1. All machine work may be accomplished on a CNC vertical mill capable of 3-4 axis interpolation with sufficient height to accommodate block height. The bore center distances must be maintained within ±.0005 for sleeve installation to seal properly. (see block specification sheets for dimensions)(See #12 for bore center specs.)

2. All machining must produce a good surface finish and the tolerances must be maintained to assure a quality fit and sleeve seal.

3. Block must be square and perpendicular to machine head. Fixturing should be on main journals provided they are not cracked or distorted. Out of Line 1 and 5, main journals will require main line boring prior to block/sleeve machine work.

4. Final sleeve installation should be accomplished with a brass or aluminum mandrel in cylinders 1 through 4, in that order.

5. After sleeve installation, install a deck plate or head, torque and leave til block is cool.

6. Pressure checking of sleeve seal should be accomplished with a top deck plate and water pump plug as shown in photos on Page 11. The main cap bolts can be used to torque down the top deck plate which should be gasketed with thin rubber sheeting.

7. Finish boring and honing should only be accomplished with a deck plate installed.

8. Field service and singular sleeve replacement is possible and practical by using a slide hammer sleeve puller with the drive mandrel "Flatted" and oriented to provide main web clearance. Sleeves can then be ordered from Darton, by cylinder number.

9. If needed for oversized bores, machine sleeve I.D. out to allow .004-.008 from finished size for cylinder honing.

10. Prior to boring for sleeve installation, bore the existing sleeve to .010 over to finish bore dimension stopping at the main bearing web.

11. Seal wire grooves in the top of the sleeves can only be machined after decking.

12. B-16 / B-18—3.543 [90mm]
    F22 & H22/23 & K20—3.701 [94 mm]

NOTES/CAUTIONS

1. Caution: measure each sleeve prior to boring diameter “C” located on the block prints. After measuring each sleeve, machine block to have a .000 to .002 clearance.

2. Take precaution on final washout of block in order not to damage flange sealant or o-rings.

OSHA

Always use approved protective equipment for sight, hearing, breathing, and hands while machining or using chemicals. MSDS sheets are available on chemicals supplied as part of this kit, upon request.
INSTALLATION PROCEDURES

ALL HONDA 4 CYLINDERS

Clean and strip block of all excess bolts, brackets, etc.

Fixture block on machine surface and square, level and secure.

OSHA

Always use approved protective equipment for sight, hearing, breathing, and hands while machining or using chemicals. MSDS sheets are available on chemicals supplied as part of this kit, upon request.
OSHA
Always use approved protective equipment for sight, hearing, breathing, and hands while machining or using chemicals. MSDS sheets are available on chemicals supplied as part of this kit, upon request.
Sequentially bore using bore spacing specifications shown on prints.

OSHA
Always use approved protective equipment for sight, hearing, breathing, and hands while machining or using chemicals. MSDS sheets are available on chemicals supplied as part of this kit, upon request.
Continue boring operation to completely remove parent bore material to crankcase.
1. All machine work may be accomplished on a CNC vertical mill capable of 3-4 axis interpolation with sufficient height to accommodate block height. The bore center distances must be maintained within ±.0005 for sleeve installation to seal properly. (see block specification sheets for dimensions)

2. All Remaining inner bore material must be removed to solid area as described in blueprint for cylinder 1. Use a mill and interpolate height, diameter and depth to clean residual parent bore.

3. Block must be square and perpendicular to machine head. Fixturing should be on

Interpolate a mill cutter and bore upper register according to print.

machining must produce a good surface finish and the tolerances must be maintained to assure a quality fit and sleeve seal.

NOTE: It is essential that all parent bore material be removed down to crankcase surface. No gap can remain. If any gap exists, it must be ground out by hand and filed/deburred (see prints).

OSHA
Always use approved protective equipment for sight, hearing, breathing, and hands while machining or using chemicals. MSDS sheets are available on chemicals supplied as part of this kit, upon request.
OSHA

Always use approved protective equipment for sight, hearing, breathing, and hands while machining or using chemicals. MSDS sheets are available on chemicals supplied as part of this kit, upon request.

