

2017

*CODE N-NEW U-USED R-REBUILT

QUAN.	* PART NO. OR DESCRIPTION	AMOUNT
15	WASH CAPS	39.50
24	LIFTERS	105.-
24	ROD BEARINGS	95.50
12	PUSHRODS	115.-
	VALVE SPRING SHIMS	4.50
13	VALVE STEM SEALS	21.95
15	HEAD BOLT WASHERS	17.40
1	CRANKSHAFT SEAL	8.-
15	VALVE STEM KEEPERS	24.75
15	VALVE SPRING SEATS	50.8
15	VALVE SPRINGS	103.50
24	MAIN BEARINGS	61.50
	ROCKER SHAFT SPACERS	8.40
6	TIMES SEATS	9.-
15	MOTOR + CONDENSER	25.75
1	DISTRIBUTOR CAP	43.50
15	SPARK PLUGS	5.75
8	WASHERS	1.50

TOTAL PARTS 744.25

QUAN.	* SUBLET REPAIRS	AMOUNT
	HONE CYLINDERS .004	75.-
	SPECIAL LEG/GRIND/PLAN	325.-
	MAG/GRIND/UTLIZE CRANK	325.-

TOTAL SUBLET REPAIRS 725.-

ESTIMATE AMOUNT - FOR PARTS AND LABOR

ORIGINAL ESTIMATE \$	AUTHORIZED BY	TEARDOWN ESTIMATE: I understand that my vehicle will be reassembled within _____ days of the date shown above if I choose not to authorize the services recommended.
PHONE	DATE	TIME
REVISED ESTIMATE \$	REASON	ADDITIONAL COST \$
AUTHORIZED BY	IN PERSON PHONE #	DATE TIME

TIME RECEIVED AM [] PM []

TIME PROMISED AM [] PM []

YEAR [] MAKE BRISTOL LICENSE [] ODOMETER []

MODEL [] MOTOR NUMBER 0-91-10 SERIAL NUMBER []

PHONE WHEN READY YES [] NO [] DELIVER YES [] NO []

RESIDENCE [] BUSINESS []

RETAIN PARTS FOR MY INSPECTION []

DISCARD PARTS []

SIGNED X TERMS CASH: UNLESS ARRANGEMENTS MADE PRIOR TO AUTHORIZATION

I hereby authorize the repair work to be done along with the necessary materials. You and your employees may operate vehicle for purposes of testing, inspection or delivery at my risk. An express mechanic's lien is acknowledged on vehicle to secure the amount of repairs thereto. You will not be held responsible for loss or damage to vehicle or articles left in vehicle in case of fire, theft, accident or any other cause beyond your control.

MECH.	OPER.	REPAIR ORDER-LABOR INSTRUCTION	LABOR CHARGE
		BUILD ENGINE FROM PARTS + DYNO TIME	2800.-
		HOT TANK + MAG BLOCK + CRANK	45.-
		BALANCE ENGINE ASSEMBLY	65.-
		ROCK UP FOR STROKE LENGTH, PTOV, PARTIAL COMPLIATION	95.-
		SURFACE BLOCK	75.-
		MEASURE RODS/MACE BRONZE BUSHINGS, CHAMFER, DRILL	
		OIL HOLES / INSTALL	90.-
		BORE CYLINDERS TO SQUARE W/ BLOCK	85.-
		GRIND PORTS + POCKETS	275.-
		LEARN HONE GUIDES .030	65.-

QTY.	AMOUNT	QTY.	AMOUNT
15	GALLONS OF GAS 57.75		
6	QUARTS OF OIL 8.70	TOTAL GAS OIL & GREASE	66.45

- WE RECOMMEND THE FOLLOWING REPAIRS:
- _____
 - _____
 - _____
 - _____

BILLING

CASH [] OK'D BY []

CHARGE []

INTERNAL []

