



# Test Monitoring Center

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APPROVED BY ASTM D02.B 12/9/98  
(DATE)

## HIGH TEMPERATURE CYCLIC DURABILITY INFORMATION LETTER 98-2

June 26, 1998

*ASTM consensus has not been obtained on this information letter. An appropriate ASTM ballot will be issued in order to achieve such consensus.*

TO: High Temperature Cyclic Durability Surveillance Panel

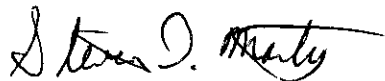
SUBJECT: 1. Approved Test Hardware Configurations  
2. Revised Report Forms and Data Dictionaries  
3. New Parts Use & Parts Inspection Requirements

1. At the June 3, 1998 High Temperature Cyclic Durability Surveillance Panel meeting, the panel approved two hardware configurations. These two hardware configurations are the only two configurations acceptable for reference and non-reference oil testing at this time. In addition, non-reference oil tests must be run on the same hardware configuration as was used to calibrate the stand. Section 9.6 has been added to Test Method D 5579. Section 10.2.1 has been revised to include Table 4, which lists part numbers of the approved hardware configurations. Annex A2 has also been revised to list the part numbers for both configurations. This change is effective June 3, 1998.

2. Annexes A3, Report Forms and A4, Data Dictionary have been revised to allow the inclusion of hardware identification. The report forms and data dictionary are effective July 27, 1998.

3. Section 10.2.2 was revised to require that the low range mainshaft hub P/N 84KC47, used with the configuration listed as post Information Letter 98-2 (POST-IL-98-2) be replaced each test. Section 10.2.2 has also been revised to require that the high range mainshaft gear, used with the POST-IL-98-2 configuration be inspected prior to each test. This change is effective June 3, 1998.

The attached pages reflect the addition of these items to Test Method D 5579.



Steve Marty  
Chairman  
High Temperature Cyclic Durability  
Surveillance Panel



John L. Zalar  
Administrator  
ASTM Test Monitoring Center

Attachment

c: Data Communications Committee  
Christine Bogdon, TMC

(Revises Test Method D5579-94)

11.1.1.1 If the test oil is a non-reference oil, first ensure that acceptable results on the passing and failing reference oils have been obtained, and then conduct the non-reference oil test on the same hardware configuration used for the reference oil tests.

10.2.1 *General*--Assemble all parts as instructed in the MACK Transmission Service Manual T2130/2180, except where the service manual applies to parts which are modified for this test method. Use the part numbers identified in Table 4 for the appropriate hardware configuration.

Use test oil for lubricating parts during assembly.

**TABLE 4 Part Numbers for Approved Configurations**

Part Description	TEST HARDWARE CONFIGURATION	
	PRE-IL-98-2	POST-IL-98-2
Synchronizer Clutch Assembly	320KB450C	320KB459
Synchronizer Pin (3 each)	301KC240B	301KC33
Synchronizer Pin (3 each)	301KC241B	301KC34
Synchronizer Pin (3 each)	48AX17	301KC35
Synchronizer Pre-load Spring (3 each)	107KD244	107KD247
High Range Mainshaft Gear	751KB489	751KB4123
Low Range Mainshaft Hub	84KC42	84KC47
Compound Mainshaft, Rear	601KC429	601KC429
Bearing, Compound Mainshaft	None required	46AX538
Thrust Washers, Mainshaft (2 each)	223KD316A	None Required
Snap Ring (2 each)	97AX151	97AX151
Snap Ring (2 each)	97AX267	97AX267
Shift Rail	591KC3154A	591KC2370
O-ring, Low Range Shift Piston	56AX560	56AX595
Piston, High Low Range Shift	336KC318	336KC334
Cylinder Housing, Hi-Lo Shift Piston	55KC46A	55KC418
O-ring, Compound Shift Piston	None Required	56AX533
O-ring, Range High Low Shift Piston	56AX588	56AX594
Countershaft Gear, Front	757KB3322 757KB4108	757KB4108
Countershaft Gear, Rear	757KB4106 757KB440A	757KB4106
Range Shift Valve		216KD42

10.2.2 *New Parts*—Obtain the following parts from an authorized Mack truck dealer. Install the following new parts each test:

