

URGENT

TB 1-1520-238-20-99

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

ONE TIME INSPECTION OF THE MAIN TRANSMISSION AH-64 HELICOPTERS

Headquarters, Department of the Army, Washington, D. C.
19 November 1999

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

NOTE

THIS PUBLICATION IS EFFECTIVE UNTIL RESCINDED OR SUPERSEDED.

1. Priority Classification. URGENT

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 horizontal dash //--//**. The **red horizontal dash //--//** entry shall state, "Inspect aircraft transmission historical records in accordance with TB 1-1520-238-20-99". The **red horizontal dash //--//** may be cleared when the inspection of paragraph 8 and correction procedures in paragraph 9 are completed. Inspect all aircraft as soon as practical but no later than the task inspection suspense date. Failure to comply with the requirements of this TB within the time frame specified will cause the status symbol of the affected aircraft 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 released until compliance with this TB has been completed.

d. Aircraft in Transit. For aircraft away from home station, this TB authorizes a one time flight with intermediate stops, as necessary, to return to the nearest secured maintenance facility or home station, prior to complying with this TB.

(1) Surface/Air Shipment. Same as paragraph 1.a.

(2) Ferry Status.

(a) Same as paragraph 1.a.

(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.

This TB supersedes USAAMCOM Safety of Flight 122136Z Nov 99 (AH-64-00-02) and USAAMCOM Safety of Flight 040051Z D 99 (AH-64-00-03).

TB 1-1520-238-20-99

f. Component/Parts in Stock at All Levels (Depot and Others) Including War Reserves. Upon receipt of this TB, the material condition tags of all items in all condition codes listed in paragraph 6 shall be annotated to read, "TB 1-1520-238-20-99, One Time Inspection of the Main Transmission Not Complied With."

(1) Wholesale Stock. Report receipt of this TB in accordance with paragraph 14.c(1). Upon receipt of this TB, all serviceable items (condition codes //A//, //B//, //C//, //D//, and //E//) listed in paragraph 6 located in wholesale depot storage shall be placed in condition code //J// and tagged with a suspended tag/label--Material, DD Form 1576/DD Form 1576-1. Do not remove original condition tags. Report compliance with this TB in accordance with paragraph 14.d(1).

(2) Retail Stock. Report receipt of this TB in accordance with paragraph 14.c(2). Upon receipt of this TB, commanders and others maintaining retail stock at installation level and below shall contact the supported aviation unit to perform the inspection required by paragraph 8 and the correction procedures of paragraph 9 on discrepant materiel. Disposition of discrepant materiel will be in accordance with paragraph 10. Report compliance of this TB in accordance with paragraph 14.d(2).

g. Components/Parts in Work (Depot Level and Others). Items listed in paragraph 6 in work will not be issued until compliance with this TB.

2. Task/Inspection Suspense Date. Prior to next flight.

3. Reporting Compliance Suspense Date. N/A.

4. Summary of the Problem.

a. A recent accident was caused by a simultaneous in-flight dual failure of both the primary and secondary over running clutches inside the main transmission accessory gearbox. This failure resulted in the loss of all AC electrical, primary and hydraulic systems, and pressurized air system.

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

c. The purpose of this TB is to:

(1) Require a one time inspection of all AH-64 main transmissions.

(2) Establish a retirement life of 750 flight hours for the primary and secondary clutch assemblies inside the accessory gearbox portion of the main transmission.

(3) Establish additional criteria for main transmission removal.

(4) Establish a change to the -10 Operator's Manual.

5. End Items To Be Inspected. All AH-64 series aircraft.

6. Assembly Components To Be Inspected.

NOMENCLATURE	PART NUMBER	NATIONAL STOCK NUMBER
Main Transmission	7-311310001/-5	1615-01-165-9452
Main Transmission	7-311310001-25	1615-01-224-4853
Main Transmission	7-311310001-27	1615-01-219-8667
Main Transmission	7-311310001-33	1615-01-234-2180
Main Transmission	7-311310001-35	1615-01-243-4220
Main Transmission	7-311310001-37/-39	1615-01-252-6376
Main Transmission	7-311310001-43	1615-01-461-8845

7. Parts To Be Inspected. N/A.

8. Inspection Procedures.

- a. Conduct a records check of the aircraft historical record, DA Form 2408-16, to determine:
- (1) Main transmission serial number.
 - (2) Main transmission part number.
 - (3) Main transmission Time Since New (TSN) flight hours.

