The conversion operations (TOCOO, TOCSC, TOCSR, TODENSE) accept inputs in COO, CSC, CSR, or dense formats.

MatrixSparse Index Data Type

Index waves, containing row or column indices or indices into values waves (i.e., pointer waves), must be signed 64-bit integer waves which are typically created using Make/L.

MatrixSparse Transformations

You can optionally tell MatrixSparse to operate on a transformed version of an input sparse matrix. The available transformations are named T for transpose, H for Hermitian, and N for no transformation (default).

The opA keyword tells MatrixSparse to operate on a transformed version of sparse matrix A. For example this command:

```
MatrixSparse rowsA=4, colsA=4, csrA={values,columns,ptrB}, opA=T,
            vectorX=vector, operation=MV
```

operates on a transposed version of sparse matrix A.

The opG keyword tells MatrixSparse to operate on a transformed version of sparse matrix G.

Optional Sparse Matrix Information

The MatrixSparse sparseMatrixType keyword allows you to provide optional information characterizing the sparse matrix inputs. If you know the characteristics of a sparse matrix input, you can use sparseMatrixType to pass this information to MatrixSparse. This can improve performance.

The syntax of the sparseMatrixType keyword is:

```
sparseMatrixType={smType,smMode,smDiag}
```

All of the parameters are keywords.

smType: GENERAL, SYMMETRIC, HERMITIAN, TRIANGULAR, DIAGONAL, BLOCK_TRIANGULAR, or BLOCK_DIAGONAL.

smMode: LOWER or UPPER.

smDiag: DIAG or NON_DIAG.

MatrixSparse Operations

This section documents each of the operations supported by **MatrixSparse**. It is assumed that you have read and understood the background material presented under **Sparse Matrices** on page III-151.

The following sections use these abbreviations:

Symbol	Stands For	Specified By Keywords
smA	Sparse matrix A	rowsA, colsA, csrA (1)
smG	Sparse matrix G	rowsG, colsG, csrG (1)
dmB	Dense matrix B	matrixB
dmC	Dense matrix C	matrixC
vX	Vector X	vectorX
vY	Vector Y	vectorY
alpha	Scalar value alpha	alpha and, for complex input, alphai