	Number Required	Mack Part No.
Kit (Parts in this kit are listed in Annex A2)	1	377SH21
Range Fork	1	575KB457
Low Range Mainshaft Hub	1	84KC47 (POST-IL-98-2 Configuration only)

10.2.2.1 Inspect the following parts after each test and replace if worn or damaged:

	Number Required	Mack Part No.
Thrust Washer	3	233KD249
Thrust Washer	2	233KD316A
Clutch Housing	2	53KC486D
High Range Mainshaft Gear	1	751KB4123 (POST-IL-98-2 Configuration only)

**Annex A2 TEST KIT PARTS**

**TABLE A2.1 Test Kit Parts**

**Mack Truck Kit No. 377SH21**

Name	Quantity	PRE-IL-98-2 Part Number	POST-IL-98-2 Part Number
Sliding Clutch	1	320KB450C	320KB459
Pin	3	301KC240B	301KC33
Pin	3	301KC241B	301KC34
Spacer Tube	3	301KC243C	301KC243C
Ball/Pin	6	48AX17	301KC35
Spring	6	107KD244	107KD247
Friction Disk	8	495KB361	495KB361
Reaction Disk	8	495KB367	495KB367

**A3. Report Forms**

**TEST METHOD D5579**

**(HIGH TEMPERATURE CYCLIC DURABILITY TEST)**

**VERSION 19980605**

**CONDUCTED FOR:**

*TSTSPON1*

*TSTSPON2*

<i>LABVALID</i>	V = VALID
	I = INVALID
	N = RESULTS CANNOT BE INTERPRETED. (REFER TO COMMENT SECTION)

Test Number			
Stand #:	<i>STAND</i>	Stand Run #:	<i>STRUN</i>
EOT Date:	<i>DTCOMP</i>	EOT Time:	<i>EOTTIME</i>
Oil Code: <sup>A</sup>	<i>CMIR/OILCODE</i>		
Formulation/Stand Code:	<i>FORM</i>		
Alternate Codes:	<i>ALTCODE1</i>	<i>ALTCODE2</i>	<i>ALTCODE3</i>

In my opinion this test *OPVALID* been conducted in a manner in accordance with the Test Method D5579 and the appropriate amendments through the information letter system. The remarks included in the report describe the anomalies associated with this test.

<sup>A</sup> CMIR or Non-Reference Oil Code

SUBMITTED BY: \_\_\_\_\_ *SUBLAB*  
Testing Laboratory

\_\_\_\_\_ *SUBSIGIM*  
Signature

\_\_\_\_\_ *SUBNAME*  
Typed Name

\_\_\_\_\_ *SUBTITLE*  
Title

\_\_\_\_\_ *SUBSECT*  
Section

**Fig. A3.1 TEST REPORT COVER**

TEST METHOD D5579  
(HIGH TEMPERATURE CYCLIC DURABILITY TEST)

FORM 1  
TEST RESULT

TEST LAB	LAB
TEST STAND NO.	STAND

Test Hardware Configuration	Test Date Completed	Total Test Hours	Stand Run No.	Oil Code No.	No. of Cycles to Unsynchronized Shifts	Laboratory Oil Code
TESTHARD	DTCOMP	TESTLEN	STRUN	CMIR/OILCODE	EOTCYCU	LABOCODE
Reason for Test Termination: EOTRSN 1 = Client Request 2 = Unsynchronized Shifts (gear clashing) 3 = Unable to maintain test conditions or other (see comments section)						
Test Stand and Laboratory in accordance with Information Letters through: INFOLE7N						
Formulation / Stand Code: FORM						

