1R SCOTE TEST PROCEDURE
FORM 1

METHOD

VERSION *20020207*

CONDUCTED FOR

	V = VALID
	I = INVALID
	N = RESULTS CAN NOT BE INTERPRETED AS REPRESENTATIVE OF OIL PERFORMANCE (NON-REFERENCE OIL) AND SHALL NOT BE USED FOR MULTIPLE TEST ACCEPTANCE CRITERIA.

	RO = REFERENCE OIL TEST
	NR = ALL OTHER TESTS

	WAS THIS TEST RUN UNDER A VALID CALIBRATION? (Y/N)

	LAB IS CURRENTLY OPERATING UNDER AN LTMS PRECISION ALARM *
	STAND IS CURRENTLY OPERATING UNDER AN LTMS PRECISION ALARM *

* Check box only if YES

Test Number		
Test Stand:	Engine Run	
EOT Time:	EOT Date:	
Oil Code:		
Formulation/Stand		
Alternate Codes:		
SAE Viscosity Grade:		

In my opinion this test been conducted in accordance with the 1R Test Procedure(Research Report) and the appropriate amendments through the information letter system. The remarks included in the report describe the anomalies associated with this test.

SUBMITTED BY: _____

Testing Laboratory

_____

Signature

_____

Typed Name

_____

Title

1R SCOTE TEST PROCEDURE
FORM 2
TEST REPORT SUMMARY

LAB:	EOT DATE:	END TIME:	METHOD:
STAND:	RUN NUMBER:		
FORMULATION/STAND CODE:			
OILCODE:			

START DATE:	START TIME:	TOTAL TEST LENGTH:	TMC OIL
LAB INTERNAL OIL		ENGINE SERIAL NUMBER:	

	CORRECTION EFFECTIVE DATE	WD	TGC	TLC	BOTOC g/h	EOTOC g/h	OIL CON. DELTA EOTOC–BOTOC g/h
UNADJUSTED LAB RATING							
INDUSTRY CORRECTION (IF ANY)							
SUBTOTAL							
LAB SEVERITY ADJUSTMENT (IF ANY) [B]							
TOTAL							

	EFFECTIVE DATE	WD	TGC	TLC	BOTOC g/h	EOTOC g/h	OIL CON. DELTA EOTOC–BOTOC g/h
TEST TARGET MEAN [A]							
TEST TARGET STD [A]							
API PASS LIMIT [B]							

	REFEREE LAB	WD	TGC	TLC	
REFEREE RATINGS [A]					

	TOP	INT. 1	OIL	PISTON CROWN	PISTON SKIRT	LINER
RING LOSS OF SIDE CLEARANCE (mm)						
RING END GAP INCREASE (mm)						
IS THE RING STUCK?						
SCUFFED AREA %						
AVERAGE WEAR STEP (µm)						
% BORE POLISH						

Notes: [A] Reference oil tests or as requested by test sponsor
[B] Non-reference oil tests only

1R SCOTE TEST PROCEDURE
FORM 3
OPERATIONAL SUMMARY

LAB:	EOT DATE:	END TIME:	METHOD:
STAND:		RUN NUMBER:	
FORMULATION/STAND CODE:			
OILCODE:			

CONTROLLED PARAMETERS

OPERATING PARAMETER	QUALITY INDEX THRESHOLD	EOT QUALITY INDEX	PROCESS			TOTAL DATA POINTS		
			UNITS	TARGET	AVERAGE	SAMPLES [A]	BQD [B]	OVER/UNDER RANGE [C]
ENGINE SPEED	0.00		r/min	1800				
FUEL FLOW	0.00		g/min	240				
HUMIDITY	0.00		g/kg	17.8				
COOLANT FLOW	0.00		L/min	75				
TEMPERATURE								
COOLANT OUT	0.00		˚C	105				
OIL TO MANIFOLD	0.00		˚C	120				
INLET AIR MANIFOLD	0.00		˚C	60				
FUEL INTO HEAD	0.00		˚C	42				
PRESSURES								
OIL TO MANIFOLD	0.00		kPa	415				
INLET AIR (ABSOLUTE)	0.00		kPa	292				
FUEL FROM HEAD	0.00		kPa	275				
EXHAUST (ABSOLUTE)	0.00		kPa	252				