DATE	1 / 1
WRITTEN BY	
OPERATION	LABOR CHARGE
LUBRICATE	
CHANGE OIL	
CHANGE OIL FILTER CART.	
SERVICE AIR CLEANER	
CHANGE TRANS. OIL	
ADJUST TRANSMISSION	
CHANGE DIFF. OIL	
PACK FRONT WHEEL BRGS.	
ROTATE TIRES	
ADJUST BRAKES	
TOTAL LABOR	4810.-
PARTS	744.25
SUBLET REPAIRS	725.-
GAS, OIL AND GREASE	66.45
SUB TOTAL	
SALES TAX	60.80
TOTAL AMOUNT	6642.85

INVOICE

*CODE N=NEW U=USED R=REBUILT

CROWTHER RACING ENGINES

1308 Dynamic Street
Petaluma, CA 94954
(707) 778-6050

8134

OFFICE COPY

QUAN.	PART NO. OR DESCRIPTION	AMOUNT
1	Oil Pump	67.50
2	LIFTERS	72.80
2	FRONT SEALS	18.90
1	HELICOIL	95
TOTAL PARTS		160.15
QUAN.	SUBLET REPAIRS	AMOUNT
	REBUILD + GRIND CAM	545-
	SHIPPING	34.87
TOTAL SUBLET REPAIRS		579.87
ESTIMATE AMOUNT PARTS AND LABOR		
ORIGINAL ESTIMATE:		
PARTS	LABOR	
AUTHORIZED BY:	PHONE DATE TIME	ORIGINAL ESTIMATE: \$
TEARDOWN ESTIMATE: I understand that my vehicle will be reassembled within _____ days of the date shown above if I choose not to authorize the services recommended.		TEARDOWN ESTIMATE: \$
REVISED ESTIMATE:		
ADDITIONAL PARTS	ADDITIONAL LABOR	ADDITIONAL COST: \$
AUTHORIZED BY:	<input type="checkbox"/> IN PERSON DATE TIME	REVISED ESTIMATE: \$
	<input type="checkbox"/> PHONE #	
ESTIMATE TOTAL		

DEALER REGISTRATION NO.		DATE 10/2/97	
TIME RECEIVED		WRITTEN BY	
AM	PM	OPERATION	LABOR CHARGE
TIME PROMISED		LUBRICATE	
AM	PM	CHANGE OIL	
YEAR	MAKE <i>Bmw</i>	CHANGE OIL FILTER CART.	
	MODEL <i>318i</i>	SERVICE AIR CLEANER	
	LICENSE	CHANGE TRANS. OIL	
	MOTOR NUMBER	ADJUST TRANSMISSION	
	SERIAL NUMBER	CHANGE DIFF. OIL	
PHONE WHEN READY	DELIVER	PACK FRONT WHEEL BRGS.	
YES <input type="checkbox"/> NO <input type="checkbox"/>	YES <input type="checkbox"/> NO <input type="checkbox"/>	ROTATE TIRES	
RESIDENCE		ADJUST BRAKES	
BUSINESS			
RETAIN PARTS FOR MY INSPECTION <input type="checkbox"/>			
DISCARD PARTS <input type="checkbox"/>			
SIGNED <input checked="" type="checkbox"/>			
TERMS CASH: UNLESS ARRANGEMENTS MADE PRIOR TO AUTHORIZATION			

I hereby authorize the repair work to be done along with the necessary materials. You and your employees may operate vehicle for purposes of testing, inspection or delivery at my risk. An express mechanic's lien is acknowledged on vehicle to secure the amount of repairs thereto. You will not be held responsible for loss or damage to vehicle or articles left in vehicle in case of fire, theft, accident or any other cause beyond your control.