STAND OPERATIONALLY VALID REFERENCE OIL TEST HISTORY IN CHRONOLOGICAL ORDER										
Reference Oil Performance	Test Hardware Configuration	Test Date Completed	Total Test Hours	Stand Run No.	CMIR No.	TMC Oil No.	No. of Cycles to Unsynchronized Shifts	Laboratory Oil Code		
LOW	TESTHL	DTCOMPL	TESTLENL	STRUNL	CMIRL	INDL	EOTCYCUL	LABOCODL		
HIGH	TESTR001	COMPR001	TOTHR001	STDRR001	CMIRR001	TMCNR001	CYCHR001	LBOCR001		
HIGH	TESTR002	COMPR002	TOTHR002	STDRR002	CMIRR002	TMCNR002	CYCHR002	LBOCR002		
HIGH	TESTR003	COMPR003	TOTHR003	STDRR003	CMIRR003	TMCNR003	CYCHR003	LBOCR003		
HIGH	TESTR004	COMPR004	TOTHR004	STDRR004	CMIRR004	TMCNR004	CYCHR004	LBOCR004		
HIGH	TESTR005	COMPR005	TOTHR005	STDRR005	CMIRR005	TMCNR005	CYCHR005	LBOCR005		
AVERAGE CYCLES FOR HIGH REFERENCE OIL TESTS								CYCHAVG		

Fig. A3.2 TEST RESULT SUMMARY

**TEST METHOD D5579  
(HIGH TEMPERATURE CYCLIC DURABILITY TEST)  
FORM 2  
TEST CONDITIONS AND MEASUREMENT SUMMARY**

LAB	<i>LAB</i>	STAND NO.	<i>STAND</i>
OIL CODE/CMIR	<i>CMIR/OILCODE</i>	STAND RUN NO.	<i>STRUN</i>

TEST CONDITIONS			
HOURS RUN	<i>TESTLEN</i>	WARMUP TIME	<i>WUPTIME</i>
		MINUTES	
TAILSHAFT SPEED R/MIN	<i>ITAILRPM</i> MIN.	<i>XTAILRPM</i> MAX.	<i>ATAILRPM</i> AVG.
OIL SUMP TEMP F	<i>ISUMPTMP</i> MIN.	<i>XSUMPTMP</i> MAX.	<i>ASUMPTMP</i> AVG.
SHIFT AIR PRESSURE, PSI	<i>ISHAIRPR</i> MIN.	<i>XSHAIRPR</i> MAX.	<i>ASHAIRPR</i> AVG.

**PRE TEST MEASUREMENTS**

**COUNTERSHAFT NO.**

FINAL PRELOAD  
(Spec.: 0.0020in.-0.0060in.)

1A	2A	3A
<i>FNLOAD1A</i>	<i>FNLOAD2A</i>	<i>FNLOAD3A</i>

TORQUE, lbf-in.  
(Low-Range)

BREAK	TURN
<i>TORQBRK</i>	<i>TORQTRN</i>

TEST RESULTS		
RANGE FORK NO.	<i>RFORKNO</i>	
		Left
		Right
PAD HARDNESS (Pre Test) Rc		<i>PADHARDL</i>
PAD MEASUREMENT THICKNESS (Pre Test) in.		<i>PADMPREL</i>
PAD MEASUREMENT THICKNESS (Post Test) in.		<i>PADMPOS</i>
TOTAL WEAR, in.		<i>WEARTOTL</i>
AVERAGE WEAR, in.		<i>WEARAVG</i>

**MACK TRANS FRICTION DISC THICKNESS & WEAR**

	REAR			
	DISC #1	DISC #2	DISC #3	DISC #4
PRE-TEST, in.	<i>ETHICKR1</i>	<i>ETHICKR2</i>	<i>ETHICKR3</i>	<i>ETHICKR4</i>
POST-TEST, in.	<i>OTHICKR1</i>	<i>OTHICKR2</i>	<i>OTHICKR3</i>	<i>OTHICKR4</i>
WEAR, in.	<i>WEARR1</i>	<i>WEARR2</i>	<i>WEARR3</i>	<i>WEARR4</i>

	FRONT			
	DISC #5	DISC #6	DISC #7	DISC #8
PRE-TEST, in.	<i>ETHICKF5</i>	<i>ETHICKF6</i>	<i>ETHICKF7</i>	<i>ETHICKF8</i>
POST-TEST, in.	<i>OTHICKF5</i>	<i>OTHICKF6</i>	<i>OTHICKF7</i>	<i>OTHICKF8</i>
WEAR, in.	<i>WEARF5</i>	<i>WEARF6</i>	<i>WEARF7</i>	<i>WEARF8</i>