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All sleeves totally, coat o’ring grooves with supplied lubricant and install o’rings using standard o’ring practice. **Caution, do not over stretch or nick o’rings, water leaks will result.**

Arrange all sleeves prior to install according to bore number.

OSHA

Always use approved protective equipment for sight, hearing, breathing, and hands while machining or using chemicals. MSDS sheets are available on chemicals supplied as part of this kit, upon request.
INSTALLATION PROCEDURES

ALL HONDA 4 CYLINDERS

Pre-heat block, cool sleeves and install in bore sequence. Be sure to square/align flats 90° to assure fit.

Finished block. Use an appropriate solid deck plate to seal off deck and test installation to 30-40 psi to assure no water leaks.

OSHA

Always use approved protective equipment for sight, hearing, breathing, and hands while machining or using chemicals. MSDS sheets are available on chemicals supplied as part of this kit, upon request.

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* CAUTION *

On some Honda blocks when machining the lower register of the number one cylinder you may reveal casting imperfections, which open to the front cover area. The hole that appears is from one of the bolt seats that hold on the timing cover. (noted by the red pencil) To seal this, apply some silicone to the end of the bolt when replacing the timing cover. Take caution and check for this and other holes because it does not occur on all blocks after machining is completed. Also prior to installation apply flange sealent to highlighted area.(see highlight)

OSHA

Always use approved protective equipment for sight, hearing, breathing, and hands while machining or using chemicals. MSDS sheets are available on chemicals supplied as part of this kit, upon request.
ALL HONDA 4 CYLINDERS

This view shows the free standing wall that is remaining after machining to “B” depth.

*note—free standing wall in sand cast water jacket area will vary in size.

This view shows the finished machine block.
1. Casting ridge begins at a 30° cut to eliminate remaining free standing wall down to surface “BB”.
2. Refer to page 11 for example picture of cut in cylinder #1.

*note—cylinder #1 shown and is typical for cylinder #4.

OSHA
Always use approved protective equipment for sight, hearing, breathing, and hands while machining or using chemicals.
MSDS sheets are available on chemicals supplied as part of this kit, upon request.

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FOR BEST RESULTS:
Darton recommends the use of a Cometic MLS head gasket (non HP) when running any of our MID kits.

NOTES/CAUTIONS:
1. Make sure that block and head surfaces are machined within proper RMS specification. (For specifications contact Cometic tech at (440) 354-0777).
2. Depending on the type of head bolts used, retorque head bolts to proper specifications may be required.

OSHA
Always use approved protective equipment for sight, hearing, breathing, and hands while machining or using chemicals. MSDS sheets are available on chemicals supplied as part of this kit, upon request.
Darton recommends the use of Evans coolant with all MID kits!

**MPG+** for all street applications.

**MPGR** for full race applications.

OSHA

Always use approved protective equipment for sight, hearing, breathing, and hands while machining or using chemicals. MSDS sheets are available on chemicals supplied as part of this kit, upon request.

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All Honda Engines with Darton MID Sleeves

ADDITIONAL INSTRUCTIONS

Break-in, tuning

Fill the engine with a good grade of mineral oil (not synthetic) with viscosity for your bearing clearance and intended use. Prime the oil system before engine start with ignition off using the engine or dyno starter. We require break-in and tuning using an engine dyno or chassis dyno as follows:

- After initial start up, warm up engine at 2000-2500. Precaution should be exercised to prevent excessively rich or lean conditions, which will gall the cylinders. Monitor oil pressure and temperatures.
- After initial run, adjust valves if using adjustable valve train and retorque heads. Check for leaks.
- Street engines will require multiple run ins with increasing rpm and load up to maximum output.

