PREMIUM DIAMOND DRILLING BITS, SHOES & EQUIPMENT

“Built to last, built to cut fast”
Ultraterra Core Bits

Precision Matrix & Crown Design Chart

Long Life Reaming Shells

Stabilized 10” Reaming Shell

Diamond & Carbide Stabilized Locking Couplings

Stabilized Adaptor Coupling

ALL-TERRAIN Impregnated Casing Shoes

Polycrystalline Core Bits

Fast Cutting Surface Set Core Bits

“Devil’s Dread” Crushed Carbide Tools

Innertube parts

Subs & Adaptors

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**MATRIX SELECTION & TROUBLESHOOTING**

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Call the factory or your representative for additional help.
Free cutting
SOFT matrix
for production
in hard rock

The Drilling Industry has asked for a free cutting, abrasion resistant, straight-hole, long life core bit. They want to cut the hardest rock, faster.

The goal is to maximize productivity, while minimizing the cost to do so.

The UltraTerra Precision Series is designed to deliver exactly that:

- The matrix metallurgy makes use of the latest technology to maximize penetration rates.
- These bits are 30% softer – cutting hard rock faster and straighter.
- Less push means straighter holes.

Check the chart on the next page for complete details or ask your representative today about how you can run the NEW UltraTerra Precision Series (patent pending) bit.

- NEW TECHNOLOGY - WORLDWIDE PATENT PENDING MATRIX PROCESS!
- FASTER PENETRATION RATES
- LONGER LIFE (Ultra-abrasion resistant gauges)
- PRECISION, VIBRATION FREE DRILLING
- STRAIGHTER HOLES
- HEAVY DUTY HARDMETAL RIBS AVAILABLE
## Precision Matrix & Crown Design Chart

<table>
<thead>
<tr>
<th>SOFT ROCK</th>
<th>HARD ROCK DESCRIPTION</th>
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<tr>
<td>Any Abrasion</td>
<td>Extreme Abrasive Some Nil Nil</td>
</tr>
<tr>
<td>Any Fracturing</td>
<td>Extreme Fractured Minor Solid Solid Core</td>
</tr>
<tr>
<td>Hardness &lt;MOHS 3</td>
<td>Soft to Medium Medium Medium with hard bands Hard to Very Hard Extremely Hard</td>
</tr>
</tbody>
</table>

### Surface Set or Polycrystalline Set

**VERY FAST CUTTING**

- **Long-life and abrasion resistant crown design. Good results with any matrix.**

### Wireline bits

- All popular core barrel designs and sizes: A, B, N, H, P

### Conventional bits

- All CDA/DCDMA standard items: IEW/EW-S, IAW/IW-S, AW34, LTK 46, JKT 48, LTK 56, BW44, A, B, N, H

### International metric T-series:

- T(2), T-36, .46, .56, .66, .76, .86, .101

### International metric B-series:

- B-36, 46, 56, 66, 76, 86, 101

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For longest bit life, start with the lowest number in each application zone.

**1X to 3X**

- Face Discharge

**4X to 5X**

- Heavy Duty

**6X to 9X**

- Standard

**10X to 15X**

- Turbo

**Please ask about any size or style not listed.**

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**PREMIUM DIAMOND DRILLING BITS, SHOES & EQUIPMENT**

**Diaset Products Ltd.**

- Head Office: #6 – 7191 Progress Way • Delta, British Columbia • Canada V4G 1K8
- Phone: 1.604.940.9507 • Fax: 1.604.940.9534 • Skype: diaset.sales • E-mail: bits@diaset.com

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**1.800.663.5004 | diaset.com**
Cross reference chart of UltraTerra PrecisionX Matrix types to others:

