**PURPOSE**
Compute a binary pattern of -1 and +1.

**DESCRIPTION**
The BINPAT function is used in the construction of Yates design matrices for 2-level full factorial designs. If one is constructing a design to examine k factors, such a Yates design will have $2^k$ rows and k columns. The first argument (usually a variable) designates the row numbers in the matrix and so is commonly the sequence 1 to $2^k$. The second argument (usually a parameter) designates the column number in the Yates design matrix and so is commonly 1 to k. The output from the BINPAT command (usually a variable) is a series of -1’s and +1’s corresponding to a given column in the Yates design matrix. Thus if one were constructing a 2-level design to examine 3 factors (i.e., k=3), the Yates design matrix would consist of $2^3 = 8$ rows and k = 3 columns. The Yates design matrix could be computed with the following commands:

```
LET X = SEQUENCE 1 1 8
LET X1 = BINPAT(X,1)
LET X2 = BINPAT(X,2)
LET X3 = BINPAT(X,3)
```

This would yield the following Yates values for X1, X2, and X3:

```
X1  X2  X3

-1  -1  -1
+1  -1  -1
-1  +1  -1
+1  +1  -1
-1  -1  +1
+1  -1  +1
-1  +1  +1
+1  +1  +1
```

**SYNTAX**

```
LET <y2> = BINPAT(<y1>,<a1>) <SUBSET/EXCEPT/FOR qualification>
```

where `<y1>` is a variable or a parameter specifying the rows of the design matrix;

- `<a1>` is a parameter designating the column of the design matrix to compute;

- `<y2>` is a variable or a parameter (depending on what `<y1>` is) where the computed column of the design matrix is stored;

and where the `<SUBSET/EXCEPT/FOR qualification>` is optional and rarely used in this context.

**EXAMPLES**

```
LET X2 = BINPAT(X,2)
LET X3 = BINPAT(X,3)
```

**NOTE**
Yates designs can also be read directly from the various on-line design of experiment files in the DATAPLOT reference file directory. The list of available designs can be viewed by entering the command:

```
LIST 2KINDEX.DAT
```

The $2^3$ design can be read by entering:

```
SKIP 25
READ 2TO3.DAT X1 X2 X3
```

The above file names can vary (e.g., lower case or a different extension) on some operating systems. If you cannot locate these files, check with your local site installer.

**DEFAULT**
None

**SYNONYMS**
None
RELATED COMMANDS

YATES ANALYS = Analyze a Yates design.

APPLICATION

Yates design matrices

IMPLEMENTATION DATE

90/12

PROGRAM

LET X = SEQUENCE 1 1 8
LET X1 = BINPAT(X,1)
LET X2 = BINPAT(X,2)
LET X3 = BINPAT(X,3)
SET WRITE DECIMALS 0
PRINT X1 X2 X3

The following output is generated.

<table>
<thead>
<tr>
<th>X1</th>
<th>X2</th>
<th>X3</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>1</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>-1</td>
<td>1</td>
<td>-1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>-1</td>
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<tr>
<td>-1</td>
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<td>1</td>
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<td>1</td>
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<td>1</td>
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<tr>
<td>-1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>