**Fig. A3.3 TEST CONDITIONS AND MEASUREMENT SUMMARY**



**TEST METHOD D5579  
(HIGH TEMPERATURE CYCLIC DURABILITY TEST)  
DOWNTIME AND COMMENTS  
FORM 3**

LAB <i>LAB</i>	STAND NO. <i>STAND</i>
OIL CODE/CMIR <i>CMIR/OILCODE</i>	STAND RUN NO. <i>STRUN</i>

**TEST LOST TIME:**

RECORD: THE TIME SHUTDOWN, TIME OFF TEST CONDITIONS, EARLY INSPECTIONS/TERMINATION WITH REASONS AND MINIMUM OIL TEMPERATURE IN DEGREES FAHRENHEIT.

Number of Downtime Occurrences			<i>DWNOCR</i>
Test Hours	Date	Downtime	Reasons
<i>DOWNH001</i>	<i>DDATH001</i>	<i>DTIMH001</i>	<i>DREAH001</i>
<i>TOTLDOWN</i>			Total Downtime

Other Comments		
Number of Comment Lines	<i>TOTCOM</i>	
<i>OCOMH001</i>		
Number of Cycle Shift Plots	<i>TOTPLOTS</i>	

**Fig. A3.4 DOWNTIME AND COMMENTS**

TEST METHOD D5579  
(HIGH TEMPERATURE CYCLIC DURABILITY TEST)  
FORM 4  
SHIFT GRAPHS

LAB	LAB	STAND NO.	STAND
OIL CODE/CMIR	CMIR/OILCODE	STAND RUN NO.	STRUN

CYIMR001

Fig. A3.5 SHIFT GRAPHS

TEST METHOD D5579  
(HIGH TEMPERATURE CYCLIC DURABILITY TEST)  
FORM 5  
SHIFT TIME GRAPHS

LAB	LAB	STAND NO.	STAND
OIL CODE/CMIR	CMIR/OILCODE	STAND RUN NO.	STRUN

CYIMR002

Fig. A3.6 SHIFT TIME GRAPHS

8-jun-1998

A4. Data Dictionary

Sequence	Form	Test Area	Field Name	Field Length	Decimal Size	Data Type	Units/Format	Description
10	0	HTCT	VERSION	8	0	C	YYYYMMDD	HTCT VERSION 19980605
20	0	HTCT	TSTSPON1	40	0	C		CONDUCTED FOR, LINE 1
30	0	HTCT	TSTSPON2	40	0	C		CONDUCTED FOR, LINE 2
40	0	HTCT	LABVALID	1	0	C	V, I OR N	TEST LAB VALIDATION (V, I OR N)
50	0	HTCT	STAND	5	0	C		STAND
60	0	HTCT	STRUN	4	0	C		STAND RUN
70	0	HTCT	DTCOMP	8	0	C	YYYYMMDD	COMPLETED DATE (YYYYMMDD)
80	0	HTCT	EOTTIME	5	0	C	HH:MM	END OF TEST TIME (HH:MM)
90	0	HTCT	CMIR	6	0	C		CMIR
100	0	HTCT	OILCODE	38	0	C		NON-REFERENCE OIL CODE
110	0	HTCT	FORM	38	0	C		FORMULATION/STAND CODE
120	0	HTCT	ALTCODE1	10	0	C		ALTERNATE OIL CODE 1
130	0	HTCT	ALTCODE2	10	0	C		ALTERNATE OIL CODE 2
140	0	HTCT	ALTCODE3	10	0	C		ALTERNATE OIL CODE 3
150	0	HTCT	OPVALID	8	0	C		OPERATIONAL VALIDITY STATEMENT -- HAS/HAS NOT
160	0	HTCT	SUBLAB	40	0	C		SUBMITTED BY: TESTING LABORATORY
170	0	HTCT	SUBSIGIM	70	0	C		SUBMITTED BY: SIGNATURE IMAGE