MECH.	OPER.	REPAIR ORDER - LABOR INSTRUCTION	LABOR CHARGE
		MODIFY LIFTERS	225-
		CHANGE VALVE SPRINGS / MODIFY TOP COLLECTS	165-
		PARTIAL DISASSEMBLY / FTR CAM + LIFTERS	950-
		CHECK BEARINGS / TIME CAM / REASSEMBLE	
		MODIFY OIL PUMP GEARS	175-
		HELICOIL CAM STD	20-
CROWTHER RACING ENG 10-13/97 AN + CAR 11019 228703			
PAID to check. 11019-			

QTY.	AMOUNT	QTY.	AMOUNT	BILLING	TOTAL LABOR
GALLONS OF GAS		POUNDS OF GREASE		<input type="checkbox"/> CASH	1535-
QUARTS OF OIL		TOTAL GAS OIL & GREASE		<input type="checkbox"/> CHARGE	PARTS 160.15
WE RECOMMEND THE FOLLOWING REPAIRS:				<input type="checkbox"/> INTERNAL	SUBLET REPAIRS 579.87
1. _____					GAS, OIL, AND GREASE
2. _____					SUB TOTAL
3. _____					SALES TAX 12.01
4. _____					TOTAL AMOUNT 2287.03

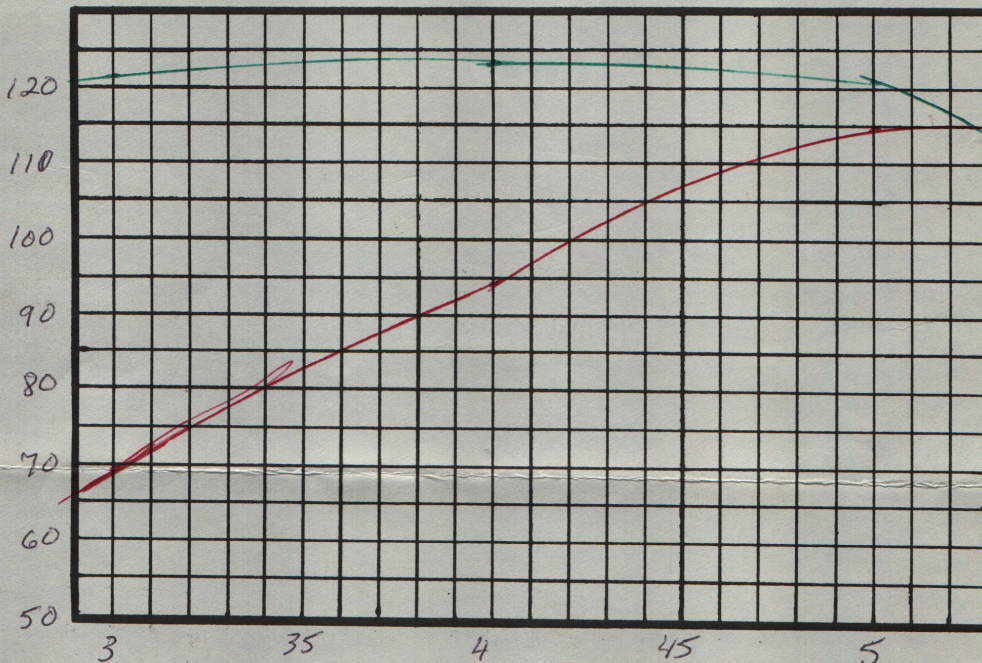
REDIFORM® 4S489/4P489 POLYPAK (50 SETS)

CROWTHER RACING ENGINES

Engine Specifications

Engine BRISTOL C-91-10 [REDACTED] Date 3/12/92
 Displacement _____
 Bore 2.620
 Stroke 3.775
 Ignition Timing 42-43° TOTAL
 Valve Clearance COLD
 Intake 1.008
 Exhaust 1.010
 Spark Plugs NIPONDENSO U22FS-U
 Carburetion 3-WEBER 34ICH
 Venturi 29 MM Emulsion tube FB
 Main jet 140 Idle jet 50
 Air jet 165 Pump jet 40

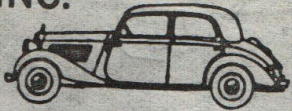
Power Curve:
 Horsepower —
 Torque —



Notes:

PAUL'S AUTOHAUS, INC.