NOTE

Units will verify the serial number of the transmission in the DA Form 2408-16 with the transmission in the aircraft.

b. If the transmission serial number matches any of the following, proceed to paragraph 9.b: serial numbers A13-0184, A13-0269, A13-0031, A13-0069, A13-0139, D13-0146, D13-0433, D13-0467, A13-0264, A13-0311, or A13-0522.

- c. If the serial numbers do not match any of those listed in paragraph 8.b., continue with the inspection.
- d. Determine the main transmission TSN from the aircraft log book.

(1) If TSN hours do not exceed 750, the inspection is complete. Annotate the new 750 flight hour replacement for the clutches on the main transmission DA Form 2408-16 with two new line entries—one for the primary and one for the secondary ACC module (sprag) clutch per the instructions below.

(a) Non-ULLS-A units add the ACC module clutch, primary and ACC module clutch, secondary to the main transmission, DA Form 2408-16, using the following information:

1. Block 6A, Nomenclature and WUC.
 - a. Top Line. Enter "ACC Module Clutch, Primary" and "ACC Module Clutch, Secondary".
 - b. Bottom Line. Enter "06A11A" for the ACC Module Clutch, Primary, and "06A11B" for the ACC Module Clutch, Secondary.
2. Block 6B, P/N and NSN.
 - a. Top Line. Enter "7-113100109".
 - b. Bottom Line. Enter "1615-01-172-5060".
3. Block 6C, Component Ser No. Location. Enter "Unknown".
4. Block 6D, No Prev O/H. Enter "RC".
5. Block 6E, Nomen Inst Hrs. Leave blank at this time. It is unknown.
6. Block 6F, Nomen RMVL Hrs. Not required at this time.
7. Block 6G, Time Since O/H. Enter "RC".
8. Block 6H, Comp Inst Hrs. Compute the hours for the clutch in accordance with paragraph 8.d. and enter here.
9. Block 6I, Comp RMVL Hrs. Not required at this time.
10. Block 6J, OH or Replace Live. Enter "750".

11. Block 6K, Replacement Due (ACFT hrs). Compute when the clutch is next due replacement based on ACFT Hrs.

(b) ULLS-A Units. The ULLS-A masterfiles are in the process of being updated. Until that is accomplished, the system administrator may add the primary and secondary accessory module clutches to the component parts masterfile as follows.

1. From the main menu:

- a. Select "Production Processes".
- b. Then select "Masterfiles Maintenance".
- c. Then select "Add/Modify/Delete".
- d. Then select "Component Parts Masterfile".

2. Four separate entries must be added to the masterfile. One entry is required for each of the two new Work Unit Codes (WUCs) for each model (AH-64A and AH-64D). Data field for the new entries are as follows.

- a. Aircraft Model.
 - (1) AH-64A
 - (2) AH-64D.
- b. Work Unit Code.
 - (1) 06A11A.
 - (B) 06A11B.
- c. Part Number. 7-113100109.
- d. Noun nomenclature.
 - (1) ACC Module Clutch, Primary.
 - (2) Module Clutch, Secondary.
- e. NSN. 1615011725060.
- f. Component Model. (A) AH-64A and (B) AH-64D.
 - (1) AH-64A.
 - (2) AH-64D.
- g. Component Type. RC.
- h. Higher Work Unit Codes. 06A.
- i. Level. 2.
- j. Configuration. Leave blank.
- k. Quantity per NHA. 1.
- l. Warranty in Effect. N.
- m. Warranty Period in Days. 0.
- n. Warranty Period in A/C Hrs. 0.
- o. Separate 2408-16. N.
- p. Higher Component -16. Y.
- q. Aircraft Time Change -16. N.
- r. Aircraft Condition -16. N.

- s. Separate 2408-16-1. N.
- t. Higher -16-1. N.
- u. TASN Item. N.
- v. 2410 Required. Y.
- w. Federal Manufactures Code. 02731.
- x. TBO/Replacement. 750.
- y. Reference or Source Document. Added, TB 1-1520-238-20-99, dated 19 November 1999.

(2) If TSN hours exceed 750, follow the procedures in 9.b.

e. If any of the following fault events occur during aircraft operation, proceed to the correction procedures in paragraph 9.a.

- (1) The APU will not start (hang-start) and no deficiencies are noted during normal APU troubleshooting (not an APU problem).
- (2) The APU moves rotor system during APU start.
- (3) Engines fail to operate the accessory gearbox when the Np/Nr is advanced beyond 95 percent.
- (4) Accessory gearbox seizes.
- (5) Pilot notes simultaneous failure of AC electrical, hydraulic, and pneumatic subsystems.