Use of a dyno allows one to apply a pre-set load to allow the piston rings, and other components to seat properly. It is also much easier to monitor temperatures and pressures than while driving. Most dynos are equipped with O₂ and EGT probes to aid in tuning. The timing and fuel curve needs to be tailored to your particular engine to ensure the engine stays out of detonation, which will lead to engine failure. A racing engine is generally built with sufficient clearance to require no further break-in after dyno tuning and power runs. However, we recommend head bolt torques be re-checked cold after dyno testing as the head gaskets will take a set. Remember to replace oil and filter after the dyno session as bearing coatings and metal particles will be trapped in the oil filter. Inspect the oil for foreign material and excessive bearing flakes.

A street engine should be driven moderately for the first thousand miles, as follows:

- full throttle high torque power useage should be limited and never be used until the engine has been running for at least 15 minutes.
- from 0-500 miles, do not exceed 4000 rpm.
- from 500-1000, do not exceed 6000 rpm.
- over 1000 miles, no restrictions.

Also, do not run at the same speed for extended periods during break-in. Make certain the engine is operating at proper coolant temperature and oil pressure. Do not allow the engine to overheat. Make necessary changes if required (radiator, fan, tuning) to get the engine to run in the proper temperature range. We also recommend you do not run synthetic oil until at least 5000 miles. Synthetics work so well that the engine will never break in properly if it is used too soon.

OSHA

Always use approved protective equipment for sight, hearing, breathing, and hands while machining or using chemicals. MSDS sheets are available on chemicals supplied as part of this kit, upon request.
Results with Sunnen Honing Stones on Darton Cylinder Sleeve Material

**EHU 412**

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**EHU 412**

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**EHU 518**

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### Sunnen CV-616 Set-up

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#### JHU 623

**C30 PHT 731 - 15 Seconds**

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Results obtained with Sunnen MAN 845 honing oils. Results may vary with other oils.
Honda M.I.D. D16-S1
Cylinder #1

NOTE:
1. BORE THRU TO MAIN WEB AT FINISH
BORE DIA. +.010
2. ON #1 CYL. ONLY REMOVE REMAINING .320" ALUM WALL
DOWN TO 4.445" BY MILLING OR HAND GRINDING.
THIS WILL ELIMINATE ALL ALUMINUM THAT WOULD
FORM A GAP BETWEEN SLEEVE AND WATER JACKET.
REFER TO PHOTO #6162 IN INSTALLATION MANUAL.

A
.002±.002
[13.208mm±.051mm]

B
4.335±.001
[109.955mm±.025mm]

C
3.240±.001
[82.296mm±.004mm]

D
SEE NOTE #4
Honda M.I.D. D16-S3
Cylinder #2-3-4

NOTE:
1. BORE THRU TO MAIN WEB AT FINISH
BORE DIA +0.010
NOTE:
1. BORE THRU TO MAIN WEB AT FINISH
   BORE DIA +0.010
2. ON #1 CYL ONLY REMOVE REMAINING 320° ALUM WALL
   DOWN TO 4.246 BY MILLING OR HAND GRINDING.
   THIS WILL ELIMINATE ALL ALUM WALL THAT WOULD
   FORM A GAP BETWEEN SLEEVE AND WATER JACKET.
   REFER TO PHOTO #8182 IN INSTALLATION MANUAL.

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<th>APPROVAL</th>
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<tr>
<td>B</td>
<td>1. ON STH # 1 &amp; 2 H4 3.200±.001 WAS 3.154.001</td>
<td>05/06/03</td>
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<td>C</td>
<td>1. ON STH 1-6 0.756 76.1.200/200 WAS 3.001</td>
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A         [13.208mm±.051mm]
B         [81.280mm±.254mm]
C         [133.858mm±.01mm]

Honda M.I.D. B16-S1
Cylinder #1

Darton International, Inc.