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<tr>
<th>ROCK TYPE</th>
<th>ROCK FEATURES</th>
<th>UltraTerra PrecisionX (Diaset)</th>
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<th>HOBIC</th>
<th>FORDIA</th>
<th>HAYDEN</th>
<th>DRILLER’S EDGE</th>
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<tr>
<td>Chert</td>
<td>Extremely Hard, Non-Abrasive</td>
<td>#13X* #12X* #11X* #10X* #9X</td>
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<td>13AC-15AC</td>
<td>Shark 12</td>
<td>Shark Adv 13</td>
<td>T04, T19,</td>
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<td>Jasperite</td>
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<td></td>
<td>10, 10COM</td>
<td>11AC</td>
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<td></td>
<td>T25, T26,</td>
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<tr>
<td>Quartzite</td>
<td>SOLID</td>
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<td></td>
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<td></td>
<td></td>
<td>T46</td>
<td>HR14</td>
</tr>
<tr>
<td>Rhyolite</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Diorite</td>
<td>Very Hard, Non-Abrasive</td>
<td>#8X</td>
<td>8, 8ABR</td>
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<td>#7X</td>
<td>8COM</td>
<td>11AC</td>
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<tr>
<td>Gneiss</td>
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<td>T43, T46</td>
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<td>Granite</td>
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<td>7AC, 7AA</td>
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<td>T25, T27</td>
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</tr>
<tr>
<td>Quartz</td>
<td>Medium Grained</td>
<td>#6X</td>
<td>7AC, 8AC, 8AA</td>
<td></td>
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<td></td>
<td></td>
<td>HR10</td>
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<tr>
<td>Skarns</td>
<td>Competent to Fractured</td>
<td></td>
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<td></td>
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<td>Hero 7</td>
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<td></td>
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<tr>
<td>Silicified Volcanics</td>
<td>Hard Abrasive Medium Grained Competent to Fractured</td>
<td>#7X</td>
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<td>7AC, 7AA</td>
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<tr>
<td>Basalt</td>
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<td>5AC</td>
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<td>5, 6</td>
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<tr>
<td>Dolorite</td>
<td>Abrasive Medium Grained</td>
<td>#4X</td>
<td>7AC, 7AA</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>HR10</td>
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<td>Gabbro</td>
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<tr>
<td>Dolomite</td>
<td>Medium Soft</td>
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<td>5AC</td>
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<td>D4, D5, D6,</td>
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<tr>
<td>Weathered Granites</td>
<td>Abrasive Medium to Coarse Grained Competent to Fractured</td>
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<td>5AC</td>
<td>Shark 4</td>
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<td>3, 4</td>
<td>T23</td>
<td>D7, D8</td>
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<tr>
<td>Peridotite</td>
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<td></td>
<td></td>
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<td>HR7,</td>
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<tr>
<td>Shale</td>
<td>Very Abrasive</td>
<td>#2X</td>
<td>2</td>
<td>3AC</td>
<td>Shark 1</td>
<td>2, 1</td>
<td>T23</td>
<td>D2, D3</td>
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<tr>
<td>Limestone</td>
<td>Coarse Grained</td>
<td>#1X</td>
<td>1</td>
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<tr>
<td>Sandstone</td>
<td>Soft</td>
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</tr>
</tbody>
</table>

*Use #10X or higher in solid formations only

Please ask about any size or style not listed.
Long Life
Reaming Shells

Our most popular product.

**STANDARD FEATURES:**

1. **LONG PAD** heavily set with diamonds. The matrix pad butts securely against the bit blank, preventing shoulder wear and “walkover” into the bit blank.

2. **CONCENTRIC CAST PAD** runs true and will not break off. Less vibration.

3. **SPIRAL CARBIDE REINFORCED WATERWAYS**

4. **AAA DIAMONDS** on the leading edge. This is a DIASET EXCLUSIVE, increases penetration rates and enables the shell to cut more freely.

**UPGRADE OPTIONS:**

5. **PREMIUM GOLD:** larger, premium diamonds, 4140 heat treated alloy full hole “polk” or “hexagonal” blank design. LARGE premium diamonds are well anchored, resisting pull out. Heavy-duty “polk” blank.

**PLATINUM:** All the features of our PREMIUM GOLD plus carbide wear pads welded to the blank and ground to size. (Platinum does not use a full hole “polk” blank design)

**GRADES AVAILABLE:**

- STANDARD (Copper)
- PREMIUM (Gold)
- PLATINUM
Long Life Reaming Shells

**THE DIASET DIFFERENCE**

**HEAVY-DUTY “POLK” STYLE BLANK** the thickest blank available in the industry. Milled flutes allow flushing, blank lasts longer. (Gold/Premium grade only)

**LONG MATRIX PAD** heavily set with diamonds. The matrix pad butts securely against the bit blank, preventing shoulder wear and “walkover” into the bit blank.