180	0	HTCT	SUBNAME	40	0	C		SUBMITTED BY: SIGNATURE TYPED NAME
190	0	HTCT	SUBTITLE	40	0	C		SUBMITTED BY: TITLE
200	0	HTCT	SUBSECT	40	0	C		SUBMITTED BY: SECTION
210	1	HTCT	LAB	2	0	C		LAB CODE
220	1	HTCT	TYPE	13	0	C		TESTTYPE, NON-REFERENCE OR REFERENCE
230	1	HTCT	TESTHARD	15	0	C		TEST HARDWARE CONFIGURATION
240	1	HTCT	TESTLEN	6	0	C	HHH:MM	TEST LENGTH (HHH:MM)
250	1	HTCT	EOTCYCU	8	0	N		END OF TEST CYCLES
260	1	HTCT	LABOCODE	12	0	C		LABORATORY INTERNAL OIL CODE
270	1	HTCT	EOTRSN	1	0	C	1,2 or 3	REASON FOR TEST TERMINATION(1,2 or 3)
280	1	HTCT	INFOLETN	5	0	C	YY-NN	INFORMATION LETTER NUMBER (YY-NN)
290	1	HTCT	TESTHL	15	0	C		REFERENCE TEST HARDWARE CONFIGURATION -- LOW
300	1	HTCT	DTCOMPL	8	0	C	YYYYMMDD	REFERENCE COMPLETED DATE--LOW (YYYYMMDD)
320	1	HTCT	TESTLENL	6	0	C	HHH:MM	REFERENCE TEST LENGTH--LOW (HHH:MM)
330	1	HTCT	STRUNL	4	0	C		REFERENCE STAND RUN--LOW
340	1	HTCT	CMIRL	6	0	C		CMIR--LOW
350	1	HTCT	INDL	6	0	C		TMC OIL CODE--LOW
360	1	HTCT	EOTCYCUL	8	0	N		END OF TEST UNSYNCHRONIZED CYCLES--LOW
370	1	HTCT	LABOCODL	12	0	C		LABORATORY INTERNAL OIL CODE - LOW
380	1	HTCT	TESTRxxx	15	0	C		REFERENCE TEST HARDWARE CONFIGURATION -- HIGH
390	1	HTCT	COMPRxxx	8	0	C	YYYYMMDD	REFERENCE COMPLETED DATE--HIGH (YYYYMMDD)
410	1	HTCT	TOTHRxxx	6	0	C	HHH:MM	REFERENCE TEST LENGTH--HIGH (HHH:MM)
420	1	HTCT	STDRRxxx	4	0	C		REFERENCE STAND RUN--HIGH
430	1	HTCT	CMIRRxxx	6	0	C		CMIR--HIGH
440	1	HTCT	TMCNRxxx	6	0	C		TMC OIL CODE--HIGH
450	1	HTCT	CYCHRxxx	8	0	N		END OF TEST UNSYNCHRONIZED CYCLES--HIGH
460	1	HTCT	LBOCRxxx	12	0	C		LABORATORY INTERNAL OIL CODE - HIGH
470	1	HTCT	CYCHAVG	8	0	N		AVERAGE OF HIGHS FOR UNSYNCHRONIZED CYCLES-HIGH
480	2	HTCT	WUPTIME	5	0	N	MINUTES	WARM UP TIME (MINUTES)
490	2	HTCT	ITAILRPM	4	0	N	R/MIN	MIN TAILSHAFT SPEED (R/MIN)
500	2	HTCT	XTAILRPM	4	0	N	R/MIN	MAX TAILSHAFT SPEED (R/MIN)
510	2	HTCT	ATAILRPM	4	0	N	R/MIN	AVG TAILSHAFT SPEED (R/MIN)
520	2	HTCT	ISUMPTMP	4	0	N	°F	MIN OIL SUMP TEMPERATURE (°F )
530	2	HTCT	XSUMPTMP	4	0	N	°F	MAX OIL SUMP TEMPERATURE (°F )
540	2	HTCT	ASUMPTMP	4	0	N	°F	AVG OIL SUMP TEMPERATURE (°F )
550	2	HTCT	ISHAIRPR	5	1	N	PSI	MIN SHIFT AIR PRESSURE (PSI)