NON-CONTROLLED PARAMETERS

OPERATING PARAMETER	PROCESS			TOTAL DATA POINTS		
	UNITS	TYPICAL RANGE [D]	AVERAGE	SAMPLES [A]	BQD [B]	OVER/UNDER RANGE [C]
INTAKE AIR FLOW	kg/h	360–410				
POWER	kW	65–70				
TORQUE	Nm	330–350				
BLOWBY	L/min	20–56				
TEMPERATURE						
COOLANT IN	˚C	97–101				
COOLANT DELTA T	˚C	4–8				
OIL COOLER IN	˚C	120–124				
HEATING OIL	˚C	165 max.				
EXHAUST	˚C	590–620				
PRESSURES						
CRANKCASE	kPa	0.09–0.3				
COOLANT TO JUG	kPa	64–92				

A Total number of data points taken as determined from test length and procedural specified sampling rate.
B Number of Bad Quality Data points not used in the calculation of the statistical measures.
C Number of points clipped by over/under range limits of the statistical measures.
D Gathered from 1Q Matrix Test data.

1R SCOTE TEST PROCEDURE
FORM 4
ASSEMBLY MEASUREMENTS AND PART RECORD

LAB:	EOT DATE:	END TIME:	METHOD:
STAND:		RUN NUMBER:	
FORMULATION/STAND CODE:			
OILCODE:			

ASSEMBLY MEASUREMENTS AND PARTS RECORD	
INJECTOR SETTING (GO / NO-GO)	
WAS TIMING INITIALIZED? (YES/NO)	
PISTON/HEAD CLEARANCE mm	
CAM GEAR BACKLASH mm	
DESIRED FUEL TIMING ˚BTC	
INTAKE VALVE OPEN ˚ATC	
INJECTOR PLUNGER LIFT mm @ 72˚	
INTAKE VALVE LIFT mm @ 456˚	
EXHAUST VALVE LIFT mm @ 247˚	

	PART NUMBER	SERIAL NUMBER	DATE CODE	INSPECTION CODE
LINER	A	B	A	
TOP RING	C	E		
INTERMEDIATE RING	C	E		
OIL RING	C	E		
PISTON CROWN	D	D	F	G
PISTON SKIRT	H	I		
FUEL INJECTOR	J	K		
ECM EPROM	L			
PISTON COOLING JET				

A On liner O.D.

B On liner O.D. (NNNN)

C On box label

D On top of piston

E On paper envelope containing the ring

F Number below "E" located on piston top

G Number above "E" located on piston top

H On bottom surface of skirt rim

I On bottom surface under pin bore

J On top surface of plunger

K On top surface of plunger - 6 digits

L On ECAT software

1R SCOTE TEST PROCEDURE
FORM 5
PISTON RATING SUMMARY

TEST IDENTIFICATION	LAB:	EOT DATE:	END TIME:	STAND:	RUN #:	METHOD:
FORMULATION/STAND CODE:				OILCODE:		
TEST FUEL:	FUEL BATCH:	DATE RATED:	RATER INITIALS:	VERIFIED BY:		
LAST STAND REFERENCE INFORMATION	DATE COMPLETED:	STAND #:	RUN #:	TMC OIL CODE:		

	WD	TGC	TLC	BOTOC g/h	EOTOC g/h
LAST REF. THIS STAND					
INDUSTRY AVERAGE					
INDUSTRY STD					

TOTAL PISTON RATINGS SUMMARY

		GROOVES				LANDS					GROOVE		LANDS				OIL COOLING GALLERY		UNDER CROWN	
	DEP. FACTOR	NO. 1		NO. 2		NO. 1		NO. 2		DEP. FACTOR	NO. 3		NO. 3		NO. 4					
		A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.		A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.
CARBON	HC – 1.0																			
	MC – 0.5																			
	LC – .25																			
	TOTAL																			
VARNISH	8 – 9									7.5										
	7 – 7.9																			
	6 – 6.9																			
	5 – 5.9									4.5										
	4 – 4.9																			
	3 – 3.9																			
	2 – 2.9									1.5										
	1 – 1.9																			
	>0 – 0.9																			
	CLEAN		0		0		0		0	CLEAN		0		0		0		0		0
	TOTAL																			
RATING																				
LOCATION FACTOR		2		3		1		3			20		20		60		0.5		1	
IND RATING																				

