DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

INITIAL AND RECURRING INSPECTION OF BUCS SERVOCYLINDERS FOR CORRECT ELECTRICAL NULL, AH–64A AND AH–64D HELICOPTERS

Headquarters, Department of the Army, Washington, D. C.
14 May 1999

NOTE

THIS PUBLICATION IS EFFECTIVE UNTIL RESCINDED OR SUPERSEDED.

1. **Priority Classification** See AR 95–1, Paragraph 6–6A for exception authority of major commanders.

a. Aircraft in Use. Upon receipt of this Technical Bulletin (TB) the condition status symbol of the cited aircraft will be changed to a **red dash"//–//"** The **red dash"//–//"** Entry shall state "initial inspection of BUCS servocylinders for correct electrical null required, IAW TB 1–1520–238–20–94. The **red dash"//–//"** may be cleared when the inspection of Para 8 is completed. The affected aircraft shall be inspected as soon as practical but no later than the task/inspection suspense date. Failure to comply with the requirements of this message within the time frame will cause the status symbol to be upgraded to a **red "//X//"**.

b. Aircraft in Depot Maintenance. Aircraft will not be issued until compliance with this TB has been completed.

c. Aircraft Undergoing Maintenance. Aircraft will not be issued until compliance with this TB has been completed.

d. Aircraft in Transit.

(1) Surface/Air Shipment. Perform task/inspection within 10 hours or 14 days of arrival.

(2) Ferry Status. Inspect at final destination.

(a)Same as paragraph 1a.

(b)Those aircraft that have a DD 250 and are at (Boeing) will be inspected prior to ferry to final destination.

e. Maintenance Trainers (Category A and B). Same as paragraph 1.a.

f. Component/Parts in Stock Including War Reserves at All Levels (Depot and Others). Upon receipt of this TB the material condition tags of all items in all condition codes listed in paragraph 7 shall be annotated to read "TB 1–1520–238–20–94 Inspection of BUCS Servocylinders for Correct Electrical Null not complied with".

This TB supersedes USAAMCOM Safety of Flight Message 222003Z APR 99 (AH–64–99–02).

(1) Wholesale stock– Same as Paragraph 1F

(2) Retail Stock– Same as Paragraph 1F

g. Aircraft at the Boeing, Mesa production facility will be inspected by the contractor.

2. **Task/Inspection Suspense Date.** Within 10 flight hours/ 14 days.

3. **Reporting Compliance Suspense Date**.N/A.

4. **Summary of the Problem**.

a. Investigation into a BUCS activation in–flight has revealed a suspect condition in the BUCS AH–64A and AH–64D servocylinders. The servocylinder contains a Linear Variable Differential Transducer (LVDT) which may move out of an electrical null position. The LVDT transmits the position of the piston to the Digital Automatic Stabilization Equipment Computer (DASEC) or Flight Management Computer (FMC). If the LVDT probe moves out of the null condition, this will cause a BUCS system activation.

b. For manpower/downtime and funding impacts, see paragraph 12.

c. The purpose of this TB is to direct initial and recurring inspections of the AH–64A and AH–64D BUCS Servocylinders for correct electrical null.

5. **End Items to be inspected**. All AH–64A aircraft with Serial Numbers 88–0200 and subsequent (PV530 and subsequent) and all lot 2 and subsequent AH–64D (97–5027 and subsequent). .

6. **Assembly Components to be Inspected**. N/A

7. **Parts to be Inspected**.

a. Nomenclature–Lateral/Collective Servocylinder

Parker Hannifin P/N	MDHS PART NUMBER	NATIONAL STOCK NUMBER
289300–1019	7–311820011–13	1650–01–273–7610
289300–1017	7–311820011–11	1650–01–273–7610
289300–1015	7–311820011–9	1650–01–273–7610
289300–1009	7–311820011–7	1650–01–273–7610
289300–1007	7–311820011–5	1650–01–273–7610

b. Nomenclature– Longitudinal Servocylinder

Parker Hannifin P/N	MDHS PART NUMBER	NATIONAL STOCK NUMBER
308900–1015	7–311820012–13	1650–01–273–7609
308900–1013	7–311820012–11	1650–01–273–7609
308900–1011	7–311820012–9	1650–01–273–7609
308900–1009	7–311820012–7	1650–01–273–7609
308900–1007	7–311820012–5	1650–01–273–7609

c. Nomenclature– Directional Servocylinder

Parker Hannifin P/N	MDHS PART NUMBER	NATIONAL STOCK NUMBER
289400–1009	7–311820014–7	1650–01–273–7608
289400–1007	7–311820014–5	1650–01–273–7608
289400–1005	7–311820014–3	1650–01–273–7608

8. **Inspection Procedures**.

a. Steps 8.a through 8.c applies to AH–64A; Step 8.d applies to AH–64D: Perform the appropriate tasks. Annotate the DA Form 2408–18 that recurring inspections are required every125 aircraft hours. The 125 hour recurring inspection will coincide with phase and mid–phase intervals. ULLS A units will use inspection number A226.