Sequence	Form	Test Area	Field Name	Field Length	Decimal Size	Data Type	Units/Format	Description
560	2	HTCT	XSHAIRPR	5	1	N	PSI	MAX SHIFT AIR PRESSURE (PSI)
570	2	HTCT	ASHAIRPR	5	1	N	PSI	AVG SHIFT AIR PRESSURE (PSI)
580	2	HTCT	FNLOAD1A	7	4	N	IN	FINAL PRELOAD COUNTERSHAFT NO. 1A (IN)
590	2	HTCT	FNLOAD2A	7	4	N	IN	FINAL PRELOAD COUNTERSHAFT NO. 2A (IN)
600	2	HTCT	FNLOAD3A	7	4	N	IN	FINAL PRELOAD COUNTERSHAFT NO. 3A (IN)
610	2	HTCT	TORQBRK	4	0	N	LBF-IN.	TORQUE BREAK (LBF-IN.)
620	2	HTCT	TORQTRN	4	0	N	LBF-IN.	TORQUE TURN (LBF-IN.)
630	2	HTCT	RFORKNO	5	0	C		RANGE FORK NO.
640	2	HTCT	PADHARDL	5	1	N	ROCKWELL C	PAD HARDNESS--PRE TEST--LEFT (ROCKWELL C)
650	2	HTCT	PADHARDR	5	1	N	ROCKWELL C	PAD HARDNESS--PRE TEST--RIGHT (ROCKWELL C)
660	2	HTCT	PADMPREL	7	4	N	IN	PAD MEASUREMENT THICKNESS-LEFT-PRE TEST (IN)
670	2	HTCT	PADMPRER	7	4	N	IN	PAD MEASUREMENT THICKNESS-RIGHT-PRE TEST (IN)
680	2	HTCT	PADMPOS	7	4	N	IN	PAD MEASUREMENT THICKNESS-LEFT-POST TEST (IN)
690	2	HTCT	PADMPOS	7	4	N	IN	PAD MEASUREMENT THICKNESS-RIGHT-POST TEST (IN)
700	2	HTCT	WEARTOTL	7	4	N	IN	TOTAL PAD WEAR-LEFT (IN)
710	2	HTCT	WEARTOTR	7	4	N	IN	TOTAL PAD WEAR-RIGHT (IN)
720	2	HTCT	WEARAVG	7	4	N	IN	AVERAGE PAD WEAR (IN)
730	2	HTCT	ETHICKR1	7	4	N	IN	REAR DISC #1 THICKNESS AND WEAR PRE-TEST (IN)
740	2	HTCT	ETHICKR2	7	4	N	IN	REAR DISC #2 THICKNESS AND WEAR PRE-TEST (IN)
750	2	HTCT	ETHICKR3	7	4	N	IN	REAR DISC #3 THICKNESS AND WEAR PRE-TEST (IN)
760	2	HTCT	ETHICKR4	7	4	N	IN	REAR DISC #4 THICKNESS AND WEAR PRE-TEST (IN)
770	2	HTCT	OTHICKR1	7	4	N	IN	REAR DISC #1 THICKNESS AND WEAR POST-TEST (IN)
780	2	HTCT	OTHICKR2	7	4	N	IN	REAR DISC #2 THICKNESS AND WEAR POST-TEST (IN)
790	2	HTCT	OTHICKR3	7	4	N	IN	REAR DISC #3 THICKNESS AND WEAR POST-TEST (IN)
800	2	HTCT	OTHICKR4	7	4	N	IN	REAR DISC #4 THICKNESS AND WEAR POST-TEST (IN)
810	2	HTCT	WEARR1	7	4	N	IN	REAR DISC #1 THICKNESS AND WEAR (IN)
820	2	HTCT	WEARR2	7	4	N	IN	REAR DISC #2 THICKNESS AND WEAR (IN)
830	2	HTCT	WEARR3	7	4	N	IN	REAR DISC #3 THICKNESS AND WEAR (IN)
840	2	HTCT	WEARR4	7	4	N	IN	REAR DISC #4 THICKNESS AND WEAR (IN)
850	2	HTCT	ETHICKF5	7	4	N	IN	FRONT DISC #5 THICKNESS AND WEAR PRE-TEST (IN)
860	2	HTCT	ETHICKF6	7	4	N	IN	FRONT DISC #6 THICKNESS AND WEAR PRE-TEST (IN)
870	2	HTCT	ETHICKF7	7	4	N	IN	FRONT DISC #7 THICKNESS AND WEAR PRE-TEST (IN)
880	2	HTCT	ETHICKF8	7	4	N	IN	FRONT DISC #8 THICKNESS AND WEAR PRE-TEST (IN)
890	2	HTCT	OTHICKF5	7	4	N	IN	FRONT DISC #5 THICKNESS AND WEAR POST-TEST (IN)
900	2	HTCT	OTHICKF6	7	4	N	IN	FRONT DISC #6 THICKNESS AND WEAR POST-TEST (IN)
910	2	HTCT	OTHICKF7	7	4	N	IN	FRONT DISC #7 THICKNESS AND WEAR POST-TEST (IN)
920	2	HTCT	OTHICKF8	7	4	N	IN	FRONT DISC #8 THICKNESS AND WEAR POST-TEST (IN)
930	2	HTCT	WEARF5	7	4	N	IN	FRONT DISC #5 THICKNESS AND WEAR (IN)
940	2	HTCT	WEARF6	7	4	N	IN	FRONT DISC #6 THICKNESS AND WEAR (IN)
950	2	HTCT	WEARF7	7	4	N	IN	FRONT DISC #7 THICKNESS AND WEAR (IN)
