain.
- 3.1.3 The email notification shall identify the link where the SOP resides within the **Documentum** domain.
- 3.1.4 Must submit native (Microsoft Word®) SOP document(s) to RQAW for final review prior to signatures.
- 3.1.5 Must submit signed Portable Document Format (PDF) SOP to RQAW for final review, prior to being sent to Overhaul Support & Document Configuration Management (ODCM) for upload into **Documentum**.
- 3.1.6 Establishes and assigns staff to the RQAW Validation Team to complete the required responsibilities and procedural steps as indicated within this SOP.

### **3.2 Vice President & Chief Mechanical Officer (VP-CMO), Rail:**

- 3.2.1 Has overall responsibility for administration and compliance with this SOP.
- 3.2.2 Ensure all Chief Mechanical Officer–Rail (CMOR) Managers are made aware of this SOP and any changes thereto through the Scheduled Meetings and fully comply with all requirements herein.



## **Procedures for Control of Non-Revenue 7K Vehicles and Release for Mainline Travel**

### **3.3 Deputy Chief Mechanical Officer(s) / Senior Program Manager(s), Vehicle Program Services (CENV):**

- 3.3.1 Primary responsibility for administration and compliance with this SOP and its related forms.
- 3.3.2 Ensure CENV personnel are made aware of this SOP and any changes thereto, through the weekly engineering staff meeting and fully comply with all requirements herein.

### **3.4 General Superintendent (GS), CMNT:**

- 3.4.1 Has overall responsibility for administration and compliance with this SOP.
- 3.4.2 Ensure all CMNT and Car Track Equipment Maintenance (CTEM) Assistant General Superintendents (AGSs) and Superintendents are made aware of this SOP and any changes thereto, through the Superintendent Meeting and fully comply with all requirements herein.
- 3.4.3 Is responsible for the final approval of the request and to distribute the list of 7K Qualified Cars (Cars that meet DST, 60-day PI and Pass MSI 140026 Measurements) to CMNT, RTRA, RAIL, SAFE, and RQAW **stakeholders** daily.

### **3.5 CMNT Service Delivery Team**

- 3.5.1 Ensure all CMNT Service Delivery Team members are aware of this SOP and any changes thereto through the Scheduled Meetings and fully comply with all requirements herein.
- 3.5.2 Shall coordinate with the appropriate party (KRC or CMNT or Other) the repair of cars on '7K Axle Active Failures List' to ensure restrictions are lifted, and once repair has been complete coordinate review with RQAW, and after that is complete, remove repaired car from the 7K Axle Active Failures List.

### **3.6 CMNT Shop Supervisors**

- 3.6.1 Ensure all CMNT Shop Personnel are aware of this SOP and any changes thereto through the Scheduled Meetings and fully comply with all requirements herein
- 3.6.2 Ensures that all 7K Cars in STORAGE fully comply with Operating Rule (OR) 3.126 (as updated in Permanent Order T-21-22).
- 3.6.3 Ensures that all cars on "7K Axle Active Failure List" are compliant with Service Bulletin (SB) SBF-110, latest revision.
- 3.6.4 Ensures that all cars in their assigned yard that are "QUAL FOR NON-REV" (Gray) have received a Daily Safety Inspection prior to use.

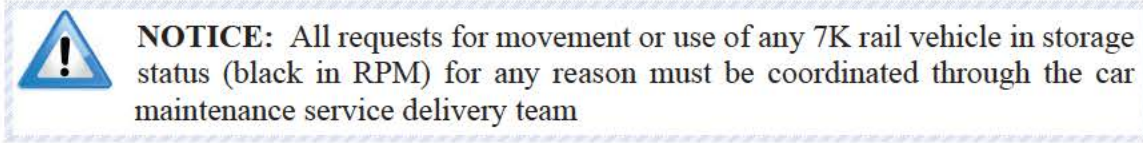
### **3.7 RQAW Validation Team**

- 3.7.1 Ensure all RQAW Validation Team members are aware of this SOP and any changes thereto through the Scheduled Meetings and fully comply with all requirements herein.
- 3.7.2 Ensure that the Quality Checks per this procedure are completed in a timely manner and any anomalies are reported to all key stakeholders.