(1) Apply external Primary Hydraulic Power TM 1–1520–238–23, paragraph 1.72.

(2) Install Rig Pins as Required

(a) Install –9 Rig Pin in collective control linkage IAW TM 1–1520–238–23, (paragraph 11.282.3 step h).

(b) Install –9 Rig Pin in longitudinal control linkage IAW TM 1–1520–238–23, (paragraph 11.286.3 step f).

(c) Install –9 Rig Pin in lateral control linkage IAW TM 1–1520–238–23, (paragraph 11.290.3 step g).

(d) Install –9 Rig Pin in directional control linkage IAW TM 1–1520–238–23, (paragraph 11.294.3 step k).

(3) Remove External primary hydraulic power (paragraph 1.72).

(4) Enter pilot station (paragraph 1.56). Observe all safety precautions.

(5) Open ASE DC circuit breaker on pilot center circuit breaker panel.

WARNING

Turn off power before disconnecting or reconnecting wires or connectors. High current 28VDC and/or 115VAC is present. Failure to do so could result in death or serious injury. If injury occurs, seek medical aid.

b. Perform servocylinder LVDT null check.

NOTE

All testing should be conducted with the filter adapters installed.

NOTE

The below referenced items are located in ref 13 (a) (TM 1–1520–238–23) on page 11–934 and page 11–935.

(1) Detach filter adapter A708 (14) from DASE computer (13). Do not disconnect connector P688 from filter adapter A708.

(2) Detach filter adapter A707 (15) from DASE computer (13). Do not disconnect connector P686 from filter adapter A707.

(3) Apply external electrical power TM 1–1520–238–23, paragraph 1.70.

(4) Apply external primary hydraulic power TM 1–1520–238–23, paragraph 1.72.

NOTE

For Table 1, TM 1–1520–238–23, page 11–939, substitute filter A708 for connector P688 and substitute filter A707 for connector P686.

(5) Check for null of less than 0.05 volts RMS at corresponding servocylinder ram LVDT connector/filter pins. Test all eight connector pairs TM 1–1520–238–23, paragraph 11.217, Table 1. Record indication on the DA form 2408–13–1.

(6) If voltage in step (2) is less than 0.05 volt RMS, the inspection is complete.

(7) If voltage of 0.05 volts RMS or less is not obtained, manually move push–pull rod (18) or (19) of the corresponding servocylinder to obtain null of less that 0.05 volt RMS. Use multimeter. Record the new null reading on DA form 2408–13–1. If the voltage is less than 0.05 volts RMS the inspection is complete.

(8) If voltage of 0.05 RMS or less is still not obtained, re–rig flight controls IAW ref 13.a and repeat inspection procedures.

(9) If null of less than 0.05 volt RMS cannot be obtained, the servocylinder will be repaired by supporting OLR teams IAW paragraph 9 and 10 of this TB.

c. Disconnect external power–

(1) Attach filters A707 and A708 to DASE computer (13).

(2) Inspect (QA).

(3) External primary hydraulic power disconnected ref 13.a, paragraph 1.72.

(4) Remove rig pins as required (TM 1–1520–238–T). Inspect (QA)

CAUTION

Failure to remove rig pins will result in sheared cylinder shear pins.

d. The following steps apply to AH–64D Ref 13.(C) (TM 1–1520–Longbow/Apache IETM, CD No.1 Version 3.1.2, data 19 Nov. 98, CD Date 6 Dec 98). Perform the following steps from the AH–64D IETM task:

(1) Open and remove access panels.

(a) Remove access panels L200 and R200.

(b) Open access panel R295.

(c) Remove access panel L540.

(2) Apply External power to aircraft

(a) Apply external electrical power.

(b) Apply external air power.

(c) Apply external hydraulic power.

(3) Enter pilot station. Observe all safety precautions. OPEN BUCS/FMC CMPTR circuit breaker on circuit breaker panel No.2.