960	2	HTCT	WEARF8	7	4	N	IN	FRONT DISC #8 THICKNESS AND WEAR (IN)
970	3	HTCT	DWNOCR	2	0	Z		NUMBER OF DOWNTIME OCCURRENCES
980	3	HTCT	DOWNHxxx	6	0	C	HHH:MM	DOWNTIME TEST HOURS XXX (HHH:MM)
990	3	HTCT	DDATHxxx	8	0	C	YYYYMMDD	DOWNTIME DATE XXX (YYYYMMDD)
1000	3	HTCT	DTIMHxxx	6	0	C	HHH:MM	DOWNTIME TIME XXX (HHH:MM)
1010	3	HTCT	DREAHxxx	60	0	C		DOWNTIME REMARKS/REASONS XXX
1020	3	HTCT	TOTLDOWN	6	0	C	HHH:MM	DOWNTIME TIME TOTAL (HHH:MM)
1030	3	HTCT	TOTCOM	2	0	Z		TOTAL # OF COMMENTS & OUTLIERS LINES
1040	3	HTCT	OCOMHxxx	70	0	C		OTHER DOWNTIME COMMENT XXX
1050	3	HTCT	TOTPLOTS	2	0	Z		NUMBER OF CYCLE SHIFT PLOTS INCLUDED IN REPORT
1060	4	HTCT	CYIMRxxx	60	0	C		CYCLE SHIFT PLOT IMAGE

```

#####
#
#           D a t a D i c t i o n a r y R e p e a t i n g           #
#           F i e l d S p e c i f i c a t i o n s                   #
#                                                                 #
#####
# The following contains specifications and field groupings for fields in the
# Data Dictionary that are REPEATING Fields.  These fields can be identified
# in the Data Dictionary by the Hxxx or Rxxx in the last four positions of the
# field name.
#
# Repeating fields are used to specify repeating measurements.
#
# The format for a repeating field name is 4 descriptive characters followed
# by the letter H or R followed by 3 characters for the actual interval
# the measurement was taken. The field will always be a total of 8 characters.
#
# Example ABCDHxxx.
#
# The following is the format of this specification:
#
# Column 1 - 8:   Repeating Field Name
# Column 10 - 17: The Parent Field Name of the Group
# Column 19 - 80: Comments about the Repeating Field Group.
#
# The lines following the Repeating Field Name Record will contain the required
# measurements for the particular field.  Multiple 80 character lines
# can be specified.  A blank line marks the end of each specification.
#
# The Field Name in Column 10-17 designates the the Group in which the field
# belongs.  The First field name in a group is the Parent of the grouping
# and can be used to determine how fields should be grouped.
# The changing of the Parent Field marks the end of a repeating group
# specification.
#
# Example:
#
# VIS_Hxxx, DVISHxxx and PVISHxxx expanded for transmission (8 and 16 hours):
#
#           VIS_H008
#           DVISH008
#           PVISH008
#           VIS_H016
#           DVISH016
#           PVISH016
#
# Note:  During electronic transmission, repeating field groups must be kept
# together with in the specified group but the order with in the group
# does not have to be maintained.
#
#####
#           Start of Field Grouping Specifications           #
#####
HTCT VERSION 19980605
TESTRxxx TESTRxxx   REFERENCE TEST HARDWARE CONFIGURATION -- HIGH
001 002 003 004 005

COMPRxxx TESTRxxx   REFERENCE COMPLETED DATE--HIGH (YYYYMMDD)
001 002 003 004 005