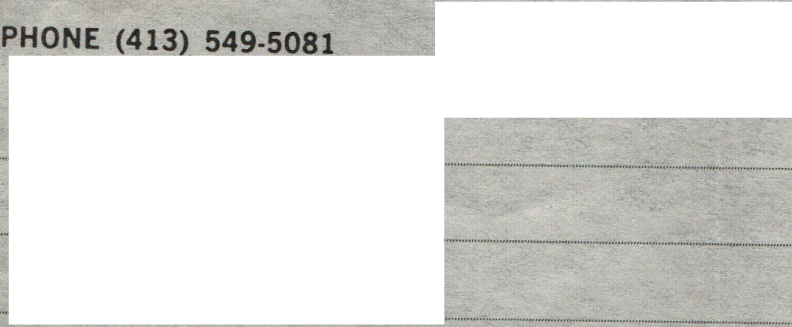
P.O. BOX 978
233 NO. PLEASANT ST.
AMHERST, MA 01004



INVOICE

FAX OR PHONE (413) 549-5081

TO



DATE 9/17/91	ORDER NO.
SHIP TO	

Phone

SALESPERSON	DATE SHIPPED	SHIPPED VIA	F.O.B. POINT	TERMS	
6/11/91	9/17/91	UPS	BMW	COD - cash or check	
QUANTITY	DESCRIPTION		UNIT PRICE		TOTAL
2	VS06.300 Complete German headlights		143	33	286 66
	7% shipping/handling				20 07
	UPS/COD				3 75
	Total COD				\$310 48

RETURNS: No goods will be accepted for credit unless returned with our return authorization (RG) number. All returns subject to current policies.

SHORTAGES: No claim for shortage will be considered unless reported within 10 days of receipt of consignment. Claim for damages to be made to carrier

ORIGINAL

Thank You

Crowther Race Engines

Rods 45#
Mains 42#
Heads 40

Prepared for Date 3/13/91

General
 Engine number C-91-10
 CID _____
 Bore 2.620 (66.51 mm)
 Stroke 3.775 (95.9 mm)

Piston pins
 Manufacturer Venolia
 Part no. _____
 Locks _____

Pistons
 Manufacturer Venolia
 Part no. _____
 Compression Ratio _____
 Piston-to-bore clearance:
 1. _____ 5. _____
 2. _____ 6. _____
 3. _____ 7. _____
 4. _____ 8. _____
 Piston pin boss-to-rod clearance _____
 Piston pin end play _____

Piston rings
 Top: Mfr. DEVES Part no. 1925A + .060
 Middle: Mfr. ↓ Part no. ↓
 Bottom: Mfr. _____ Part no. _____

Connecting rods
 Manufacturer stock
 Part no. _____
 Center-to-center length too long
 Rod bolts _____
 Torque spec. 45*
 Stretch spec. .0045 / .0055 actual
 Block R/Big End bearing = 1.913 ± .0002

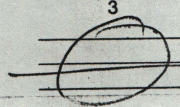

Crankshaft
 Manufacturer _____
 Part no. _____
 Main bearing mfr. AE ENGINE PARTS
 Main bearings part no. M/S 207 SA.010" 112
 Rod bearing mfr. Clevite
 Rod bearings part no. CBS/A-679 P-.010 See below
 Clearances: _____

Manufacturer _____
 Part no. _____
 Main bore diameter 2.2715 / 2.2720
 Cylinder diameter 2.620
 → SET 2 sets and use only w/ one in each set - see below

