

# HASHX\$ - Calculate File Hash Total

The HASHX\$ routine can be used to calculate a simple Hash Total for a Global or Windows file.

## 1. Invocation

To calculate the file hash total code:

```
CALL HASHX$ USING fd hash length
```

where *fd* is a **closed** OR\$98 or OR\$98X FD containing the name of the file. The 32-bit hash value is returned in the PIC X(4) hash field. The block-length for the hash algorithm must be specified in the PIC 9(4) COMP length field.

## 2. STOP Codes and Exception Conditions

No STOP codes are generated by HASHX\$.

The following EXIT codes may be returned by HASHX\$:

EXIT code	\$\$COND	Description
12506	6	The file specified in the OR\$98 or OR\$98X FD could not be opened.
12507	7	The file specified in the OR\$98 or OR\$98X FD could not be read.

## 3. Programming Notes

HASHX\$ calculates the Adler-32 checksum by calculating two 16-bit checksums and concatenating their bits into the 32-bit result. The first 16-bit checksum, A, is the sum of all bytes in the string plus one. The second 16-bit checksum, B, is the sum of the individual values of A from each step.

At the beginning of an Adler-32 run, A is initialized to 1, B to 0. The sums are done modulo 65521 (the largest prime number smaller than  $2^{16}$ ).

The function may be expressed as:

$$\begin{aligned}
 A &= 1 + D_1 + D_2 + \dots + D_n \pmod{65521} \\
 B &= (1 + D_1) + (1 + D_1 + D_2) + \dots + (1 + D_1 + D_2 + \dots + D_n) \pmod{65521} \\
 &= n \times D_1 + (n-1) \times D_2 + (n-2) \times D_3 + \dots + D_n + n \pmod{65521}
 \end{aligned}$$

$$Adler-32(D) = B \times 65536 + A$$

where D is the string of bytes for which the checksum is to be calculated, and n is the length of D.

If the supplied block length is 0, the extent of the file is used. If the supplied block length is larger than the file-extent it is truncated to the file extent. The HASHX\$ algorithm is relatively slow and may be slow if the block length is large.

## 4. Examples

[EXAMPLES REQUIRED]

## 5. Copy-Books

None.

## 6. See Also

HASH\$ Calculate File Hash Total

HASHE\$ Calculate File Hash Total (extended)