## Procedures for Control of Non-Revenue 7K Vehicles and Release for Mainline Travel

### 3.8 RTRA

- 3.8.1 Ensure all RTRA Staff are aware of this SOP and any changes thereto through the Scheduled Meetings and fully comply with all requirements herein.
- 3.8.2 Only authorize the use of 7K Cars for Non-Revenue movement and use that are identified in Rail Performance Monitor (RPM) as “QUAL FOR NON-REV” (Gray).



- 3.8.3 Ensure all RTRA Staff are trained using the color codes within the RPM system.
  - 3.8.3.1 Cars in “**STORAGE**” are color-coded Black.
  - 3.8.3.2 Cars that are “**Qual for Non-Rev**” are color-coded Gray.

## 4. DEFINITIONS

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- 4.1 **Class 1 Rail Vehicles:** A type of rail vehicle that was originally designed for transportation of passengers.
- 4.2 **Documentum:** Electronic document management system software that provides a single source for documentation storage and controlled access.
- 4.3 **Stakeholders:** Departments and personnel that are directly affected by this SOP.
- 4.4 **Limited Yard Move:** This RPM restriction will allow normal movement of a car within a yard. It will prevent application of a Train ID and it will prevent a Train from being Dispatched. The RPM status is colored BLACK
- 4.5 **Yard Restriction:** For the purpose of this SOP, the car is restricted to the yard where it is located and flagged in RPM. The RPM status is colored BLACK
- 4.6 **MAXIMO:** Enterprise asset management software system that provides a single source for documentation, monitoring, maintaining, planning, scheduling, and analyzing assets and inventory
- 4.7 **Move Restricted:** This RPM restriction prevents movement of any car within RPM system. The RPM status is colored BLACK.
- 4.8 **Qual for Non-Rev Move:** This is a new status for 7K cars that have been qualified for yard-to-yard movement (Cars that meet Daily Safety Test [DST], 60-day PI and Pass MSI 140026 Measurements), operator qualification testing, vehicle testing, or any activity on mainline. The RPM status is colored Gray to allow easy identification.

**Procedures for Control of Non-Revenue 7K Vehicles and Release for Mainline Travel**

**4.9 “7K Axle Active Failures List”:** This report is a Microsoft Excel® spreadsheet that contains the list of all axle failures, and pertinent information regarding the axle state. The minimum information required in the spreadsheet is defined by the column headings as follows:

**Table 1: 7K Axle Active Failures List**

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Index	Car Number	Axle	Axle Serial Number	Heat Lot	Conditional Acceptance Date	B2B Measurement	Dial Gauge Measurement	Journal Bearing Gap Measurement	Maximo WO	Inspection Date	Mileage	Failure Criteria	Status	Current Axle Location	Reference

“Failure Criteria” column M, will indicate “Movement”; “Movement/Out of Tolerance”; and “Out of Tolerance”

“Status” column N, will indicate: “Dismounted”; “Remounted”; “On-Car” and “WIP”

**4.10 “7K Cars Qualified for Non-Rev Movement List”:** This report is generated from an Excel spreadsheet that produces a table all 7K Cars that Qualified for Non-Revenue movements. The movement reason is specified in the column labeled “Move Reason” or within the title of the table. The minimum information required in the report table is as follows:

**Table 2: 7K Cars Qualified for Non-Rev Movement List**

7K Cars Qualified for Non-Rev Movement							
CMNT Superintendent	Yard	Car	Move Reason	MSI 140026 Inspection Date	MSI 140026 Inspection Results	Next MSI 140026 Inspection Due Date	PI Due Date

**4.11 “7K Fleet Status List”:** This report is modified from the current “7K Cars within 60-Day PI Window” that is maintained by CMNT that indicates the status of the 7K Cars for PI compliance. The table of information for the 7K Fleet Status list shall contain the following:

**Table 3: 7K Fleet Status List**

7K Fleet Status List											
Yard	Car	Maximo Status	RPM Move Restricted	RPM Limited Yard Move Restricted	RPM Yard Restricted	MSI 140026 Inspection Date	MSI 140026 Inspection Results	Next MSI 140026 Inspection Due Date	PI Completed Date	PI Due Date	Notes