```

TOTHRxxx TESTRxxx REFERENCE TEST LENGTH--HIGH (HHH:MM)  
001 002 003 004 005

STDRRxxx TESTRxxx REFERENCE STAND RUN--HIGH  
001 002 003 004 005

CMIRRxxx TESTRxxx CMIR--HIGH  
001 002 003 004 005

TMCNRxxx TESTRxxx TMC OIL CODE--HIGH  
001 002 003 004 005

CYCHRxxx TESTRxxx END OF TEST UNSYNCHRONIZED CYCLES--HIGH  
001 002 003 004 005

LBOCRxxx TESTRxxx LABORATORY INTERNAL OIL CODE - HIGH  
001 002 003 004 005

DOWNHxxx DOWNHxxx DOWNTIME TEST HOURS XXX (HHH:MM)

DDATHxxx DOWNHxxx DOWNTIME DATE XXX (YYYYMMDD)

DTIMHxxx DOWNHxxx DOWNTIME TIME XXX (HHH:MM)

DREAHxxx DOWNHxxx DOWNTIME REMARKS/REASONS XXX

OCOMHxxx OCOMHxxx OTHER DOWNTIME COMMENT XXX

CYIMRxxx CYIMRxxx CYCLE SHIFT PLOT IMAGE  
001 002

Summary of HTCT Data Dictionary changes from Version 19971117 to Version 19980605

Sequence Number	Form Number	Field Name	Field Length	Decimal Size	Data Type	Units of Measure	Description	
OLD	10	0	VERSION	8	0	C	YYYYMMDD	HTCT VERSION 19971117
NEW	10	0	VERSION	8	0	C	YYYYMMDD	HTCT VERSION 19980605
OLD	230	1	DTSTRT	8	0	C	YYYYMMDD	STARTING DATE (YYYYMMDD)
NEW								
OLD	280	1	DTSTRTL	8	0	C	YYYYMMDD	REFERENCE STARTING DATE-LOW (YYYYMMDD)
NEW								
OLD	310	1	EOTTIMEL	5	0	C	HH:MM	REFERENCE END OF TEST TIME-LOW (HH:MM)
NEW								
OLD	380	1	STRTRxxx	8	0	C	YYYYMMDD	REFERENCE STARTING DATE-HIGH (YYYYMMDD)
NEW								
OLD	400	1	EOTTRxxx	5	0	C	HH:MM	REFERENCE END OF TEST TIME-HIGH (HH:MM)
NEW								
OLD								
NEW	230	1	TESTHARD	16	0	C		TEST HARDWARE CONFIGURATION
OLD								
NEW	290	1	TESTHL	16	0	C		REFERENCE TEST HARDWARE CONFIGURATION -- LOW
OLD								
NEW	380	1	TESTRxxx	16	0	C		REFERENCE TEST HARDWARE CONFIGURATION -- HIGH
OLD								
NEW	380	1	TESTR001	16	0	C		Expansion of TESTRxxx
OLD								
NEW	380	1	TESTR002	16	0	C		Expansion of TESTRxxx
OLD								
NEW	380	1	TESTR003	16	0	C		Expansion of TESTRxxx
OLD								
NEW	380	1	TESTR004	16	0	C		Expansion of TESTRxxx
OLD								
NEW	380	1	TESTR005	16	0	C		Expansion of TESTRxxx

Data Dictionary Operations Legend:

INSERT: An New entry without an Old entry  
 MODIFICATION: An Old entry with a New entry  
 DELETION: An Old entry without a New entry  
 Note: A field RENAME consists of a deletion of the Old field and the insertion of the New Field