Mains DK HT +.025 @ EDGE

	1	2	3	4	5
Bearings	<u>2.1195</u>	<u>2.1191</u>	<u>2.1191</u>	<u>2.1196</u>	_____
Journals	<u>2.1167</u>	<u>2.1169</u>	<u>2.1169</u>	<u>2.1168</u>	_____
Clearance	<u>.0027</u>	<u>.0022</u>	<u>.0022</u>	<u>.0028</u>	_____

Rods

	1	2	3	4
Bearings	<u>1.7630</u>	<u>1.7632</u>	<u>1.7630</u>	<u>1.7630</u>
Journals	<u>1.7608</u>	<u>1.7607</u>	<u>1.7609</u>	<u>1.7607</u>
Clearance	<u>.0022</u>	<u>.0025</u>	<u>.0021</u>	<u>.0023</u>
Bearings	<u>1.7630</u>	<u>1.7630</u>		
Journals	<u>1.7607</u>	<u>1.7607</u>	_____	_____
Clearance	<u>.0023</u>	<u>.0023</u>	_____	_____

Notes
 * main bearings - Have to use wide bearings in ea. of 2 sets purchased - need to machine width on opposite sides of upper & lower #2 & #3 mains for centering
 * checked rod & main bearing ID'S w/ Housing bore as per above - ground crankshaft accordingly
 * valves were Honatit int #1403 / exh #1402
 * rod bearings can use VPR 203B-010" or Clevite CBS/A-679P-01 (fits alpha 1300/1350 cc engine) need to trim approx 100 off of side opposite tang to fit Bristol rod widths

Manufacturer VEBAC/KE
 Crnd no. 90383 16-9
 Serial no. _____
 Type _____
 Running duration: _____
 Intake _____
 Exhaust _____
 Lobe lift: _____
 Intake .286" actual
 Exhaust .286 "
 Valve lift: _____
 Intake .445
 Exhaust .448
 Valve lash (hot _____ or cold X)
 Intake _____ .008
 Exhaust _____ .010
 Check timing at _____ tappet height
 Lobe centers 10.65/8
 Duration at 050 tappet height:
 Intake 231°
 Exhaust 230°
 Torque range _____

Intake open _____ Intake close _____ Intake Center Line 108 1/2
 Exhaust open _____ Exhaust close _____ Exhaust Center Line 105
 Overlap 10.065 EX 0.95
 LIFT @ 10% 10.049 EX 1.07
Valve Train
 Rocker arm mfr. and part no. _____
 Rocker arm ratio 1.58
 Pushrod mfr. and part no. _____
 Pushrod length 10 7/8 & 5 5/8
 Intake valve springs: _____
 Mfr. Crane
 Part no. 99859
 Exhaust valve springs: _____
 Mfr. Same
 Part no. _____

TRW
 VP76
 Valve
 Seals

Spring seat pressure 80# @ 1.330 & 225#
 Spring open pressure 140# w/ T = 150# RB = 100#
 Valve stem mfr. and part no. 99916 Clearance _____
 Valve retainer mfr. and part no. _____
 Stud girdle mfr. and part no. for modifications
 Intake valve-to-piston clearance:
 1. .311 5. _____
 2. _____ 6. _____
 3. _____ 7. _____
 4. _____ 8. _____
 Exhaust valve-to-piston clearance:
 1. .334 5. _____
 2. _____ 6. _____
 3. _____ 7. _____
 4. _____ 8. _____

Miscellaneous
 Water pump mfr. and part no. _____
 Pulleys _____
 Fuel pump mfr. and part no. _____
 Flywheel mfr. and part no. _____
 Alternator mfr. and part no. _____

Notes: 44.17 cc w/ pist. @ .500" down in hole
28.0 swept cyl vol
16.87 total + dome @ TDC
17.06 total + dome @ TDC after Block decking
2.620 x 3.775

2	333.51	Ch	65.0
	65.0	gPKT	5.7
	5.7		70.7
	404.21	dome	17.05
	17.05		53.65 = 7.2 w/ copper head gPKT
	87.16		7.7 w/ skin