WD:	TLHC %:	TGF %:	IGF %:	TLFC %:
UNWEIGHTED:	TLC:	TGC:	IGC:	UNDERCROWN CARBON:

1R SCOTE TEST PROCEDURE
Form 5A

LAB:	EOT DATE:	END TIME:	METHOD:
STAND:		RUN NUMBER:	
FORMULATION/STAND CODE:			
OILCODE:			

Refer to Appendix A14 for an example of Piston Rating Worksheet.

1R SCOTE TEST PROCEDURE
FORM 6
SUPPLEMENTAL PISTON DEPOSITS (GROOVE SIDES AND RINGS)

LAB:	EOT DATE:	END TIME:	METHOD:
STAND:		RUN NUMBER:	
FORMULATION/STAND CODE:			
OILCODE:			

DEPOSIT TYPE			CARBON			VARNISH									
			HC	MC	LC	8 – 9	7 – 7.9	6 – 6.9	5 – 5.9	4 – 4.9	3 – 3.9	2 – 2.9	1 – 1.9	>0 –	CLEAN
GROOVE TOP AND BOTTOM	1	T													
		B													
	2	T													
		B													
	3	T													
		B													
TOP BOTTOM AND BACK OF RINGS	1	T													
		B													
		BK													
	2	T													
		B													
		BK													
	3	T													
		B													
		BK													

ADDITIONAL DEPOSIT & CONDITION RATINGS

PISTON CROWN	
PISTON SKIRT	
RINGS	
LINER	

1R SCOTE TEST PROCEDURE
FORM 6A
REFEREE RATING

TEST IDENTIFICATION			
LAB:	EOT DATE:	END TIME:	METHOD:
STAND:	RUN #:		
FORMULATION/STAND CODE:			
OILCODE:			
REFEREE RATING INFORMATION			
COMPANY:	RATING NUMBER:	DATE RATED:	RATER:

TOTAL PISTON RATINGS SUMMARY

		GROOVES				LANDS					GROOVES		LANDS				OIL COOLING		UNDER CROWN	
	DEP. FACTOR	NO. 1		NO. 2		NO. 1		NO. 2		DEP. FACTOR	NO. 3		NO. 3		NO. 4					
		A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.		A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.
CARBON	HC-1.0																			
	MC-0.5																			
	LC-.25																			
	TOTAL																			
VARNISH	8 - 9									7.5										
	7 - 7.9																			
	6 - 6.9																			
	5 - 5.9									4.5										
	4 - 4.9																			
	3 - 3.9																			
	2 - 2.9									1.5										
	1 - 1.9																			
	>0 - 0.9																			
	CLEAN		0		0		0		0			0		0		0		0		0
	TOTAL																			
RATING																				
LOCATION FACTOR		2		3		1		3			20		20		60		0.5		1	
IND RATING																				

WD:	TLHC %:	TGF %:	IGF %:	TLFC %:
UNWEIGHTED:	TLC:	TGC:	IGC:	UNDERCROWN CARBON:

1R SCOTE TEST PROCEDURE
FORM 7
OIL ANALYSIS DATA

TEST IDENTIFICATION			
LAB:	EOT DATE:	END TIME:	METHOD:
STAND:		RUN NUMBER:	
FORMULATION/STAND CODE:			
OILCODE:			
TEST FUEL:		FUEL BATCH:	

OIL ANALYSIS	NEW														
VISC @ 100°C															
VISC @ 40°C															
TBN D4739															
TAN D664															
TGA Soot %															
WEAR METALS (ppm)															
Fe															
Al															
Si															
Cu															
Cr															
Pb															
FUEL DILUTION %															
IR O_2															
BLOWBY (L/min)															
Oil Consumption g/h for hrs ending															
Oil Consumption r^2															
FUEL POSITION (mm)															

NOTE:
(1) Total Oil In System 5800 ± 50 grams.
(2) Refill oil scale cart to full level every 36 hours. Take oil samples, as shown, before adding oil.