WARNING

Turn off power before disconnecting or reconnecting wires and connectors. High current 28 VDC and/or 115 VAC is present. Failure to do so could result in death of serious injury.

(4) Install rig pins as required.

(a) Install –9 Rig Pin in collective control linkage, Ref 13.c.

(b) Install –9 Rig Pin in longitudinal control linkage, Ref 13.c.

(c) Install –9 Rig Pin in lateral control linkage, Ref 13.c.

(d) Install –9 Rig Pin in directional control linkage, Ref 13.c.

(5) Check servocylinders for electrical null.

(a) Detach connectors P428 and P429 from FMC computer.

(b) Check for null of less than 0.05 volt RMS at corresponding servocylinder RAM motional transducer connector pins (Table 1). Record the null reading on the DA Form 2408–13–1.

(c) If voltage is less than 0.05 volt RMS at corresponding servocylinder RAM motional transducer connector pins (Table 1). Then inspection is completed.

(d) If voltage of 0.05 volt RMS is not obtained, manually move push–pull rod of corresponding servocylinder to obtain null of less than 0.05 volt RMS. Use multimeter. Record the new null reading on the DA Form 2408–13–1. If the voltage is less than 0.05 volt RMS, the inspection is complete.

(e) If voltage of 0.05 RMS or less is still not obtained, re–rig flight controls IAW ref 13.a and repeat inspection procedures.

(f) If null of less than 0.05 volt RMS cannot be obtained, replace servocylinder will be repaired by supporting OLR teams IAW paragraph 9 and 10 of this message.

9. **Correction Procedures.**

a. Contact the project 'OLR' POC at paragraph 16.c for servocylinder repair/exchange insrtuctions.

b. Remove and replace servocylinder per Ref 13.a or 13.c and applicable paragraph below dependent upon servo:

(1) Directional servocylinder removal: AH–64A, TM 1–1520–238–23 paragraph 7.23, AH–64D, TM 1–1520–Longbow/Apache IETM task: Servocylinder, hydraulic, directional servocylinder, remove and install.

(2) Collective servocylinder removal: AH–64A, TM 1–1520–238–23 paragraph 7.41, AH–64D, TM 1–1520–Longbow/Apache IETM task: Servocylinder, hydraulic, collective servocylinder, remove and install.

(3) Lateral servocylinder removal: AH–64A, TM 1–1520–238–23 paragraph 7.44, AH–64D, TM 1–1520–Longbow/Apache IETM task: Servocylinder, hydraulic, lateral servocylinder, remove and install.

(4) Longitudinal servocylinder removal: AH–64A, TM 1–1520–238–23 paragraph 7.47, AH–64D, TM 1–1520–Longbow/Apache IETM task: Servocylinder, hydraulic, longitudinal servocylinder, remove and install.

10. **Supply/Parts and Disposition**.

a. Parts Required. Items cited in paragraph 7 may be required to replace unserviceable items.

Parker Hannifin P/N	MDHS PART NUMBER	NATIONAL STOCK NUMBER
289300–1025	7–311820011–17	1650–01–273–7610
308900–1021	7–311820012–17	1650–01–273–7609
289400–1015	7–311820014–11	1650–01–273–7608

b. Requisitioning Instructions. All requisitions shall use project code (CC 57–59) "XFL" , "X–RAY–FOXTROT–LIMA." Replacement parts through normal supply channels using normal supply procedures, only when the component is unserviceable for reasons other than null check.

NOTE

Project code "XFL" , "X–RAY–FOXTROT–LIMA", is required to track and establish a data base of stock fund expenditures incurred by the field as result of TB actions.

c. Bulk and Consumable Materials. N/A.

d. Disposition. Returned removed parts/components using normal supply procedures, only when the component is unserviceable for reasons other than null check. All turn–in documents must include project code (CC 57–59) "XFL", "X–RAY–FOXTROT–LIMA".

e. Disposition of Hazardous Material. N/A.

11. **Special Tools, Jigs and Fixtures Required**. N/A.

12. **Application**.

a. Category of Maintenance. AVUM. Aircraft downtime will be charged to AVUM.

b. Time Required.

(1) Total of 4 man-hours using 2 persons.