012" = 1cc removed from head
int Prop @ 10° w/ gPKT .465"
" w/ T @ valve @ 10° .154
.311
Grh Prop @ 10° w/ gPKT .500"
" left @ valve @ 10° .166
.334

STARTING TETS: MAIN 120
 AIR 200
 EMOL 1002
 LGNT 26m
 STARTER 9.5
 URS 1.5

Injection system
 Manifold mfr. _____
 Manifold part no. _____
 Manifold porting by _____
 Carburetor (or injection) mfr. _____
 Carburetor (or injection) part no. _____

Lubrication system
 Oil pump mfr. and part no. _____
 Windage tray mfr. and part no. _____
 Pan mfr. and part no. _____
 Dry sump pump mfr. and part no. _____

Exhaust system
 Header mfr. and part no. _____
 Primary tube dia. _____ length _____
 Collector dia. _____ length _____

Cylinder heads
 Manufacturer Pistol
 Part no. 85C
 Porting by CREIBRI
 Valve guide type Stock reamed .030" over
 Valve guide part no. & mfr. _____
 Intake seat angles: 1403 Horatio 11/32
 Top cut 37 Seat 45 Bottom cut 55
 Exhaust seat angles: 1402 Horatio 11/32
 Top cut 37 Seat 45 Bottom cut 55
 Head gasket mfr. and part no. _____
 Head gasket compressed thickness Copper = .062
 Head CC's:
 1. _____ 5. _____
 2. _____ 6. _____
 3. _____ 7. _____
 4. _____ 8. _____
 Dead cylinder volume _____
 Live cylinder volume _____
 Total cylinder volume _____
 Compression ratio _____

Balancing Components
 Piston (1) _____ Weight (Grams) 274
 Piston pin (1) _____ 61
 Piston Rings _____
 Pin locks _____
 Total rod _____
 Reciprocating rod _____
 Rotating rod _____
 Bearing insert _____
 Oil _____

Ignition system
 Distributor mfr. and part no. LUCAS
 CAP Amplifier mfr. and part no. LUCAS DDB 161
 Points mfr. and part no. LUCAS DSB 122C
 Points gap .016 dwell _____
 Condenser mfr. and part no. LUCAS DCB 121
 ROTOR Coil mfr. and part no. Peper -141-3013
 Advance curve _____
 Spark plug mfr. and part no. NIPPONDENSO U12FS-U
 Spark plug gap _____
 Wire assembly mfr. and part no. _____

BOSCH DIST
 DWELL 35°
 12° ADVANCE @ 2000 RPM
 " " @ 1100 RPM

MEGACYCLE CAMS

90 MITCHELL BLVD. SAN RAFAEL, CA 94903 (415) 472-3195

SPECIAL INSTRUCTIONS

TIMING CARD

MAKE & MODEL: A.C. BRISTOL

CAM # #90096

Timing at .040" Lift at the Follower
TIMING CHECKED WITH ZERO CLEARANCE

*CAM
LIFT*

	INTAKE	EXHAUST
OPEN:	2° BTC	42° BBC
CLOSE:	42° ABC	2° ATC
CAM LIFT:	.208"	.208"
DURATION:	224°	224°
LOBE CENTER:	110°	110°
LASH or RUNNING CLEARANCE (cold)	.004"	.006"

7/92

MEGACYCLE CAMS

90 MITCHELL BLVD. SAN RAFAEL, CA 94903 (415) 472-3195

SPECIAL INSTRUCTIONS

TIMING CARD

MAKE & MODEL: _____

CAM # _____

Timing at .040" Lift at the follower
TIMING CHECKED WITH ZERO CLEARANCE
(see running clearance - lash below)

	INTAKE	EXHAUST
OPEN:	BTC	BBC
CLOSE:	ABC	ATC
Cam LIFT:		
DURATION:		
LOBE CENTER:		
LASH or RUNNING CLEARANCE (cold)		