1R SCOTE TEST PROCEDURE
FORM 8
DOWNTIME SUMMARY

LAB:	EOT DATE:	END TIME:	METHOD:
STAND:		RUN NUMBER:	
FORMULATION/STAND CODE:			
OILCODE:			

Number of Downtime Occurrences				
TEST HOURS	**DATE**	**DOWNTIME**	**REASONS**	
			TOTAL DOWNTIME (125 HR. MAX)	

Comments		
Number of Comment Lines		

1R SCOTE TEST PROCEDURES
FORM 9
RING MEASUREMENTS

LAB:	EOT DATE:	END TIME:	METHOD:
STAND:		RUN NUMBER:	
FORMULATION/STAND CODE:			
OILCODE:			

ALL RING MEASUREMENTS ARE MADE USING METRIC FEELER GAGES

RING GAPS (mm)	**1Y4014 TOP**	**1Y4013 INTERMEDIATE**	**1Y4012 OIL**
SPECIFICATIONS	0.350mm – 0.550mm	0.754mm – 0.906mm	0.400mm – 0.750mm
PRE-TEST			
POST-TEST			
INCREASE			

RING SIDE CLEARANCE*		**A**	**B**	**C**	**D**	**AVG.**	**MIN.**	**SPECIFICATION**
TOP	PRE-TEST							0.090mm – 0.127mm
	POST-TEST							
	LSC							
INT.	PRE-TEST							0.060mm – 0.110mm
	POST-TEST							
	LSC							
OIL	PRE-TEST							0.030mm – 0.080mm
	POST-TEST							
	LSC							

* NOTES:

1. WRITE "STUCK" IN PLACE OF DIMENSION WHEN APPLICABLE

2. WRITE "<0.03 mm" FOR CLEARANCE WHEN APPLICABLE.

3. WRITE ">" BEFORE CALCULATED DECREASE OR AVERAGE DECREASE VALUES THAT INCORPORATE A "<0.03 mm" IN CALCULATION.

4 LSC = LOSS OF SIDE CLEARANCE

5. MIN: OIL RING MINIMUM SIDE CLEARANCE IS MEASURED 360˚AROUND PISTON.

1R SCOTE TEST PROCEDURE
FORM 10
LINER MEASUREMENTS

LAB:	EOT DATE:	END TIME:	METHOD:
STAND:		RUN NUMBER:	
FORMULATION/STAND CODE:			
OILCODE:			

LINER SURFACE FINISH (µm)			
DISTANCE FROM TOP	TRANSVERSE	LONGITUDINAL	AVERAGE
130 mm			
50 mm			
25 mm			
		TOTAL AVERAGE (Spec: 0.4 – 0.8 µm)	

% LINER BORE POLISH – GRID (ADD T/AT VALUES FROM GRID)	
THRUST	
ANTI–THRUST	
TOTAL	

LINER BORE MEASUREMENT (137.154mm minimum)			
BEFORE TEST – DIAMETER (DIAL BORE GAGE)			
BORE HEIGHT	**LONGITUDINAL**	**TRANSVERSE**	**OUT OF ROUND** (0.038 mm max)
250 mm			
210 mm			
170 mm			
130 mm			
50 mm			
25 mm			
15 mm			
TAPER (0.050 max)			

AFTER TEST – (SURFACE PROFILE)				
	LONGITUDINAL µm		**TRANSVERSE µm**	
	FRONT	**REAR**	**T**	**AT**
WEAR STEP @ 13 mm				

1R SCOTE TEST PROCEDURE
FORM 11
CHARACTERISTICS OF THE DATA ACQUISITION SYSTEM

LAB:	EOT DATE:	END TIME:	METHOD:
STAND:		RUN NUMBER:	
FORMULATION/STAND CODE:			
OILCODE:			