9. Correction Procedures.

a. If any of the faults listed in paragraph 8.e. occur while operating the aircraft:

- (1) Replace the main transmission.
- (2) Submit a category 1 deficiency report.

b. If any of the serial numbers match those listed in paragraph 8.b., or the main transmission TSN exceeds 750 hours, contact the LOG POC in paragraph 16.b. and report the following data:

- (1) Reference this TB number.
- (2) Date of the inspection.
- (3) Aircraft serial number(s).
- (4) Main transmission part number and serial number.
- (5) Main transmission TSN and Time Since Overhaul (TSO).

c. If the LOG POC confirms that the primary and secondary clutch assemblies inside the transmission accessory gearbox have exceeded 750 operating hours, change the aircraft status to a **red //X//**. The **red //X//** entry shall state, "Replace main transmission in accordance with TB 1-1520-238-20-99." Follow-on instructions from the LOG POC will provide disposition and requisition instructions. Aircraft on **red //X//** status symbol will be maintained in flyable storage with ground run-ups authorized.

d. Repeat the inspection procedures in paragraph 8 for the replacement transmission before installing it, to verify its serviceability.

10. Supply/Parts and Disposition.

a. Parts Required. Main Transmission, NSN 1615-01-252-6376, will be required to replace defective items.

TB 1-1520-238-20-99

b. Requisitioning Instructions---for all units, regardless of priority status. Submit requisitions for replacement parts for affected aircraft upon receipt of this TB. Requisition replacement parts using normal supply procedures. Requisitioning activities will pay standard price when ordering parts; however, retail SMA activities will provide 100% credit for turn-ins, reflecting the defective Army-managed NSN and project code "XF7".

c. Bulk and Consumable Materials. N/A.

d. Disposition. Return defective assets using the normal material return program; however, it is imperative that turn-ins be processed and shipped as expeditiously as possible to B52 in condition code "J", using the return priority 03. The use of premium transportation is mandatory for this item.

NOTE

Project code "XF7" is required to track and establish a database of stock fund expenditures incurred by the field as a result of SOF actions.

11. Special Tools and Fixtures Required. N/A.

12. Application.

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

b. Estimated Time Required.

(1) Records Check. Total of 1 man-hour using 1 person.

(2) Remove and replace the main transmission:

(a) Total of 16 man-hours using 2 persons.

(b) Total of 8 hours downtime per end time.

c. Estimated Cost Impact To the Field. \$295,880 total cost per aircraft (1 main transmission, all listed at paragraph 6).

d. TB/MWOs To Be Applied Prior To Or Concurrently With This Inspection. N/A.

e. Publications Which Require a Change As a Result of This Inspection.

(1) TM 1-1520-238-10/-CL, TM 1-1520-251-10/-CL, TM 1-1520-238-23, and the IETM for the AH-64D 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.

(2) The following changes will be made to TM 1-1520-238-10 page 9-13 paragraph 9.12 and to TM 1-1520-251-10 page 9-16 paragraph 9.19:

WARNING

Immediate emergency action must follow failure of dual hydraulic system. Any hesitation could result in loss of helicopter control. With emergency hydraulic switch on, flight control inputs must be kept to a minimum, as hydraulic pressure may only be available for 30 to 41 seconds. It is imperative that a landing be executed without delay.

(3) The following changes will be made to the emergency procedure for TM 1-1520-238-10 page 9-13 paragraph 9.12.1 and TM 1-1520-238-CL page E-7 (PRI HYD PSI and UTIL HYD PSI light on):

- (a) EMER HYD switch – ON.
- (b) LAND WITHOUT DELAY.

(4) The following changes will be made to the emergency procedure for TM 1-1520-251-10 page 9-16 paragraph 9.19.1 and TM 1-1520-251-CL page E-13 (Primary Hydraulic Pressure Low [PRI HYD PSI] and Utility Hydraulic Pressure Low [UTIL HYD PSI]). The UFD will display HYD FAIL –

- (a) EMERG HYD button – Press ON.
- (b) LAND WITHOUT DELAY.

(5) TB 1-1500-341-01 shall be changed to add the 750 hour clutch retirement life.