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Honda M.I.D. B16-S3
Cylinder #2–3

NOTE:

1. BORE THRU TO MAIN WEB AT FINISH
BORE.008"+0.010

REV
DESCRIPTION
DATE
APPROVAL

A

Φ4.825±0.001
[91.1747±0.025

Φ3.300±0.005
[88.8605±0.127

Φ3.300±0.005
[88.8605±0.127

Φ3.500±0.005
[88.9000±0.125

0.025±0.005 x 60° CHAM

SEE NOTE #1

D

4.245±0.001
[107.823±0.025

5.270±0.000
[133.858±0.00

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Page 23 - revised 4.19.05

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Honda M.I.D. B16-S5
Cylinder #4

NOTE:
1. BORE THRU TO MAIN WEB AT FINISH
BORE DIA +0.010
2. ON #4 CYL ONLY REMOVE REMAINING .020" ALUM WALL
DOWN TO 4.245 BY MILLING OR HAND GRINDING.
THIS WILL ELIMINATE ALL ALUM WALL THAT WOULD
FORM A GAP BETWEEN SLEEVES AND WATER JACKET.
REFER TO PHOTO #8162 IN INSTALLATION MANUAL.

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<th>DESCRIPTION</th>
<th>DATE</th>
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A
.520±.002
[13.208mm±.051mm]

B
3.860±.010
[97.790±.254mm]

C
3.900±.005
[99.080±.127mm]

B
3.750±.001
[95.250±.025mm]

B
4.826±.001
[122.476±.025mm]

SEE NOTE #1
Honda M.I.D. B16-S6
Cylinder #4

---

[Diagram of cylinder with dimensions and notes]
Honda M.I.D. B18-S1
Cylinder #1

NOTE:
1. BORE THRU TO MAIN WEB AT FINISH
BORE Dia. +0.010
2. ON CYL 1 ONLY REMOVE REMAINING 320° ALUM WALL
DOWN TO 4.495 BY WILING OR HAND GRINDING.
THIS WILL ELIMINATE ALL ALUM WALL THAT WOULD
FORM A GAP BETWEEN SLEEVE AND WATER JACKET.
REFER TO PHOTO # B162 IN INSTALLATION MANUAL.

REMARKS

<table>
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<th>DESCRIPTION</th>
<th>DATE</th>
<th>APPROVAL</th>
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</table>
| A   | 1. 90° BORE 1-4 4.205 708+0.000 Max +0.001
     | 90° BORE 1-4 4.205 708+0.000 Max +0.001   | 01/15/04 |          |

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Page 27 - revised 4.19.05
Honda M.I.D. B18-S3
Cylinder #2–3

1. Bore thru to main web at finish
Bore O.D. +0.010

A
1.00±0.002
[25.4±0.051mm]

B
3.100±0.005
[88.900mm±0.020mm]

C
3.501±0.001
[88.900mm±0.004mm]

D
0.25±0.005 x 60° CHAM

SEE NOTE #1

---

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Page 29 - revised 4.19.05
Honda M.I.D. B18-S5
Cylinder #4

NOTE:
1. BORE THRU TO MAIN WEB AT FINISH
   BORE DIA +.010
2. ON #4 CYL ONLY REMOVE REMAINING 28G ALUM WALL DOWN TO .4495 BY MILLING OR HAND GRINDING.
   THIS WILL ELIMINATE ALL ALUM WALL THAT WOULD FORM A GAP BETWEEN SLEEVE AND WATER JACKET.
   REFER TO PHOTO #8162 IN INSTALLATION MANUAL.

Diagram with dimensions and notes.
NOTE:

1. BORE THRU TO MAIN WEB AT FINISH
   BORE 0.01A +0.010

---

Honda M.I.D. H22-S3
Cylinder #2-3
NOTE:
1. DECK BLOCK SURFACE AFTER SLEEVE INSTALLATION.
NOTE:
ON #1 CYL. REMOVE REMAINING 0.020 ALUM.
WALL DOWN TO 0.035 BY MILLING OR HAND GRINDING.
THIS WILL ELIMINATE ALL ALUM. WALL THAT WOULD
FORM A GAP BETWEEN SLEEVE AND WATER JACKET.
REFER TO PHOTO PAGE 11 IN INSTALLATION MANUAL.