**SPIRAL TUNGSTEN CARBIDE** reinforced waterways.

**AAA DIAMONDS** on the leading edge.
This is a DIASET EXCLUSIVE, increases penetration rates and enables the shell to cut more freely.

**Wireline bits**
All popular corebarrel designs and
Sizes: A, B, N, H, P

**Conventional bits**
All CDA/DCDMA standard items
IEW/IEW-S, IAW/IAW-S, AW34, LTK 46, JKT 48, LTK 56, BW44, A,B,N,H

**International metric T-series:**
T(2), T-36, .46, .56, .66, .76, .86, 101
**Stabilized 10” Reaming Shells**

**DIASET EXCLUSIVE FEATURES:**

1. **PREMIUM AAA DIAMONDS** on the leading edge. This shell reams and cuts freely, increasing penetration rates.

2. **TWO DIAMOND RING PADS** heavily set with diamonds. We use LARGE premium diamonds to improve the "diamond anchor" in abrasive conditions, the diamonds will not pull out. The “pin” matrix pad butts securely against the bit blank, preventing shoulder wear and bit blank damage due to "walkover".

3. **CONCENTRIC** cast diamond pad, runs true, reduces vibration, increases core recovery. Diamond pad is NOT brazed on, pad will not break off.

4. **SPIRAL, CARBIDE REINFORCED WATERWAYS** 100% hole coverage, smooth, vibration free operation.

5. **4140 HEAT TREATED STEEL** Toughest in the industry.

We are happy to quote on your specific requirements
Diamond & Carbide Stabilized Locking Couplings

**STYLE #1:** the matrix pad butts securely against the adaptor body, preventing shoulder wear and “walkover”.

**STYLE #2:** The matrix pad is mid-body. This design is useful for wedging.

**DIASET EXCLUSIVE FEATURES:**

1. **LONG CARBIDE** stabilizer pad, set with diamonds.

   **CONCENTRIC** cast diamond pad, runs true, reduces vibration. Not brazed on, pad will not break off.

2. **SPIRAL**, full contact, carbide reinforced waterways

3. **"POLK" / "HEXAGONAL"** body design. Stabilizes best, and removes cuttings faster.

   “Non-polk” recommended for faulted, sandy conditions

**HEAT TREATED** 4140 alloy steel.

Strongest in the industry.

**WIRELINE** sizes available: A, B, N, H, P

N.B. - due to design constraints, not all back-ends can have “POLK” style bodies

**UNDERGROUND VERSION:**

no tab on locking coupling

Use with our stabilized adaptor couplings.

This system helps reduce vibration & increases bit penetration and life
Stabilized Adaptor Coupling

THE DIASET DIFFERENCE:
1. SPIRAL, full contact, body
2. “POLK” / “HEXAGONAL” waterway flute design.
   Stabilizes best, and removes cuttings faster.

“Non-polk” recommended for faulted, sandy conditions

HEAT TREATED 4140 alloy steel.
Strongest in the industry.

WIRELINE sizes available: A, B, N, H, P

N.B. - due to design constraints, not all back-ends can have “POLK” style bodies

Proven to drill the straightest holes in the industry

Use with our stabilized locking couplings.
This system helps reduce vibration & increases bit penetration and life

diaset.com
ALL-TERRAIN Impregnated Casing Shoes

STANDARD FEATURES:

- **#6 Matrix is standard** Proven to penetrate overburden FAST
- **Heavy waterway reinforcement** Ensures flushing, keeps tool cool and cutting fast.
- **Excellent gauge reinforcement** Improves life
- **Premium tubing** Strong crown bond. Wrench and abrasion resistant.
- **Computer threaded** Precision cut. Won’t gall or damage your casing.
- **Variety of impregnated depths** to suit your job 1.6, 3.2, 6.5 mm

<table>
<thead>
<tr>
<th>GRADE &amp; APPLICATION GUIDE:</th>
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<tbody>
<tr>
<td><strong>UTILITY SHOE</strong></td>
</tr>
<tr>
<td>- No boulders</td>
</tr>
<tr>
<td>- Soft sand and soils</td>
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<tr>
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</tbody>
</table>

CUSTOM DESIGNS AVAILABLE:

- Heavy-duty style: core bit crown with casing threads.
- Wireline rod threads (rod shoe)
- Non-standard I.D. (Turns a shoe into a bit. Coresprings or soil baskets available)
- Custom O.D. And I.D. Can be built to your specifications.