13. References.

- a. TB 1-1500-341-01, Aircraft Components Requiring maintenance Management and Historical Data Reports, dated 1 July 1999.
- b. TM 1-1520-238-10, Operator's Manual for Helicopter, Attack, A-64A Apache, dated 31 August 1994.
- c. TM 1-1520-238-CL, Operator's Checklist for Helicopter, Attack, AH-64 Apache, dated 31 August 1994.
- d. TM 1-1520-238-23, Aviation Unit and Intermediate Maintenance Manual for AH-64A Apache Attack Helicopter, dated 16 May 1994.
- e. TM 1-1520-251-10, Operator's Manual for AH-64D Longbow Apache Helicopter, dated 15 December 1998.
- f. TM 1-1520-251-CL, Operator's Checklist for AH-64D Longbow Apache Helicopter, dated 15 December 1998.
- g. Interactive Electronic Technical Manual (IETM): TM 1-1520-LONGBOW/APACHE IETM, CD No. 1, Version 3.1.2, Data 19 November 1998, CD dated 1 December 1998 (or subsequent).

14. Recording and Reporting Requirements.

a. Reporting Compliance Suspense Date (Aircraft). Upon entering requirements of this TB on DA Form 2408-13-1 on all subject MDS Aircraft, forward a priority TB, Datafax or e-mail to CDR, AMCOM, ATTN: AMSAM-SF-A (SOF Compliance Officer), Redstone Arsenal, AL 35898-5000, in accordance with AR 95-1. Datafax number is DSN 897-2111 or (256) 313-2111. E-mail address is "SAFEADM@REDSTONE.ARMY.MIL". This 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: CDR, AMCOM, ATTN: SFAE-AV-AAH-LF. The report will include the data required in accordance with paragraph 9.b. Inspection and reports will be completed no later than 7 days after task/inspection suspense date.

c. Reporting TB Receipt (Spares).

(1) Materiel in Wholesale Storage. Report receipt of this TB by e-mail or Datafax to the point of contact listed in paragraph 16.c. within 3 working days from the date of this TB. Provide local point of contact.

(2) Materiel in Retail Storage. Report receipt of this TB by e-mail or 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).

TB 1-1520-238-20-99

(1) Materiel in Wholesale Depot Storage. Report compliance with this TB to the wholesale materiel point of contact (spares) listed in paragraph 16.c. within 7 days of the date of this TB on DD Form 1225. Provide the cost of compliance with this TB to include an estimate of the cost reimbursable funding required to move serviceable items on hand listed in paragraph 6 to a work area, unpack the materiel, repack the materiel after inspection by AMCOM inspectors, and return the materiel to storage, as appropriate. Report, by original serviceable condition code //J//. Report by e-mail or Datafax and provide local point of contact.

(2) Materiel in Retail Storage. Report compliance with this TB to the logistical point of contact in paragraph 16.b. within 14 days of the date of this TB. Report the quantity inspected by condition code and the resulting condition code. Report by e-mail or Datafax and provide local point of contact.

e. The following forms are applicable and are to be completed in accordance with DA PAM 738-751, 15 March 1999.

NOTE

ULLS-A Users will use applicable "E" forms.

(1) DA Form 2408-5-1, Equipment Modification Record (Main Transmission).

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

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

(4) DA Form 2408-15, Historical Record for Aircraft (annotate the serial number of the main transmission inspected).

(5) DA Form 2408-16, Aircraft Component Historical Record.

(6) DA Form 2410, Component Removal and Repair/Overhaul Record.

(7) DD Form 1575/DD Form 1574-11, Serviceable tag/label--materiel (color yellow). (Annotate remarks block with "Inspected serviceable in accordance with TB 1-1520-238-20-99".)

(8) DD Form 1575/DD Form 1575-1, suspended tag/label--materiel (color brown). (Annotate remarks block with "Suspended in accordance with TB 1-1520-238-20-99".)

(9) DD Form 1577-2/DD Form 1577-3, unserviceable (repairable) tag/label--materiel (color green). (Annotate remarks block with "Unserviceable in accordance with TB 1-1520-238-20-99".)

15. Weight and Balance. N/A.

16. Points of Contact.

a. Technical point of contact for this TB is Daniel Rice, AMSAM-AR-AE-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.Daniel@redstone.army.mil".

b. Logistical points of contact for this TB are as follows:

(1) Primary. Al Hopkins, DSN 746-4791 or commercial (256) 876-4791.