## 5. ABBREVIATIONS and ACRONYMS

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<b>AGS:</b>	Assistant General Superintendent
<b>CENV:</b>	Vehicle Program Services
<b>CMNT:</b>	Office of Car Maintenance
<b>CMOR:</b>	Chief Mechanical Officer - Rail
<b>CTEM:</b>	Car Track Equipment Maintenance
<b>DST:</b>	Daily Safety Test
<b>GS:</b>	General Superintendent
<b>MSI:</b>	Maintenance Service Instructions
<b>MSRPH:</b>	Metrorail Safety Rules and Procedures Handbook
<b>MTPD:</b>	Metro Transit Police Department
<b>OPR:</b>	Office of Primary Responsibility
<b>OR:</b>	Operating Rule
<b>PDF:</b>	Portable Document Format
<b>PI:</b>	Periodic Inspection
<b>PO:</b>	Permanent Order
<b>PTASP:</b>	Public Transportation Agency Safety Plan
<b>QICO:</b>	Office of Quality Assurance, Internal Compliance & Oversight
<b>ROCC:</b>	Rail Operations Control Center
<b>RPM:</b>	Rail Performance Monitor
<b>RQAW:</b>	Railcar Quality Assurance and Warranty Compliance
<b>RTRA:</b>	Office of Rail Transportation
<b>SAFE:</b>	Department of Safety
<b>SB:</b>	Service Bulletin
<b>SOP:</b>	Standard Operating Procedure
<b>WMATA:</b>	Washington Metropolitan Area Transit Authority



## 6. PROCEDURES

Procedure #	Content
6.1	<b>RQAW Validation Team Duties</b>
6.2	<b>CMNT Service Delivery Team Duties</b>
6.3	<b>Request for 7K for Non-Revenue Service</b>
6.4	<b>7K Cars Qualified for Non-Revenue Service</b>
6.5	<b>RQAW Validation of 7K Cars Qualified for Non-Revenue Service</b>
6.6	<b>RQAW Storage and Record Keeping MSI 140026 Att. C</b>
6.7	<b>Management of 7K MSI 140026 Failed Cars</b>
6.8	<b>Release and/or Transfer of 7K Cars from Yards to Mainline Travel that are currently in “INACTIVE” status noted as STORAGE – Black Color</b>

### 6.1 RQAW Validation Team Duties

- 6.1.1 Perform quality review over list of active MSI 140026 failures daily.
- 6.1.2 Perform quality review of list of 7K cars qualified for non-revenue use daily.
- 6.1.3 Perform quality review of RPM data to verify proper application of asset status and RPM restrictions by comparing the RPM report of 7K Series Rail Vehicle statuses to the report provided by the CMNT Service Delivery Team daily.

### 6.2 CMNT Service Delivery Team Duties

- 6.2.1 Monitor scheduled maintenance (PI) compliance for the 7K fleet. Work with the PI facilities scheduling additional cars for PI to increase compliance.
- 6.2.2 Monitor established MSI 140026 requirements for all 7K cars. Work with the Service & Inspection facilities to coordinate MSI 140026 checks as needed.
- 6.2.3 Review results from MSI 140026 (latest rev) and report out on any cars that fail, daily (**7K Axle Active Failures List**).
- 6.2.4 Maintain list of cars with active failures from MSI 140026 (latest rev). Update that list as failed axles are replaced, or additional axles are identified, ensuring the associated **MAXIMO** work orders for corrective action are captured (**7K Axle Active Failures List**).
- 6.2.5 Maintain list of **7K Cars Qualified for Non-Rev Movement List** that passed the requirements and reports daily.
- 6.2.6 Maintain list of PI compliant cars.
- 6.2.7 Maintain accurate **MAXIMO** and RPM status of all 7K cars.
- 6.2.8 Establish and update as needed in RPM, the “Limited Yard Movement” Restriction on all 7K Cars in RPM that are in STORAGE (Black).
- 6.2.9 Establish and update as needed in RPM the “Yard Restriction” to establish the yard the car is located at the time the restriction is set or updated.



## Procedures for Control of Non-Revenue 7K Vehicles and Release for Mainline Travel

6.2.10 Establish and update as needed in RPM, the “Move Restricted” Restriction on all 7K Cars on the “7K Axle Active Failure List”

### 6.3 Request for 7K for Non-Revenue Service

6.3.1 All requests for 7K Cars (movement or use) shall be sent to the CMNT Service Delivery Team via the WMATA approved email system for evaluation for consideration.