(2) Total of 2 hours downtime for one end item.

c. Estimated Cost Impact of Stock Fund Items to the Field. Cost of items listed in paragraph 7 range from $44,201 to $71,300.

d. TB's/MWO's to be Applied Prior to or Concurrently with this Inspection. N/A.

e. Publications Which Require Change as a Result of This Inspection. TM 1–1520–238–23 and TM 1–1520–Longbow/Apache IETM, shall be changed to reflect this TB. A copy of this TB shall be inserted in the appropriate TM as authority to implement the change until the printed change is received.

13. **References**.

a. TM Aviation Unit and Intermediate Maintenance Manual for Helicopter, Attack AH–64A, Apache: TM 1–1520–238–23, 16 May 94 with changes.

b. TM Aviation Unit and Intermediate Maintenance Repair Parts and Special Tools List for Helicopter, Attack AH–64A, Apache: TM 1–1520–238–23P, 8 May 96 with changes.

c. Interactive Electronic Technical Manual (IETM): TM 1–1520–Longbow/Apache IETM, CD No.1 version 3.1.2, data 19 Nov. 98, CD date 6 Dec 98 or subsequent.

14. **Recording and Reporting Requirements**.

a. Upon entering requirements of this TB on DA Form 2408-13-1 on all subject MDS aircraft, forward a priority message, datafax or E-Mail to Commander, AMCOM, ATTN.: AMSAM-SF–A (SOF Compliance Officer), per AR 95-1. Datafax number is DSN 897-2111 or commercial (256) 313-2111. E-Mail address is "SAFEADM@REDSTONE.ARMY.MIL". The report will cite this TB number, date of entry in DA Form 2408-13-1, the aircraft mission design series and serial numbers of aircraft in numerical order.

b. Task/Inspection reporting suspense date (aircraft)– Upon completion of inspection, units will forward a priority message to: Commander, AMCOM ATTN.; SFAE–AV–AAH–LF. Datafax number is DSN 897–4343 or commercial (256) 313–4343. E–Mail address is PattonJ@peoavn.restone.army.mil. The report will cite this TB number, aircraft and component hours, and results of the inspection. Inspection and reports will be completed no later than 10 days after the task/inspection suspense date.

c. Reporting compliance suspense date (spares)–

(1) Material in Wholesale Depot Storage– Report receipt of this TB by E–mail or datafax to the whole material (spares) point of contact listed in paragraph 16 c with in 3 working days form the date of this message. Provide local point of contact.

(2) Material in Retail Storage– Report receipt of this message by E–mail and datafax to the logistical point of contact listed in paragraph 16.b within 7 days from the date of this TB. Provide local point of contact.

d. Task/Inspection reporting suspense date (spares)

(1) Material in Wholesale Depot Storage– Report compliance with this TB to the whole material (spares) point of contact listed in paragraph 16.c with in 7 working days form the date of this TB on DD form 1225. Provide cost of compliance with this message to include an estimate of the cost reimbursable funding required to annotate material condition tags IAW para 1.f. To return the material storage, as appropriate report by E–mail or datafax and provide local point of contact.

(2) Material in Retail Storage– Report receipt of this TB to the logistical point of contact listed in paragraph 16.b within 14 days from the date of this TB. Report quantity inspected condition code and the resulting condition code. Report by E–mail and datafax and provide local point of contact. Negative reports are required

e. The following forms are applicable and are to be completed in accordance with DA PAM 738-751,15 June 1992:

NOTE

ULLS–A user will use applicable “E” Forms.

(1) DA Form 2408-5–1, Equipment Modification Record(servocylinder).

(2) DA Form 2408-13, Aircraft Status Information Record.

(3) DA Form 2408-13-1, Aircraft Inspection and Maintenance Record.

(4) DA Form 2408-13-2, Related Maintenance Action Record.

(5) DA Form 2408-15, Historical Record for Aircraft.

(6) DA Form 2408-16, Aircraft Inspection and Maintenance Record.

(7) DA Form 2408-18, Equipment Inspection List.

(8) DA Form2410, Component Removal and Repair/overhaul record (Only if the servocylinder is removed or replaced).

(9) DD Form 1574 (Yellow Tag) for in stock items that are determined to be serviceable. (Mark inspected serviceable in accordance with this TB).

(10)DD Form 1577–2/DD Form 1577–3(Green Tag Label) For items that are determined to be unserciceable (repairable). (Mark inspected unserviceable in accordance with this TB).

15. **Weight and Balance**. N/A.