PARAMETER (1)	SENSING DEVICE (2)	CALIBRATION FREQUENCY (3)	RECORD DEVICE (4)	OBSERVATION FREQUENCY (5)	RECORD FREQUENCY (6)	LOG FREQUENCY (7)	SYSTEM RESPONSE (8)
OPERATION CONDITIONS							
ENGINE SPEED (r/min)							
ENGINE POWER (kW)							
FUEL FLOW (g/min)							
HUMIDITY (g/kg)							
TEMPERATURES (°C)							
COOLANT OUT							
COOLANT IN							
OIL TO MANIFOLD							
OIL COOLER IN							
INLET AIR							
EXHAUST							
FUEL TO HEAD							
PRESSURES (kPa)							
OIL TO MANIFOLD							
INLET AIR							
EXHAUST							
FUEL FROM HEAD							
CRANKCASE							
FLOWS (L/min)							
BLOWBY							
COOLANT FLOW							

LEGEND:
(1) OPERATING PARAMETER
(2) THE TYPE OF DEVICE USED TO MEASURE TEMPERATURE, PRESSURE, OR FLOW
(3) FREQUENCY AT WHICH THE MEASUREMENT SYSTEM IS CALIBRATED
(4) THE TYPE OF DEVICE WHERE DATA IS RECORDED
LG – HANDLOG SHEET
DL – AUTOMATIC DATA LOGGER
SC – STRIP CHART RECORDER
C/M – COMPUTER, USING MANUAL DATA ENTRY
C/D – COMPUTER, USING DIRECT I/O ENTRY
(5) DATA AREA OBSERVED BUT ONLY RECORDED IF OFF SPEC.
(6) DATA ARE RECORDED BUT ARE NOT REATINED AT EOT
(7) DATA ARE LOGGED AS PERMANENT RECORD, NOTE SPECIFY IF:
SS – SNAPSHOT TAKEN AT SPECIFIED FREQUENCY
AG/X – AVERAGE OF X DATA POINTS AT SPECIFIED FREQUENCY
(8) TIME FOR THE OUTPUT TO REACH 63.2% OF FINAL VALUE FOR STEP CHANGE AT INPUT

1R SCOTE TEST PROCEDURE
FORM 12
ENGINE OPERATIONAL DATA PLOTS

LAB:	EOT DATE:	END TIME:	METHOD:
STAND:		RUN NUMBER:	
FORMULATION/STAND CODE:			
OILCODE:			