6.3.2 RTRA and all other offices, including CMNT, shall email requests to:

██████████@wmata.com

6.3.3 CMNT Service Delivery Team shall complete the evaluation per the steps outlined in §6.2 of the SOP and notify the requesting party the 7K Cars (movement or use) if the request is approved.

### 6.4 7K Cars Qualified for Non-Revenue Service

6.4.1 CMNT Service Delivery Team receives requests for movement or use of any 7K Car and evaluates each for necessity and availability.

6.4.2 CMNT Service Delivery Team will consolidate the requests for 7K Cars (movement or use) and develop a list of cars that are eligible to be qualified.

6.4.3 CMNT Service Delivery Team submits the list of 7K Cars (movement or use) eligible to the General Superintendent (GS).

6.4.4 The GS reviews the lists and provides concurrence via email to the CMNT Service Delivery Team for approval and to SAFE ██████████@wmata.com) for information that the list of 7K Cars is Qualified (movement or use).

6.4.5 CMNT Service Delivery Team receives the approval for the 7K Qualified Cars from the GS and then updates the status in RPM.

6.4.5.1 For each 7K Qualified Car, Service Delivery updates **MAXIMO** Asset Status to “**LIMITED USE**”

6.4.5.2 For each 7K Qualified Car, Service Delivery removes RPM restriction, sets RPM status to “**QUAL FOR NON-REV**” and verifies Car turns Gray in RPM.

6.4.6 The GS distributes the list of 7K Qualified Cars to CMNT, RTRA, Rail Operations Control Center (ROCC), RAIL, SAFE and RQAW **stakeholders** daily.

6.4.7 Upon the expiration of “Qualification”; based on the agreed upon number of days allowed for non-revenue service, CMNT Service Delivery Team will return the vehicle to “**REMOVED FROM SERVICE**” in **MAXIMO**, establish “Limited Move Restriction” in RPM and verifies the Car turns Black in RPM.

6.4.8 CMNT Service Delivery Team will ensure that within the daily list of 7K Qualified Cars, Cars that have expired have been removed from the list and returned to “**STORAGE**” (Black) cars.

## Procedures for Control of Non-Revenue 7K Vehicles and Release for Mainline Travel



**NOTICE:** Any request for car movement, where the car cannot be qualified for movement through this process, shall be elevated with the necessary information to the CMNT General Superintendent for review.

**NO MOVEMENT OF CARS IS ALLOWED PENDING QUALIFICATION OF CARS AND GS APPROVAL**

### 6.5 RQAW Validation of 7K Cars Qualified for Non-Revenue Service

- 6.5.1 Review the MSI 140026 Att. C and perform a quality check to assure all the necessary information has been captured daily.
- 6.5.2 Compare the “**7K Axle Failure list**” submitted by CMNT Service Delivery Team against the collected MSI 140026 Att. C to confirm the reported failed axle is captured properly.
- 6.5.3 Report the results of the Quality Check on the “**7K Axle Failure list**” to the CMNT Service Delivery Team, CENV, and CMNT **stakeholders** daily.
- 6.5.4 Compare the “**7K Cars Qualified for Non-Rev Movement List**” submitted by CMNT Service Delivery Team against the data collected from §6.5.1 and §6.5.2 to confirm the list does not contain any cars with reported failures.
- 6.5.5 Report the results of the Quality Check on the list “**7K Cars Qualified for Non-Rev Movement List**” of cars submitted to SAFE per §6.5.4 to the CMNT Service Delivery Team, CENV, CMNT and SAFE **stakeholders** daily.
- 6.5.6 Perform a quality review of the RPM data to verify the proper application of assets and RPM restrictions by comparing the “**7K Fleet Status**” and the “**Cars Qualified for Non-Revenue Movement List**” reports provided by CMNT Service Delivery Team daily.
- 6.5.7 Report the results of the Quality Check on the lists per §6.5.6 to the CMNT Service Delivery Team, CENV, CMNT, RTRA, ROCC and SAFE **stakeholders** daily.