THE DIASET DIFFERENCE

High Diamond Concentration Helps Diaset shoes last longer

Please ask about any size or style not listed.
Polycrystalline Diamond Core Bits

Exceptional features found in Diaset polycrystalline core bits:

- large 3 mm x 5 mm polycrystalline pins
- heavy duty outside and inside gauge (wear) protection. Tungsten carbide wear pads, plus large, strong gauge polycrystalline pins.
- for soft rock only

Large 3mm x 5mm polycrystalline diamond pins, won’t dull or polish (in the correct application). This used bit shows the exposure that the polypins generate.

Profile of new bit. A portion of the polycrystalline pin protrudes from the free cutting matrix, the rest of the pin is embedded into the matrix.

As the bit wears, the pins wear while retaining exposure. The cylindrical shape of the pin results in even drilling characteristics throughout the life of the bit.
Fast Cutting Surface Set Core Bits

Surface set bits are characterized by:
• very fast cutting in SOFT rock
• low unit price - less than comparable impregnated tools.

The price of premium natural diamond has become very reasonable, making surface set bits an excellent option for all soft formations, such as sandstones, shales, limestone, salt (potash) and similar formations.

CARBONADO type of unique polycrystalline natural diamonds can be used in diamond exploration work. They are exceptionally tough, and provide tremendous penetration rates and tool life in soft kimberlite type formations.

Multi-Step Profile
Recommended for “thick kerf” wireline drilling.
Customer may specify:
- diamond size and grade,
- # steps,
- # waterways (standard or face discharge)
- junk slots
- heavy duty gauge protection

Rounded Profile
Recommended for “thin kerf” wireline, conventional core bits or casing shoes.
Customer may specify:
- diamond size and grade,
- # waterways
- heavy duty gauge protection
“Devil’s Dread” Crushed Carbide Tools

“Devil’s Dread” is the name we’ve given these tools; they are tough, cut fast, last long, and are priced much lower than diamond tools. Crushed agglomerated carbide tools (core bits and casing shoes) provide excellent service in clays, soft shales, sandstones and similar formations. The individual carbide pieces average 1/4” (6.5 mm) in diameter. They are highly irregular in shape, providing self cleaning, large cutting surfaces. The carbide pieces are brazed to the tool blank and to each other, resulting in an “impregnated” cutting action— as one carbide piece wears off, another sharp one below it is exposed and continues cutting. These tools will mill stuck steel also!

Sizes: “N” core and larger.

Typical Devil’s Dread profile.
The carbide is stacked 10 mm high providing “impregnated” style cutting.

Typical crown pattern.
Aggressive carbide pieces agglomerated together with wide waterways to flush cuttings.
Innertube Parts Availability

Innertube parts for 3 wireline systems and many types of conventional systems are available from DIASET.

The “MW” corelifter, a DIASET exclusive, is a well proven and recommended long-life alternative for thinwall wireline systems. DIAMOND IMPREGNATED corelifters are the longest lasting, toughest lifters available. Several wireline sizes are commonly used, minimum orders will apply.

<table>
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<tr>
<th>Conventional Parts</th>
<th>WIREFLINE INNERTUBE PARTS</th>
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<tr>
<td>Hole Sizes: E to H</td>
<td>Hole Sizes: A, B, N, H, P</td>
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<tr>
<td>Systems: most standard</td>
<td>Systems: W/L Wireline</td>
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<tr>
<td>Metric TT &amp; T2</td>
<td>Hole Sizes: A, B, N</td>
</tr>
<tr>
<td>Hole Sizes: TW, DBGM</td>
<td>Hole Sizes: N, H</td>
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<tr>
<td>Systems: WB</td>
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<td>PRODUCT</td>
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<td>Stabilizer</td>
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<td>Core Lifter Case</td>
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<td>MW &amp; Broached Lifter</td>
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<td>Diamond Core Lifter</td>
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<tr>
<td>Slotted Lifter</td>
<td>✔</td>
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</table>
Subs & Adaptors

Diaset subs and adaptors are manufactured from premium 4130 steel alloy - outlasts mild steel by a factor of 2:1. Many standard drilling threadforms are available, as are combinations: pin to pin, pin to box, box to box. Illustrated below are some standard and exclusive designs.