1R SCOTE TEST PROCEDURE
FORM 13
TORQUE AND EXHAUST TEMPERATURE HISTORY

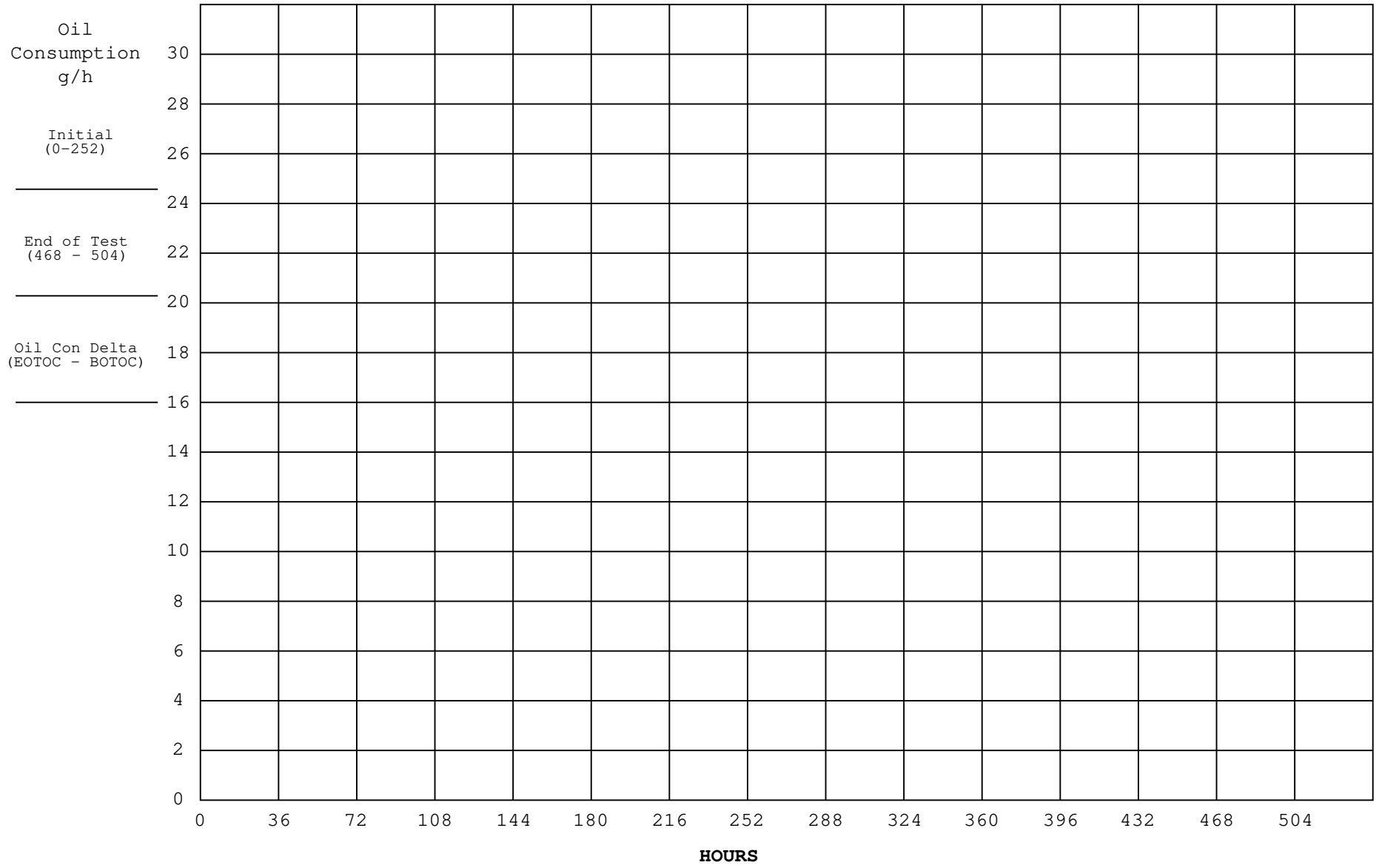
LAB:	EOT DATE:	END TIME:	METHOD:
STAND:		RUN NUMBER:	
FORMULATION/STAND CODE:			
OILCODE:			

Data From Last 10 Tests

Test No.	1	2	3	4	5	6	7	8	9	10
Avg. Exh Temp.										
Avg.Eng.Torque										

1R SCOTE TEST PROCEDURE
FORM 14
OIL CONSUMPTION

LAB:	EOT DATE:	END TIME:	METHOD:
STAND:		RUN NUMBER:	
FORMULATION/STAND CODE:			
OILCODE:			



1R SCOTE TEST PROCEDURE
Form 15
PISTON, RING AND LINER PHOTOGRAPHS

LAB:	EOT DATE:	END TIME:	METHOD:
STAND:		RUN NUMBER:	
FORMULATION/STAND CODE:			
OILCODE:			

Refer to Appendix A14 for example of Photo

1R SCOTE TEST PROCEDURE
FORM 16
SEVERITY ADJUSTMENT HISTORY

LAB:	EOT DATE:	END TIME:	METHOD:
STAND:		RUN NUMBER:	
FORMULATION/STAND CODE:			
OILCODE:			

USAGE DATES		WD		TGF		TLC		BTOC		ETOC	
START	TIME	Zi	S.A.	Zi	S.A.	Zi	S.A.	Zi	S.A.	Zi	S.A.

1R SCOTE TEST PROCEDURE
Form 17
FUEL BATCH ANALYSIS

LAB:	EOT DATE:	END TIME:	METHOD:
STAND:		RUN NUMBER:	
FORMULATION/STAND CODE:			
OILCODE:			

Refer to Appendix A14 for examples of appropriate Fuel Batch Analysis

1R SCOTE TEST PROCEDURE
Form 18
TMC CONTROL CHART ANALYSIS
(Reference Oil Tests Only)

LAB:	EOT DATE:	END TIME:	METHOD:
STAND:		RUN NUMBER:	
FORMULATION/STAND CODE:			
OILCODE:			

Refer to Appendix A14 for example of Control Chart Analysis page.