### 6.6 RQAW Storage and Record Keeping MSI 140026 Att. C

- 6.6.1 RQAW will scan the individual MSI 140026 Att. C from the MSI 140026 as Attachment C into the SharePoint Site under the appropriate railcar folders.
- 6.6.2 Perform a quality spot check of the **MAXIMO** database to ensure the MSI 140026 Att. C are properly stored and recorded as attachment within the correct work order.
- 6.6.3 Report the results of the quality spot checks for any issues noted in the **MAXIMO** records and notify the [REDACTED]@wmata.com, team for correction.



## Procedures for Control of Non-Revenue 7K Vehicles and Release for Mainline Travel

### 6.7 Management of 7K MSI 140026 Failed Cars

- 6.7.1 The CMNT Supervisor shall assign staff to initiate SBF-110 for any 7K cars with active MSI 140026 Failures.
- 6.7.2 The CMNT Supervisor shall confirm that SBF-110 has been completed on the 7K cars properly, via email to the CMNT Service Delivery Team, to confirm that SBF-110 has properly been applied to the car.
- 6.7.3 The CMNT Supervisor shall ensure that **MAXIMO** RCAR reflects active MSI 140026 failures.

### 6.8 Release and/or Transfer of 7K Cars from Yards to Mainline Travel that are currently in “INACTIVE” status noted as STORAGE – Black Color

- 6.8.1 All requests for 7K Cars (movement or use) shall be sent to the CMNT Service Delivery Team via email for evaluation, eligibility, and consideration.
- 6.8.2 If the On-Duty Supervisor receives a request to move a 7K Car from the assigned yard to another yard via mainline travel, the On-Duty Supervisor must inform the requestor to contact CMNT Service Delivery Team.
- 6.8.3 If the On-Duty Supervisor is the requestor because there is a need to move a 7K Car to another shop for inspection and/or repair, the On-Duty Supervisor must send a request to CMNT Service Delivery Team for processing.
- 6.8.4 If the AGSs have been contacted for or require movement of a 7K Car to another shop for inspection and/or repair, the AGS must send their request to CMNT Service Delivery Team for processing.



**NOTICE:** RQAW and CMNT AGS shall perform independent periodic audits to and report to the VP & Chief Mechanical Officer on the compliance status for OR 3.126 to indicate if the CARS are being stored correctly. All discrepancies will be reported to the shop superintendents and/or supervisors for immediate corrective action.

## 7. SAFETY MANAGEMENT

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This document has been created in compliance with WMATA’s Public Transportation Agency Safety Plan (PTASP) and safety policy. Any hazards and risks associated with the processes within this document have been evaluated for safety and have appropriate mitigation strategies established as part of WMATA’s overall risk assessment management, where applicable and/or relevant. This document is also subject to monitoring for safety risk mitigation adherence and safety performance, and has effective communication practices in place, including adequate safety training to ensure competencies, and to solicit feedback from the affected employees, where applicable and/or relevant. For further guidance on WMATA’s safety plan, visit the Department of Safety’s (SAFE) intranet homepage.

## **8. REFERENCES**

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- SBF-110 Procedure for Removing and Releasing 7K Cars from Service Due To Back-To-Back and/or Journal Bearing Gap Failures.
- MSI 140026 WHEEL BACK-TO-BACK AND JOURNAL BEARING MEASUREMENTS
- Permanent Order T-21-22 Modification to Operating Rule 3.126 Storage of Rail Vehicles

## **9. RECORDS**

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- MSI 140026 Attachment C: 7000 Series Wheel Back-to-Back Measurement and Journal Bearing Gap Verification Checklist

## **10. ATTACHMENTS**

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N/A

**Course Title: 7K Back-to-back and Journal Bearing Class**

**Course Code:** TBD

**Revision Number:** 4

**Revision Date:** 5/6/22

**Length of Course:** Approximately 4 hours

**Class Schedule:** Various

**Course Structure:**

\_\_\_ Classroom PowerPoint Presentation

\_\_\_ Practical Demonstration

\_\_\_ Practical Exam

\_\_\_ Written Exam

**Contact Information:** Joseph Robinson, TSMT

**Course Description:** This course is designed to familiarize WMATA personnel with the procedures for performing Wheel set inspections in accordance with MSI 140026 rev. 3.

**Course Objective:** This course is designed to familiarize the CMNT technicians with the appropriate knowledge & skillset to perform wheel set back-to-back and journal bearing measurements at more frequent intervals.