**DIASET (exclusive) “No-Leak” Pin Design.**

O-ring on pin reduces spray - keeps drill crew dry and happy. Available on wireline and flush joint casing designs. *Ask us about it!*

**MANY THREAD FORMS AVAILABLE:**

- **HOLE & CASING SIZES:** E, A, B, N, H, P, S
- **MOST COMMON WIRELINE ROD THREADS**
- **ALL CONVENTIONAL ROD THREADS**
- **CASING THREADS:** *W, *WT, *X
- **API (REG.):** 2 3/8, 2 7/8, 3 1/2, 4 1/2

*We provide CNC machining services
Let us quote your parts!*

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diaset.com

Canada / U.S.A. Toll-free
1.800.663.5004
How to Select the Correct Diaset Core Bit

Selection Guide & Troubleshooting Tips

A Define rock hardness
1. For softer rock: (Moh’s hardness to 5). Use lower matrix numbers #2X - #7X
2. For very soft rock (Moh’s hardness to 3, use a PCD, Polycrystalline or Surface Set
3. Harder rock: Use higher matrix number #8X - 13X

B Define the degree of abrasiveness, fractures or breaks within a particular rock formation
1. Coarse grained and fractured: use a lower matrix number
2. Fine grained and solid: use a higher matrix number

C Define type of diamond drill used:
1. High powered drills (>100 h.p.), choose lower matrix numbers to maximize bit life.
2. Low powered drills choose a higher matrix number to get better penetration.
3. If ground or rig conditions force you to turn at lower RPM, then choose a lower matrix number. (Low RPM makes a matrix act differently)
4. Always use the highest RPM that suits the conditions.

D Tips for selecting the correct matrix type
If you started with a Diaset matrix #7X HD, and if productivity is too slow, try a #8X or higher matrix number. A Turbo crown design will cut the fastest in hard, solid rock. If bit life is too low, try a lower matrix number, such as matrix #6X. Review the troubleshooting guide to pinpoint specific formation problems, to help you fine tune for the selection of the next bit.

If drilling conditions are unknown, start with a Matrix #7X, Heavy Duty (HD) crown design

Call the factory or your representative for additional help.
New Bit & Normal Wear Pattern

New Bit Observation
- v-ring pattern allows bit to start drilling quickly, stabilizes bit to bottom of hole.

Normal Wear
- O.D. and I.D. gauge intact
- flat to slight rounded profile
- “teardrop” matrix wear pattern behind diamond

Comments
- correct drilling procedure
- correct matrix selection
I.D. Gauge Problems

Observations:
- rounded wear to I.D.
- excessive diamond exposure
- complete loss of I.D. gauge

Probable causes:
- Hard, broken or fractured formation
- excessive penetration rate for the RPM used
- insufficient fluid flow
- mis-latched innertube
- high bit load
- improper innertube adjustment

Possible solutions:
- retrieve innertube immediately upon core block
- clean hole properly before each core run
- use a harder (lower number) matrix
- increase pump output.
- check rod string for leaks, split rods
- adjust innertube to allow more fluid flow
- increase RPM
O.D. Gauge Problems

**Observations:**
- rounded wear to O.D.
- complete loss of O.D. gauge

**Probable causes:**
- vibration
- excessive RPM
- bit reaming down an undersize hole
- bit following a worn bit
- insufficient fluid flow (attempting to make bit cut faster)

**Possible solutions:**
- alter RPM to reduce vibration. May have to change matrix to suit new RPM
- stabilize drill string
- adjust bit weight to reduce vibration
- check reaming shell, replace if undersized
- start drilling with new bit well before bottom of hole to ensure hole size matches new bit.
- increase fluid flow
- softer (higher number) matrix
Burnt & Polished Bits

Burnt Bit Observations:
• melted crown.
• diamonds and waterways fused

Probable causes:
• insufficient fluid flow
• split drill rod(s)

Possible solutions:
• check pump
• check innertube adjustment
• check rods for leaks or cracks
• increase fluid flow

Polished Bit Observations:
• no or poor diamond exposure
• smooth surface

Probable causes:
• wrong matrix selection, diamond concentration too high
• drill too small to push this bit

Possible solutions:
• use a softer (higher number) matrix
• try decreasing fluid flow rate slightly
• sandblast face of bit to expose diamonds
• maintain torque, keep the bit cutting