(2) Alternate. Jim Mason, SFAE-AV-AAH-LF, DSN 897-4242 or commercial (256) 313-4242. Datafax is 897-4343; e-mail is "MasonJ@peoavn.redstone.army.mil".

c. Wholesale materiel point of contact (SPARES) for this TB is Pam Watkins, AMSAM-MMC-VS-AB, DSN 897-1347 or commercial (256) 313-1347. Datafax is DSN 897-1557 or commercial (256) 313-1557; e-mail is "Watkins-Pa@redstone.army.mil".

d. Forms and records point of contact for this TB is Ann Waldeck, AMSAM-MMC-VS-AB, 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".

e. Safety point of contact for this TB is Howard Chilton, AMSAM-SF-A, DSN 897-2068 or commercial (256) 313-2068. Datafax is DSN 897-2111 or commercial (256) 313-2111; e-mail is "Howard.Chilton@redstone.army.mil".

f. Foreign Military Sales (FMS) recipients requiring clarification of action advised by this TB should contact one of the following (Huntsville, AL, time is GMT minus 6 hours):

(1) CW5 Joseph L. Wittstrom, Security Assistance Management, AMSAM-SA, DSN 897-0681 or commercial (256) 313-0681, e-mail "WittstromJL@redstone.army.mil".

(2) Ronnie W. Sammons, AMSAM-SA-CS-NF, DSN 897-0869 or commercial (256) 313-0869, e-mail "SammonsRW@redstone.army.mil".

g. After hours, contact the 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-sp@redstone.army.mil". A reply will be furnished directly to you. Instructions for sending an electronic 2028 may be found at the back of this manual.

TB 1-1520-238-20-99

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whomever" <whomever@avma27.army.mil>

To: <mpmt%avma28@st-louis-emh7.army.mil>

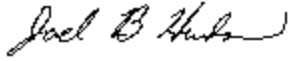
Subject: DA Form 2028

1. **From:** Joe Smith
2. **Unit:** home
3. **Address:** 4300 Park
4. **City:** Hometown
5. **St:** MO
6. **Zip:** 77777
7. **Date Sent:** 19-OCT-93
8. **Pub no:** 55-2840-229-23
9. **Pub Title:** TM
10. **Publication Date:** 04-JUL-85
11. **Change Number:** 7
12. **Submitter Rank:** MSG
13. **Submitter FName:** Joe
14. **Submitter MName:** T
15. **Submitter LName:** Smith
16. **Submitter Phone:** 123-123-1234
17. **Problem:** 1
18. **Page:** 2
19. **Paragraph:** 3
20. **Line:** 4
21. **NSN:** 5
22. **Reference:** 6
23. **Figure:** 7
24. **Table:** 8
25. **Item:** 9
26. **Total:** 123
27. **Text:**

This is the text for the problem below line 27.

By Order of the Secretary of the Army:

Official:



JOEL B. HUDSON
*Administrative Assistant to the
Secretary of the Army*

9932103

ERIC K. SHINSEKI
*General, United States Army
Chief of Staff*

Distribution:

To be distributed in accordance with Initial Distribution Number (IDN) 313864 requirements for TB 1-1520-238-20-99.

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.

TEAR ALONG PERFORATED LINE

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER

SIGN HERE

THE METRIC SYSTEM AND EQUIVALENTS

WEIGHT MEASURE

1 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

WEIGHTS

1 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

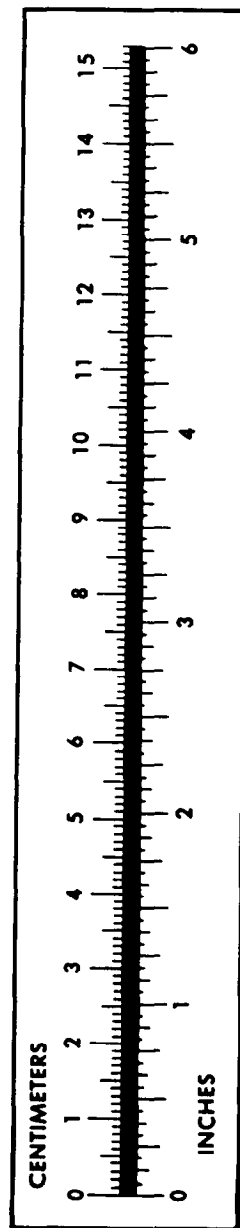
TEMPERATURE

$5/9(^{\circ}\text{F} - 32) = ^{\circ}\text{C}$
 212° Fahrenheit is equivalent to 100° Celsius
 90° Fahrenheit is equivalent to 32.2° Celsius
 32° Fahrenheit is equivalent to 0° Celsius
 $9/5^{\circ}\text{C} + 32 = ^{\circ}\text{F}$

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
its	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
ometers per Liter	Miles per Gallon	2.354
ometers per Hour	Miles per Hour	0.621



PIN: 077708-000