**Course Outline:**

**I. PURPOSE**

**II. SCOPE**

**III. RESPONSIBILITIES**

- a. Railcar Quality Assurance and Warranty Compliance (RQAW)/Senior Manager
- b. Vice President & Chief Mechanical Officer (VP-CMO), Rail
- c. Deputy Chief Mechanical Officer(s) / Senior Program Manager(s), Vehicle Program Services (CENV)
- d. General Superintendent (GS), CMNT
- e. CMNT Service Delivery Team
- f. CMNT Supervisors
- g. RQAW Validation Team
- h. RTRA
- i. CMNT technicians

**IV. DEFINITIONS**



- a. Class 1 Rail Vehicles
- b. Specified wheelset limit

**V. ABBREVIATIONS & ACRONYMS**

**VI. PROCEDURES**

- a. MSI 140026 rev.3

**VII. Safety Management**

**VIII. References**

**IX. Records**

**X. Attachments**

- a. Attachment A – 7K Back - to- Back and Journal Bearing Verification Flowchart
- b. Attachment B - 7K Series Wheel Back- to- Back Baseline Measurement and Journal Bearing Gap verification checklist
- c. Attachment C- 7K Series Wheel Back- to- Back Measurement and Journal Bearing Gap verification checklist

**Target Audience:** The target audience for this training are WMATA employees who are assigned to perform, inspect, & ensure wheel set reliability and compliance for 7K rail cars.

**Methods of Evaluation:**

\_\_\_ Practical examination

\_\_\_ Written examination

**Course Materials:**

- Student Guide
- Instructor Guide
- PowerPoint Presentation
- Copy of latest attachments
- Copy of MSI 140026 rev.3

# **Course Title: CMOR SOP 10x.0x Control of 7K Vehicles for Compliance with Wheelset Requirements**

**Course Code:** TBD

**Revision Number:** 2

**Revision Date:** 5/6/22

**Length of Course:** Approximately 1 hour

**Class Schedule:** Various

## **Course Structure:**

\_\_\_ Classroom Lecture

\_\_\_ Field Instruction

\_\_\_ On-the-Job (OJT) Training

## **Instructor:**

**Contact Information:** Joseph Robinson, TSMT

**Course Description:** This course is designed to familiarize WMATA personnel with the procedures for controlling movement of 7K vehicles that are wheelset compliant during manual wheelset inspections in accordance with CMOR SOP 10x.0x

**Course Objective:** This course is designed to familiarize the ELES technicians with the appropriate knowledge & skillset to perform movement of 7K vehicles that are wheelset compliant during manual wheelset inspections in accordance with CMOR SOP 10x.0x

## **Course Outline:**

### **I. PURPOSE**

### **II. SCOPE**

### **III. RESPONSIBILITIES**

- a. Railcar Quality Assurance and Warranty Compliance (RQAW)/Senior Manager
- b. Vice President & Chief Mechanical Officer (VP-CMO), Rail
- c. Deputy Chief Mechanical Officer(s) / Senior Program Manager(s), Vehicle Program Services (CENV)
- d. General Superintendent (GS), CMNT
- e. CMNT Service Delivery Team
- f. CMNT Supervisors
- g. RQAW Validation Team
- h. RTRA

- IV. **DEFINITIONS**
  - a. **Class 1 Rail Vehicles**
  - b. **Documentum**
  - c. **Stakeholders**
  - d. **MAXIMO**
  - e. **“7K Active Car Report”**
- V. **ABBREVIATIONS & ACRONYMS**
- VI. **PROCEDURES**
  - a. **Process for Manual Wheelset Inspections**
- VII. **Safety Management**
- VIII. **References**
- IX. **Records**
- X. **Attachments**

**Target Audience:** The target audience for this training are WMATA employees who are assigned to perform, monitor, & ensure positive control 7K vehicle movement for 7K vehicles that are wheelset compliant

**Methods of Evaluation:**

\_\_\_ Written examination

\_\_\_ Class activity using in & out-of-compliance scenarios

**Course Materials:**

- Student Guide
- Instructor Guide
- PowerPoint Presentation
- Copy of CMOR SOP 10x.0x (latest revision)
- Copy of SBF-110 (latest revision)