16. **Points of Contact**.

a. Technical point of contact for this TB is Mr. Daniel Rice, AMSAM-AR-E–I–P–A, DSN 897-4804 or commercial (256)313-4804, datafax is DSN 897–4923 or commercial (256) 313–4923, E–Mail is rice–dr@redstone.army .mil.

b. Logistical point of contact for this TB is Mr.John Patton, SFAE-AV-AAH-LF, DSN 897-4244/4189 or commercial (256) 313-4244/4189, datafax is DSN 897–4343 or commercial (256) 313–4343, E–Mail is pattonj@peoavn.redstone.army .mil.

c. Project OLR support point of contact for this TB is Mr. Lowell Morgan, AMSAM–MMC–RE–FM, DSN 788–7902 OR commerical (256) 842–7902, datafax is DSN 897–2051, commerical (256) 313–2051, E–Mail, is morgan–ld@exchange1.redstone.army.mil.”

d. Wholesale material point of contact (spares) is Ms. Deborah Madris, AMSAM–MMC–VS–AB, DSN 897–1345 or commercial (256) 313–1345, datafax is DSN 897–1556 or commercial (256) 313–1556, E–Mail is madaris–dl@exchange1.redstone.army .mil.

e. Forms and records point of contact for this TB is Ms. Ann Waldeck, AMSAM-MMC-RE–FF, DSN 746-5564 or commercial (256) 876-5564, datafax is DSN 746–4904 or commercial (256) 876–4904, E–Mail is waldeck–AB@redstone.army .mil.

f. Safety point of contact for this TB is Mr. Howard Chilton. AMSAM-R-X, DSN 897-2068 or commercial (256) 313-2068, datafax is DSN 897–2111 or commercial (256) 313–2111, E–Mail is chilton–hl@redstone.army .mil.

g. Foreign Military Sales (FMS) recipients requiring clarification of action advised by this TB should contact CW5 Joseph L. Wittstrom, Security Assistance Management, AMSAM-SA, DSN 897-0681 or com-

mercial (256) 313-0681, E–Mail is wittstrom–jl@redstone.army .mil. or Mr. Ronnie W. Sammons, AMSAM–SA–CS–NF, DSN 897–0869 or commercial (256) 313–0869, datafax is DSN 897–0411 or commercial (256) 313–0411, E–Mail is sammons–rw@redstone.army .mil. Huntsville, Al is GMT minus 6 hours.

h. After hours contact AMCOM Command Operations Center (COC) DSN 897-2066/7 or commercial (256) 313-2066/7.

17. **Reporting of Errors and Recommending Improvements.** You can improve this TB. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to: Commander, US Army Aviation and Missile Command, ATTN.: AMSAM–MMC–LS–LP, Redstone Arsenal, AL 35898–5230. You may also submit your recommended changes by e–mail directly to LS–LP@Redstone.Army.Mil. Instructions for sending an electronic 2028 may be found at the back of this manual. A reply will be furnished directly to you.

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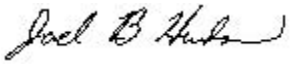

JOEL B. HUDSON
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General, United States Army
Chief of Staff

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

THEN...JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

SOMETHING WRONG WITH PUBLICATION

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT.

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

TEAR ALONG PERFORATED LINE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

THE METRIC SYSTEM AND EQUIVALENTS

'NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

'VEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

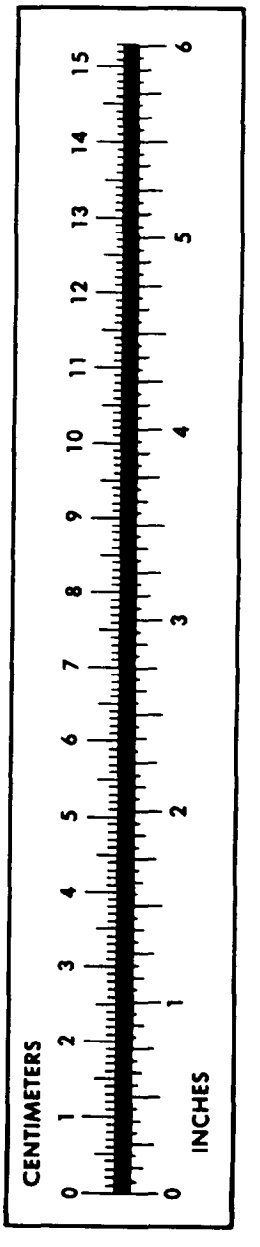
TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
ıts	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
lometers per Liter	Miles per Gallon	2.354
meters per Hour	Miles per Hour	0.621



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